

**COMPLAINT COUNSEL’S
PROPOSED FINDINGS OF FACT,
CONCLUSIONS OF LAW,
AND ORDER**

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UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION

DOCKET NO. 9305

PUBLIC VERSION

IN THE MATTER OF
UNION OIL COMPANY OF CALIFORNIA

COMPLAINT COUNSEL'S PROPOSED
FINDINGS OF FACT

(VOLUME V)

XXVI. By the Time CARB and the Refiners Learned of the Unocal Patent, the Industry and the Regulators Were “Locked-in” to the Phase 2 Regulations and Related Modifications.

3703. A consumer's options can change over time as the consumer makes choices and incurs significant costs. Where there is “lock-in or sunk costs by the buyer that lead to market power or bargaining power on the seller's side,” this is called “*ex post* lock-in” or “*ex post* bargaining power,” according to both Complaint Counsel's economic expert Dr. Shapiro, and Unocal's economic expert Dr. Teece. (Shapiro, Tr. 7062; Teece, Tr. 7568).

3704. According to Unocal's economic expert Dr. Teece, “the adoption of a standard can affect the bargaining position of the parties.” (RX 1162A at 028). Even though a technology may only be slightly better than alternatives before the standard is adopted, “once the patented technology is adopted as a standard, firms may commit to the standard and invest in complementary assets” and become locked-in. (RX 1162A at 028).

3705. “Lock-in” is just a little more graphic word for significant switching costs. Inherent in the notion of lock-in is that the decision maker had choices *ex ante*. Similarly inherent is the notion that one made a choice and now the decision maker is stuck with it in the sense that it is hard to switch because the options are reduced or less attractive. Lock-in also has a temporal notion in that there is a comparison of two different periods of time.

(Shapiro, Tr. 7345-7346).

3706. CARB and the refiners are locked-in to the CARB regulations by reason of specific investments. CARB and the refiners made choices among many options to implement regulations and modify refineries while ignorant of Unocal's patent applications and Unocal's intention to enforce the resulting patents. (CCPF ¶¶ 2574-2629, 2536-2477, 2543-2573, 3803-3904).
3707. As a consequence of their earlier decisions, CARB and the refiners cannot now practically adopt alternatives to their earlier decisions or switch to others that produce equivalent outcomes. (CCPF ¶¶ 3708-3947).

A. CARB Could Not Roll Back the Phase 2 RFG Regulations to Avoid the Unocal Patent.

3708. By the time CARB became aware of the Unocal patent, CARB was locked-in to the Phase 2 regulations for a variety of reasons. (CX 1720A at 028 (Shapiro Expert Report)).
3709. The fact that CARB is locked-in is significant. Unocal's ability to profitably charge supra-competitive, opportunistic, *ex post* royalties depends in large part upon the fact that CARB had significantly less flexibility in setting its rules after CARB actually learned of Unocal's patent than it did in 1991 when CARB was deceived by Unocal. (CX 1720A at 028 (Shapiro Expert Report)). In other words, Unocal's *ex post* monopoly power is due in large part to the fact that CARB is locked-in to its regulations. (CX 1720A at 028 (Shapiro Expert Report)).
3710. By the time CARB learned about the Unocal patents, CARB could not simply roll back the regulations. Peter Venturini, the lead manager of the Phase 2 project, believed that by late 1993 CARB as a practical matter was locked-in to the Phase 2 regulation as written. (Venturini, Tr. 245-246).
3711. Michael Kenny, CARB's General Counsel at the time, wrote an internal memo in March 1995 stating that rescinding the CARB Phase 2 regulations to deal with the Unocal patent was "not a viable option since the companies have already spent the money for the modifications to the refineries." (CX 900; Kenny, Tr. 6541). As Judge Kenny explained, "My view is that we could not roll back." (Kenny, Tr. 6539-6541).
3712. Both Complaint Counsel's economic expert Dr. Shapiro and Unocal's economic expert Dr. Teece agree that the possibility that CARB might change its regulations is not a viable alternative. In Unocal's '393 patent litigation against six major refiners, Dr. Teece stated, "[I]t would be very hard for CARB, given the public positions it's taken, to then say, well, but now we think we'll roll back this regulation a little bit to make it possible for the potential licensees here to avoid paying a patent to Unocal." (CX 1332 at 032; CX 1720A at 028 (Shapiro Expert Report)).

3713. When asked whether it was a viable alternative for the refiners to go to CARB and seek a change in the regulations after learning of the Unocal patent, Unocal's economic expert Dr. Teece testified, "I don't believe it's viable." (CX 1332 at 032; CX 1720A at 027 (Shapiro Expert Report)).
3714. Dr. Teece testified in this current litigation that he still stands by this earlier testimony, that it was not a viable option for CARB change its regulations *ex post*. (RX 1162A at 096).
3715. Unocal's lawyers in the '393 patent litigation, from the same firm defending the instant FTC action against Unocal, also argued in their closing that CARB was locked in by 1995. Unocal's attorney argued to the jury, "Conclusion. Gee, if you keep these regulations, you'll be forcing the industry to infringe the Unocal patent. Potential significant cost increases resulting. Throwing up all these red herrings to CARB back in 1995. Did CARB relax the regulations? No. You didn't hear one piece of testimony in this case that the regulations were relaxed because they wouldn't. And they won't." (CX 1825 at 089).

B. CARB Knew That Refiners Had Made Billions of Dollars of Specific Investments to Modify Their Refineries.

3716. CARB could not revise the Phase 2 regulations after late 1993 in order to avoid the Unocal patent because CARB had already imposed billions of dollars of modification costs on the refiners and needed to give the refiners assurances that the regulation would be implemented as written. As Dr. Shapiro explained, an important element of lock-in at CARB was the substantial sum that refiners had already invested to comply with the CARB regulations. (CX 1720A at 029 (Shapiro Expert Report)).
3717. Peter Venturini, the lead manager at CARB of the Phase 2 project, testified that CARB recognized the importance of the refiners' investment:

[W]e had adopted a regulation that was imposing costs on the order of, say, \$5 billion on the refineries. They had relied on the action of our agency to commit to those investments.... It was important that there be some certainty, so if – so from our perspective, we were – felt that we had made this major commitment. We had directed the refineries to invest. They were proceeding on that. And if we did not honor our commitment, it wouldn't have been appropriate for us.

(Venturini, Tr. 308-309).

3718. Once refiners made the CARB Phase 2 investments, the refiners generally wanted the

regulations to go into effect, since otherwise they could not recover their specific capital costs. The desire to recover their considerable investments explains, in part, why refiners did not press CARB to rescind the Phase 2 regulations after learning of the first Unocal patent. (CX 1720A at 027 (Shapiro Expert Report)).

3719. A major reason that CARB, after late 1993, could not revise the Phase 2 regulations to avoid the Unocal patent was because “by that time frame, the refiners had committed substantial amounts of capital to make the changes that they needed to make.” (Venturini, Tr. 307).
3720. By the time they learned of the Unocal patent in 1995, CARB officials believed that CARB could not roll back the Phase 2 regulations as a means of resolving the Unocal patent issues because refiners already had spent substantial money. Rolling back the regulations was “not a viable option since the companies have already spent the money for the modifications to the refineries.” (CX 900; Kenny, Tr. 6541).
3721. CARB viewed rolling back the Phase 2 regulation in 1995 as potentially creating competitive inequities, depending on refiners’ different degrees of investment. As Judge Kenny explained, CARB “had moved so far down the path of implementation that it would be a competitive issue with regard to the manufacturers.” (Kenny, Tr. 6539-6541).
3722. In the years following the approval of Phase 2 mandatory specifications in November 1991, CARB staff sufficiently monitored refiners’ progress to know when refiners had made substantial financial and other commitments keyed to the version of Phase 2 adopted by CARB in September 1992. (Venturini, Tr. 246).
3723. The Phase 2 regulations required the California refining industry to provide CARB staff with detailed information on the implementation plans associated with the regulations. The information included “what do they do, what their plans are in how much fuel they will be producing, and so on.” Refiners provided the information in decreasing intervals as implementation approached – yearly, then every six months, then in shorter intervals. Refiners in California complied with the requirements and requests to provide such information. (Courtis, Tr. 5723-5724, 5726).
3724. CARB staff became aware of supply and production issues during the Phase 2 implementation for two reasons described by Mr. Courtis. First, “[w]e wanted to be sure when 1996 comes that the California refiners would be ready to produce clean fuels for the state of California.” CARB staff also tracked implementation because “we wanted to be sure that we assisted the California refineries through the process of preparing for the production of clean fuels.” (Courtis, Tr. 5723-5724). CARB kept abreast of the refiners’ progress in their refinery modifications for Phase 2 because CARB staff believed that a smooth transition and timely compliance by refiners were an important part of the Phase 2 rulemaking. (Venturini, Tr. 246).

3725. CARB sent a letter on September 28, 1993, reminding oil companies about the requirements for providing CARB information on steps taken to comply with the Phase 2 regulations. In this document Mr. Boyd requested from all refiners, in addition to the information required by the regulations, “preliminary estimates of the volumes of reformulated gasoline that they will have the capability to produce and the volume they expect to produce in 1996.” (CX 1518 at 002; Courtis, Tr. 5781-5782).
3726. On November 23, 1993, CARB invited the public to participate in a workshop to discuss the information required in compliance plans. CARB staff informed the public that compliance plans must “contain sufficient information to allow ARB staff to accurately monitor the fuel provider’s compliance efforts” and had the purpose “to assure sufficient production capacity and that adequate supplies of complying fuel will be available to meet demand.” (CX 894; CX 894 at 001; CX 915 at 010; Courtis, Tr. 5782).
3727. CARB expected compliance plans from large refiners starting in March 1993, then March 1994, with quarterly updates after March 1994, and then monthly updates after September 1995. (CX 915 at 008).
3728. CARB informed refiners in the November 1993 workshop that compliance plans should include “all key events and their projected completion dates pertaining to planning, financing, and all necessary construction; sufficient increments of progress so that the producer’s compliance efforts can be monitored.” (CX 915 at 013).
3729. CARB informed refiners and the public in November 1993 it “view[ed] communication as a very critical element of this [transition to RFG] process,” and that CARB staff “encourage[d] frequent and open communication.” (CX 915 at 023).
3730. CARB staff tracked refinery’s plans for compliance, including process units and the costs associated to comply with Phase 2 regulations. CARB staff used information from sources including discussions with industry and environmental impact reports prepared by the refineries. (CX 910; Courtis, Tr. 5782-5783).
3731. Knowing that CARB’s RFG regulations would affect the amount of fuel produced, fuel availability was a “very critical component” of CARB staff’s review in order to avoid fuel shortages. Mr. Courtis kept abreast of supply and production levels for gasoline in California. CARB staff obtained information on gasoline production from both the California Energy Commission and other sources. They also looked at the demand for California-produced fuels. (Courtis, Tr. 5722).
3732. During the Phase 2 modification process, CARB requested periodic compliance reports because CARB was very interested in ensuring that there was an adequate supply of reformulated gasoline as of the effective date of the regulations in 1996. (Lamb, Tr. 1923).

3733. By virtue of the compliance reporting system and CARB staff's continued close interaction with refiner representatives on other matters such as finalizing the predictive model, CARB staff learned that refiners had made significant financial and other investments keyed to the CARB Phase 2 regulations. (Venturini, Tr. 246). CARB received compliance plans from refiners on an annual basis, starting in March 1993. (CX 355 at 005). During 1994, CARB staff and representatives of the California Energy Commission met with refiners to discuss their progress towards Phase 2 compliance. (CX 355).
3734. Unocal wanted to give CARB the message that it wanted certainty. In October 1991 Unocal took the position that "certainty must be the same with specs or model," reflecting the viewpoint that Unocal did not want CARB to change the specifications or regulations after Unocal begun to spend money to modify its refineries. (Lamb, Tr. 2068-2069; CX 449 at 002).
3735. CARB staff also visited refiners to assess their progress towards Phase 2 compliance. (CX 915 at 022). CARB regularly communicated with refiners because CARB provided refiners with assistance on permitting. (CX 1518; Lamb, Tr. 1941).
3736. CARB requested that ARCO provide reports concerning the progress of the modifications of the Carson refinery. "The project team led by Rick Dernbach [of ARCO] gave CARB periodic updates as to the status" of the modifications at the Carson refinery. CARB required ARCO to give periodic updates because "CARB was concerned about supply for California." (Hoffman, Tr. 4920-4921).
3737. Shell reported to CARB the volume of CARB Phase 2 gasoline that Shell intended to produce at its Martinez and Anacortes refineries. This was something that CARB required. (Banducci, Tr. 3475). These reports to CARB were required on a periodic basis. (Banducci, Tr. 3476-3477).
3738. Chevron reported to CARB the progress of its refinery modifications and its intended production levels for both of its California refineries (CX 1702 at 001).
3739. Exxon provided CARB with information about the progress of its Phase 2 modification efforts, including the status of any modification projects, schedules for milestones and estimated volumes. (Eizember, Tr. 3158).
3740. Following the adoption of the Phase 2 specifications, Unocal submitted numerous compliance reports on a periodic basis to CARB. *See* (CX 322 (February 26, 1993); CX 1054 (November 5, 1993); CX 941 (March 1, 1994); CX 978 (May 31, 1994); CX 986 (September 1, 1994); CX 1005 (November 1, 1994); CX 995 (November 29, 1994); CX 1011 (February 28, 1995); CX 411 (May 30, 1995); CX 413 (August 28, 1995); CX 1048 (September 26, 1995); CX 1052 (November 3, 1995); CX 2122 (January 2, 1996)).

3741. There were regular lines of communication open between CARB and members of Auto/Oil and WSPA. CARB met regularly with Auto/Oil and WSPA representatives. (CCPF ¶¶ 938-961, 1015-1029).
3742. Auto/Oil, WSPA and individual refiners knew that CARB was interested in obtaining information related to cost, because CARB had made this point very clear. (CCPF ¶¶ 962-986, 1380-1393, 1977-2013)).
3743. WSPA actively searched for information on refinery modification costs and shared that information with CARB. (CCPF ¶¶ 1004-1005, 1394-1404). Knowledge of the Unocal patents would have been passed on to CARB through the Turner Mason cost study. (CCPF ¶¶ 1977-2013).
3744. There were regular lines of communication between individual refiners and CARB. (CCPF ¶¶ 938-961).
3745. CARB kept abreast of refiners' progress in their refinery modifications for Phase 2 because staff believed that a smooth transition and timely compliance by refiners to be an important part of the Phase 2 rulemaking. (Venturini, Tr. 246).
3746. CARB staff had knowledge of when refiners had made significant financial and other investments keyed to Phase 2 as adopted by virtue of this this compliance reporting system and staff's continued close interaction with refiner representatives on other matters such as finalizing the predictive model. (Venturini, Tr. 246).
3747. Unocal itself claimed that it was locked in by June 1994, Lamb saying -- "it is now June, 1994, and any opportunity to save capital investment has expired. We are now in the process of building facilities that it now appears could have been less expensive if the model was promulgated earlier. Fortunately, however, there is still time to benefit from operational savings." (CX769 at 066 (CARB Transcript of Public Meeting re: Predictive Model (June 9, 1994))).
3748. CARB received compliance plans from refiners on an annual basis, starting in March 1993. (CX 355 at 005). During 1994, CARB staff and representatives of the California Energy Commission met with all refiners, large and small, to discuss their progress towards Phase 2 compliance. (CX 355).
3749. CARB also visited refiners to assess their progress towards Phase 2 compliance. (CX 915 at 022).
3750. CARB was regularly communicating with refiners because CARB was providing refiners with assistance on permitting. (CX 1518; Lamb, Tr. 1941). "Because of the importance of getting the -- of getting as smooth a transition as possible and making sure all the refineries were ready on time, we undertook a significant cooperative effort with the

refineries to assist them in getting their permits, providing information.” (Venturini, Tr. at 246).

3751. A Mobil representative told CARB that as of June 1994 “we’ve committed substantial resources toward complying with the rule and now are supporting CARB’s objective of an orderly and smooth transition to Phase 2 gasoline.” (CX 769 at 089).
3752. In the months leading up to January 1995 CARB knew from its refiner compliance reporting system that refiners had made significant progress in reconfiguring their refineries (CX 355 at 002).

C. The Need for Coordination with Refiners and Auto Manufacturers Prevented CARB From Rescinding the Phase 2 Regulations.

3753. Rescinding the Phase 2 regulation after CARB learned of the Unocal patent would have imposed significant coordination burdens. CARB worked with refiners to ensure that they were able to get permits so that the transition to Phase 2 could be “as smooth a transition as possible.” (Venturini, Tr. at 246).
3754. Unocal’s economic expert, Dr. Teece, notes that coordination costs can be an important impediment to changing standards. (CX 1720A at 031 (Shapiro Expert Report, *citing* David J. Teece and Edward F. Sherry, “Standards Setting and Antitrust,” *Minnesota Law Review*, June 2003, p. 1937)). Altering the regulations late in the regulatory process could increase the likelihood of supply disruptions or operational problems. (CX 1720A at 031-032 (Shapiro Expert Report)).
3755. CARB knew by the time Unocal announced that it had a patent, the refiners had already accomplished engineering and design, made substantial investments, secured permits, and taken other actions needed to ensure compliance with the Phase 2 regulations by the effective date of March 1996. Peter Venturini, the lead manager at CARB of the Phase 2 project, explained that the regulation probably could not have been rescinded after the late 1993 time frame. (Venturini, Tr. 245- 246). Mr. Venturini explained:

Basically after the regulation was enacted, the refiners had a relatively short period of time in which to make the investments, to secure all of the permits, do the engineering and the design, to make sure that they were ready to go in 1996. And by around the late ‘93 time frame, they’ve already made significant commitments in terms of getting to there in time, so that’s probably the practical time frame where they were getting locked-in.

(Venturini, Tr. 245- 246).

3756. CARB created a team within the fuels section to assist California refiners to expedite

permitting “so as to smooth the way towards production of Phase 2 gasoline” Curtis and others on this team talked with local authorities about the benefits of the Phase 2 RFG regulations, including providing detailed information on the local benefits of the regulations. “The overall objective was to work together with the California refining industry to smooth their path in producing reformulated gasoline so we would be able to assure that when 1996 come we’ll have clean reformulated gasoline produced in California at the daily supplies.” (Curtis, Tr. 5724-5725, 5728-5729).

3757. Unocal told CARB in June 1994 that “any opportunity to save capital investment has expired. We are now in the process of building facilities that it now appears could have been less expensive if the model was promulgated earlier.” (CX 769 at 066 (CARB Transcript of Public Meeting re: Predictive Model June 9, 1994)).
3758. In order to be able to complete their projects on time, refiners needed to receive permits about two years before the required start-up of the refinery unit. (Sarna, Tr. 6350).
3759. CARB staff recognized that environmental permitting in California was a “hard process” that started “pretty soon immediately after the adoption of the Phase 2 regulations.” (Curtis, Tr. 5729).
3760. Exxon informed CARB of the critical role of permitting and the risk of delay in getting the permits. “This schedule is very aggressive and involves a good deal of overlap between steps. The most significant critical path item is permitting. Delays in obtaining the necessary permits for this project could jeopardize completion by March 1, 1996 since construction cannot begin until permits have been issued.” (Eizember, Tr. 3126; CX 5057 at 002).
3761. Chevron informed CARB: “If any of our permits are delayed, our ability to produce any California Phase 2 gasoline by the 1996 compliance dates will be severely impacted.” (CX 1702 at 001).
3762. There were costs for coordination not only with refiners but also with automobile manufacturers. After 1993 “the auto manufacturers were relying on this fuel to help them meet the upcoming low-emission vehicle regulations, and a lot of investment had been made and we were basically locked-in at that point.” (Venturini, Tr. 307). Automobile manufacturers “were very interested in this cleaner-burning fuel because they could then design the next generation of vehicles, of the low-emission vehicles, using this fuel and may not have to use other fuels. It was important that there be some certainty, so if – so from our [CARB’s] perspective, we were – felt that we had made this major commitment.” (Venturini, Tr. 308-309).

D. The Need for Coordination by CARB in Implementing a State Implementation Plan Prevented CARB From Rescinding the Phase 2 Regulations.

3763. An impediment to CARB rolling back the Phase 2 regulation as a means of avoiding the Unocal patents was that CARB in November 1994 submitted to the U.S. EPA a State Implementation Plan incorporating emissions reductions attributable to Phase 2 as written. (CX 1720A at 030-031 (Shapiro Expert Report); Kenny, Tr. 6539- 6541).
3764. Judge Kenny, CARB's principal negotiator of the State Implementation Plan with the U.S. EPA, explained: "My view was that we could not roll back ... We had also moved down the path of adopting a state implementation plan that incorporated some of the emission reductions that were associated with the rule. We had submitted that state implementation to the U.S. EPA. We were involved in negotiations with the U.S. EPA and the environmental community." (Kenny, Tr. 6539- 6541).

E. CARB Could Not Avoid the Unocal Patents in Subsequent "Phase 3" Amendments to the RFG Regulations.

1. Events Leading up to the "Phase 3" Rulemaking in 1999.

3765. The CARB Phase 2 regulations went into effect on March 1, 1996, and refiners commenced selling Phase 2 compliant gasoline as of that date. (Venturini, Tr. 135).
3766. In the late 1990s, there was a mounting concern over ground-water pollution effects from the use of methyl tertiary butyl ether ("MTBE") as an oxygenate in California. MTBE had become the refiners' oxygenate of choice to satisfy the oxygenate requirements of the CARB Phase 2 RFG regulation. (Venturini, Tr. 127). In anticipation of the MTBE ban, CARB staff proposed changes to the Phase 2 regulations in a proceeding titled "Phase 3." Peter Venturini, as in Phase 2, was the lead manager of the Phase 3 effort. (Venturini, Tr. 92, 127-129; CX 51 at 009).
3767. Discussions began at CARB prior to 1998 about how CARB would approach concerns about MTBE use. Most of the Phase 3 activities started after 1998. (Courtis, Tr. 5716, 5735).
3768. In 1998 CARB had deferred consideration of additional flexibility for the reformulated gasoline regulations. CARB waited until it could revisit the predictive model for an opportunity to provide additional flexibility to the refining industry. (Simeroth, Tr. 7493-7494).

2. Because of Refiner Sunk Investments, EPA's Approval of the SIP Incorporating Phase 2, and Further California Legislative and Executive Directives, CARB in Phase 3 Could Not Rescind or Reduce the Emissions Benefits of the Phase 2 Rule as a Means of Avoiding the Unocal Patents.

3769. Michael Kenny, as Executive Director of CARB from August 1996 through January 2003, was responsible for proposing the Phase 3 recommendations to the CARB Board and to work with and supervise CARB staff to that end. (Kenny, Tr. 6497-6498, 6535, 6574).
3770. CARB's Phase 3 proceeding was primarily designed to remove the use of MTBE as a way of satisfying CARB Phase 2 requirements. (Kenny, Tr. 6574).
3771. CARB in the Phase 3 proceeding could not rescind or reduce the emissions benefits or Phase 2 as a means of giving relief from the Unocal patent "without significant issues." (Kenny, Tr. 6575-6576). One of the significant issues was that "Phase 2 gasoline regulations had been adopted in 1991. Subsequent to that point in time, the refiners had spent significant amounts of money to comply with Phase 2 requirements." (Kenny, Tr. 6575).
3772. Another "significant issue" that constrained CARB in the Phase 3 proceeding from rescinding or reducing the emissions benefits of the Phase 2 regulation was that Phase 2 was a component of an arduously-negotiated SIP that had been officially approved by the EPA. The EPA had approved that SIP in September 1996. (Kenny, Tr. 6575-6576).
3773. Another reason that CARB in the Phase 3 proceeding could not rescind or reduce the emissions benefits of the Phase 2 regulation was the fact that the California legislature in the so-called "Sher Bill" in 1999 had imposed a statutory prohibition against reducing the emissions reduction benefits of the CARB RFG rule. Governor Davis imposed a similar prohibition by Executive Order in 1999. (Venturini, Tr. 128, 847; CX 55 at 075).
3774. According to Dr. Griffin, the SIP and the Sher Bill limited CARB's options in the Phase 3 proceeding. "It is possible that they may have precluded CARB from changing its regulations *ex post* to allow refiners more flexibility to avoid the patents." (RX 1164A at 053).

3. Due to the Breadth of Unocal's Patent Claims, CARB in Phase 3 Could Not Revise the Phase 2 Rule in a Manner That Avoided Unocal's Patents and Maintained the Necessary Emissions Benefits.

3775. One reason that it was impractical in Phase 3 for CARB to avoid Unocal patents and also maintain emissions benefits was that, just to offset the loss of MTBE, CARB had to exploit pollution-reducing measures that otherwise would have been needed to avoid the Unocal patents. MTBE had the effect of reducing aromatics, benzene, sulfur and olefins because it tended to dilute these hydrocarbons. Steps, like reducing sulfur levels, that

would have been needed if CARB was to avoid Unocal patents by substantially raising T50 requirements or taking other patent-relief steps, were required to be used to offset the loss of MTBE. (Sarna, Tr. 6148; CX 1797A at 004-005 (Sarna Expert Rebuttal Report)).

3776. For the Phase 3 regulations CARB staff had the charge for “coming up with specifications that would allow the phaseout of MTBE, that would preserve the benefits of the program and provide additional flexibility to the producers of Phase 3 reformulated gasoline.” (Simeroth, Tr. 7493).

3777. CARB staff in the Phase 3 proceeding believed that any substantial upward adjustment to the T50 specification to give patent relief could not be adequately offset by more stringent requirements elsewhere. Therefore, CARB proposed an upward adjustment of the T50 flat limit by only two degrees, from 211 to 213 degrees Fahrenheit and preserved the “cap” of 220 degrees Fahrenheit. (CX 1417 at 001).

3778. Judge Kenny testified that one of CARB’s “underlying and overriding concerns was that we not lose emissions reductions. We were under a legislative mandate to not lose emissions reductions. However, we did learn that we could maintain those emissions reductions while providing some flexibility to the refiners which would provide some cost savings, which is what paragraph 2 in this exhibit is referring to.” (Kenny, Tr. 6576-6577).

3779. The slight increase in the T50 flat and averaging limits in Phase 3 did not enable refiners additional flexibility to blend around Unocal’s patent portfolio on a consistent or significant basis. (CX 1797A at 004-005); CCPF ¶¶ 3793-3860, 3928-3941).

3780. {

} (Sarna, Tr. 6288-6289, *in camera*). Each refiner has testified that the Phase 3 regulations have not allowed for substantial blend-around. (CCPF ¶¶ 3928-3941).

4. Unocal Representatives Strenuously Argued in Phase 3 Against Relaxing T50 Requirements on Supposed Environmental Protection Grounds.

3781. During the time he was employed at Unocal, Denny Lamb participated in the CARB Phase 3 proceedings on behalf of Unocal. (Lamb, Tr. 1868-1870; CX 1741). Denny Lamb and David Beehler of Robins, Kaplan, Miller & Ciresi both attended the same meetings relating to the Phase 3 RFG regulations. (Lamb, Tr. 1810-1811). The sign in

sheet for one of the meetings reflects that Lamb attended Phase 3 RFG meetings at CARB with David Beehler of Robins, Kaplan, Miller & Ciresi. (CX 1741). Denny Lamb and David Beehler of Robins, Kaplan, Miller & Ciresi talked about the Phase 3 RFG regulations.

3782. Following Denny Lamb's retirement from Unocal in 1998, he participated in the Phase 3 proceedings and provided comments to CARB as a retained consultant on behalf of the Robins, Kaplan, Miller & Ciresi, the law firm that represented Unocal's RFG patent interests. (Lamb, Tr. 1799-1801, 1812).
3783. On May 23, 2000, Denny Lamb sent Catherine Witherspoon of CARB an email in which he stated that he was "under contract to the law firm representing Unocal's RFG patent interests." (CX 732 at 001; Lamb, Tr. 1801, 1812). In this email, Denny Lamb raised concerns relating to the Phase 3 RFG regulations. (Lamb, Tr. 1801-1802).
3784. During the time that Denny Lamb was under contract to Robins, Kaplan, Miller & Ciresi, he helped draft comments submitted by George Walker of Unocal to CARB concerning the Phase 3 RFG regulations. (Lamb, Tr. 1802-1803, 1812-1813, 2091; CX 372; CX 612 (April 24, 2000 Unocal comments by George Walker)). At this time, David Beehler was Denny Lamb's primary contact person at Robins, Kaplan, Miller & Ciresi. (Lamb, Tr. 1813).
3785. A copy of the April 24, 2000 Unocal comments to CARB that Denny Lamb helped to draft were transmitted by fax both the Charles Strathman of Unocal's legal department and David Beehler of Robins, Kaplan, Miller & Ciresi. (Lamb, Tr. 1809-1810).
3786. The April 24, 2000 comments that Unocal submitted to CARB concerning the Phase 3 RFG proceedings opposed, and took exception to, CARB's proposal to relax the T50 flat and averaging limits. (CX 612 at 001; Lamb, Tr. 1803-1804, 2091-2092). In the April 24, 2000 Unocal comments to CARB, Unocal stated that CARB's proposed change in the T50 flat and averaging limits should be eliminated. (Lamb, Tr. 1814-1815).
3787. During the time that Denny Lamb was under contract to Robins, Kaplan, Miller & Ciresi, he spoke at a CARB public meeting on December 9, 1999 concerning the Phase 3 RFG regulations. (Lamb, Tr. 1815; CX 1768 at 001, 302-303). Denny Lamb characterized CARB's proposed relaxation of the T50 flat and averaging limits as "an attack on T50," and he compared this "attack on T50" to the attack on Pearl Harbor. (Lamb, Tr. 1815-1816, 1818; CX 1768 at 303 ("This week, as you all know we celebrated, I guess if you want to call it a celebration, but it was the 48th anniversary of Pearl Harbor. But on December 7 I opened my email only to find that there had been an attack on T50.")).
3788. By contrast, in the earlier Phase 2 RFG proceedings, Denny Lamb had strenuously argued on behalf of Unocal against numerous provisions of Phase 2, including aromatics, oxygen, RVP, T90, sulfur, olefins and benzene – except for T50. (CX 33 at 007, 009-

012, 014).

3789. Although Unocal previously had argued against most of the provisions in Phase 2 (except T50), Unocal in a letter in the Phase 3 proceeding decried “environmental backsliding” and argued strenuously against any relaxation of T50. (CX 612 at 001, 005).
3790. During the CARB public meeting on December 9, 1999 concerning the Phase 3 RFG regulations, Denny Lamb told the CARB board that he was an “independent consultant” but did not disclose that he was representing the law firm – Robins, Kaplan, Miller & Ciresi – that was representing Unocal’s RFG patent interests. (Lamb, Tr. 1818; CX 1768 at 302-303).
3791. At the time of the Phase 3 RFG proceedings, and by the time Unocal submitted its April 24, 2000 comments to CARB, Unocal had sold its refining and marketing assets to Tosco. (Lamb, Tr. 1807; Answer, ¶ 13). By the time of the CARB Phase 3 RFG proceedings, Unocal no longer produced gasoline for sale in California and owned no refineries or retail service stations. (Lamb, Tr. 1808).
3792. During the Phase 3 proceedings, Denny Lamb did not discuss or disclose to CARB any of Unocal’s pending patent applications. (Lamb, Tr. 1819).

5. CARB’s Issuance of Phase 3 Regulations That Provided No Significant Relief from the Unocal Patents Did Not Signify Indifference to the Patent Issue.

3793. CARB, though locked-in to the Phase 2 regulation as written, continued to be concerned about the potential impact of the Unocal patent, including litigation. (Kenny, Tr. 6577-6578). As Judge Kenny, then the Executive Officer of CARB, explained: “We thought it was a very important issue. We thought we had been misled throughout the process of the Phase 2 regulatory adoption. We thought that was an inappropriate activity on the part of Unocal.” (Kenny, Tr. 6579).
3794. CARB expressed concern about the Unocal patent in a briefing to the Governor’s Office. As Judge Kenny explained: “I think we were looking at this in the big-picture context, is that we have reformulated gasoline, Unocal has a patent on that gasoline that’s produced under that regulatory requirement, and I think we were looking at the consequences to the state of California in particular to consumers who would be purchasing gasoline.” (CX 895A; Kenny, Tr. 6593-6595).
3795. CARB’s sister agency, the California Energy Commission, also expressed concern about the potential impact of the Unocal patents, including a report on a proposed California Strategic Fuel Reserve, on effects of the phase-out of MTBE, and others. The Unocal patents are “of concern to the California Energy Commission.” (Boyd, Tr. 6746-6747, 6749-6751, 6755; CX 1717 at 130).

3796. One CEC report stated: “The Unocal patents are a significant additional burden on California’s ability to meet growing demands for transportation fuels while improving air quality.” (CX 1717 at 130; Boyd, Tr. 6747).
3797. The CEC was informed by a consultant that “Unocal’s gasoline patents reduce gasoline supply.” (Boyd, Tr. 6746).
3798. At a CEC meeting, the CEC was informed that “the Unocal patents scare blenders to death.” (CX 2150 at 268-269; Boyd, Tr. 6749). Another CEC report identified the Unocal patent as a “significant barrier for imports.” (CX 1224 at 015; Boyd, Tr. 6750-6751).
3799. CARB also believed that the Unocal patent was affecting gasoline supply. (Boyd, Tr. 6752-6753).
3800. In 2000, CARB joined in an amicus brief urging the Federal Circuit to overturn the jury verdict upholding the Unocal patent, because Unocal acted “inequitably” by failing to tell CARB about its patent application. (CX 1340 at 013-015).

F. Unocal Itself Claimed in Subsequent Patent Litigation That CARB and the Refiners Were Locked-in.

3801. In the patent litigation between Unocal and six refiners, Dr. Teece testified to the jury on behalf of Unocal stating that refiners, after spending the money to reconfigure their refineries to produce Phase 2 gasoline, would not find it reasonable to tell CARB to change the regulations to give them relief from Unocal patents. Dr. Teece explained:

CARB – and this is thinking back from ‘95 -- is taking the position that these regulations are good and that it’s going to result in a cleaner environment and cleaner burning gasoline is good for California. So it would be very hard for CARB, given the public positions it’s taken, to then say, well, but now we think we’ll roll back this regulation a little bit to make it possible for the potential licensees here to avoid paying a patent to Unocal.

(CX 1332 at 032).

3802. Unocal contended in pleadings from the patent litigation that “asking CARB to change the regulations would not be a realistic means of avoiding infringement.” (CX 1323 at 054-055).

G. Refiners Are “Locked-in” to Producing Infringing Gasoline.

1. By the Time the Refiners Learned of the Unocal Patents, They Had Invested Years of Work in the Phase 2 Modifications.

3803. Unocal did not announce the existence of its patent until a press release on January 31, 1995. (Lane, Tr. 3038-3039; CX 375).
3804. Most refiners, including Shell and ARCO, did not learn about the Unocal patent until the existence of the patent was actually announced. (Hoffman, Tr. 4934; Banducci, Tr. 3484).
3805. Other refiners, including Texaco and Chevron, learned about the Unocal patent sometime in 1994. Although Texaco and Chevron tried to contact Unocal to learn about Unocal's intentions, Unocal declined to express these intentions until its January 31, 1995, press release announcing the existence of the patent. (Derr, Tr. 5096-5099; CX 7048 (Hancock, Dep. at 273); CCPF ¶¶ 2543-2563).

a. By the Time Refiners Learned of the Unocal Patent, They Were Stuck with the Plans for Refinery Modifications That They Had Submitted Shortly After the Filing of Permit Applications.

3806. By the time that the refiners learned about the Unocal patent, the refiners were stuck with their Phase 2 plans and could not take steps to mitigate the effects of the Unocal patent. (CCPF ¶¶ 3807-3904). As Unocal's technical expert Mr. Stellman concedes, refiners in the first half of 1994 could not have abandoned their modifications and still have been able to produce the same amount of CARB gasoline by March 1996. (Stellman, Tr. 7941-7942).
3807. To meet the March 1, 1996 deadline for producing CARB Phase 2 gasoline, it was crucial for refiners to complete the environmental permit process. California refinery projects were constrained by requirements from multiple federal, state and local regulations relating to air, water, and solid waste. (Sarna, Tr. 6350; RX 1154A at 011).
3808. The CARB Phase 2 projects required more than 20 different permits for each refinery. The time required from submitting the application to obtaining all of the permits was at least 12 months and often closer to two years. (RX 1154A at 011; CCPF ¶ 3809).
3809. The primary requirements of the permit process involved meeting the requirements of the California Environmental Quality Act (CEQA), completing the Environmental Impact Report, and obtaining the various permits required by the local air quality management districts. (RX 1154A at 011-012).
3810. Unocal's technical expert Dr. Teece, stated that "As a general matter, due to the times required for the California permitting process, design, and engineering, and given that

construction had to be completed by March 1, 1996 when the Phase 2 regulations went into effect, the revisions planned for a specific refinery were basically set at the time the permit applications were submitted to the state of California, generally in late 1992 and early 1993.” (RX 1165A at 006).

3811. To be able to complete their projects on time, refiners had to receive the permits about two years before the start-up of the unit. (Sarna, Tr. 6350).
3812. Changing the scope of the refinery modifications to permit blend-around of the Unocal patents would have had to happen no later than a few months into the permitting process in order to meet the deadline for producing CARB gasoline. (RX 1154A at 012).
3813. Refiners recognized the importance of completing the permit process early. The permitting process is much more rigorous in California than other places, making permits a key consideration in project approval and management. (Hoffman, Tr. 4877). In general, the permitting process for refinery projects that affected emissions in California took two years. (Hoffman, Tr. 4877-4878).
3814. ARCO was aware that it was on a very tight schedule to obtain permits needed to achieve its refinery modifications in time to meet new air quality regulations: “Air permit delay as a result of the Environmental Impact Report being delayed in the CEQA process is probably the greatest schedule exposure for the project.” (RX 452 at 006).
3815. ARCO’s permitting strategy was based on a worst-case scenario with the understanding that the permits could be narrowed down as the actual situation became more certain. This was because it would take two years to get the permits. (Hoffman, Tr. 4877-4878).
3816. Chevron found it imperative to receive its permits in a timely manner because if any permits were delayed, Chevron’s ability to produce any California Phase 2 gasoline would “be severely impacted”. (CX 1703 at 001).
3817. Exxon expected the permitting process under the California Environmental Quality Act to take 18 months from the time the application was submitted to the time the permits were issued, and in its planning Exxon budgeted 18 months for the permit approval process. (Eizember, Tr. 3119, 3122; CX 975 at 026). It was important to Exxon to ensure that there were no substantial modifications to the scope of permitted activities. This was important because it was critical that the project be completed on time and that Exxon comply with the regulatory requirements. (Eizember, Tr. 3121).
3818. By the time refiners learned of the Unocal patent, every refiner had long submitted its permit application, and thus was locked-into its current modification program. Refiners generally completed their applications by late 1992 or 1993. (CX 355 at 006; CCPF ¶¶ 2334-2350).

b. Opportunities to Make Alternative Refinery Modifications That Would Allow for the Same Level of Production of CARB Gasoline While Avoiding Unocal Patents Were Lost Well Before Refiners Learned of the Patents.

3819. A number of refiners had committed funds to the Phase 2 modifications projects prior to learning about the Unocal patents. For example, prior to learning of the Unocal patent ARCO had committed \$232,973,000 to its CARB Phase 2 modifications project (CX 5093 at 021); Exxon had committed \$125 million to the Benicia Phase 2 project. (CX 980 at 005; Eizember, Tr. 3130); Shell had committed close to \$300 million (Banducci, Tr. 3513-3514); and Chevron's Executive Committee had approved \$1.106 billion in expenditures. (CX 5012 at 002).
3820. A number of refiners had begun construction, and had gone a long way towards completing their projects, prior to learning about the Unocal patents. For example, ARCO's Phase 2 projects were between 51 and 71 percent complete, while ARCO's Clean Air Act projects were 97 percent constructed (CX 5093 at 004). At this time 16 percent of the field construction had been completed for the Exxon Benicia Phase 2 modification. (Eizember, Tr. 3135; CX 5068 at 004). At this time, Shell had completed a number of its projects. (CX 5114 at 004).
3821. As set forth below, refiners were committed to their planned Phase 2 modifications long before learning about the Unocal patent. (CCPF ¶¶ 2321-2477, 3822-3904).

ARCO's (BP's) Carson Refinery

3822. Arco's permit process for modifications to its Carson refinery related to the CARB Phase 2 regulations were already in progress in August, 1991. (Hoffman, Tr. 4878). ARCO began more detailed engineering feasibility studies relating to RFG modifications as early as 1992. (CX 5079; RX 1154A at 013 (Sarna Expert Report)).
3823. Process engineering studies for modifications to ARCO's Carson refinery were begun for the Clean Air Act Phase 1 projects in the second quarter of 1992, and in the third quarter of 1992 for CARB Phase 2 projects. (RX 1154A at 013). ARCO planned to select the technology and the engineering contractors by mid-1992. (CX 5052 at 020).
3824. ARCO believed that, to meet the CAA compliance deadline of January 1, 1995, ARCO required permits for modifications to ARCO's Carson refinery to start above ground construction by June 1, 1993. (CX 5052 at 006).
3825. ARCO engaged in a "Public Comment & Workshop" relating to its permit applications in March of 1993. (CX 355 at 006). Air Permits were issued to ARCO's Carson Refinery in July of 1993. (CX 355 at 006).

3826. Any change to ARCO's modification plan for its Carson refinery would have had to take place no later than approximately July or August 1993 in order to meet the March 1, 1996 deadline for producing CARB gasoline. (RX 1154A at 013).
3827. By February 1994, ARCO was scheduled to spend in excess of \$120 million dollars of its initial \$162 million authorization towards achieving the goals of its Clean Fuels Project. Expenditures related to the Clean Fuels Project were scheduled to be completed by December 1994. (RX 452 at 021). By March 1994 ARCO expected to have spent over \$125 million on clean fuels projects. (CX 5052 at 021).
3828. ARCO began construction on CARB projects during the second half of 1994. (CX 5052 at 020).
3829. ARCO learned of the Unocal patent through Unocal's press release in January 1995. (Hoffman, Tr. 4934).
3830. Upon learning of the patent, the President of ARCO Products Company gave Michael Hoffman, the Head of Engineering at the time for ARCO the "accountability for bringing together relevant parties to address the impacts of the patent on ARCO's business" by the president of ARCO Products Company. (Hoffman, Tr. 4935).
3831. By the time of Unocal's press release, ARCO was "fully committed from a capital standpoint" and already in construction of equipment to meet the CARB specifications at the field of the Carson refinery. (Hoffman, Tr. 4936).
3832. As Mr. Hoffman explained: "We were fully committed. We were in construction in the field at the Carson refinery of the equipment to meet CARB's specification. So there was a decision not to do anything about the project at that time." (Hoffman, Tr. 4936).
3833. The contemporaneous documents demonstrate that ARCO had fully committed to the Phase 2 modifications to its Carson refinery. As of January 1995, "engineering was almost completely finished, procurement was complete, and construction was between a hundred percent and 50 percent complete." (Hoffman, Tr. 4938; CX 5093 at 019-020).
3834. In February 1995, ARCO's construction related to CARB Phase 2 at its Carson refinery was going strong. "Construction manpower continues to ramp up as planned. Peak manpower will be reached in March at approximately 1250 people. B&RB Construction is 71% complete versus a plan of 73% but is on track to finish by July 1st. Performance for the period remained at 1.25." (CX 5093 at 006).
3835. As of February 1995, ARCO's construction for various CARB projects was between 51 and 71 percent complete, while Clean Air Act projects were 97 percent constructed. (CX 5093 at 004).

3836. As of February 1995, ARCO had committed \$232,973,000 to its CARB Phase 2 modifications project. (CX 5093 at 021).

Chevron's El Segundo and Richmond Refineries

3837. The process of modifying Chevron's California refineries took about five years. (Gyorfi, Tr. 5238).

3838. Chevron had to go through several steps to build the modifications to its California refineries. (Gyorfi, Tr. 5237-5238).

3839. Chevron generated a pre-appropriation request that gave initial funding so that estimates could be done to generate appropriation requests. (Gyorfi, Tr. 5237). The pre-appropriation request also started the environmental impact report, which was a necessary step to get the air quality permits. (Gyorfi, Tr. 5237).

3840. The next step was filing for the air quality permits, which takes a considerable amount of time. (Gyorfi, Tr. 5237).

3841. By the time the air quality permits were filed, the final cost estimates were ready to get the appropriation request approved. (Gyorfi, Tr. 5237).

3842. Throughout this time the engineering continued and the long-delivery pieces of equipment were ordered because some of them had very long delivery times. (Gyorfi, Tr. 5237-5238).

3843. Finally, construction agreements were initiated and people were moved on-site to start construction. (Gyorfi, Tr. 5238).

3844. Chevron began engineering feasibility studies in 1991 to support the permitting process for the modification project at El Segundo. Chevron had performed preliminary studies relating to RFG modifications as early as 1990 before any gasoline specification changes were adopted. Other engineering studies were performed in 1991 and throughout 1992 to determine the most economic refinery configuration. The process engineering was begun in January of 1993. (RX 1154A at 015).

3845. Chevron began engineering feasibility studies in 1991 to support the permitting process for the Richmond modification project. Chevron had performed preliminary studies relating to RFG modifications as early as 1990, before any gasoline specification changes were adopted. Other engineering studies were performed in 1991 and throughout 1992 to determine the most economic refinery configuration. The process engineering was begun in the beginning of 1992. (RX 1154A at 017).

3846. Permitting applications and activities by Chevron for CARB projects at El Segundo were conducted in 1992 and 1993. (CX 355 at 006).
3847. Permitting applications and activities by Chevron for CARB projects at Richmond were conducted in late 1992 and 1993. (CX 355 at 006).
3848. A major change by Chevron to the CARB project at El Segundo to enable blending around the Unocal patents would have had major impacts on the other process and utility systems. A scope change of this magnitude should ideally have been initiated at the very beginning of the engineering studies, but not later than a few months into the permitting process, or fourth quarter 1993, to meet the March 1, 1996 deadline for production of CARB gasoline at El Segundo. (RX 1154A at 015).
3849. A major change by Chevron to the CARB project at Richmond to enable blending around the Unocal patents should ideally have been initiated at the very beginning of the engineering studies in the first quarter of 1992 to fully develop an optimized plan. The permitting process was begun in June of 1992 with the permits to construct issued by April of 1994. A scope change of this magnitude should ideally have been initiated at the very beginning of the engineering studies, but not later than a few months into the permitting process, or about the first quarter of 1993, to meet the March 1, 1996 deadline for production of CARB gasoline. (RX 1154A at 017).
3850. As Chevron's former head of refining testified, in late 1993 or early 1994 "at the absolute latest" it became impractical for Chevron to substantially change its refinery modifications plans and still comply with CARB Phase 2. (Gyorfi, Tr. 5239).
3851. Chevron learned about Unocal's patent in April of 1994. (Gyorfi, Tr. 5258). Chevron did not learn about Unocal's intention to enforce the patent until January 1995. (Gyorfi, Tr. 5240).
3852. By late 1993 or early 1994 it was too late for Chevron to change its investment plans. New long-delivery equipment would have to be ordered and an air permit amendment would have to be filed, a process which typically takes between eighteen months and two years and sometimes even longer. By the time that Chevron learned about the existence of the Unocal patent, construction had already begun on a number of projects. By the time that Chevron learned about Unocal's intention to enforce the patent, construction was far along on most projects at both refineries. (CX 5010 at 003-004; Gyorfi, Tr. 5239).
3853. Chevron did not make any changes to its refinery modification program to try to avoid the Unocal patent because it was "just simply way too late." Plants were already under construction and nearing completion and it would have been impossible to make any significant modifications and still achieve the compliance deadline. (Gyorfi, Tr. 5240).

3854. Chevron's executive committee approved \$1.106 billion in expenditures to upgrade its refineries to produce CARB Phase 2 gasoline by September 2, 1993, more than six months before Chevron learned about the Unocal patent's existence, and nearly 15 months before Chevron learned that Unocal intended to enforce its patent. (CX 5012 at 002).

Exxon's (Valero's) Benicia Refinery

3855. At Exxon, "[a]n item on the critical path is one in which if that item is at all delayed, the final completion of the project would be delayed." In order for Exxon to complete the process for modifications of its Benicia refinery in time for the March 1996 deadline, a number of critical path items had to be completed. (Eizember, Tr. 3109).
3856. The first critical path item for Exxon was the completion of the screening studies, which evaluated "the kinds of changes that might be appropriate to respond to the changes that were being considered." (Eizember, Tr. 3104). Exxon believed that these screening studies had to be done by the third quarter of 1992. (CX 975 at 026; Eizember, Tr. 3109).
3857. The work on these screening studies began in late 1990 or early 1991. (Eizember, Tr. 3111.) The Exxon screening study considered a number of options, and as the regulatory requirements became clear, the options were narrowed to a shorter list of the best, which then got presented for final decisions by the appropriate authority. (Eizember, Tr. 3104-3105).
3858. The screening studies were actually completed by the third quarter of 1992. (Eizember, Tr. 3112; CX 975 at 026). Had the screening studies not been completed, the Benicia modifications project would not have been completed on time. (Eizember, Tr. 3112-3113).
3859. The next critical path item for Exxon was to select a scheme, or to define the project. Exxon believed that this item had to be completed by the middle of the third quarter of 1992. (CX 975 at 026; Eizember, Tr. 3109-3110). The selection of the scheme is also referred to at Exxon as the definitive planning basis for the project. (Eizember, Tr. 3106-3107, 3109-3110).
3860. The definitive planning basis for the Benicia Phase 2 modifications was completed by October 20, 1992, and summarized in a presentation prepared and reviewed by the Benicia refinery management. (Eizember, Tr. 3106; CX 975 at 001-002). If project definition had not been completed on time, the Benicia refinery modifications would not have been operable by March 1996. (Eizember, Tr. 3122; CX 975 at 026).
3861. The next critical path item for Exxon was the preparation of permit applications. In order for the permit application to be completed, the definitive planning basis has to be set.

Without the definitive basis of the project, it is impossible to define the emission changes in the permit application. (Eizember, Tr. 3110).

3862. Exxon believed that permit applications had to be completed by the fourth quarter of 1992 in order for the modifications to proceed as scheduled. (CX 975 at 026; Eizember, Tr. 3110). In January 1993, Exxon filed its permit application with the Bay Area Air Quality Management District and the City of Benicia. (CX 5057 at 001).
3863. The permit application for Exxon's Benicia refinery was completed in May of 1993. (CX 355 at 006). The "Public Comment & Workshop" for Exxon's Benicia refinery took place in October of 1993. (CX 355 at 006). Air Permits were issued to Exxon's Benicia refinery in December of 1993. (CX 355 at 006).
3864. For the Benicia Phase 2 modifications, there were several types of permits required, including a permit to construct, issued by the Bay Area Air Quality Management District, a city use permit, and a city building permit. From the perspective of controlling schedule, the city use permit was the permit that Exxon considered the most important. (Eizember, Tr. 3118).
3865. Exxon expected the permitting process under the California Environmental Quality Act to take 18 months from the time the application was submitted to the time it had the permits to construct. Exxon budgeted 18 months for the permit approval process. (Eizember, Tr. 3119, 3122; CX 975 at 026).
3866. Exxon was not allowed to do any facilities construction on the refinery site, such as breaking the ground and digging foundations, until Exxon had received the permit to construct. (Eizember, Tr. 3122; CX 975 at 026). Exxon actually received its permit at the end of 1993. (Eizember, Tr. 3122; CX 5057 at 001; CX 355 at 006).
3867. If Exxon had wanted to make a major change to the refinery modifications project, it needed to identify the change and design it sufficiently in advance of the fourth quarter of 1992 so that the permit application could have been submitted on time. (Eizember, Tr. 3123-3124; CX 975 at 026).
3868. Exxon needed to know about changes early because the projects had to be defined in order to get the permit applications completed on time. If Exxon had decided to make a change in the facilities different from what it had submitted in the permit application, the change would have required a re-application or a major revision to the application and could have substantially extended the time to get the permit. (Eizember, Tr. 3120).
3869. Because the permit application had to be submitted by the middle of the fourth quarter of 1992, Exxon would have decided on the change, designed it and completed a new permit application so that the application could have been submitted in the middle of the fourth quarter of 1992. (Eizember, Tr. 3123-3124; CX 975 at 026).

3870. Exxon “could not have made a project change that would have required a change in the permit once the permit application was submitted and still had been able to meet the start-up date.” (Eizember, Tr. 3123).
3871. As it sought its permit applications, Exxon continued with its modification planning and implementation. On June 23, 1993, the Exxon Management Committee approved the award of the \$225 million Benicia Engineering/Procurement/Construction (“EPC”) contract to The Ralph M. Parsons Company. (CX 5058 at 001). This EPC contract was entered into on June 30, 1993. (CX 5059 at 005; Eizember, Tr. 3115).
3872. The EPC contractor was the primary contractor in charge of doing the detailed engineering, buying the materials, and then erecting all of the steel that ultimately became the Benicia Modifications Project. (Eizember, Tr. 3115).
3873. On April 18, 1994, the Exxon Management Committee approved the final \$176 million for the Benicia Phase 2 modifications. This brought the total amount approved to \$206 million. (CX 5066 at 002; Eizember, Tr. 3132-3133). Exxon ultimately spent approximately \$190 million on the Phase 2 projects. (Eizember, Tr. 3135).
3874. Exxon refinery management first learned of the Unocal patent in February 1995. (Eizember, Tr. 3206).
3875. In January of 1995, just prior to when Exxon refinery management learned of the Unocal patent, 91 percent of the detailed engineering had been completed for the Benicia Phase 2 modifications. (Eizember, Tr. 3134; CX 5068 at 004).
3876. In January 1995, just prior to when Exxon refinery management learned of the Unocal patent, 94 percent of the overall procurement had been completed for the Benicia Phase 2 modifications. (Eizember, Tr. 3134; CX 5068 at 004).
3877. By February 1995, just as Exxon refinery management learned of the Unocal patent, Exxon had committed approximately \$125 million to the Benicia Phase 2 project. (CX 980 at 005; Eizember, Tr. 3130). The term “committed,” in Exxon’s parlance, meant either spent or had become obligated to spend. (Eizember, Tr. 3129- 3130).
3878. By May 1994, it was not even feasible to abandon the substantial modifications and default to the minimal investment options. It was no longer feasible to implement the minimal investment case sometime shortly after the decision to appropriate the Benicia Phase 2 modifications. Eizember Tr. 3208. This decision was made on April 18, 1994. (Eizember, Tr. 3132-3133; CX 5066).
3879. Even if Exxon refinery management had been told about the patent in May 1994, there was nothing that could have been done to change the project that was underway. By

February 1994, Exxon had committed approximately \$20 million to the Benicia Phase 2 project. (Eizember, Tr. 3130).

3880. It was important to Exxon to be sure that permits were issued in accordance with the critical path deadlines “[b]ecause by this schedule there was no room for slippage of the permitting activity without any delay in the project completion.” (Eizember, Tr. 3121).
3881. The project continued and mechanical completion was achieved six days ahead of schedule on November 30, 1995. (CX 5069 at 004; Eizember, Tr. 3136).

Shell’s Martinez Refinery

3882. Shell began engineering feasibility studies in 1991 to support the permitting process for the project to modify its refinery at Martinez. Other engineering studies were being performed in 1991 and throughout 1992 to determine the most economic refinery configuration. The process engineering was begun in January of 1993. (RX 1154A at 023).
3883. A change in the scope of the modifications at Shell’s Martinez refinery to include modifications for blend-around of the Unocal patents should ideally have been initiated at the very beginning of the engineering studies in the first quarter of 1992 to fully develop an optimized plan. (RX 1154A at 023).
3884. In October 1991, Shell began its preparation of the land use permit. The permit application was submitted in February of 1992 with authority to construct being received in December of 1993. (CX 5097 at 001; CX 355 at 006; Banducci, Tr. 3505-3506; CX 5112). Twenty-two months passed from the submittal of the land use permit application to the finalization of the BAAQMD permit. (CX 5097 at 001).
3885. Shell understood that once the land-use permit and air permit approvals are received, a company is basically committed to executing the project in a certain way, and in order to change course the company has to go back and seek amendment to those permits. (Banducci, Tr. 3515).
3886. A major change by Shell in the scope of the Martinez refinery modifications later than the first quarter of 1993 would have delayed the introduction of CARB-compliant gasoline production beyond March 1, 1996. (RX 1154A at 023).
3887. Shell received its land-use permit on October 12, 1993. Shell was not permitted to start construction at the Martinez facility prior to this date. Shell did not do any construction at all or any preparation of the lands prior to this date. (Banducci, Tr. 3505; CX 5110 at 002).
3888. Shell learned about the Unocal patent on January 31, 1995. (Banducci, Tr. 3484).

3889. By the time Shell learned about the Unocal patent on January 31, 1995, nearly all of the \$300 million in capital had been spent in the Phase A project at the Martinez facility, and about \$300 million had been spent in Phase B of the project. (Banducci, Tr. 3513-3514).
3890. As of January 31, 1995, approximately \$1 million dollars a day were being spent on the total project for the Shell Martinez refinery, and approximately 2500 people a day were working the project. Not all of these people were Shell employees; most of them were contractors who had contracts saying that Shell would pay them a certain amount for this project. (Banducci, Tr. 3514).
3891. There would have been severe consequences to stopping or abandoning the Shell Martinez project as of January 31, 1995. These would have included the loss of \$300 million in capital expended for the phase B and residue reduction facilities, the loss of 2500 construction workers going off to seek other sources of employment, and the partially built facilities with no practical value in terms of being able to use them. (Banducci, Tr. 3514-3515).
3892. In March 1994, Shell issued a monthly progress report on its Martinez refinery that included a Clean Fuels Program Overall Progress Schedule. (CX 5114 at 004).
3893. According to this schedule, Phase A of the project at the Martinez refinery included the isomerization unit, hydrogen plant, boiler feedwater, support facilities, and lubes hydrotreater. (CX 5114 at 004).
3894. By the second quarter of 1994, construction had begun on a number of projects related to the Martinez Phase 2 modification. Most others had construction scheduled to begin shortly, with completion in 1996. (CX 5114 at 004).

Texaco's Los Angeles/Wilmington and Bakersfield Refineries

3895. During 1993 Texaco submitted its permit applications for modifications of its refinery at Wilmington, and had already received public comments on its permit applications by January 1994. (CX 355 at 006).
3896. Texaco began reconfiguring its Los Angeles Refinery for CARB Phase 2 shortly after the regulation was issued in November of 1991. By late 1993 the Los Angeles Refinery was locking in to these modifications, a year before Texaco had useful information on the Unocal patent. (CX 7048 (Hancock, Dep. at 276)).
3897. Although Texaco asked Unocal what its intentions were for the patent, Unocal did not make their intentions clear until they released a public announcement on January 31, 1995. By that point in time, the Texaco refinery at Bakersfield was already locked-in to changes. (CX 7048 (Hancock, Dep. at 273)).

3898. For Texaco to have made a decision on how to proceed with regards to CARB compliance refinery modifications, Texaco needed to know what Unocal's intentions were with the patent before they became locked-in. (CX 7048 (Hancock, Dep. at 274)).
3899. A major change in scope of the modifications at Texaco's Wilmington refinery that would have begun no later than the first few months of the permitting process, or no later than the third quarter of 1993, would have delayed the introduction of CARB compliant gasoline production beyond March 1, 1996. (RX 1154A at 018).

Mobil's (ExxonMobil's) Torrance Refinery

3900. The permitting process for the Mobil refinery at Torrance was carried out through 1993. (RX 1154A at 022).
3901. By December 1993, there had already been a public comment and workshop on Mobil's permit application for the modifications to its refinery at Torrance. (CX 355 at 006).
3902. Any change in Mobil's plan for modifications to its Torrance refinery that would have resulted in additions to the project would have had to begin no later than the first quarter of 1993 to avoid missing the March 1, 1996, deadline for producing CARB gasoline. (RX 1154A at 022).

Ultramar's (Valero's) Wilmington Refinery

3903. The "Public Comment & Workshop" for the permitting process for Ultramar's (Valero's) Wilmington refinery took place in August of 1993. (CX 355 at 006).
3904. Air permits were issued to Valero's Wilmington Refinery in August of 1993. (CX 355 at 006).

H. Phase 2 Modification Pushed Refiners Towards the Claims of the Unocal Patents.

3905. Without knowledge of Unocal's patents, refiners made their refinery modifications with the objective of lowering the concentrations of olefins and distillation temperatures (T50 and T90), as the Phase 2 CARB regulations directed them to do. These strategies had the effect of driving the refiners' CARB Phase 2 summer gasoline production towards infringing the Unocal patents. (RX 1154A at 010).
3906. In order to avoid the numerical limitations of the Unocal patents, a refiner must blend according to one of two proven methods:

- a. Method A requires a T50 temperature greater than 210 degrees Fahrenheit and an olefins concentration on a hydrocarbon-only basis greater than 8 percent, a T90 temperature greater than 315, and a paraffins concentration less than 80 percent. (Sarna, Tr. 6136; RX 1154A at 026).
 - b. Method B requires a T50 temperature of greater than 215 degrees and a paraffins concentration less than 80 percent. (Sarna, Tr. 6136; RX 1154A at 026).
3907. Olefins and distillation temperatures were on average high enough before the adoption of the CARB Phase 2 specifications to avoid overlap with claims of the patents, but lower than the cap limits allowed by CARB. (RX 1154A at 010).
3908. Prior to Phase 2, most refiners had gasoline pools that on average had T50 temperatures above 210 degrees. Some of them were above 220 degrees. The average T50 temperature for all California refiners was 212 degrees. (CX 5 at 016; Sarna, Tr. 6204).
3909. Prior to Phase 2, average olefin level for all California refiners in 1991 was 9.60. (CX 5 at 016). Thus, prior to Phase 2, the average refiner had a high enough T50 (212 degrees) and a high enough olefin level (9.60 degrees) to regularly avoid the Unocal patent claims. (CCPF ¶ 3915).
3910. When planning the Phase 2 modifications at its Benicia refinery, Exxon did not try to raise the T50 in Benicia's gasoline pool because the CARB regulations would require a lower T50. (Eizember, Tr. 3177).
3911. When planning the Phase 2 modifications at its Benicia refinery, Exxon was not trying to maintain an olefin level that was at the higher end of the allowable level under the CARB regulations, because Exxon was targeting for a lower average level and thought that reducing olefins was consistent with the general direction of the regulations. (Eizember, Tr. 3177-3178).
3912. In developing its planning basis for the CARB Phase 2 modifications, Exxon selected target values so that its Benicia refinery would be operable on average during the gasoline blending season and as such they would have been set close to the CARB average specifications. (Eizember, Tr. 3142). For example, the T50 was reduced to a target of 200 degrees because the CARB average specification was 200 degrees. (Eizember, Tr. 3144).
3913. As a result of the Phase 2 modifications undertaken by refiners, T50 temperatures generally were brought down. Some refiners brought their T50 temperatures down as low as 195 degrees. (Sarna, Tr. 6205).
3914. In analyzing how to make its refinery modifications, ARCO based its plan on reducing its gasoline specifications below the CARB required specifications. Significantly, ARCO

planned on reducing its T50 to 200 degrees Fahrenheit and its olefin level to 4.5 percent. (CX 5079 at 002).

3915. The average olefin level for all California refiners in 1991 was 9.60. (CX 5 at 016). Consistent with the teachings of CARB, refiners tried to lower the olefin levels. (Sarna, Tr. 6206). By 1997, {

} (RX 1165 at 050, *in camera*).

3916. The average T50 for all California refiners in 1991 was 212 degrees. (CX 5 at 016). By 1997, {

} (RX 1165 at 050, *in camera*).

3917. Prior to Chevron making its Phase 2 refinery modifications, the typical olefin level at the Chevron El Segundo refinery was 13 %. (CX 5018 at 006).

3918. By 1997, the average olefin level at the Chevron El Segundo refinery was { }%. (RX 1165 at 050, *in camera*).

3919. Prior to Chevron making its refinery modifications, the typical T50 at the Chevron El Segundo refinery was 205 degrees Fahrenheit. (CX 5018 at 006).

3920. After Chevron made its refinery modifications, the average T50 at the Chevron El Segundo refinery was { }degrees. (RX 1165 at 050, *in camera*).

3921. The typical olefin level at the Exxon Benicia refinery prior to the Phase 2 modifications was 13 percent. (Eizember, Tr. 3143).

3922. The typical olefin level at the Exxon Benicia refinery at the time Exxon sold the refinery in 1997 was in the range of about 3-4 percent. (Eizember, Tr. 3143; RX 1165 at 050, *in camera* (average olefin level for Benicia in 1997 was { })).

3923. The typical T50 at the Exxon Benicia refinery prior to the refinery modifications was 220 degrees Fahrenheit. (Eizember, Tr. 3144).

3924. The typical T50 at the Exxon Benicia refinery at the time Exxon sold the refinery in 1997 was about 200 degrees or slightly lower. (Eizember, Tr. 3144; RX 1165 at 050, *in camera* (average T50 level for Benicia in 1997 was { })).

1. There Are No Practical Steps That Refiners Can Take Today to Substantially Decrease the Amount of Likely Infringement.

3925. Engineers at each of the refineries have studied whether the refineries can, through operational steps or capital investment, substantially avoid the Unocal patents. No such steps have been identified. (CCPF ¶¶ 3803-3929, 2326-2470).
3926. The fact that refiners are locked in is underscored by the testimony of Unocal’s economic expert, Dr. Griffin. Dr. Griffin testified that in order for the refiners as a whole to reduce their matching rate with the Unocal patents from 88% overlap down to 80% overlap, the refiners would have to spend \$248.5 million in modifications. (Griffin, Tr. 8518-8520; RX 1164A at 058).
3927. Dr. Griffin determined that, assuming a royalty rate of 1.7 cents per gallon, it is uneconomical for the refiners as a whole to spend money on further capital expenditures to reduce the matching rate below 78.7 percent. (Griffin, Tr. 8516, 8518).
3928. {

} (Simonson, Tr. 6040, *in camera*; CCPF ¶¶ 3929-3930).

3929. {

} (Simonson, Tr. 6040, 6046, *in camera*).

3930. {

} (Simonson, Tr. 6079, *in camera*).

3931. Valero Wilmington has also considered capital investments as a specific effort to make CARB gasoline that would not overlap with the Unocal patents, but when all of the claims are looked at together, they’re so encompassing that Valero “doesn’t think it is possible” to avoid the patents. (CX 7050 (Ibergs, Dep. at 67-68)). In order to identify possible capital modifications, “the starting point” is to form an opinion on if there is “a solution that could avoid all of these claims and at the same time blend gasoline in a real world that complies with the CARB and federal regulations.” Valero’s conclusion was that there wasn’t such a solution. (CX 7050 (Ibergs, Dep. at 68); CCPF ¶¶ 3402-3448).

3932. Shell’s experienced refinery and technical experts, such as Bob Millar (L.A. Refinery), Mark Boone (Bakersfield Refinery), and Dr. Chuck Lieder (Westhollow Research Center) have “spent a great deal of time” considering alternative technologies to permit blending around the Unocal patents and have not found any “alternative technology available to achieve the means to blend around the five Unocal patents at comparable cost or comparable production rates for effectiveness.” (CX 7048 (Hancock, Dep. at 255-256)).

3933. In their analyses, these experts have “explored all reasonable alternatives,” including the effect of olefin concentration on the ability to avoid the Unocal patents. (CX 7048 (Hancock, Dep. at 257)).

3934. {

} (CX 7048C
(Hancock, Dep. at 227, *in camera*)).

3935. {

} (CCPF ¶¶ 3508-3509, 3541-3544, 3570, 3576-3579,
3932-3939). {

} (Lieder, Tr. 4815, *in camera*). {

} (Lieder, Tr. 4819, *in camera*).

3936. BP was unable to identify any technologies that would enable it to refine, produce, or supply CARB compliant summertime reformulated gasoline at “lower cost or higher effectiveness” that would avoid the claims of the five Unocal patents. (CX 7078 (Youngman, Dep. at 109-110)). (CCPF ¶¶ 3937-3939).

3937. {

} (CX 7078C (Youngman, Dep. at 76-77, *in camera*)). {

} (CX 7078C (Youngman, Dep. at 76-77, *in camera*)).

3938. Likewise, all of the studies done at BP have not identified any capital changes that could actually be made at the Carson refinery to avoid overlap with the numerical limits of Unocal’s patents to Hoffman or any others at ARCO and BP. (Hoffman, Tr. 4995).

3939. The fact that there were no capital changes made at the Carson refinery to avoid overlap with the numerical limitations of Unocal's patents is consistent with the results of the studies that were conducted relating to the Carson refinery prior to the end of August of 2003. (Hoffman, Tr. 4995-4996).

3940. {

} (Engibous, Tr. 4063-4064, *in camera*).

3941. {

} (Eizember, Tr. 3584, *in camera*).

I. Unocal's Own Experts Have Admitted That Refiners Were Locked-in By Their Prior Huge Investments to Produce RFG Under Phase 2 Regulations.

3942. Unocal's economic expert, Dr. Teece, testified in the '393 litigation that the hypothetical negotiators, in determining Unocal's royalty, would also have to consider that refiners could not build around the patents:

There might be other theoretical options that the hypothetical negotiators would consider as well, such as rebuilding their refineries. However, there is no evidence to suggest that any additional reconfiguration would aid any individual refiner in completely avoiding infringement of Unocal's patent, and Plaintiffs admit they have not considered such an option. Even if such rebuilding were possible, it would likely be very expensive and would take time to implement.

(CX 1323 at 056).

3943. Dr. Teece then testified to the jury that "irreversible fixed assets" are also important, meaning that refiners faced prohibitive cost in having created refineries they could not economically shut down yet would have to spend more money on to upgrade if the regulations were changed yet again.

Question: And what the companies did is they rejected and spent the money to change their refineries so that they could comply with the regulations; correct? That's the sunk money you're talking about.

Dr. Teece: And the analogue here is that they would take the lower cost alternative, which is the license.

Question: But here in this case, by the time of the hypothetical, the defendants have spent all this sunk money, the billions of dollars. They have made the very choice they already said. We'll invest the money so we can control T50 and T90, and it's all in there. It's all in place, and we've spent the money.

Dr. Teece: You're absolutely right, **because they have made billions of dollars of upgrades, but they haven't taken into account the fact that the '393 patent is out there. So they are stuck. They're going to have to take the license.** Precisely my point, Mr. Gould.

(CX 1332 at 051; Teece, Tr. 7706-7707) (emphasis added).

3944. Similarly, {

} (Shapiro, Tr. 7214, *in camera*; Griffin, Tr. 8508-8509, 8516, 8518).

3945. Similarly, in the '393 litigation, Dr. Teece examined the possibility that the refiners could make capital investments to "build around" the Unocal patent and determined that there were "two main problems" with doing that alternative. First, he testified that "it requires a substantial investment" and refiners "have collectively already invested billions of dollars in refinery upgrades to enable them to produce significant quantities of CARB-compliant gasoline." (CX 1346 at 022; Teece, Tr. 7658).

3946. Second, Dr. Teece explained that "the 'build around' option cannot be exercised quickly" because of the time for planning, identifying alternatives, completing the redesign, and getting permits," which "may involve years." Dr. Teece wrote that, in "addition to the time required for the company's internal capital budgeting and planning process, there is a significant time required to identify the needed alternatives and complete the redesign. The firm must also obtain permits for the necessary new construction . . . All told, the delays may involve years . . . Furthermore, whatever build-around investment is contemplated, the prospect of day-to-day variability and episodic infringement is still present . . . In summary, the capital costs likely to be involved in 'build-around' are far

larger than would be justified by the expected costs of the royalties.” (CX 1346 at 023; Teece, Tr. 7658).

3947. Dr. Teece wrote: “There might be other theoretical options that the hypothetical negotiators would consider as well, such as rebuilding their refineries. However, there is no evidence to suggest that any additional reconfiguration would aid any individual refiner in completely avoiding infringement of Unocal’s patent, and Plaintiffs admit they have not considered such an option. Even if such rebuilding were possible, it would likely be very expensive and would take time to implement.” (CX 1323 at 056).

XXVII. Unocal’s Deceptive Conduct Caused it to Achieve Market Power.

A. Unocal’s Deceptive Conduct Before CARB Was Material to CARB’s Decisionmaking.

1. It Was Important for CARB to Know That Unocal’s Plan to Charge Royalties Could Significantly Raise the Cost of the Phase 2 Reformulated Gasoline Regulations.

a. CARB Followed its Statutory Mandates and Considered Cost and Maintaining Competition as an Integral Part of the Phase 2 Reformulated Gasoline Rulemaking.

3948. CARB, in developing motor vehicle fuel specifications, had to consider the “effect of the standards and regulations on the economy of the state.” (CX 1665 (Cal. Health & Safety Code §§ 43013(e), 43018(e) (1991))).

3949. The legislature directed CARB to adopt measures and take actions that it deemed “cost effective.” (CX 1665 (Cal. Health & Safety Code §§ 43013(a), 43018(b)-(c) (1991))).

3950. The legislature directed CARB to adopt standards and regulations to result in “most cost-effective *combination* of control measures.” (CX 1665 (Cal. Health & Safety Code § 43018(c) (1991)) (emphasis added)).
3951. The CARB Board in a Resolution relating to Phase 2 explicitly stated the goal to “define the ‘cleanest’ possible gasoline . . . at the lowest cost to the consumer.” (CX 817 at 003).
3952. CARB in the Phase 2 Staff Report recognized that the goal to provide “the cleanest possible gasoline at the least cost to the consumer.” (Venturini, Tr. 200-201; CX 52 at 006).
3953. CARB staff also stated that “lower cost to the consumer” was relevant in the Predictive Model phase of the rulemaking. (CX 53 at 006, 053, 054).
3954. The fact that a provision may add five to six cents per gallon to the cost of the regulation was viewed as important to CARB’s decision making in 1991 and 1992, according to CARB’s Executive Officer at the time. (Boyd, Tr. 6866-6867).
3955. One reason Executive Officer Boyd would not have approved a Phase 2 rule that permitted Unocal to charge substantial royalties was that “believe me, in those days, a nickel increase in the cost of a gallon of gasoline in California would have extreme negative consequences.” (Boyd, Tr. 6734).
3956. The Executive Officer of CARB viewed cost-of-compliance information as a matter of vital interest to CARB. (Boyd, Tr. 6706-6707).
3957. Executive Officer Boyd, if told of the Unocal patent, would have been concerned that “if indeed Unocal intended to charge in various forms for and to license or to charge royalties, this would have an impact to the cost of the product to refiners which would be passed on to the California consumer, which would then have an impact on the state of California’s economy.” (Boyd, Tr. 6733 - 6734).
3958. According to Executive Officer Boyd, Unocal’s intention actually to enforce an issued patent “would bring a cost element into the equation” and it would become “very relevant to whether or not the regulation could be passed in the form that is was.” (Boyd, Tr. 6907).
3959. According to Chairman Sharpless, “if it turned out that we had information that this rule would have somehow not been a good rule in terms of other reasons, economic reasons, then, I think that would have definitely have been a major consideration on the part of the board. . . . if something came up that said wait a minute, red flag, there’s a problem here, would we march off that cliff? No. Wouldn’t be responsible.” (CX 7063 (Sharpless, Dep. at 198)).

3960. Executive Officer Boyd viewed absolute cost to the consumer as a “standard against which” the Phase 2 rule had to be judged, although comparing Phase 2 with previous measures on a dollars/ton pollution reduced basis was also relevant. (Boyd, Tr. 6867-6868; CX 52 at 078).
3961. CARB staff also did not view the California Clean Air Act as requiring them to propose a rule with maximum feasible emissions regardless of cost. According to Peter Venturini “cost is a very significant consideration throughout this whole process.”(Venturini, Tr. 258-259).
3962. According to Peter Venturini, [o]ne of the things that was very important to us in this regulation was basically the cost, the ultimate cost to the consumer . . . We were embarking at this time on probably one of the most significant efforts that I had every dealt with at the Air Resources Board. We were talking about a measure that could impact California’s refineries to the tune of maybe \$5 billion or more, a regulation that could impact the consumer of ten or more cents per gallon . . . So we were extremely concerned . . .” (Venturini, Tr. 108-109).
3963. CARB staff, consistent with statutory directives, issued a Phase 2 Technical Support Document and Staff Report that analyzed at length estimated compliance costs and cost to the consumer, in both absolute terms and as comparisons with other measures in terms of dollars/ton of emissions reductions. (CX 5 at 137-142, 148; CX 52 at 071-077).
3964. One source of concern was that CARB, in imposing cost on oil companies, likely would be imposing those costs on the driving public. It was Peter Venturini’s experience that “when we impose a cost on the people that we regulate that ultimately that cost is passed on to the consumer. (Venturini, Tr. 166-167; 262-263).
3965. Staff demonstrated concern for ultimate cost to the consumer, by performing analysis showing an estimated cost of 12 to 16 cents per gallon. That translated to 14 to 20 cpg if a fuel economy penalty was added. (CX 52 at 071).
3966. CARB, in line with this concern over cost to the consumer, actively monitored prices of gasoline in California with the assistance of the California Energy Commission. (Venturini, Tr. 265).
3967. CARB staff, now and in Phase 2, had great concern about the impact of CARB’s actions on the economy of the state, particularly, the impact on the consumer. CARB has addressed these issues in all of its regulatory programs and staff conducted relevant analyses in the Phase 2 rulemaking. (Venturini, Tr. 96).
3968. CARB technical staff evaluated the costs to refiners and consumers as a part of considering “the effect of the standards and regulations on the economy of the state,” as

required by California Health and Safety Code § 43018(e). (CX 1665 (Cal. Health & Safety Code § 43018(e) (1991)); Venturini, Tr. 203-205).

3969. The CARB Board found in November 1991 that the Phase 2 regulations would result in an increase of the cost of gasoline between 12 cents and 17 cents per gallon. (CX 817 at 007).
3970. The CARB Board and staff, based on cost considerations, rejected numerous rule proposals that would have made Phase 2 more effective in cleaning the air. (CCPF ¶¶ 2124-2136, 2143-2156, 4002-4003, 4005-4014).
3971. CARB viewed the statutory directive to consider the effect of its Phase 2 regulation on the “economy of the state” as also requiring CARB to make findings relating to the effect of its regulations on competition. (Kenny, Tr. 6512; CX 1665 (Cal. Health & Safety Code §§ 43013(e), 43018(e) (1991))). CARB viewed the “economy of the state” provision as, among other things, a directive to avoid granting monopolies. (Kenny, Tr. 6511-6512; CX 1665 (Cal. Health & Safety Code §§ 43013(e), 43018(e) (1991))).
3972. In certain areas, the statute laid out more explicit duties with respect to how CARB should preserve competition. Section 43635 of the Health & Safety Code, for example required cross-licensing of pollution control devices for used motor vehicles in circumstances where only one such device had been certified in a given subclass. (CX 1665 (Cal. Health & Safety Code § 43635 (1991))).
3973. Chairman Sharpless in the transcript of the November 1991 Board hearing stated, “I’m all for the competition that you [small refiners] provide. There’s also the issue of how we enforce such a thing, the competitive issue, and several others.” (CX 773 at 347).
3974. Chairman Sharpless in the transcript of the November 1991 Board hearing also was concerned that the major refiners, too, not be unduly disadvantaged by the small refiner exception, stating, “I would only comment that the competition equation cuts both ways. By recognizing the difficulty of small refiners . . . it does give you a competitive advantage in the market, and not necessarily, if the majors are going to have to go out and do major capital construction costs, are they going to be able to totally recoup somehow, because you’re keeping prices down through your competition. So, I think the difficulty that this Board is going to have to face in dealing with the small refinery issue is how to balance these competition issues. I, for one, do not want to see small refiners go out of business because of this regulation.” (CX 774 at 060-061).
3975. The Final Statement of Reasons issued by CARB in connection with the Phase 2 rules includes numerous references to CARB’s concern about maintaining competition with respect to small refiners. The Final Statement of Reasons stated: “Elimination of the small refiner segment of the California refining industry would result in job losses and would likely have anti-competitive effects because small refiners contribute to

competition in the petroleum market. We have concluded that it is preferable to tailor our regulations in a way that minimize the likelihood that they will put a number of companies out of business, especially when the regulatory economic costs are higher for these companies than for the rest of the industry.” (CX 10 at 015-016). The Final Statement of Reasons noted that the small refiner exemption reflected CARB’s desire not to “reduce competition in the gasoline market and [cause] an ultimate increase in gasoline prices.” (CX 10 at 187). The Final Statement of Reasons stated that all gasoline types should be treated equally because the costs will be borne by consumers. (CX 10 at 027) .

3976. Chairman Sharpless in the transcript of the November 1991 Board hearing also stated concern about equitable competition among competing alternative fuels. (CX 773 at 278).

b. CARB Expected That Outside Parties, When Urging CARB to Incorporate Research in the Phase 2 Regulations, Would Not Deceive CARB.

3977. Michael Kulakowski, one of Unocal’s point men at CARB on Phase 2, testified that CARB during that rulemaking would have viewed patent information as pertinent to its deliberations. (Kulakowski, Tr. 4586-4587).

3978. CARB staff working on the Phase 2 cost analysis wanted to know “what the actual cost to the refining industry would have been.” (CX 7040 (Aguila, Dep. at 87-88)).

3979. Patents could impose costs like any other cost factor, and there was no CARB guideline or customs at CARB that would have suggested that patent costs were somehow immaterial. (Kenny, Tr. 6514).

3980. Patent costs patents at the time of Phase 2 were “not new” to CARB or outside their ken. Staff was “aware of patents” and that some companies marketed patented additives at the time. (CX 7040 (Aguila, Dep. at 5, 8-11,16)). Ultimately, CARB staff “would have expected to receive all relevant information on costs.” (CX 7040 (Aguila, Dep. at 123)).

3981. In fact, companies before the time of the Phase 2 rulemaking had informed CARB of pending patents. (Venturini, Tr. 187).

3982. Unocal itself had informed CARB about a pending detergent additive patent in 1989 during the Phase 1 proceeding. (Venturini, Tr. 187-189; CX 1093 at 027). Unocal in 1989, describing to CARB staff an intake system detergent, stated that Unocal would be

introducing that summer an intake system detergent as to which Unocal had a “Unique Unocal Patent Pending Development.” (Venturini, Tr. 187-189; CX 1093 at 027).

3983. CARB’s Executive Officer believed that patent costs should be disclosed if they carry a “significant cost” to regulations. (Boyd, Tr. 6904-6905).
3984. CARB staff expected that a company, if offering research for use in the Phase 2 rulemaking, would inform CARB of any associated proprietary interest if it had a significant cost implication for the regulation. (Venturini, Tr. 189; Boyd, Tr. 6907).
3985. Peter Venturini , the lead manager of Phase 2, was aware of no instance in his 30-year career, other the Unocal patent episode, where a company had stated that CARB could use the company’s research and then later stated “by the way, there’s a charge for that.” (Venturini, Tr. 191).
3986. The Auto/Oil agreement and the group’s policy provided for the dedication of intellectual property rights relating to emissions research to the public. (CX 4001; Kiskis, Tr. 3830-3834; CX 7076 (Youngblood, Dep. at 10-11); CX 4179 at 001).
3987. The Turner Mason Report commissioned by WSPA analyzed in detail potential costs of Phase 2. That report included a line item for patent royalties. (CX 1106 at 098-099).
3988. According to James Aguila, who authored much of the Phase 2 cost analysis, the task was “to have a realistic idea of incremental operating costs, which could be construed to mean that could be an overall cost for that company.” (CX 7040 (Aguila, Dep. at 88-89, 141)).
3989. CARB staff informed refiners that CARB staff was “exploring the costs associated with the regulation, which could be portrayed in many different lights.” (CX 7040 (Aguila, Dep. at 193)).
3990. Mr. Aguila, if he had known about a patent cost associated with an upcoming regulation “would have added the cost of a potential patent as a factor in my final cost estimate.” To know where, specifically he would “put” the cost (as asked on examination by Unocal’s counsel), Mr. Aguila would have to understand more about how the patent cost applied – for example, whether to the operation of a piece of equipment, or for producing a certain formula. (CX 7040 (Aguila, Dep. at 196-197)).
3991. Unocal itself had submitted information about process royalties, including royalties associated with Unocal’s hydrocracking patents, to Turner Mason in connection with the preparation of WSPA’s report. (Cunningham, Tr. 4126-4131).

c. Unocal Knew That CARB Expected, and Depended On, the Accuracy and Truthfulness of Cost Information Provided by Refiners.

3992. CARB staff members Peter Venturini and others specifically told Michael Kulakowski of Unocal in mid-1991 that CARB staff needed truthful cost information from the refiners. (Kulakowski, Tr. 4451-4453). According to Michael Kulakowski, “CARB made it clear that they were under a legislative requirement to determine the cost and cost-effectiveness of their regulations when we began the Phase 2 rulemaking.” (Kulakowski, Tr. 4448).
3993. Unocal regulatory staff also knew from CARB’s methodology that staff were serious about obtaining accurate cost estimates. (Kulakowski, Tr. 4468-4469). CARB was using a methodology to convert capital investment costs into cents-per-gallon cost and translating this to consumer cost taking into account a mileage penalty. (Kulakowski, Tr. 4469). The capital investment conversion was not a straight-forward methodology, and CARB had taken the time to understand how to make the calculation. (Kulakowski, Tr. 4469).
3994. In mid-October 1991 Unocal “anticipated an opportunity to sit down in private with CARB and discuss their proposal and some major areas of concern that we might have with that proposal.” Lamb sought the input of Unocal’s Vice President of Refining, Mr. Felderman, so he could present to CARB “refining’s major issues and see if we couldn’t deal with those in this private consultation meeting.” Unocal did have such a meeting with CARB staff. (Lamb, Tr. 2280-2281, 2288; CX 32).
3995. Unocal participated in an industry effort, through the Western States Petroleum Association, to estimate the cost impact of CARB’s Phase 2 regulations. (Kulakowski, Tr. 4472).
3996. CARB staff expected that a company, if offering research for use in the Phase 2 rulemaking, would inform CARB of any associated proprietary interest if it had a significant cost implication for the regulation. (Venturini, Tr. 189 (the lead manager of Phase 2 testifying that disclosure is required if the company “intended to charge for it” and if that patent “was significantly important to our rulemaking, particularly if it had a cost implication.”); Boyd, Tr. 6907 (CARB’s Executive Officer stating that disclosure is necessary when the patent has “significant cost.”)).
3997. An added reason that CARB would expect disclosure of relevant patents was the central role that the Auto/Oil group played in the Phase 2 development process. That Group had an explicit policy that work of the Group given to CARB should be free of intellectual property right claims. *See, e.g.*, (CX 4001; Kiskis, Tr. 3830-3834; CX 7076 (Youngblood, Dep. at 10-11); CX 4179 at 001).
3998. CARB did not expect participants would lie when providing factual information about cost. (Venturini, Tr. 163 (important for cost information to be truthful); Boyd, Tr. 6691 (staff needed truthful information for its own credibility with the Board); Kenny, Tr.

6519-6520 (CARB's historic practice has been one where "parties had dealt with one another in good faith, in an honest and reliable fashion.")).

3999. How CARB staff used WSPA's Turner Mason study illustrates how CARB expected and relied on key truthful facts presented by refiners, while fully recognizing that the refiners could draw dramatically different conclusions. (CX 1106 (Turner Mason Study); CX 10 at 085 (CARB criticisms of methodology); Venturini, Tr. 270-271 (CARB nevertheless relied on Turner Mason in deciding to amend its proposal to permit more averaging)).
4000. WSPA had hired Turner Mason to conduct an analysis for WSPA of the estimated costs of staff's October 4 proposed Phase 2 rule. Turner Mason made a presentation to CARB staff on its findings on November 1, 1991. (Venturini, Tr. 270-273; CX 280).
4001. CARB staff believed that its reliance on actual cost data from the refiners, rather than modeling, resulted in an estimate superior to that provided by WSPA in its cost studies, stating that staff believes the data received from the refiners in the staff's survey depicts the most realistic likely effects of the regulations. This is because the data were provided by refiners themselves and are based on real refinery configurations rather than on the composite hypothetical linear programming model that was used in the Turner Mason Study. (CX 10 at 082 (CARB October 1992 Final Statement of Reasons)).
4002. Because the Turner Mason study had truthfully disclosed its methodology and key assumptions, CARB staff could analyze the study results in light of those assumptions. (CX 10 at 082-084).
4003. CARB staff, despite its disagreement with Turner Mason's ultimate conclusions, relied on the study's cost information about "averaging" provisions to refashion lower-cost proposed Phase 2 RFG regulations to present to the CARB Board in November 1991. (Venturini, Tr. 270-271; CX 1106).

d. During the Phase 2 Rulemaking, CARB Modified the Proposed Phase 2 Regulations Due to Cost Concerns.

4004. The materiality of the Unocal's actual and potential claims for royalties are evident from CARB's actions during the Phase 2 RFG proceeding to minimize cost. (Fletcher, Tr. 6485).
4005. CARB staff presented an alternative proposal at the November 1991 board hearing, which differed from the original October 1991 staff proposal. The board took testimony from witnesses at the hearing and a board member looked at other, more stringent specifications than CARB staff's alternative proposal. The adopted proposal resulted from this process. (Fletcher, Tr. 7019; CX 870; CCPF ¶¶ 2124-2134).

4006. CARB staff – in its most stringent rule proposal of October 1991 – specifically gave relief on the T50 specification in reliance on refiner cost information. (CX 5 at 033; Venturini, Tr. 256-258).
4007. During the development of the Phase 2 RFG proposal CARB staff rejected a T50 flat limit of 200, based on cost concerns. Staff made this decision even though it compromised additional emission reductions. (CX 5 at 033; Venturini, Tr. 256-258).
4008. Peter Venturini explained staff’s adoption of a less stringent T50 requirement than initially considered on the basis that “it would make it more difficult and more costly for refineries to meet other specifications, particularly the RVP limit.” (Venturini, Tr. 256-258).
4009. CARB rejected the stricter requirements proposed by auto companies’s association (“MVMA”) on the basis that, [w]hile the MVMA proposal includes more stringent criteria for some gasoline properties and would achieve greater emissions reductions, it is sufficiently less cost-effective to make the proposed specifications not justified at this time.” (CX 10 at 027).
4010. CARB rejected a suggestion by General Motors of lower caps on sulfur, which would provide greater emission reductions because it “would have significantly increased the costs of producing Phase 2 reformulated gasoline.” (CX 10 at 034).
4011. CARB rejected Ford’s proposed Phase 2 RFG specifications on the grounds that the “emissions reductions that may be derived as a result of the specifications proposed by Ford are not cost-effective.” (CX 10 at 029).
4012. CARB rejected GM’s suggestion of a lower T90 cap because “[w]e do not believe more stringent limits would be cost-effective in the context of the full spectrum of Phase 2 RFG standards.” (CX 10 at 045).
4013. In an instance where General Motors sought certain treatment of the aromatics specification, ARCO took the position that the recommendation would result in a “overly expensive” and “severe reformulation” that ARCO did not know technically how to achieve. ARCO provided CARB with a summary of its analysis on the issue, and the adopted regulations did not include the type of aromatics specification at issue in this instance. (Clossey, Tr. 5507-5509; RX 75 at 001).
4014. Dennis Lamb acknowledged that Unocal and CARB found “common ground” at least in CARB’s acceptance of the concept of avoiding cost by adopting averaging for the T50 specification, and in making certain changes to the aromatics and oxygen specifications. (Lamb, Tr. 2287, 2291-2292).

e. Unocal Urged CARB to Avoid Costs That Had Far Less Potential Impact than Unocal's Patents.

4015. Dennis Lamb was one of Unocal's two employees most involved with the Phase 2 proceeding. Dennis Lamb understood that CARB's economic evaluation during the Phase 2 regulations included producer's costs to comply with the regulations. He understood at the time that compliance costs were a major consideration for CARB in the development of the RFG regulations. (Lamb, Tr. 1945-1946).
4016. Dennis Lamb knew that CARB was concerned about the economic impact the RFG regulations would have on consumer price. (Lamb, Tr. 1945).
4017. Michael Kulakowski was one of two Unocal employees most involved with the Phase 2 proceeding. (Kulakowski, Tr. 4390-4395). Mr. Kulakowski believes that refiners in general should have informed CARB of expected costs of compliance with Phase 2. (Kulakowski, Tr. 4494-4495).
4018. Michael Kulakowski also believed during the rulemaking that CARB would have viewed patent information as pertinent to its deliberations. (Kulakowski, Tr. 4586-4587).
4019. Unocal regulatory staff also knew that the California Clean Air Act specifically required CARB to evaluate the cost and cost-effectiveness of its proposed rules. (Kulakowski, Tr. 4449). Unocal also was well aware that CARB considered both cost and cost-effectiveness in forming the Phase 2 RFG regulations. (Kulakowski, Tr. 4448).
4020. CARB itself made it clear to Unocal representatives that it was under a legislative requirement to determine these factors related to cost. (Kulakowski, Tr. 4448). CARB repeatedly expressed its concern about cost at workshops, discussions with industry members, and by its commitment of resources to cost analysis. (Kulakowski, Tr. 4448).
4021. Unocal at the November 1991 CARB Board hearing expressed support for WSPA's analysis "that identified more cost-effective levels of control for each fuel parameter." (Lamb, Tr. 2302; CX 774 at 023).
4022. Unocal participated in an industry effort, though the Western States Petroleum Association, to estimate the cost impact of CARB's Phase 2 regulations. (Kulakowski, Tr. 4472).
4023. Whereas Unocal is now hoping to charge hundreds of millions of dollars a year, Unocal in the Phase 2 proceeding felt that CARB should view as material the \$10 million Unocal could save if CARB had in place the predictive model. (Kulakowski, Tr. 4544; CX 40 at 008; CX 39 at 004).

4024. Unocal in its November 21, 1991, written comment also complained that a winter oxygenate requirement would “cost the consumer in the range of 7.3 to 10.3 million,” an amount that would translate to a mere fraction of a cent per gallon to the consumer. (CX 33 at 016).
4025. Whereas Unocal now seeks to collect 5.75 cents per gallon for its ‘393 patent, Dennis Lamb testified at the November 1991 Board hearing that a small refiner exemption costing as little as 3 cents per gallon “would destroy any ability the industry may have to recover the extensive investments being required.” (CX 774 at 040).
4026. Dennis Lamb also voiced concern over “flexibility” of the Phase 2 regulations. (CX 774 at 020 (the vehicle testing alternative only gives “an illusion of flexibility.”)).
4027. Unocal in a June 19, 1992 comment opposed a small refiner exemption on the ground that an added cost of 6 cents per gallon would result in an unjustified “economic windfall” and “hamper capital recovery” by competing refiners. (CX 39 at 002-003; Lamb, Tr. 1960).
4028. Kulakowski’s testimony at the August 14, 1992 LEV hearing also reiterated the Unocal position that its potential cost savings of \$10 million annually should be material in CARB’s decision making. (CX 40 at 008).
4029. Dennis Lamb of Unocal stated at a public meeting on June 9, 1994 that Unocal has “always been a strong advocate of a predictive model and the economic flexibility potential of that concept.” (CX 769 at 065).
4030. Unocal in written comments on the predictive model on June 3, 1994 continued to argue for more flexibility to enable additional cost savings. (CX 43).
4031. Unocal, in comments submitted to CARB relating to CARB’s development of a predictive model, cast itself as having taken a position on the predictive model keyed to the “cost effectiveness” of the regulations. Unocal stated: “We are pleased that most of the model decisions have been based on sound science and have observed our basic criteria of necessity and cost effectiveness.” (CX 43 at 005; Lamb, Tr. 2101-2102).

2. To Preserve the Integrity of its Decisionmaking, it Was Important for CARB to Know That Issuing Phase 2 as Adopted Would Facilitate Unocal’s Acquisition of Monopoly Power.

a. Avoiding Favoring Individual Companies Was Integral to CARB’s Mission.

4032. Peter Venturini, the Chief of CARB’s division responsible for reformulated gasoline, believed CARB, if knowing of Unocal’s pending patent, did not have the discretion to go

forward with Phase 2 RFG regulation as written for the very reason that it would be “giving basically one entity a monopoly.” Mr. Venturini further testified that “Our whole system, the whole integrity of our regulatory process would just collapse if it were okay for people to use our regulatory process to gain unfair competitive advantage. It just wouldn’t work.” (Venturini, Tr. 151, 844, 862-863 (CARB not in business of providing benefits to “one entity”)).

4033. Peter Venturini, if knowing in 1991 that Unocal intended to charge money for any fuel with an RVP up to 8.0 and a T50 up to 215 degrees, would have viewed that fact as very important in CARB’s decision making on Phase 2. (Venturini, Tr. 843-844).
4034. CARB Board Chairman Sharpless believed that the CARB Board, if learning of the Unocal pending patent “would have been asking a lot of serious questions about how that would affect market and how that would affect the ability of one company to sort of have control of certain aspect of the marketplace . . . that would be a major concern and I think it would have caused the board to want to have further investigations. I don’t think the board would take action that November had they known.” (CX 7063 (Sharpless, Dep. at 226-227)).
4035. CARB had a policy not to confer a monopoly. (CCPF ¶¶ 2153-2156, 4032).

b. Unocal Believed and Stated Publicly That CARB Was under a Duty to Preserve Competition and a “Level Playing Field.”

4036. Dennis Lamb, Unocal’s representative to CARB, also believed that CARB was interested in preserving competition during the Phase 2 regulations. (Lamb, Tr. 2050).
4037. Unocal believed in a “level playing field.” (Lamb, Tr. 1958; CX 39 at 002)
4038. In public and in its dealings with CARB, Unocal took positions with regard to the Phase 2 regulations that sought “the playing field to be level among all competitors.” (Kulakowski, Tr. 4542).
4039. Unocal strongly opposed waivers that would allow individual refiners to avoid compliance with the Phase 2 regulations due to lack of supply of oxygenates, arguing that such waivers might “result in an imbalance in the marketplace and an unenforceable regulation.” (Kulakowski, Tr. 4541-4542; CX 38 at 002-003).
4040. Unocal told CARB, with respect to the predictive model, should seek “parity in the treatment of parties” and avoid “an imbalance in the marketplace.” (Kulakowski, Tr. 4541-4543; CX 38 at 002-003).
4041. Unocal in a June 19, 1992 comment to CARB opposed a small refiner exemption on the ground that an added cost of 6 cents per gallon would result in an unjustified “economic

windfall” and “hamper capital recovery” by competing refiners. (CX 39 at 002-003; Lamb, Tr. 1960).

4042. Unocal in a June 19, 1992 comment to CARB stated that “Unocal is strongly opposed to differential treatment for any segment of the refining industry.” (CX 39 at 001).
4043. Unocal representative Michael Kulakowski at a CARB hearing on certification fuels for LEV vehicles in August 1992 urged CARB to adhere to the principle of a “level playing field.” (CX 40 at 006 (“Now, Unocal wants to believe that the terms “fuel neutral” and “level playing field” are more than just buzzwords and requests that the Board only approve certification specifications that completely support these concepts.”))).
4044. Unocal in May 1992 opposed an independent refiners’ exemption on the grounds that it would cause “market disruptions, interfere with refiners’ capital recovery, and would benefit companies that were as big or bigger than Unocal.” (CX 311 at 001-002; Kulakowski, Tr. 4491-4493).

3. To Further the Purposes of its Regulatory Decisionmaking, it Was Important for CARB to Know That Unocal’s Pending Patents Could Impact the Supply of Phase 2 Compliant Reformulated Gasoline.

a. CARB Had a Responsibility to Ensure an Adequate Supply of Gasoline.

4045. If CARB had gone forward with Phase 2 as written, knowing of the pending Unocal patent, one or more California refiners likely would have substantially reduced their supply to the California market. (CCPF 433-450, 4088-4650).
4046. CARB viewed maintaining adequate supply of gasoline as a “very important” consideration in the Phase 2 rulemaking. CARB “certainly did not want to be responsible for fuel shortages and gas lines, and so forth, so it was very important to us to make sure that we had the proper balance in the regulations between the emissions reductions, the ability to produce product and the cost to the consumer.” (Venturini, Tr. 263-264).
4047. To Robert Fletcher, a Phase 2 supervisor, maintaining adequate supply was an aspect of satisfying the “feasibility” requirement in § 43018 of the Health & Safety Code. (Fletcher, Tr. 6446-6447; CX 1665 (Cal. Health & Safety Code § 43018(b)(1991))).
4048. CARB staff believed that it could not propose a Phase 2 regulation if even one major refiner reduced its participation in the California gasoline market. (Venturini, Tr. 263).
4049. CARB staff recognized that refiners might not fully invest in the California gasoline market if cost the refinery cost for Phase 2 modifications were too high, and this would result in inadequate supply. (Venturini, Tr. 262-263).

4050. A further reason that CARB staff was concerned about the cost of Phase 2 was that foreign importers and refiners outside California would not replace lost supply if a current refiner reduced its participation in the California market. (Venturini, Tr. 264-265 (“There is ability to bring gasoline from imports, but that typically, because of the distance and so forth, is at a higher cost. And also it was uncertain how many of the refineries outside would be interested in making this fuel.”)).
4051. CARB staff “wanted to be sure when 1996 comes that the California refiners would be ready to produce clean fuels for the state of California.” CARB staff also tracked implementation because “we wanted to be sure that we assisted the California refineries through the process of preparing for the production of clean fuels.” (Courtis, Tr. 5723-5724).
4052. CARB created a fuels team having the overall objective of working “together with the California refining industry to smooth their path in producing reformulated gasoline so we would be able to assure that when 1996 come we’ll have clean reformulated gasoline produced in California at the daily supplies.” (Courtis, Tr. 5724-5725, 5728-5729).
4053. One of the tasks of the Phase 2 CARB staff team was to keep abreast of supply and production levels for gasoline in California. CARB staff obtained information on gasoline production from both the California Energy Commission and other sources. (Courtis, Tr. 5722).
4054. Refiners provided the information in decreasing intervals as implementation approached – yearly, then every six months, then in shorter intervals. Refiners in California complied with the requirements and requests to provide such information. (Courtis, Tr. 5723-5724, 5726).
4055. The CARB Board and staff both considered, as part of their cost inquiry in Phase 2, how the regulation would affect the supply and demand of gasoline in California. (Kenny, Tr. 6517-6518).
4056. One goal in developing the predictive model was to provide refiner flexibility and “greater certainty that there will be no disruptions in the supply of gasoline. This should help avoid price increases due to any real or perceived fuel shortages” (CX 53 at 019, 053).

b. Unocal Was Well Aware That CARB Viewed Any Threat to Supply as a Critical Factor in the Phase 2 Rulemaking and Implementation.

4057. Unocal knew that CARB had concerns about the potential supply of Phase 2 fuel. Dennis Lamb of Unocal recognized that CARB’s concerns with supply “grew over time.”

(Lamb, Tr. 1917-1918, 1945); *see also* (Jessup, Tr. 1297 (one of Unocal's inventors also aware of CARB supply concerns)).

4058. CARB expressed concerns at the March 1995 meeting with Unocal about how the '393 patent might affect supply. (Lamb, Tr. 2046-2047).
4059. According to Unocal, anything that could affect the volume of Phase 2 gasoline produced "should have concerned CARB to assure a successful implementation of the program." (Kulakowski, Tr. 4489).
4060. Unocal during the predictive model development expressed supposed concern that the industry as a whole not suffer if certain predictive model aspects "adversely impact the volume and production cost of RFG." (CX 393 at 002).
4061. In opposing a small refiner exception to CARB's Phase 2 rules, Unocal argued that the small refiners exception "could affect the decisions of other refiners on how to invest to make CARB gasoline. It could affect the volume that they decided to try to produce and the extent to which they modified their refineries to produce that gasoline." (Kulakowski, Tr. 4489).
4062. According to Unocal, anything that could affect the volume of Phase 2 gasoline produced "should have concerned CARB to assure a successful implementation of the program." (Kulakowski, Tr. 4489).

B. CARB Officials Relied on Unocal's Deceptive Conduct and Were Deceived.

1. CARB Included a T50 Specification in the Regulations Because Unocal Presented its Research to CARB Staff.

a. CARB Staff Did Not Have Sufficient Information to Justify a T50 Specification Before Receiving Unocal's Release of Its 5/14 Research.

4063. As of January 1991 CARB staff had not identified T50 as an independent parameter to include in any formal proposal for Phase 2. CARB staff had not seen sufficient information to justify an independent T50 standard. (CX 785 at 005; Curtis, Tr. 5758-5759; Venturini, Tr. 177-178).
4064. In early summer 1991 CARB staff focused its attention on two distillation parameters – T90 and driveability index. According to Mr. Fletcher, staff had awareness that T50 might have some benefits, but lacked technical justification for a T50 specification. CARB staff shared with the public its thoughts on distillation parameters in the notice for the June workshop, and then at the workshop itself. (Fletcher, Tr. 6459-6460).

4065. On May 23, 1991, CARB staff disseminated a public notice for a June 11 workshop for Phase 2. This notice listed as distillation properties “under consideration” T90 and driveability index, but did not mention T50 as an independent specification. (Venturini, Tr. 206-208; CX 492 at 004).
4066. CARB staff at the June 11, 1991, workshop similarly did not present T50 as an independent specification under consideration. The slide presentation lists T90 and driveability index as the distillation parameters under consideration, with the levels for these specifications to be determined. (CX 1047 at 014; Venturini, Tr. 208-209).
4067. As of June 11, 1991, CARB staff did not possess information sufficient to constitute substantial evidence for a T50 specification. (Venturini, Tr. 208-209; Fletcher, Tr. 6460).
4068. Unocal knew that prior to the June 20, 1991 meeting with CARB, CARB had not proposed a T50 specification. (CCPF ¶¶ 1069-1082).
4069. CARB staff as of August 1991 did not have substantial evidence to support a T50 specification, absent permission to rely on Unocal’s 5/14 research. (Fletcher, Tr. 6486; Curtis, Tr. 5764; CCPF ¶¶ 1277-1314).

b. The Official Rulemaking Record for Phase 2 RFG Regulations Clearly Shows CARB’s Reliance on Unocal’s T50 Research.

4070. The California APA required CARB to create a Final Statement of Reasons to explain in detail the bases for its decisions in Phase 2. (CX 7029 at 059 (Cal. Gov’t Code § 11346.7 (1991)); CX 10).
4071. CARB staff “prepared detailed technical response to justify the technical view” in relation to each comment, and this response appears in the Final Statement of Reasons after the summarized comment. (Curtis, Tr. 5755; CX 10). The Staff Report refers directly to Unocal’s research results, noting the Unocal has “conducted studies showing that reducing T50 results in a decrease in emissions of volatile organic compounds and carbon monoxide, and has no significant effect on emissions of oxides of nitrogen. The Unocal results indicate that a 10 degree reduction in T50 results in a nine percent decrease in volatile organic compound emissions and a five percent decrease in carbon monoxide emissions.” (CX 52 at 033; Fletcher, Tr. 6468).
4072. CARB’s Final Statement of Reasons explicitly states that the results from Unocal’s research formed the basis for the T50 specification: “In fact, Unocal has evaluated the effects of T50, and it is the results from this study that form the basis for the T50 specification.” (CX 10 at 075; Venturini, Tr. 294-295).

4073. CARB's Final Statement of Reasons explicitly explains why Unocal's research information played a crucial role in the T50 specification: "The Unocal study was used in the discussion of the effect of T50 on emissions because it is the only study that evaluated T50 and provided a statistical analysis." (CX10 at 075; Venturini, Tr. 296).
4074. CARB's Final Statement of Reasons also explicitly explains how Unocal's research information complemented other research used by CARB staff to develop the regulation proposal: "[t]he limit on T50 was necessarily based on other work (Unocal) because the Auto/Oil work did not examine T50." (CX 10 at 048).
4075. CARB's Final Statement of Reasons singles out the Unocal research as the one T50 study that independently controlled for T50's effects, stating, "Unocal tested an extensive fuel matrix which included T50 as one design variable. . . . The Auto/Oil study did not include T50 as a variable. . . . Therefore, the Unocal work should provide a superior estimate of the effect of T50 on emissions." (CX 10 at 047; Venturini, Tr. 294-295).
4076. CARB staff identified reliance on research from Unocal to include the T50 parameter in the Phase 2 proposal. (Fletcher, Tr. 6486; Venturini, Tr. 141, 148; Courtis, Tr. 5764).
4077. The Technical Support Document for the Phase 2 RFG rulemaking highlights CARB's reliance on Unocal's emissions research results in the development of the Phase 2 RFG regulations. (CX 5 at 028-033, 297-298; Courtis, Tr. 5740). John Courtis of CARB staff personally used information from Unocal to co-author the Phase 2 Technical Support Document. (Courtis, Tr. 5740; CX 5 at 031-033, 298).

i. CARB Relied on Unocal's Equations.

4078. Unocal provided CARB with the equations developed based on the 10-car study in Unocal's research program on July 1, 1991. (CX 25).
4079. The Technical Support Document explains that CARB used the Unocal regression equation: "In order to evaluate the sensitivity of emissions to T50 changes, staff have used the Unocal regression equation (See Appendix 11)." (CX 5 at 028, 297-298).
4080. CARB published Unocal's regression equation from the July 1, 1991, letter to CARB at Appendix 11 of the Technical Support Document. (CX 5 at 297-298; CX 25 at 002; Lamb, Tr. 1837).
4081. CARB used Unocal's regression equations "[i]n order to evaluate the sensitivity of emissions to T50 changes." (CX 5 at 028, 297-298).
4082. A table in the Technical Support Document depicts the results of CARB's analysis using Unocal's regression equation. The title reads: "Table II-11: Sensitivity Analysis of T50 Changes on Exhaust Emissions Using Unocal Regression." (CX 5 at 033).

4083. In the Technical Support Document chart titled “Sensitivity Analysis of T50 Changes on Exhaust Emissions Using the Unocal Regression,” the term “Unocal regression” refers to information provided to CARB by Unocal. (Courtis, Tr. 5738; CX 5 at 033).
4084. CARB chose a specific T50 value of 210 degrees Fahrenheit based on “[t]he results of the analysis shown in Table II-11” of the Technical Support Document – *i.e.*, the regression analysis using Unocal’s equation. (CX 5 at 033).
4085. Unocal provided CARB with a computer disk containing data from Unocal’s 10-car program on or within a few days of July 25, 1991. (CX 1247; Jessup, Tr. 1538-1541).
4086. Mr. Courtis personally used data provided by Unocal to put together the October 1991 CARB staff proposal. Data housed by CARB at the Teale Data Center includes data from Unocal that Mr. Courtis “used to verify the regression equations that were provided to us by Unocal.” (Courtis, Tr. 5777-5779; CX 1810 at 005).
4087. Mr. Courtis used data from Unocal prior to the November 1991 board hearing “because we had to look at the background information behind all the regression equations that we had, and that’s what we did.” (Courtis, Tr. 5941).
4088. One of the files housed at the Teale Data Center with UNOCAL in the title has a creation date listed as August 2, 1991. (CX 7045 (Cleary, Dep. at 78-79); RX 122 at 005 (used as CX 1810 at trial)).

ii. CARB Relied on Unocal’s Presentation Slides.

4089. CARB staff gathered, made copies, and made available to the public as part of the rulemaking record each document relied on during the rulemaking that CARB staff referenced in either the staff report or technical support document. (Fletcher, Tr. 6466).
4090. The Technical Support Document list of references includes #82: “Jessup, Peter, et al ‘Unocal Reformulated Fuels Technology- A Truly Innovative Approach’ Presentation to ARB, 1991.” (CX 5 at 171).
4091. CARB staff wrote the number “82” the first page of the slides for the June 21, 1991, presentation by Unocal to indicate the reference number on the technical support document. The reference referred to the whole presentation. (CX 24 at 001; CX 5 at 171; Fletcher, Tr. 6465-6466; Lamb, Tr. 1988).
4092. Technical Support Document Figure II-14, titled “Hydrocarbon Emissions Effects of Distillation T50” came from the presentation to CARB from Unocal on June 20, 1991. (CX 5 at 031; CX 24 at 026).

4093. Technical Support Document Figure II-15, titled, "CO Emissions Effects of Distillation T50" came from the presentation to CARB from Unocal on June 20, 1991. (CX 5 at 032; CX 24 at 028).
4094. Mr. Venturini identifies the substantial evidence to support a T50 specification as "the test program that Unocal presented to us. That's what's stated in our report." (Venturini, Tr. 148).
4095. CARB staff recommended to the Board a T50 specification developed based on information given to CARB by Unocal. Peter Venturini personally approved that recommendation. (Venturini, Tr. 148, 249).

c. Unocal Knew that CARB Relied on Its Research and Informed the U.S. Patent and Trademark Office That Only Unocal Research Persuasively Proved the Emission Reduction Benefits of T50.

4096. Unocal's chief patent counsel, Mr. Gregory Wirzbicki, represented to the Patent and Trademark Office in a filing he signed on April 27, 1995 in the application that lead to the '567 patent that "one of applicants' main discoveries" is that "T50 has a strong effect on exhaust hydrocarbon emissions." (CX 1792 at 109, 104-108; Wirzbicki, Tr. 1008-1009).
4097. Unocal's Chief Patent Counsel, Mr. Wirzbicki on July 10, 1995 submitted an affidavit by Dr. Jessup to the Patent and Trademark Office in connection with the prosecution of the patent application that matured into the '567 patent. (CX 1792 at 374-401).
4098. Dr. Jessup declared in the affidavit that he had reviewed data from Toyota that purportedly established a link between reductions in T50 and reductions in emissions. (CX 1792 at 377-378).
4099. Dr. Jessup explained that a Toyota representative in July 1990 gave a presentation at Unocal's research facility, at which the Toyota representative stated that he had data showing that if T50 of gasoline were increased, emissions would increase as well. (CX 1792 at 377-378).
4100. Dr. Jessup stated in his affidavit that in October 1990 he received a 19-page document from the Toyota representative concerning this research data. (CX 1792 at 378). Dr. Jessup attached his notes from the Toyota presentation and the 19-page Toyota presentation to his affidavit as attachments T1 and T2, respectively. (CX 1792 at 377-378, 380-400).

4101. Based on his review of the Toyota materials, Dr. Jessup declared that the 19-page Toyota document “provided no evidence . . . that decreasing T50 yields reductions in HC and CO emissions.” (CX 1792 at 378).
4102. The 19-page Toyota document attached as T2 to Dr. Jessup’s affidavit included on its internal page 7 (CX 1792 at 388) a bar chart entitled “Effect of T50 on Exhaust Emissions (Fuel B=100),” showing emissions for HC, CO and NOx (uncontrolled). (CX 1792 at 388, Wirzbicki, Tr. 1010-1013).
4103. Attachment T2 to Dr. Jessup’s affidavit also includes on its internal page 8 a chart comparing the fuel characteristics of its test fuels, listing properties such as aromatics, T50 and T10. (CX 1788 at 389).
4104. In his July 1995 affidavit, Dr. Jessup declared to the PTO, “Although the bar chart on page 7 of Attachment T2 allegedly relates T50 to the emissions produced from three fuels A, B, and C, the data in the document do not support this conclusion.” (CX 1792 at 378). He then referred to the pages 7-8 of the document to explain his reasoning. (CX 1792 at 378).
4105. Dr. Jessup thus understood that “data” refers to charts and analysis in addition to raw research results. (CX 1792 at 378, 388-389).
4106. Dr. Jessup then declared that he “found Toyota’s apparent reasoning for concluding that decreasing T50 decreased HC and CO emissions to be seriously flawed and scientifically invalid” (CX 1792 at 379).
4107. Mr. Wirzbicki, Unocal’s Chief Patent Counsel, had helped to prepare Dr. Jessup’s July 1995 affidavit. (Wirzbicki, Tr. 1011-1012).
4108. Dr. Jessup had also explained to Mr. Wirzbicki that he “considered the Toyota work to be unscientific and he had dismissed it out of hand.” (Wirzbicki, Tr. 1012).
4109. Mr. Wirzbicki reached the same conclusion as Dr. Jessup did about the Toyota data. (CX 1792 at 261-267; Wirzbicki, Tr. 1013).
4110. In Information Disclosure Statement No. 11, Mr. Wirzbicki himself submitted arguments concerning the Toyota research to the PTO in the application that lead to the ‘567 patent. (CX 1792 at 257-300, argument at 261-267). He also attached copies of the documents Unocal had received from Toyota concerning its research in attachments T1 and T2 to the IDS. (CX 1792 at 268-288).
4111. Mr Wirzbicki sent IDS No. 11 to the PTO on July 9, 1995, one day in advance of Dr. Jessup’s declaration. (CX 1792 at 257-300, argument at 261-267; Wirzbicki, Tr. 1010).

4112. Mr. Wirzbicki stated to the patent examiner in IDS No. 11 that:

“One of ordinary skill in this art would see that there is no legitimate basis from Toyota’s data in attachment T2 for assuming any relationship between T50 and emissions, much less Toyota’s specific conclusion that lowering T50 lowers HC and CO emissions.”

(CX 1792 at 266; Wirzbicki, Tr. 1010). Mr. Wirzbicki believed this statement was accurate when he wrote it. (Wirzbicki, Tr. 1010-1011).

4113. As with Dr. Jessup’s affidavit, Mr. Wirzbicki’s reference to “attachment T2 ” was to the 19-page document Mr. Jessup had received from Toyota. (Wirzbicki, Tr. 1010-1013; CX 1792 at 266 (Wirzbicki reference); CX 1792 at 270-288 (19-page Toyota document). Mr. Wirzbicki agreed that CX 1792 at 276 is “page 7 from T2.” (Wirzbicki, Tr. 1010-12).

4114. Mr. Wirzbicki thus also understood that “data” includes charts and analysis, and not simply raw research results. (Wirzbicki, Tr. 1010-1013; CX 1792 at 266 (Wirzbicki reference); CX 1792 at 270-288 (19-page Toyota document)).

4115. In the continuation application that lead to the ‘567 patent, Mr. Wirzbicki executed an amendment on August 21, 1995. In that amendment, Mr. Wirzbicki argued, among other things, that the pending claims were patentable. (CX 1792 at 458-473; Wirzbicki, Tr. 1013-1004).

4116. To argue that the pending claims were patentable, Mr. Wirzbicki in the August 1995 amendment compared the Auto/Oil Group study with the research Dr. Jessup and Dr. Croudace undertook. He wanted to show that the magnitude of the problem of how to reduce emissions was “so great that it caused two industries to come together to try to solve it.” (Wirzbicki, Tr. 1013-1015).

4117. Mr. Wirzbicki explained to the patent office in the August 1995 amendment that “the Auto/Oil program expended \$15 million studying only four fuel properties (not including RVP or T50).” (CX 1792 at 467; Wirzbicki, Tr. 1013-14). He stated that the “four fuel properties investigated by Auto/Oil in 1990 were: aromatics, MTBE, T90, and olefins.” (CX 1792 at 467; Wirzbicki, Tr. 1013-1015).

4118. The Auto/Oil group did not get around to studying T50 until “much later,” according to Mr. Wirzbicki. (Wirzbicki, Tr. 1015-1016).

4119. Mr. Wirzbicki believed that the facts that he set forth concerning the Auto/Oil Group in the February 1995 amendment were accurate at the time he made the statements in the amendment. (Wirzbicki, Tr. 1013-1017).

d. Unocal in the ‘393 Patent Litigation Asserted That Unocal’s T50 Research Was the Basis for CARB’s Decision to Regulate T50.

4120. Unocal’s technical expert, Mr. Stellman, explained in the ‘393 patent litigation, “Unocal provided CARB with information and data on the benefits of T50 that led CARB to believe T50 control was justified.” (CX 1331 at 017). As a result, “T50 has the greatest impact on exhaust emissions of hydrocarbons in both the EPA Complex Model and CARB Predictive Model if one holds all other parameters constant.” (CX 1331 at 002). “This is a major teaching of” the ‘393 patent.” (CX 1331 at 002 (Stellman (ARCO) Rebuttal Report)).
4121. T50 “was neither studied nor identified by Auto/Oil, CARB, Toyota, General Motors, ARCO, Chevron or any other company or group prior to the Unocal invention.” (CX 1331 at 002-003 (Stellman (ARCO) Rebuttal Report)).
4122. Unocal’s lawyer argued in his closing argument in the ‘393 patent litigation:

And we showed that in June CARB had no regulations with regard to T50 or T90, none, zero.

When you look at them, it’s there.

Then they met with Unocal and Unocal gave them information.

In fact, Dr. Croudace was sort of mad that they weren’t going to take all the information. If we are going to use the invention, why don’t you use all of it and they gave him that information in June. Then in August they came out with regulations, proposed regulations regarding T50 after they met with Unocal and got the information from Unocal, and Mr. Venturini’s testimony is clear on that.

I asked him to look at it.

“As of June 1 can you tell me where there is any reference to T50?”

“There is no specific reference. None at all. None at all.”

Then they came back and in August they came out with the new proposed regulations because they had met with Unocal and got the information from them.

(CX1765 at 023-024) (emphasis added).

4123. As Unocal argued to the District Court, “CARB itself recognized the validity and importance of the invention and used some of its contributions to the knowledge of fuel property effects on exhaust emissions in adopting its “Phase 2” regulations and in adopting a “predictive” model for reformulated gas.” (CX 1312 at 007) (Defendants’ Memorandum in Support of Their Motion to Compel Production of Documents and Deposition Testimony)).
4124. Unocal repeatedly claimed in the ‘393 patent litigation: “CARB itself recognized the validity and importance of the invention and used some of its contributions to the knowledge of fuel property effects on exhaust emissions in adopting its “Phase 2” regulations and in adopting a “predictive” model for reformulated gas.” (CX 1312 at 007; CX 1318 at 007-008, 012; CX 1314 at 007).
4125. Unocal’s public statements reinforce this point. According to a Unocal press release, “Depositions/testimony by CARB officials indicate that the agency had not even considered the impact of T-50 on tailpipe emissions until presented with evidence from Unocal.” (CX 361 at 002; Lane, Tr. 3042).
4126. “With respect to plaintiffs’ argument that such information is relevant to “commercial success”, in Unocal’s view, the commercial success of the ‘393 Patent is self-evident. The invention was such an extraordinary advancement of science that it became the framework for the CARB regulations.” (CX 1580 at 003).

e. Unocal’s Research Provided the Support Necessary for a T50 Parameter in Reformulated Gasoline Regulations.

i. CARB Staff Demanded as the Technical Basis for the Regulation Sound Studies That Proved the Independent Effects of the Gasoline Property in Question.

4127. CARB staff required a scientific and technical basis for any recommendation to the Board. (Venturini, Tr. 88).
4128. CARB staff viewed the “substantial evidence” test as one requiring a sound basis for CARB’s actions. The Technical Support Documents, Staff Reports, and Final Statements of Reasons accompanying CARB’s Phase 2 proposals contain hundreds of pages of highly technical scientific and economic analysis as such a basis. (Venturini, Tr. 88; CX 5 (Technical Support Document); CX 52 (Staff Report for mandatory specifications); CX 10 (Final Statement of Reasons); CX 53 (Predictive Model Staff Report); CX 54 (Predictive Model Final Statement of Reasons)).
4129. CARB staff presented a scientific and technical basis for the regulation in the technical support document. In the technical analysis CARB staff provided “a justification or basis and rationale for each one of the specifications that was included in the regulation.”

CARB staff evaluated the effects of Phase 2 RFG specifications as a whole, and also looked at individual specifications. Mr. Fletcher believed that to develop the overall specifications, individual specifications needed to be evaluated independently, too. (Fletcher, Tr. 6486, 6933; Venturini, Tr. 88).

4130. CARB staff applied rigorous scientific benchmarks in determining whether the Phase 2 rule should regulate specific gasoline properties. It required sound tests designed to control for the independent effects on emissions of the specific property. (Fletcher Tr. 6449-6452; CX 10 at 047).
4131. Before selecting each specification for the Phase 2 proposal, CARB staff looked at available test information “unique to that specification,” and various studies had designs specifically to look at the benefits of individual specifications. (Fletcher, Tr. 6449).
4132. CARB staff looked at all information provided during the process of developing the regulations. Staff weighted information from outside of CARB based on the design of the study. For example studies designed to look specifically at changes related to a specific parameter carried more weight than other studies. Other elements of the study design also helped staff determine the weight of information provide from outside CARB: the number and types of vehicles, comprehensiveness of the information on fuel properties, test procedures used, and fuels selected. (Fletcher, Tr. 6452).
4133. To select the level for each parameter in staff’s proposal, CARB staff looked both at the impact of the individual specification and then looked at the overall benefits that would result from the fuel once considering all specifications together. Mr. Fletcher identified that the recognition of the expense of creating reformulated gasoline highlighted the importance of considering the full scope of impacts for changing each individual specification. A change to an individual specification could increase or decrease some air pollutants, therefore staff reviewed data to determine the sorts of emissions reductions achieved from each specification. CARB staff also considered other consequences associated with changing each specification, such as whether it was possible to produce a fuel with the considered level, impacts on safety, impacts on driveability. (Fletcher, Tr. 6450-6451).
4134. CARB staff analyzed individual specifications to assess technical feasibility considerations related to the individual specifications, such as the ability to produce the fuel, the impact on vehicles, and the impact on refineries. (Fletcher, Tr. 6981-6982).
4135. CARB required proof of independent effects of each parameter. For example, it rejected a recommendation to regulate individual aromatic compound standards, stating, “We believe that the ambiguity in the data arises from the fact that all the experiments have not been designed so that the independent effects of individual aromatic compounds and other fuel properties can be discerned.” (CX 10 at 038 (Phase 2 Final Statement of Reasons); *see also* (CX 10 at 037).

4136. CARB required proof of independent effects of each parameter. For example, CARB staff explained that it used the only study parametrically designed to study the effect of T90 in analyzing that parameter. (CX 10 at 046 (Phase 2 Final Statement of Reasons)).
4137. CARB staff believed that individual Phase 2 specifications had to be supported by persuasive evidence showing that that specification had independent effects on emissions reductions. (Fletcher, Tr. 6449-6452).

ii. CARB Developed the T50 Specification Using Unocal's Research.

4138. CARB staff wanted to use the research that Unocal presented at the June 20, 1991, meeting because it was the first time that CARB had received a comprehensive assessment of emission-reducing effects of T50. (Venturini, Tr. 141-142).
4139. Peter Venturini on June 20, 1991, agreed with Unocal's assertion in its June 20, 1991, presentation that Unocal's 5/14 research was unique in that it examined ten variables, including T50, independently. (Venturini Tr. 224-225, 230-231).
4140. Robert Fletcher, an engineer and Phase 2 supervisor, considered Unocal's study to be "the first study and the only study that we had where you could specifically look at the benefits of T50 and knowing that you were seeing the benefits of T50 not influenced by other variables." (Fletcher, Tr. 6471).
4141. Without the ability to use Unocal's research, Mr. Fletcher did not have sufficient information in 1991 to propose a T50 specification in the Phase 2 regulations. (Fletcher, Tr. 6486).
4142. Mr. Fletcher drafted the preliminary draft regulations included in the workshop notice released on August 1, 1991. This notice provided "the first unveiling of possible specifications for T50." This preliminary draft regulation also listed proposed specifications for other distillation parameters, namely T90 and driveability index. (Fletcher, Tr. 6482; RX 184 at 028).
4143. The preliminary draft of a Phase 2 regulation discussed at the August 14, 1991, workshop did not constitute an actual rule recommendation for the Board. CARB staff at the time of the August 14, 1991, workshop expected that its preliminary draft of a Phase 2 regulation discussed at that workshop would change and that one or two of the distillation parameters – T50, T90, Driveability Index – would be eliminated. (Venturini, Tr. 248-251; CX 803 at 001).

4144. CARB staff did not have all data necessary to support an actual proposed rule recommendation at the time of the August 14, 1991, workshop. (Venturini, Tr. 249-250; CX 803 at 001; CCPF ¶¶ 1277-1314).
4145. After the staff report and technical support document included a proposed specification for T50, CARB staff received comments about that specification. CARB staff did not receive any additional information identifying the impacts of T50 on emissions. (Fletcher, Tr. 6483).
4146. The T50 Specification Presents the Greatest Restraint on Refiners' Ability to Both Avoid the Patents and Comply with the CARB Regulations. (CCPF ¶¶ 3905-3924, 3937).

2. CARB Reasonably Relied on Unocal's Assertions That its Research Was "Non-proprietary" and "Available" for Use and That Unocal Would Forego All "Competitive Advantage" If CARB Considered a Predictive Model.

a. Unocal Presented its Research as "Non-proprietary" and "Available" for Use.

4147. CARB as of June 1991 did not possess substantial evidence supporting a T50 specification. (Venturini, Tr. 206-208; CX 492 at 004; CX 1407).
4148. On June 20, 1991, Unocal representatives met with CARB staff and presented to them Unocal's 5/14 emissions research results. (CX 23; CX 24). Unocal's presentation to CARB clearly taught that T50 is the gasoline property that most effects both HC and CO emissions. (CX 24 at 013, 014, 026, 028, 035, 039; Jessup, Tr. 1262, 1281-1282); *see also* (CCPF ¶¶ 1137-1149, 1155-1168, 1180-1183).
4149. Unocal also promoted the use of a predictive model, such as Unocal's, as being "cost effective." (Venturini, Tr. 211; CX 23 ("Adopt Predictive Model – Practical – Cost Effective")).
4150. Unocal at the June 1991 meeting had requested that CARB treat its presentation as confidential. (Venturini, Tr. 232).
4151. CARB staff took from the June 1991 meeting the main message that T50 was an important property to address in a Phase 2 specification. (Venturini, Tr. 224-225, 228; 231; Fletcher, Tr. 6488).
4152. CARB staff requested more information, and Unocal in a letter dated July 1, 1991, provided to CARB staff the actual coefficient values of its regression equations. (Lamb, Tr. 2366; Venturini, Tr. 233-234; CX 25).

4153. In that July 1, 1991, letter Unocal stated, “As we discussed in the meeting, Unocal requests that CARB hold these equations confidential, as we feel that they may represent a competitive advantage in the production of reformulated gasoline.” (CX 25 at 001).
4154. Unocal’s July 1, 1991, letter went on to say that “[i]f CARB pursues a meaningful dialogue on a predictive model approach to Phase 2 gasoline, Unocal will consider making the equations and underlying data public as required to assist in the development of a predictive model.” (CX 25).
4155. Unocal’s representative at the time, Michael Kulakowski, recalls that Unocal placed no limitations on its offer to CARB to use the data and results from the 5/14 project if CARB complied. (Kulakowski, Tr. 4423-4424).
4156. CARB staff asked for further information to evaluate the regression equations. Dr. Jessup of Unocal gave CARB a computer disk fully describing details of Unocal’s 10-car study. (CX 1247 (photocopy of disk and printout of content); Curtis, Tr. 5745-5746 (CARB staff checked the disk information against the regression equations); Jessup, Tr. 1331-1332 (Jessup prepared the disk on July 25, 1991)).
4157. CARB staff concluded that Unocal’s research was sound and sufficient basis for a T50 specification. (Venturini, Tr. 142, 224-225, 230-231). However, CARB understood that it could not use Unocal’s research as a basis for proposing a T50 specification as long as Unocal wished confidential treatment. CARB needed to be able to state publicly its basis for its rules. (Venturini Tr. 141-142, 183; Lamb, Tr. 226).
4158. CARB as of August 1991 still did not have sufficient basis for proposing a T50 specification, absent permission to use Unocal’s 5/14 research. (Fletcher Tr. 6486; Curtis, Tr. 5764).
4159. CARB staff asked Unocal to release its research so that CARB could “use that information for the development of the regulation.” (Curtis, Tr. 5743; 5769-5770). John Curtis “asked them to allow us to go ahead and use it, to release the proprietariness and confidentiality of the data.” The objective of the conversation was to use “the information . . . for analyzing the standards.” (Curtis, Tr. 5743-5744, 5935-5937, 5961-5962).
4160. On August 27, 1991, Unocal sent CARB a letter representing that Unocal’s emissions research results were “nonproprietary” and “available” to CARB for use in the Phase 2 proceeding:

On June 20, 1991, certain Unocal representatives met with Peter Venturini and other members of his staff. During that meeting, we presented the results of three phases in Unocal’s Vehicle/Fuels testing program. We subsequently made the data base available to

the staff and agreed to make the data public if necessary in the development of a predictive model for use in the certification of reformulated gasoline.

The staff has now proposed to develop such a predictive model and requested that we make the data public.

Please be advised that Unocal now considers this data to be non-proprietary and available to CARB, environmental interest groups, other members of the petroleum industry, and the general public upon request.”

(CX 29).

4161. CARB staff took from Unocal’s August 27, 1991, letter the basic message that CARB could use Unocal’s 5/14 research, cost-free, as part of its basis for Phase 2 rule provisions. (Venturini, Tr. 143, 240-243 (“no strings attached” and gave away “competitive advantage”); Fletcher, Tr. 6480 (“available” meant “no restrictions on its use”); Curtis, Tr. 5746 (“nonproprietary” meant “not owned by Unocal, available to the public.”); Boyd, Tr. 6721-6722 (“proprietary” refers to property rights); CX 7063 (Sharpless, Dep. at 229-230) (Unocal would be asserting no property rights)).
4162. No CARB staffers knew at the time that Unocal had a plan to charge money for use of the information. (Venturini, Tr. 243; Fletcher, Tr. 6472, 6476-6477; Curtis, Tr. 5747, 5750-5751, 5770-5771, 5784-5785, 5960).
4163. CARB on October 4, 1991, formally proposed a Phase 2 regulation. That proposal included a specification requiring a flat limit of 210 degrees F for T50. (CX 5; CX 52).
4164. Peter Venturini and his staff relied on Unocal’s research in deciding to incorporate the T50 specification in its proposed rule. (CCPF ¶¶ 2050-2067). The CARB Board at a November 21-22 hearing approved an amended version of the Phase 2 rule incorporating a T50 provision, and publicly stated that Unocal’s research was the principal basis for that T50 provision. (CX 870; CX 10 at 047-048, 075); *see also* (CCPF ¶¶ 2050-2084).
4165. CARB in 1992 - 1994 subsequently developed a Predictive Model that permitted refiners to demonstrate compliance with the mandatory specifications using equivalent fuel formulas. (CX 53). CARB’s Predictive Model carried forward T50 as a relevant property. Although refiners could take advantage of the added flexibility of the model and exceed the flat limits for T50 in the rule, they could not exceed the “cap” for T50 in the rule. (CX 53 at 012, 022, 028).

4166. Unocal, instead of disclosing its patent and plan to charge money, repeatedly urged CARB to lower cost and maintain competition in other respects. *See, e.g.*, (CX 39; CX 40; CX 42; CX 43; CX 311; CX 393; CX 769).
4167. Unocal subsequently filed four more patents that had the effect of ensuring that refiners would not be able to successfully blend around its patents. (CCPF ¶¶ 2630-2691).

b. Unocal Did Not Reveal its Intentions to Enforce its Patent Rights.

4168. Unocal gave CARB no prior notice of any kind before January 31, 1995, that it claimed patent rights over reformulated gasoline. (Kenny, Tr. 6589-6590; 6671; Venturini, Tr. 320-322). To Peter Venturini's knowledge, no other CARB staffer working on Phase 2 had learned of the Unocal patent before Unocal's January 31, 1991 press release. (Venturini, Tr. 320-322).
4169. Unocal did not tell CARB at the March 1995 meeting that Unocal intended to file a second patent a week later, on March 25, 1995. Executive Officer Boyd would have viewed that as material information. (Boyd, Tr. 6740).
4170. Unocal never informed CARB Executive Officer Boyd, with respect to any of the four patents that were filed after the '393 patent, of its intent to file any of those patents. (Boyd, Tr. 6741).
4171. Unocal at a January 5, 1994, meeting with CARB Chairman Sharpless, Executive Officer James Boyd, and other CARB staff failed to disclose that the U.S. PTO had notified Unocal that all of its '393 patent claims had been allowed. (Boyd, Tr. 6849-6850).
4172. Unocal at a January 5, 1994, meeting with CARB Chairman Sharpless, Executive Officer James Boyd, and other CARB staff failed to disclose that Unocal expected that PTO shortly would be issuing the '393 patent. (Boyd, Tr. 6849-6850).
4173. Unocal at a January 5, 1994, meeting with CARB Chairman Sharpless, Executive Officer James Boyd, and other CARB staff failed to disclose that Unocal intended to charge money for the use of its RFG technology and enforce its patent against the rest of the industry. (Boyd, Tr. 6849-6850).

c. Unocal Conveyed the Basic Deceptive Message That CARB Could Use Unocal's 5/14 Research as a Basis for its Phase 2 Reformulated Gasoline Regulations Without Cost.

4174. Peter Venturini, the lead manager who proposed Phase 2, construed Unocal's August 27, 1991, letter as saying that the information presented to CARB by Unocal regarding its

5/14 research was “nonproprietary” and could be used in the Phase 2 proceeding “with no strings attached.” (Venturini, Tr. 143, 240-243).

4175. Unocal’s reference to its 5/14 research in “proprietary” or “non-proprietary” terms in the August 1991 letter (CX 29) was not an isolated incident. Unocal in its remarks at the Board hearing where Phase 2 was approved stated that Unocal had met with staff and had “provided proprietary test data.” (Lamb, Tr. 2087-2088; CX 774 at 021).
4176. Peter Venturini, taking together the July 1, 1991 and August 27, 1991, letters, also viewed Unocal as “removing their claim of competitive advantage” asserted in the July 1, 1991, letter. (Venturini, Tr. 243; CX 25; CX 29.)
4177. Other CARB staff who participated at the meeting also viewed Unocal’s August 27, 1991, letter as meaning that Unocal was making its research available with no associated costs. Robert Fletcher believed that making the research “available” meant that there were “no restrictions on its use.” (Fletcher, Tr. 6480). John Courtis believed that Unocal’s “nonproprietary” assertion meant that the research was “not owned by Unocal, available to the public.” (Courtis, Tr. 5746).
4178. CARB Executive Officer Boyd, based on staff’s briefing, also understood that Unocal had given CARB permission to use its research without retaining any property rights. (Boyd, Tr. 6710-6712, 6714-6715).
4179. Executive Officer Boyd also understood that “proprietary” meant “something that was the property of the person or company in question, be it some component of a physical plant, be it some process or some approach to making a product that was perhaps unique to that company and thus proprietary to them, their property, and oftentimes something they wanted to protect for competitive reasons.” (Boyd, Tr. 6721-6722).
4180. CARB Chairman Sharpless, based on staff’s briefing, similarly believed that Unocal was giving CARB its research without asserting any property rights. (CX 7063 (Sharpless, Dep. 229-230)). In her words, “there was an assumption that when you put information in, label it as non-proprietary, that it is in the public and that you’re not going to be pursuing patents.” (CX 7063 (Sharpless, Dep. at 229-230)).
4181. CARB General Counsel Michael Kenny, based on a later review of Unocal’s letter and its conduct, believed CARB “had been misled throughout the process of the Phase 2 regulatory adoption. We thought that was an inappropriate activity on the part of Unocal.” (Kenny, Tr. 7678-6579).
4182. Dennis Lamb testified in 1996 that CARB indicated or informed him that CARB could only use the data if it was not confidential and proprietary to Unocal. (Lamb, Tr. 2242, 2372).

4183. CARB personnel had no reason to assume that Unocal's affirmative statements in 1991 were lies or deceptive half-truths. Peter Venturini was unaware of any instance in his 30-year career at CARB where any company, other than Unocal, had told CARB that it could use the company's research and then, only later, told CARB "by the way, there's a charge for that." (Venturini, Tr. 191).
4184. Michael Kenny, CARB's General Counsel and Executive Director from 1990 through 2002, could recall no instance other than the Unocal patent episode where CARB had been led to rely on significant misrepresentations. (Kenny, Tr. 6522). In his words, the "practice of the board had been one in which the parties had dealt with one another in good faith, in an honest and reliable fashion." (Kenny, Tr. 6519-6520).
4185. As stated by CARB's General Counsel, now-Judge Kenny, the "practice of the board and the history of the board had been one in which the parties had dealt with one another in good faith, in an honest and reliable fashion." (Kenny, Tr. 6519-6520).
4186. To Peter Venturini it was obvious that lying about significant patent rights would be fatal to CARB rulemaking. According to Mr. Venturini, it's "not our practice and never has been to ask those specific [patent] questions . . . the only way our system can operate . . . is to operate on the expectation that people will be truthful in dealing with us. Our whole system, the whole integrity of our regulatory process would just collapse if it were okay for people to use our regulatory process to gain unfair competitive advantage. It just wouldn't work." (Venturini, Tr. 862-863).
4187. Unocal's use of the term "non-proprietary" was consistent with its use of the term "proprietary" as referring to ownership and property rights. (CCPF ¶¶ 1315-1349).

d. Unocal's Use of the Term Non-Proprietary Was Consistent With the Use of the Term "Proprietary" in Industry As Referring to Ownership and Property Rights.

4188. In October 1991, Unocal sent to the EPA the very same slides that Unocal used in its June 1991 presentation to CARB. (CX 297). Unocal informed the EPA that the "work covered in the slides represents our proprietary effort over several years." (CX 297). In the same transmittal, Unocal included "a computer disc with the Unocal data and a file with an explanation of how to access the data." (CX 297). Unocal informed the EPA that it was "releasing these data so as to be helpful in the current activities on constructing models that relate to fuel properties and emissions." (CX 297). Dr. Miller testified that as of the time he sent the letter to the EPA, he had permission from Unocal to share both the slides and the computer disc with the EPA. (Miller, Tr. 1418-1419).
4189. Unocal uses a "proprietary newswire" to issue press releases. Proprietary newswires are paid for by the company and the company controls the content that goes into the

publication. Nonproprietary newswires are free and the company does not have control over the content. (Lane, Tr. 3023).

4190. Other petroleum industry employees agree that the term “proprietary” means intellectual property are attached. According to Shell’s Charles Lieder: “Proprietary information is information that one is going to seek economic benefit from.” (Lieder, Tr. 4720).
4191. According to Texaco’s Robert Millar, a fuel formulation is “proprietary” if your company can use that foundation, but another company cannot use the formulation without your company’s permission. (CX 7058 (Millar, Dep. at 68-69)).
4192. Texaco’s Douglas Youngblood considers proprietary to mean “something like a patent or a trade secret...that you would have - in the case of a patent, have exclusive right to that particular area the patent is covering”. (CX 7076 (Youngblood, Dep. at 59)). According to Mr. Youngblood, “proprietary means patented”. (CX 7076 (Youngblood, Dep. at 60)). In Mr. Youngblood’s view, “proprietary” could cover trade secrets, but it usually would be the subject of a patent. (CX 7076 (Youngblood, Dep. at 61)).
4193. Former Shell executive Ron Banducci’s testified that over his 31 years at Shell, he understood the term “proprietary” to mean that “whatever was proprietary involved property rights that were solely the province of the owner of those property rights”. (Banducci, Tr. 3424).
4194. ExxonMobil manager Thomas Eizember explained that at Exxon, the definition of the word “proprietary,” was “information that had business value to Exxon.” (Eizember, Tr. 3315). The term “proprietary,” when used to describe a document, means “that there is some information with business value in the document that the label is affixed to.” (Eizember, Tr. 3117-3118).

e. Unocal’s Letters, Taken Together, Conveyed the Message That Unocal Would Give up “Competitive Advantage” If CARB Agreed to Consider a Predictive Model.

4195. On July 1, 1991, pursuant to Mr. Lamb’s instructions, Mr. Kulakowski sent the July 1, 1991, letter to CARB attaching the equations from Unocal’s 10-car study. (Kulakowski, Tr. 4424-4425; CX 25).
4196. In that letter, Unocal stated, “As we discussed in the meeting, Unocal requests that CARB hold these equations confidential, as we feel that they may represent a competitive advantage in the production of reformulated gasoline.” (CX 25).
4197. Unocal’s use of the term “competitive advantage” was a conscious one to emphasis to CARB the need to keep those equations confidential. (Kulakowski, Tr. 4425-4426).

4198. Peter Venturini understood the July 1, 1991 letter as stating that Unocal, by keeping its regression equations confidential, would retain a competitive advantage in the manufacture of reformulated gasoline. (Venturini, Tr. 233-234, 237; CX 25).
4199. Unocal in its July 1, 1991 letter stated to CARB that “if CARB pursues a meaningful dialogue on a predictive model approach to Phase 2 gasoline, Unocal will consider making the equations and underlying data public as required to assist in the development of a predictive model.” (CX 25).
4200. Peter Venturini understood Unocal’s offer in its July 1, 1991 letter to mean that if CARB agreed to the dialogue about a predictive model and “that if they release this information that they were no longer maintaining the competitive advantage.” (Venturini, Tr. 239-240).
4201. Unocal’s August 27, 1991 letter to CARB stated – “Please be advised that Unocal now considers this data to be non-proprietary and available to CARB, environmental interest groups, other members of the petroleum industry, and the general public upon request.” (CX 29).
4202. Peter Venturini believed that “If you take the two letters together, it’s basically saying they’re removing their claim of competitive advantage.” (Venturini, Tr. 243; CX 25, CX 29).
4203. Because Mr. Venturini believed that Unocal’s July 1st and August 27th letters made an independent claim of giving away “competitive advantage,” he would have viewed Unocal as representing its research was now cost-free even if Unocal had not used the “non-proprietary” term. (Venturini, Tr. 829).

f. CARB Staff Reasonably Understood Unocal’s Communications To Mean That There Were No Associated Costs with Use of Unocal’s Research.

4204. Robert Fletcher, a member of the CARB staff, “had the overall responsibility for ensuring that the information that went into the staff report and technical support document were publicly available.” (Fletcher, Tr. 6474).
4205. To Robert Fletcher, making research “publicly available” meant that CARB could “provide any of the information associated with the research to the public, that there are no restrictions on its use, there are not caveats associated with what you can or cannot release to the public.” (Fletcher, Tr. 6480).
4206. By the time of the Phase 2 Board hearing in November, CARB staff had assembled what it believed was \$30 million worth of free testing. (CX 773 at 014-015 (Robert Fletcher testifying “We are basing the proposal on the results of over 3500 vehicle emission tests

which were conducted on several hundred vehicles. This slide shows basically the seven studies that were used – that were major studies – in the development of this proposal. These studies, collectively, amounted to over \$30 million worth of testing.”); CX 388 at 024 (Fletcher accompanying slide listing the Auto/Oil AQIRP, GM/WSPA/CARB Volatility Study, ARCO Clean Fuels Program, GM/CARB EC-X Test Program, Unocal Fuels Study, Chevron Fuels Study, and API RVP/Oxygenates Study)).

4207. CARB managers also believed that, in general, that a company, if offering research for use in the Phase 2 rulemaking, would inform CARB of any associated proprietary interest as long as that interest had significant cost implications. Peter Venturini’s view was that disclosure of a patent was required if the company “intended to charge for it” and if that patent “was significantly important to our rulemaking, particularly if it had a cost implication.” (Venturini, Tr. 189). Executive Officer Boyd also believed that disclosure was necessary when the patent had a “significant cost.” (Boyd, Tr. 6907).
4208. Peter Venturini , the lead manager of Phase 2, was aware of no instance in his 30-year career, other the Unocal patent episode, where a company had stated that CARB could use the company’s research and then later stated “by the way, there’s a charge for that.” (Venturini, Tr. 191).
4209. Refiners shared information developed regarding reformulated gasoline through the National Petroleum Council, the Western State Petroleum Council and various other forums. The companies “freely shared information with each other, all with the belief and understanding that none of the companies would seek to use that information in a proprietary way.” (CX 7061 (Riley, Dep. at 25)).
4210. Companies worked together in the spirit of “good faith” to find available options for cleaning the air in California, mainly the Los Angeles basin. Industry and the authorities worked together over a period of several years toward a solution. “The advent of reformulated gasoline had to do with available options for cleaning the air.” (CX 7061 (Riley, Dep. at 26)).
4211. Reformulated gasoline was one of those solutions advocated by the oil industry. ARCO understood “that all of the parties agreed to share information which they would not routinely share with each other” with “the good faith understanding” that “it would not be used for proprietary reasons.” (CX 7061 (Riley, Dep. at 26-27)).
4212. In the Phase 2 regulation process, ARCO freely shared its work related to clean fuels with the peer group of scientists working on developing and understanding fuel reformulation and anyone else who asked to receive such information. (Clossey, Tr. 5343-5344).
4213. ARCO guaranteed that the information from its research results would be freely available by being deliberate about distributing information as it developed to the full slate of those

that expressed interest. ARCO did not explicitly state that its research results were being provided freely because ARCO "had been so aggressive . . . in all kinds of public forums, presentations and CARB discussions and WSPA discussions, that we had been crystal-clear that we will provide our information to those that asked." (Clossey, Tr. 5369).

4214. ARCO's policy regarding its reformulated fuels research was to give "information, all our information, to the public free of charge." (Segal, Tr. 5607). ARCO followed its policy in not seeking money from anyone for its EC-X research. (Segal, Tr. 5607).
4215. Auto/Oil also agreed to make all research results from the organization royalty-free and in the public domain. (CX 1720A at 016 (Shapiro Expert Report); CCPF ¶¶ 1439-1443, 1590-1667).

g. Unocal Gave CARB All of Its 5/14 Data Including the Graphs, Presentation Materials, and Equations Showing the Invention.

4216. By August 27, 1991, Unocal had provided CARB its June 20, 1991, presentation materials (charts, slides, graphs, conclusions, etc.), its regression equation and values, and a computer disk containing extensive information about the 10-car study and its relation to the regression equations. (CX 23; CX 24; CX 25; CX 1247 (Jessup computer disk); CX 29).
4217. Unocal in its August 27, 1991, letter, while also using the word "database," stated its ultimate permission in these terms – "The staff has now proposed to develop such a predictive model and requested that we make the data public. Please be advised that Unocal now considers this data to be non-proprietary and available to CARB, environmental interest groups, other members of the petroleum industry, and the general public upon request."
4218. Neither the July 1, 1991, or August 27, 1991, letter stated that CARB could use only select portions of the information that Unocal had given CARB through August 27, 1991. (CX 25; CX 29).
4219. Peter Venturini believed that Unocal in its August 27, 1991, Unocal letter to CARB authorized CARB to use as basis for Phase 2 any of the materials Unocal provided to CARB in its June 20, 1991, presentation. (Venturini, Tr. 256, 259).
4220. One reason that Mr. Venturini viewed the offer as including all Unocal's materials was his view that "data" is "basically factual information." (Venturini Tr. 225-226). He viewed charts and slides that express underlying test results as "data." (Venturini, Tr. 224-225, 227-228 (Unocal's charts were data); CX 22 at 022 to 033). He also viewed the regression equations that express the relationships revealed in test results as "data." (Venturini, Tr. 234-235).

4221. Unocal itself had used the term “data” indiscriminately in its June 20, 1991, presentation. For example, Unocal’s slide presentation referred labeled three slides in the form of graphs as “In House Data Collected.” (CX 22 at 009-011; Venturini, Tr. 224-225).
4222. Peter Venturini also viewed the regression equation coefficient values contained in Unocal’s July 1, 1991, letter as additional “data.” (Venturini, Tr. 234-235).
4223. Unocal itself also had explicitly offered to make the “equations” available in its July 1, 1991, letter. (CX 25). Unocal, in giving permission to use its “data” in the August 27th letter, stated no caveat that it was now withdrawing its prior offer to release the equations. (CX 25; CX 29).
4224. John Curtis, the member of the CARB staff who dealt most closely with Unocal representatives at this time, recalled that he asked Unocal permission to “use the information.” The “information” referred to the “whole thing, the regression equations, the presentation that was provided to us, the details, some of the background, detailed data, the whole thing.” (Curtis, Tr. 5744-5746).
4225. John Curtis explains that nobody called Mr. Lamb after receiving the August 27, 1991, letter to inquire what “this data” referred to “because our understanding that made reference to the whole information we received from Unocal. . . . In the discussion that I had we wanted the thing to be released because we wanted to use all the information for the rulemaking. . . . That’s what – that’s what we – that’s what they said. . . . That’s what we wanted to do.” (Curtis, Tr. 5938-5939; CX 29).
4226. The reasonableness of CARB’s interpretation that Unocal was offering all its materials is corroborated by Unocal testimony. Michael Kulakowski, the author of Unocal’s July 1st letter, has testified that there was no limitation placed on CARB’s use of the data and results from the 5/14 project. (Kulakowski, Tr. 4423-4424). Unocal had offered to give to CARB the data and results of the 5/14 Project. (Kulakowski, Tr. 4423).
4227. Michael Kulakowski also has specifically testified that “Unocal did grant permission for those equations to be in the technical support document.” (Kulakowski, Tr. 4432).
4228. In fact, Unocal at least by August 26, 1991, had made a decision to make public the slides, equations, and raw data that it gave to CARB. In the August 26, 1991, internal Unocal document “Management’s Clearance Request For Presentation or Publication of Paper or Talk,” Unocal’s Dr. Jessup sought permission from Unocal executives to present those slides to the American Institute of Chemical Engineers, stating, “Our corporate sponsors have decided it is time to publicize our data. This presentation is essentially the same as that give to CARB on June 20, 1991.” (CX 262 at 001 (attaching slides at pages 3-40); Jessup, Tr. 1314-1316).

4229. Dr. Jessup has admitted that, as of August 26, 1991, his corporate sponsors had told him that he could make public the 5/14 Project presentation slides, equations (with coefficients), and the underlying data. (Jessup, Tr. 1543-1544). Dr. Jessup's "corporate sponsor" was the Refining and Marketing Division headed by Mr. Beach. (Jessup, Tr. 1543).
4230. Dr. Jessup of Unocal, In explaining this request to present the slides Unocal used with CARB to the American Institute of Chemical Engineers and to "publicize our data", testified that "data" is "a loose way of saying the results from the data." (Jessup, Tr. 1317).
4231. According to Lamb, Unocal told CARB "that we would help them in any way we could... if they were willing to propose a predictive model." (Lamb, Tr. 2223).
4232. Unocal knew that CARB wanted "the actual underlying database represented in the presentation" which includes "at least" "all the information on the vehicles... all the information in regard to the fuels... and what the parameters and what levels of specification were in those fuels... and the emission results." (Lamb, Tr. 2224-2225).
4233. Nor did Unocal ever complain to CARB when CARB published Unocal's regression equations, charts, and graphs in the Technical Support Document. (Kulakowski, Tr. 4440, 4446-3347; Lamb, Tr. 1837-1838).
4234. In October 1991 Dennis Lamb and others at Unocal had received the Technical Support Document along with other rulemaking materials. (Lamb, Tr. 1999, 2051; CX 5, CX 52).
4235. Lamb understood that CARB had openly published Unocal's equations in Appendix 11 of its Technical Support Document. (Lamb, Tr. 1837-1838). Mr. Lamb also understood that CARB used Unocal's regression equations to create a table entitled, "Sensitivity Analysis of T50 Changes on Exhaust Emissions Using Unocal Regression." (Lamb, Tr. 2394; CX 5 at 033).
4236. Dr. Jessup also was aware that CARB used Unocal's ten-car equations in the CARB technical support document. (Jessup, Tr. 1293).
4237. Michael Kulakowski knew CARB used Unocal's equations to derive a sensitivity analysis of the effect of changing T50 on emissions. (CX 5 at 33; Kulakowski, Tr. 4437-4438). In fact, Mr. Kulakowski and Mr. Lamb in October 1991 discussed the fact that CARB had used the Unocal equations in the technical support document. (Kulakowski, Tr. 4438).
4238. No one at Unocal ever complained to CARB, in 1991 or later, that CARB had violated any agreement by publishing Unocal's equations. To Lamb's knowledge, no one ever

- complained to CARB concerning the publication of Unocal's equations. (Lamb, Tr. 1837-38; Kulakowski, Tr. 4439; CX 5 at 299-300).
4239. Mr. Kulakowski reviewed this language in October 1991, but he had no concern at that time that CARB had improperly used Unocal's 5/14 results. (Kulakowski, Tr. 4433-4434).
4240. The technical support document also contains two of the graphs that Unocal presented to CARB in the June 1991 meeting. (Kulakowski, Tr. 4436; CX 5 at 031-032).
4241. At the time, Mr. Lamb expressed no concern that CARB had somehow violated any confidentiality treatment of those graphs. (Kulakowski, Tr. 4436-4437).
4242. Unocal's June 1991 slide presentation in general was one of the references in CARB's technical support document. (CX 5 at 171; Kulakowski, Tr. 4439-4440). Unocal was aware of this, and the fact that the slides were made public by CARB. (Kulakowski, Tr. 4440). Neither Mr. Lamb nor anyone else at Unocal expressed any concern that CARB had violated any form of confidentiality agreement by making these slides public. (Kulakowski, Tr. 4440, 4465-4466).
4243. After the technical support document published the slides and equations from Unocal's 5/14 Project, there was no direction from Unocal's management to either no longer share confidential information with CARB or to be more careful when sharing such information with CARB. (Kulakowski, Tr. 4466).
4244. It is also CARB staff's recollection that no one from Unocal ever complained about CARB's publication of Unocal June 20th charts, its regression equations, or the slide presentation in general. (Venturini, Tr. 261-262; Curtis, Tr. 5753).
4245. Rather than complaining about CARB's publication of equations, charts, and slides, Unocal expressed concern that CARB had not used more of Unocal's information. (CX 1558 at 001 (Inventor Michael Croudace stating "We find no qualms with a T50 specification based on the Unocal vehicle testing. However, if CARB is going to use the Unocal test work to justify this specification, we would expect CARB to use all of the Unocal results."); Kulakowski, Tr. 4443, 4446 (Dennis Lamb instructed Mr. Kulakowski to contact CARB "and ask why they hadn't used other Unocal test work or made more use of the Unocal equations," making no issue about confidentiality)).
4246. Following Mr. Lamb's directions, Mr. Kulakowski contacted Mr. Fletcher at CARB and commented that CARB had not used Unocal test work that conflicted with other parts of the technical support document and asked why CARB did not make more use of Unocal's equations. (Kulakowski, Tr. 4443-4444).

4247. Rather than discontinuing cooperation with CARB, Unocal in February 1992, Unocal sent CARB a copy of an article authored by Unocal scientists Peter Jessup and Michael Croudace for the Society of American Engineers (“SAE”). (CX 1424).

C. Unocal’s Deception Before WSPA and Auto/Oil Was Material to the Decisions of California Refiners.

4248. Knowing about Unocal’s patents was important to members of the industry groups because the patents would significantly affect refiners’ costs associated with CARB Phase 2 gasoline, and therefore the amount they were willing to invest. (CCPF ¶¶ 1691-1748, 4249-4265).

4249. In 1991-1992, it would have been important for Chevron to know that Unocal had the intention to charge money for people to make gasoline in accordance with the CARB Phase 2 regulations. (Gyorfi, Tr. 5226). It would have been important for Chevron to know that Unocal had the intention to charge money because costs were a critical consideration for both the mandatory, regulatory-required projects and the discretionary projects. (Gyorfi, Tr. 5226-5227). Had Chevron known what the charge would be, they could have included that in the rate of return calculation to determine whether to proceed with the projects or not. (Gyorfi, Tr. 5227).

4250. It would have been important to Exxon to know in the fall of 1992 that Unocal had a pending patent application on reformulated gasoline. (Eizember, Tr. 3165-3166). Had Exxon known of the patent, Exxon would have tried to understand the potential costs associated with such a patent and how it might affect the different options Exxon was considering. (Eizember, Tr. 3166).

4251. Pending patent applications on technology that Exxon may use affect Exxon’s planning, because in the process of planning it’s incumbent upon planners to assess every possible cost that might affect the options being considered. (Eizember, Tr. 3164).

4252. When there is a patent that Exxon is planning on using, Exxon planners have to include the cost of any royalties on that patent in the cost of the alternatives. If Exxon knew of a patent application, Exxon would have to assess what the costs of that patent would be and how they might apply. (Eizember, Tr. 3164-3165).

4253. ARCO would have taken into consideration Unocal’s patent because knowledge of the potential license fees, royalties or money being sought by Unocal in association with their patents would have affected the “economic evaluation of the [CARB Phase 2] project.” Knowledge of the Unocal patent would have affected competitive context and risk because Unocal is a competitor of ARCO. It would have “threatened” ARCO’s marketing strategy because of the cost disadvantage. (Hoffman, Tr. 4917-4918). ARCO’s marketing strategy was to offer consumers a low price on the street, and to do

that it was important to know the costs of producing gasoline at the Carson refinery in relation to ARCO's competitors. (Hoffman, Tr. 4898).

4254. Knowledge of Unocal's pending patent application that related to many of the same properties covered by the CARB Phase 2 regulations would have affected Mr. Hoffman's analysis or recommendation with respect to the CARB Phase 2 project. (Hoffman, Tr. 4903-4904). Knowledge of the potential license fees, royalties or money being sought by Unocal in association with their patents would have informed or affected Mr. Hoffman's analysis when he was manager of planning and evaluation of ARCO Product Company. (Hoffman, Tr. 4917).
4255. Knowledge of the potential license fees, royalties or money being sought by Unocal in association with the patents "would have affected the risk which was an uncertainty of the performance of the project, which was already quite concerning to the senior management." (Hoffman, Tr. 4918).
4256. If Shell had known of the Unocal patent application in 1991, executives would "absolutely" have taken it into consideration in deciding which CARB Phase 2 compliance option to choose for Shell's Martinez and Anacortes facilities. (Banducci, Tr. 3486).
4257. Indeed, as described in more detail below, representatives of the major California refiners all testified that knowing that Unocal had a patent application and that Unocal intended to charge royalties would have affected the refineries' decisions to make investments for CARB Phase 2 gasoline. (CCPF ¶¶ 4458-4573).
4258. If refiners had learned about the Unocal patent application prior to being locked in, they would have invested much less, decreasing the supply of CARB compliant gasoline. In turn, CARB would have learned about this, and then would have taken steps to mitigate the effects of the patent. (CCPF ¶¶ 4458-4605).
4259. Representatives from the major California refineries testified uniformly that knowledge of the Unocal patents would have caused them to invest less in their CARB Phase 2 modifications. (CCPF ¶¶ 4458-4605).
4260. Had ARCO known about Unocal's patent application and its intent to enforce its patent, ARCO would not have proceeded with the investments in making CARB Phase 2 gasoline. This is because "the risk suggested by a proprietary position by any competitor would have been unacceptably high." (CX 7061 (Riley, Dep. at 11-12)). Had ARCO chosen this case, it would have produced 58,000 barrels per day, instead of the 142,000 barrels it ultimately built out to produce, a difference of 86,000 barrels per day. (Hoffman, Tr. 4978-4979, CX 5052 at 036).

4261. If Chevron had known in 1991 or 1992 of Unocal's intent to charge money to make gasoline in accordance with the CARB Phase 2 regulations, several courses of action were available. (Gyorfi, Tr. 5227). Chevron could have made a very different set of investment decisions, such as making the minimum investment, not making the modifications at all, or deferring the discretionary projects since they weren't required to make CARB Phase 2 gasoline. (Gyorfi, Tr. 5227).
4262. If Chevron had known about the Unocal patents in the early 1990s, the Executive Committee at Chevron would not have approved the CARB Phase 2 expenditures. (Derr, Tr. 5134-5135).
4263. If Texaco had known about Unocal's RFG patents before March 1994, Texaco would not have invested in the Los Angeles or Bakersfield refineries for the CARB Phase 2 program. (CX 7048 (Hancock, Dep. at 259)). Instead, had Texaco come to a decision not to invest in the refineries, "they would have shut down Bakersfield and they would have either tried to sell or shut down Los Angeles" like they had sold or shut down seven other refineries in the decade before 1991. (CX 7048 (Hancock, Dep. at 264)). Texaco also could have converted the Los Angeles refinery into a terminal. (CX 7048 (Hancock, Dep. at 311)).

D. Refiners Relied on Unocal's Statements and Conduct Conveying That Unocal's Research Was in the Public Domain Before Using Unocal's Research Materials.

1. There Were Other Options Available to Refiner Members That Would Have Mitigated Unocal's Market Power Had Refiners Timely Been Informed of the Unocal Patents.

4264. Had refiners known about the Unocal patents prior to being locked in to their current plans, refiners could have selected a different modification plan that would have reduced the level of infringement. (CCPF ¶¶ 4636-4640, 4655-4666, 4686-4697).
4265. At trial, Complaint Counsel's refining expert, Michael E. Sarna, provided testimony regarding changes that refiners could have made in order to reduce the overlap with the numerical limitations of the five Unocal patents. (CCPF ¶¶ 4606-4640, 4655-4666, 4686-4697). Mr. Sarna explained, and the evidence shows, that refiners could have made changes to their refineries to avoid the Unocal patents and at the same time make CARB Phase 2 gasoline had they known about the patents in sufficient time. (Sarna, Tr. 6186).

2. Auto/Oil Relied upon Representations That Unocal's Research Was in the Public Domain and Members Used it to Further Their Own Research.

4266. Following Dr. Jessup's September 1991 Auto/Oil presentation, the Auto/Oil members all believed they had the right to use Unocal's research data without having to worry about any restrictions, including royalty payments. (Doherty, Tr. 2798-2799, 2801; Pahl, Tr. 2772; Ingham, Tr. 2604, 2607; Klein, Tr. 2509; Segal, Tr. 5631; CX 7073 (Wise, Dep. at 19-20)).
4267. Auto/Oil representatives did not know that Unocal had filed a patent application and that Unocal intended to extract royalties from licensing fees. (Doherty, Tr. 2801; Pahl, Tr. 2773; Jessup, Tr. 1313-1314, 1547).
4268. Auto/Oil members took Unocal's statements at face value – the research, including the data about T50 – was in the public domain, *i.e.*, freely available to be used in any manner and without any strings attached. *See, e.g.* (Pahl, Tr. 2772; Ingham, Tr. 2604; CX 7049 (Hochhauser, Dep. at 138)).
4269. During the course of the Auto/Oil research, the members believed that it was important to know the potential costs of the various emissions improvements in order to develop the most cost-effective means of satisfying the new emissions goals. *See, e.g.* (Klein, Tr. 2475-2476; CX 4026 at 011).
4270. Unocal clearly understood that cost was an important and relevant factor to the Auto/Oil members: "There was a group within Auto/Oil that looked at cost constantly, potential costs." (CX 7041 (Alley, Dep. at 35-36)).
4271. Unocal's patent application has added to the cost of the T50 solution suggested by Unocal's data. *See, e.g.* (CX 1337 at 008).
4272. It was essential to Auto/Oil's mission to know of the added cost of Unocal's research, and the absence of any notification of the cost was a factor that led Auto/Oil's members to the conclusion that the data was public and that there was no additional cost attached to using Unocal's data. *See, e.g.* (CX 140 at 003; CX 4001 at 003-004, 007; Kiskis, Tr. 3833-3844; Ingham, Tr. 2595).
4273. Unocal's data provided useful information regarding T50. (Segal, Tr. 5624; Jessup, Tr. 1313). The "graph basically says that as you lower T50 below the industry average point, which is somewhere between 215 and 220 degrees, as you take T50 lower, hydrocarbon emissions are reduced proportionally." (Segal, Tr. 5624; CX 1678 at 036).
4274. Unocal's pending patent application at the time it made its presentation to Auto/Oil in September 1991, contained a claim covering T50 under 215 degrees Fahrenheit. (CX 2024 at 001 ("Claim 1 in the application of the '393 patent had a T50 of no more than 215 and an RVP of no more than 8.0."); CX 1788 at 051).

4275. Auto/Oil members took Dr. Jessup's presentation and research results and, understanding that they were permitted to do so, freely used this data and the data disks however they saw fit, with no expectation of paying either for the data, or the right to use any process or technology developed therefrom. (Klein, Tr. 2508-2509; Ingham, Tr. 2604-2605; CX 7049 (Hochhauser, Dep. at 66, 69-70, 74)).
4276. Mr. Pahl shared the Unocal research materials with his coworkers, manager, and other people within Phillips Petroleum Company that had an interest in fuel compositions because the data showed a relationship on T50 and other variables. (Pahl, Tr. 2773).
4277. Mr. Pahl believed he could share the information with his coworkers because his "understanding was that [Unocal's data] was public domain information, it wasn't proprietary or confidential, and so we were free to use it in any way we thought was appropriate." (Pahl, Tr. 2772).
4278. ARCO and Chevron made extensive use of the data in their own research efforts, understanding that the data itself, and any processes derived therefrom, to be available to all at no cost. (Ingham, Tr. 2607-2609; Segal, Tr.5627-5628).
4279. Jack Segal, who attended Unocal's presentation to Auto/Oil and its prior presentation to WSPA, circulated the Unocal slides from the Auto/Oil presentation to ARCO's Clean Fuels Task Force and to ARCO's vice president of engineering and technology. (Segal, Tr. 5627-5628; CX 272; CX 1678). At the time Mr. Segal circulated Unocal's slides from the Auto/Oil presentation to his management and colleagues, he had no idea that Unocal had filed a patent application or that Unocal had a plan to charge money for using this information. (Segal, Tr. 5628).
4280. Jack Segal testified that there was enough information on Unocal's data disk to replicate Unocal's tests. (Segal, Tr. 5617).
4281. ARCO ran regressions on Unocal's data and came to the same conclusion that "a decrease in T50 would cause a proportional decrease in carbon monoxide." (Segal, Tr. 5617-5620; CX 1592; CX 1593).
4282. At the time ARCO ran these regressions, it believed that Unocal's information was in the public domain and free to use. (Segal, Tr. 5613-5614, 5629-5631).
4283. Mr. Segal understood from Unocal's presentation to Auto/Oil that "as T50 is being decreased . . . emissions are also going down." (Segal, Tr. 5610, 5626-5627; CX 1678 at 038). Mr. Segal also understood from Unocal's presentation that "as you reduce T50 below 220, carbon monoxide emissions are also reduced." (Segal, Tr. 5627; CX 1678 at 038).

4284. Mr. Segal had no way of knowing that Unocal planned to charge money for its research data because “this was presented in an open forum at Auto/Oil and we believed that presentations in Auto/Oil were in the public domain.” (Segal, Tr. 5628).
4285. Mr. Ingham, an Auto/Oil member from Chevron, sent around a memo to numerous colleagues discussing Peter Jessup’s presentation and attaching a copy of the Unocal slides. (Ingham, Tr. 2607-2610; CX 461 at 001, 056-113). At the time that Mr. Ingham sent around the Unocal data to his colleagues, he believed that Unocal’s reformulated gasoline research was in the public domain, and believed that Chevron could use Unocal’s research information without having to worry about Unocal’s assertion of any proprietary interests in the information. (Ingham, Tr. 2604, 2610-2612, 2617-2618).
4286. Mr. Klein, an Auto/Oil member from Shell, made overhead transparencies of the Unocal slides and made a presentation to his colleagues at Shell, with the understanding that Unocal’s information was in the public domain and not subject to any intellectual property protection, because Mr. Klein “believed that it was part of the Auto/Oil program.” (Klein, Tr. 2503-2504, 2507).
4287. Mobil representatives took careful notes during Unocal’s presentation of its 5/14 research. (RX 701 at 004-005).
4288. After receiving Unocal’s research data at its presentation to Auto/Oil, and after finding out that the research data had been presented to CARB and was in the public domain, Mobil representatives in Auto/Oil compiled a memorandum to several people in Mobil’s research department, detailing Unocal’s findings, and running tests to see if Unocal’s conclusions were correct. (CX 1693). Mobil compared Unocal’s results with the Auto/Oil results. (CX 1693).
4289. Not only was Unocal’s emissions research used by individual Auto/Oil members, but it was also used in Auto/Oil studies. (Pahl, Tr. 2772).
4290. Unocal’s presentation had an effect on the research work being done at Auto/Oil. (Ingham, Tr. 2618).
4291. Unocal’s presentation to Auto/Oil “accelerated the conduct of the experiment that Auto/Oil had been planning to conduct to look at the independent effects of T50 and T90.” (Ingham, Tr. 2618).
4292. Unocal’s research helped Auto/Oil determine “the width of the T50 variable, the T90 variable and the T50/T90 study.” (Pahl, Tr. 2772; CX 748 at 037-038).
4293. Unocal’s research material was specifically used in Auto/Oil’s T50/T90 study. (Pahl, Tr. 2775; CX 748 at 037-038).

4294. GM discussed Unocal's T50 research at an Auto/Oil RPC meeting. (CX 748 at 003). Mr. Pahl testified that Unocal's research "helped guide the deliberations of the research program committee in deciding which parameters of the gasoline that we would study in the future from that point on." (Pahl, Tr. 2775).

3. WSPA Members Relied upon Representations That Unocal's Research Was in the Public Domain and Used it to Further Their Own Research.

4295. Unocal's presentation to WSPA provided useful information regarding T50. (Segal, Tr. 5620; Lieder, Tr. 4683). "The industry average T50 at that point in time was around 215 to 220 degrees Fahrenheit. This graph definitely showed a very beneficial relationship to decreasing the T50 below that range in order to reduce CO emissions." (Segal, Tr. 5620).

4296. Unocal's pending patent application at the time it made this presentation to WSPA contained a claim covering T50 under 215 degrees Fahrenheit. (CX 2024 at 001 ("Claim 1 in the application of the '393 patent had a T50 of no more than 215 and an RVP of no more than 8.0."); CX 1788 at 051).

4297. ARCO concluded that Unocal's research data had practical application in the formulation of clean fuels. (Segal, Tr. 5620).

4298. ARCO took Unocal up on its offer and received a copy of the Unocal data disk after the WSPA meeting. (Segal, Tr. 5617).

4299. There was enough information on Unocal's data disk to replicate Unocal's tests. (Segal, Tr. 5617).

4300. Having no reason to believe that he was not complying with ARCO's internal policy on receiving proprietary information, Mr. Segal circulated the Unocal slides from the WSPA presentation to ARCO's Clean Fuels Task Force and to ARCO's vice president of engineering and technology. (Segal, Tr. 5613).

4301. Shell used Unocal's data. As chair of the predictive model working group, Dr. Lieder was given Unocal's data disks to "quickly look at the data and start the combination of that with the existing data" the group already had. (Lieder, Tr. 4726).

4302. Dr. Lieder gave Unocal's data to Shell enabling them to review Unocal's data set, look at trends made evident by the Unocal data, and run "regressions on the data to see which kind of predictive models would represent just that sole data sheet." (Lieder, Tr. 4707).

4303. Dr. Lieder did regressions with the Unocal data presented at the September 10, 1991, meeting. (Lieder, Tr. 4771).

4304. After running regressions of Unocal's data, Shell confirmed the key factors of the oral presentation given by Unocal. (Lieder, Tr. 4707).
4305. Mobil believed it was free to use the data and information; it conducted a preliminary analysis of that data set and included Unocal slides in an internal memorandum. (CX 1693 at 001, 004; Jessup, Tr. 1309-1311).
4306. On September 10, 1991, Unocal gave the predictive model working group, of which Dr. Lieder was chair, the Unocal data files. (Lieder, Tr. 4692; CX 7049 (Hochhauser, Dep. at 57); CX 271 at 002-004).
4307. WSPA members used Unocal's research to help develop their proposed predictive model. (CX 7049 (Hochhauser, Dep. at 76)).
4308. After Unocal's presentation and after the WSPA predictive model group received Dr. Jessup's preliminary predictive model, WSPA took Unocal's data sets and "start[ed] to review them with the purpose of combining them into the WSPA combined database" that would be shared with CARB. (Lieder, Tr. 4692).
4309. WSPA met with CARB in October 1991 to discuss the status of the predictive model and to make a presentation to CARB. (CX 277 at 003; CX 1563 at 003). 7 people from WSPA attended this meeting, and 3 of those people were from Unocal. (CX 277 at 004).
4310. The results from a regression on the data set that Dr. Jessup created for WSPA by combining the 5/14 Project data with other data sets were "similar to those that Unocal discovered." (CX 300 at 001).
4311. As an internal Unocal October 1991 memorandum reveals, Unocal knew that WSPA's predictive model efforts were headed directly into the same results that Unocal discovered (and later patented) from its 5/14 Project. (CX 300 at 001).

E. Unocal's Deceptive Conduct Caused Unocal to Achieve Monopoly Power.

1. The Proper But-For World Is The One Where Unocal Makes Good On Its Zero Royalty Representation.

4312. As Complaint Counsel's economic expert Dr. Shapiro explained, the appropriate but-for world is the world where Unocal makes good on its representations and its technology is offered in California for zero royalties ("Zero Royalty But-for World"). (CX 1799A at 016 (Shapiro Expert Rebuttal Report)) .
4313. The Zero Royalty But-for World involves competition by Unocal in the technology market, just as it played out in the actual world, but assumes that Unocal's competitive

actions are undertaken in an honest fashion rather than being deceptive. (CX 1799A at 016 (Shapiro Expert Rebuttal Report)). In his analysis, Dr. Shapiro identified the *ex ante* period as 1991, when CARB is choosing what its regulations will be. (Shapiro, Tr. 7068). Dr. Shapiro identified the *ex post* period as 1995, when CARB and many of the refiners learn about the Unocal patents and Unocal's intention to seek royalties. (Shapiro, Tr. 7068).

4314. The Zero Royalty But-for World is superior to the but-for worlds posited by Unocal's experts, where Unocal discloses its research and the fact that it has a patent ("Hypothetical Disclosure But-for World"). (CX 1799A at 016 (Shapiro Expert Rebuttal Report)).
4315. Dr. Shapiro's Zero Royalty But-for World uses direct observations about real-world *ex ante* competition in the relevant market as the competitive benchmark, based on actual observations of technology competition playing out in the real world. (CX 1799A at 017 (Shapiro Expert Rebuttal Report)).
4316. In the Zero Royalty But-for World, if Unocal intended to make good on the royalty-free offer that it communicated, then Unocal must have determined *ex ante* that the royalty-free offer was the profit-maximizing strategy. (CX 1799A at 017 (Shapiro Expert Rebuttal Report)). If Unocal intended to make good, then Unocal's royalty-free representation is the ideal competitive benchmark. (CX 1799A at 017 (Shapiro Expert Rebuttal Report)).
4317. If Unocal had never intended to make good on its representation, then Unocal could expect such a strategy of deception to enhance its bargaining power very substantially, by an amount equal to the (expected) investments specific to CARB's Phase 2 regulations. (CX 1799A at 017 (Shapiro Expert Rebuttal Report)).
4318. With large specific investments, it is clear that the *ex post* profit maximizing royalty offer is substantially greater than the *ex ante* profit maximizing (honest) offer. Therefore, Unocal can expect to acquire significant market power from its deception. (CX 1799A at 017 (Shapiro Expert Rebuttal Report)).
4319. There is no economic analysis that lying to rational consumers can benefit those consumers. (CX 1799A at 017-018 (Shapiro Expert Rebuttal Report)).
4320. In Dr. Shapiro's expert opinion, "I consider it rather obvious that lying disrupts and undermines the competitive process itself." (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).
4321. Dr. Shapiro's Zero Royalty But-for World is also superior to Hypothetical Disclosure But-for World because it is better at deterring deceptive conduct. (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).

4322. “Such deterrence is very important . . . since deception can severely undermine the effective workings of markets.” (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).
4323. The Hypothetical Disclosure But-for World requirement would provide companies with a positive incentive to lie. Unocal’s experts argue that deceptive conduct is harmless so long as Unocal charges no more *ex post* than it could have gotten *ex ante*, had it been truthful, without inducing CARB to pick an alternative, non-infringing regulation. (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).
4324. Unocal’s expert’s Hypothetical Disclosure But-for World requirement would make lying a no-lose proposition in any bidding situation. By deceptively making a very attractive offer, a company could assure not only that it wins the *ex ante* competition, but also that it will receive the maximum possible *ex ante* price (or perhaps even more if its deception is not proven so that it can charge the profit-maximizing *ex post* price). (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).
4325. Under the Hypothetical Disclosure But-for World requirement advocated by Unocal’s experts, there is nothing to prevent a company that is lying from making a very attractive deceptive offer, since the terms that the company can later obtain without incurring liability are unrelated to its initial deceptive offer, but rather determined by the maximum *ex ante* price it could have achieved without losing the competition. (CX 1799A at 019 (Shapiro Expert Rebuttal Report)).
4326. By being honest, the company must face a tradeoff: a lower price may leave more surplus in the buyer’s hands, and a higher price risks losing the bidding competition. The approach advocated by Unocal’s experts allows a company to avoid this tradeoff by lying. (CX 1799A at 019 (Shapiro Expert Rebuttal Report)).
4327. Deception deprives the buyer of a chance to truly benefit from *ex ante* competition. Deception short-circuits the competitive process. Requiring a firm that has lied to make good on its earlier representations goes a long way towards restoring competition. (CX 1799A at 018 (Shapiro Expert Rebuttal Report)).
4328. Dr. Shapiro’s Zero Royalty But-for World approach is also superior because it requires companies to make good on their representations. Lying not only creates inefficiencies, but fundamental principles of fairness indicate that market participants should be held to their representations. (CX 1799A at 019 (Shapiro Expert Rebuttal Report)).
4329. “As someone who teaches at a business school which, like many, has been emphasizing the inclusion of a business ethics component in *all* of its classes, I believe that one cannot and should not entirely divorce economic analysis, and profit maximization, from considerations of equity and fairness.” (CX 1799A at 019 (Shapiro Expert Rebuttal Report)).

4330. Dr. Shapiro's Zero Royalty But-for World approach minimizes the need to evaluate how market participants would have responded to various to the hypothetical situations that never arose. By focusing on the but-for world in which Unocal made the same representations and subsequently lived up to them, Dr. Shapiro's approach steers clear of any speculation regarding how CARB and the refiners would have responded to alternative communications by Unocal back in 1991. (CX 1799A at 019-020 (Shapiro Expert Rebuttal Report)).
4331. Dr. Shapiro's Zero Royalty But-For World approach also avoids having to arbitrarily pick just what alternative *ex ante* conduct one uses in the but for world. It also eliminates difficulty regarding precisely what would be disclosed, when and by whom. (CX 1799A at 020 (Shapiro Expert Rebuttal Report)).
4332. Finally, Dr. Shapiro's Zero Royalty But For World approach is simple and easy to enforce. By requiring complaint counsel to construct a hypothetical world, it is plainly harder to obtain any relief from a lying firm, making it harder to police deceptive conduct. This is particularly true where other market participants have relied on the deception and made substantial investments over an extended period of time due to the passage of time and changes in economic conditions since the *ex ante* time frame. (CX 1799A at 020-021 (Shapiro Expert Rebuttal Report)).
4333. Dr. Teece and Dr. Shapiro agree that Unocal was able profitably to demand a higher price for its patents *ex post*, after CARB had adopted the Phase 2 regulations and refiners had spent billions to comply with the regulations. (CX 1720A at 026 (Shapiro Expert Report)).
4334. Dr. Teece admitted that the refiners' capital plans made to comply with CARB Phase 2 did not take into account any flexibility from the predictive model. (Teece, Tr. 7710). Nor did they take into account Unocal's patents. (Teece, Tr. 7710-7711).
4335. The evidence shows that refiners would have certainly taken steps to take into account the patents, and mitigate their effects. First, refiners would have contacted CARB to tell CARB about the patent. CARB, in turn, would have reacted and taken steps to mitigate the effects of the patent. (CCPF ¶¶ 4581-4594, 4338-4429).
4336. Second, refiners would have delayed or limited their investment plans until the uncertainty surrounding the Unocal patent application had been resolved. As a matter of course, refiners would have informed CARB of their change in investments. CARB, in turn would have taken steps to mitigate the effects of the patent. (CCPF ¶¶ 4458-4573).
4337. Third, refiners would have explored options to reduce the amount of infringement with the patents. The very availability of these options would have altered the bargaining

position for a license, forcing Unocal to license its patents at a lower rate than it ultimately did. (CCPF ¶¶ 4606-4697, 4698-4716).

F. If CARB Had Timely Knowledge of Unocal’s Patent Intentions, CARB Would Not Have Adopted Regulations That Gave Unocal a Monopoly, but Instead Would Have Selected Another Viable Alternative.

1. CARB Did Not Know it Was Taking Action Facilitating Unocal’s Exercise of Market Power.

4338. Peter Venturini, the lead manager who proposed Phase 2, did not know that issuance of Phase 2 would enhance Unocal’s market power. He had construed Unocal’s August 27, 1991 letter as saying that the information presented to CARB by Unocal regarding its 5/14 research was “nonproprietary” and could be used in the Phase 2 proceeding with “no strings attached.” (Venturini, Tr. 143, 240-243). He also viewed Unocal as “removing their claim of competitive advantage” asserted in the July 1, 1991 letter. (Venturini, Tr. 243; CX 25; CX 29).
4339. Other CARB staff also viewed Unocal’s letter as meaning that Unocal was making its research available with no associated costs. (Fletcher, Tr. 6480 (“available” meant “no restrictions on its use”); Curtis, Tr. 5746 (“nonproprietary” meant “not owned by Unocal, available to the public.”)).
4340. CARB Executive Officer Boyd also did not know that CARB’s Phase 2 reformulated gasoline regulation would enable Unocal to charge substantial sums for patent royalties. He had understood that Unocal had given CARB unqualified permission to use its research and viewed that as a significant event. (Boyd, Tr. 6710-6712, 6714-6715).
4341. CARB Chairman Sharpless, based on CARB staff’s description of Unocal’s representations, similarly believed that Unocal would assert no property rights in its research. (CX 7063 (Sharpless, Dep. at 229-230)).
4342. Unocal gave CARB no prior notice of any pending patent, or any issued patent, before January 31, 1995. (Kenny, Tr. 6589-6590; 6671; Venturini, Tr. 168). To Peter Venturini’s knowledge, no other CARB staffer working on Phase 2 reformulated gasoline had learned of the Unocal patent before Unocal’s January 31, 1991 press release. (Venturini, Tr. 320-322); *see also* (Fletcher, Tr. 6472, 6476-6477; Curtis, Tr. 5747, 5750-5751, 5770-5771, 5784-5785, 5960).

2. CARB Decision Makers Would Not Have Approved a Reformulated Gasoline Regulation Giving Unocal Substantial Market Power, But For Unocal's Misrepresentations About its Patent Rights and Plans to Charge for Use of its Technology.

a. CARB Decision Makers Would Not Have Approved the Versions of the Phase 2 Rule That Staff Proposed in October and November 1991.

4343. Peter Venturini at the time of the Phase 2 proceeding was Chief of CARB's Stationary Source Division. He had worked for CARB for more than three decades with almost every CARB Board since the creation of agency. (Venturini, Tr. 99). His background and experience during that period included such subject matters as motor vehicle fuels, consumer products control, addressing architectural coatings, the identification and control of toxic air pollutants, addressing particulate matter from diesel vehicles, permitting and new source review, and liaison with air pollution control districts, the U.S. EPA, and other California agencies like the California Energy Commission, state water board, the Office of Environmental Health and Hazard Assessment, and the Department of Toxic Substance Control. (Venturini, Tr. 81-82).
4344. Peter Venturini, during all times when he was head of the Stationary Source Division, was the gatekeeper who decided what information and proposals would be presented by Division staff to the CARB Board. Mr. Venturini also approved presentations that staff made to the Board. (Venturini, Tr. 103, 108).
4345. Unocal knew that it was important to get the support of CARB staff because the board would frequently side more with the staff than with interested parties in rulemaking proceedings. (Kulakowski, Tr. 4406-4407).
4346. Unocal therefore sought to obtain staff's support for Unocal's proposals because "[i]t just made it simpler to get the board to buy into it." (Kulakowski, Tr. 4406).
4347. As Unocal observed, during the Phase 2 proceedings, the CARB Board adopted much of what the CARB staff had proposed. (Kulakowski, Tr. 4407).
4348. The Executive Officer deferred substantially to Peter Venturini, in particular, given his position as one of the principal division chiefs in CARB and his proven track record of success. (Boyd, Tr. 6692).
4349. The CARB Board and Executive Officer depended very heavily on Mr. Venturini's technical staff due to their deep expertise and reputation for technical excellence. (Boyd, Tr. 6691 ("... they had established themselves as probably the most competent and progressive air quality agency in the nation.")).

4350. The Executive Officer of CARB depended on technical staff to perform the cost analyses. (Boyd, Tr. 6868).
4351. Peter Venturini, lead manager of the Phase 2 proceeding, had the duty to assess the “substantial evidence” supporting Phase 2 and to decide whether the proposed rule should go to the CARB Board. (Venturini, Tr. 113, 136-137; Kenny, Tr. 6526-6527).
4352. Peter Venturini, having submitted over a hundred regulations to the Board in his 30 year career, never did so without first having the belief that the regulation had substantial evidence to support it. (Venturini, Tr. 107-108, 122).
4353. Peter Venturini, would not have approved forwarding the Phase 2 recommendation to the Board in November 1991 if he knew of Unocal’s plan to charge substantial royalties. (Venturini, Tr. 243-244).
4354. Peter Venturini would have viewed the fact that Unocal had a plan to charge money for making gasoline using a T50 specification as extremely important because “we’d be basically giving one entity basically a monopoly.” (Venturini, Tr. 151).
4355. Peter Venturini would not have forwarded to the Board the Phase 2 regulation if it had an uncertainty of cost of even 1.5 cents per gallon. (Venturini, Tr. 152).

b. The Executive Officer of CARB Would Not Have Approved the Reformulated Gasoline Regulation Proposal Had He Known of Unocal’s Plans to Enforce Its Proprietary Interests in Its 5/14 Research.

4356. CARB Executive Officer James Boyd was, in effect, the “CEO” of CARB during the Phase 2 rulemaking. (Boyd, Tr. 6687-6688). As Executive Officer, James Boyd had oversight authority for all staff proposed rules, including Phase 2. (Boyd, Tr. 6687-6688).
4357. CARB technical staff working on the Phase 2 regulations often briefed CARB upper management, including Mr. Boyd, about the status of Phase 2 activities. (Fletcher, Tr. 6443-6444).
4358. Executive Officer Boyd, if knowing of the Unocal patent, would not have approved forwarding to the Board the Phase 2 rule as written, given its potentially “extreme negative consequences.” (Boyd, Tr. 6728 (testifying that he “would not have approved the regulation” during the post-Board-approval “adoption” period if he had known of the patent)).

4359. One reason Executive Officer Boyd would not have approved a Phase 2 rule that permitted Unocal to charge substantial royalties was that “believe me, in those days, a nickel increase in the cost of a gallon of gasoline in California would have extreme negative consequences.” (Boyd, Tr. 6734).
4360. Executive Officer Boyd believed that CARB was vitally interested in information that bore upon the ultimate cost to the consumer of Phase 2. (Boyd, Tr. 6706-6707).
4361. Executive Officer Boyd, if told of the Unocal patent, would have been concerned that “if indeed Unocal intended to charge in various forms for and to license or to charge royalties, this would have an impact to the cost of the product to refiners which would be passed on to the California consumer, which would then have an impact on the state of California’s economy.” (Boyd, Tr. 6733 - 6734).
4362. According to Executive Officer Boyd, Unocal’s intention actually to enforce an issued patent “would bring a cost element into the equation” and it would become “very relevant to whether or not the regulation could be passed in the form that is was.” (Boyd, Tr. 6907).

c. CARB’s General Counsel Would Not Have Approved Phase 2 RFG Regulations as Adopted Had he Known of Unocal’s Pending Patents.

4363. Michael Kenny, now a Judge in the California Superior Court in Sacramento, was General Counsel of CARB from January 1990 to August 1996. Mr. Kenny thereafter served as Executive Director of CARB, essentially CARB’s “CEO,” from August 1996 through January 2003. (Kenny, Tr. 6496; Boyd, Tr. 6687-6688 (the Executive Director position is similar to that of a Chief Executive Officer)).
4364. General Counsel Kenny’s office had the obligation to determine that the Phase 2 rulemaking record contained “substantial evidence” and that the Phase 2 record met other requirements of the California Administrative Procedures Act. Mr. Kenny’s sign off was necessary before the Phase 2 rule could be forwarded to Board in November 1991. (Kenny, Tr. 6525-6527). General Counsel Kenny reviewed the proposed Phase 2 documents before and after the November 1991 Board hearings and attended relevant Board meetings. (Kenny, Tr. 6497).
4365. General Counsel Kenny was not aware of the Unocal pending patent or any Unocal plan to charge royalties in connection with the RFG regulations when he approved Phase 2 as meeting statutory requirements. (Kenny, Tr. 6541-6542).

4366. CARB's General Counsel, Michael Kenny, "would not have signed off" on staff's proposed Phase 2 regulations, had he known about a plan by Unocal to charge money for its intellectual property rights relating to the Phase 2 proposed regulations. (Kenny, Tr. 6544).

d. CARB's Chairman and the CARB Board Would Not Have Approved a Reformulated Gasoline Regulation, As Actually Adopted in November 1991, Knowing That the Reformulated Gasoline it Mandated Potentially Overlapped with a Pending Unocal Patent.

4367. Jananne Sharpless was CARB Chairman from 1985 through November of 1993. Chairman Sharpless was the only full-time member of the CARB Board during that period. (CX 7063 (Sharpless, Dep. at 37); CX 1665 (Cal. Health & Safety Code § 39511(b) (1991))).

4368. Chairman Sharpless, before the Board approved Phase 2 RFG regulations, had been briefed by staff about Unocal's offer of research and understood that Unocal had told staff it would assert no property rights in its research. (CX 7063 (Sharpless, Dep. at 229-230)).

4369. Chairman Sharpless believed "there was an assumption that when you put information in, label it as non-proprietary, that it is in the public and that you're not going to be pursuing patents." She "did not assume that somebody would go and take a regulation and – and start patenting all parts of that regulation to their economic benefit." (CX 7063 (Sharpless, Dep. at 229-230)).

4370. Chairman Sharpless believes that the CARB Board would not have "marched off that cliff" and have approved a Phase 2 RFG regulation as it did in November 1991 if informed that Unocal had a pending patent. (CX 7063 (Sharpless, Dep. at 198)).

4371. According to Chairman Sharpless, "if it turned out that we had information that this rule would have somehow not been a good rule in terms of other reasons, economic reasons, then I think that that would have definitely have been a major consideration on the part of the board. . . . if something came up that said wait a minute, red flag, there's a problem here, would we march off the cliff? No. Wouldn't be responsible." (CX 7063 (Sharpless, Dep. at 198-199)).

4372. Chairman Sharpless believed that the CARB Board, if learning of the Unocal pending patent "would have been asking a lot of serious questions about how that would affect market and how that would affect the ability of one company to sort of have control of certain aspect of the marketplace . . . that would be a major concern and I think it would have caused the board to want to have further investigations. I don't think the board

would take action that November had they known.” (CX 7063 (Sharpless, Dep. at 226-227)).

4373. Chairman Sharpless believed that the CARB Board, if learning of the Unocal pending patent, would have the option of delaying the proceeding despite the statutory deadline in the California Clean Air Act to issue regulations by January 1992. If the regulation “couldn’t stand up against the measurements of technical feasibility and cost effectiveness, then I did have an option, and that would be that I would go back to the legislature – and I have done that – to say that the deadlines are not achievable, and recommend that there be some relief given.” (CX 7063 (Sharpless, Dep. at 151-152, 226-227)).
4374. Chairman Sharpless did not believe that the Board have been forced to issue the Phase 2 rule as written in order meet California’s Federal Clean Air Act requirements. (CX 7063 (Sharpless, Dep. at 195-196, 198)).

e. CARB’s Executive Officer Would Have Prevented the Phase 2 Reformulated Gasoline Regulations as Approved, from Being Formally Adopted in September 1992.

4375. Unocal learned in July 1992 that the U.S. Patent and Trademark Office was likely to approve most of its patent claims and that approved claims were likely to encompass many of the fuels that refiners could manufacture and still comply with the Phase 2 rule. (CCPF ¶ 2211).
4376. CARB, at the time Unocal learned that PTO was likely to approve claims overlapping with the Phase 2 rule, still had not finally “adopted” the regulation. The Board, as part of its approval of the Phase 2 specifications in November 1991, had delegated final adoption authority to Executive Officer Boyd. (CX 817 at 008 (Board Resolution); CX 816 (Executive Order adopting Phase 2 mandatory specifications)).
4377. Officer Boyd did not adopt the Phase 2 rules as written until September 18, 1992. (CX 816 at 002 (Executive Order)).
4378. After adoption, there was a further step before the CARB rules constituted a final action of the agency. The California APA required CARB to forward the proposed Phase 2 rule to the Office of Administrative Law (“OAL”). OAL was authorized to block the issuance of the Phase 2 rule if the rulemaking record lacked “substantial evidence.” (CX 7029 at 073-075 (Cal. Gov’t Code § 11349.1 (1991)); CX 7029 at 072-073 (Cal. Gov’t Code § 11349(a) (1991))).

4379. OAL approved the Phase 2 rules as written on November 16, 1992. (CX 1811 at 001).
4380. At this “adoption” phase the Executive Officer had authority of the Board to adopt or not adopt the rule based on comments received and other considerations. (Boyd, Tr. 6724 - 6727, 6729; Kenny, Tr. 6535).
4381. Unocal, although learning from the U.S. PTO that PTO was likely to approve patent claims that substantially overlapped with Phase 2 formulations, never told CARB of this fact. (Boyd, Tr. 6728 - 6729).
4382. Executive Officer Boyd, if knowing of an intent by Unocal to charge money for the use of its 5/14 research, would not have adopted the Phase 2 regulation in 1992. He “would not have approved the regulation.” (Boyd, Tr. 6728).
4383. General Counsel Kenny also had sign off authority with respect to whether CARB Phase 2 met legal requirements and could be sent to OAL for approval. (Kenny, Tr. 6525-6527). General Counsel Kenny reviewed the proposed Phase 2 documents after the November 1991 Board hearings. (Kenny, Tr. 6497).
4384. Michael Kenny as General Counsel had the authority to withhold necessary approval for the Phase 2 package to be forwarded to the Office of Administrative Law, if proposal lacked “substantial evidence” with respect to such statutory criteria as effect on the economy of the state or cost effectiveness. (Kenny, Tr. 6526-6527).
4385. General Counsel Kenny was not aware of the Unocal pending patent or any Unocal plan to charge royalties in connection with Phase 2 when he approved Phase 2 as meeting statutory requirements. (Kenny, Tr. 6541-6542).
4386. CARB’s General Counsel, Michael Kenny, “would not have signed off” on the Phase 2 regulation as written at the 1992 adoption phase, had he known about a plan by Unocal to charge money for its intellectual property rights relating to Phase 2. (Kenny, Tr. 6544).

f. The Views of CARB’s Decision Makers Are Entirely Consistent with CARB’s Contemporaneous Actions to Avoid Excessive Cost and Adverse Impacts on Competition.

4387. The views of Chairman Sharpless, Executive Officer Boyd, General Counsel Kenny, and Stationary Sources Chief Peter Venturini that they would not have approved Phase 2 as written, but for Unocal’s misrepresentations and deceptive omissions of fact, are entirely consistent with the Board’s pronouncements on the record about avoiding excessive cost and adverse impacts on competition. (CCPF ¶¶ 3948-3976).

3. CARB Had Other Alternatives Than Adopting the Reformulated Gasoline Regulations It Actually Adopted in November 1991.

a. CARB Management Had the Option of Delaying the Phase 2 Proceeding to Consider Alternatives.

4388. The California Clean Air Act directed CARB to issue a reformulated rule by “not later than January 1, 1992.” (CX 1665 (Cal. Health & Safety Code §43018(b) (1991))).
4389. The California Clean Air Act also directed that “[i]n carrying out this section, the state board shall adopt standards and regulations which will result in the most cost-effective combination of control measures . . .” (CX 1665 (Cal. Health & Safety Code § 43018(c)(1991))).
4390. The California Clean Air Act also directed CARB to consider the “the effect of the standards and regulations on the economy of the state . . .” CARB construed this directive as one not only to avoid unreasonable cost, but also as a directive to avoid conferring monopolies in CARB regulations (Kenny, Tr. 6511-6512; CX 1665 (Cal. Health & Safety Code § 43018(e) (1991))).
4391. CARB also construed these directives in §43018 of the Health & Safety Code as meaning that CARB should strive “to meet these emission reduction goals in a manner that provides flexibility for fuel producers to provide the ‘cleanest’ possible gasoline at the least cost to the consumer.” (CX 52 at 006).
4392. General Counsel Michael Kenny also was aware that the applicable California Clean Air Act provisions did not contain any sanction mechanisms in the event that CARB failed to meet the January 1992 deadline. (Kenny, Tr. 6548).
4393. CARB Chairman Jananne Sharpless, if told of Unocal’s pending patent, would have viewed delaying the Phase 2 proceeding beyond the statutory deadline as an acceptable option. (CX 7063 (Sharpless, Dep. at 151-152)).
4394. CARB Chairman Jananne Sharpless, if told of Unocal’s pending patent, viewed one option to be to “go back to the legislature . . . to say that the deadlines are not achievable, and recommend that there be some relief given.” This was something she had done before. (CX 7063 (Sharpless, Dep. at 151-152)).
4395. CARB technical staff similarly assumed that the statutory deadline was not inviolate, depending on how research projects went and other factors. Staff’s “Regulatory Workplan” for Phase 2, dated January 30, 1991, stated that “[i]f all the test results are inconclusive, several options are available. One is to conduct more tests, provided there are still questions that need to be answered. Additional tests will likely push the Phase II program into 1992.” (CX 785 at 005, 007-008; Curtis, Tr. 5756-5757 (staff had many discussions about this document)).

4396. The U.S. EPA, shortly before the CARB Board met to consider Phase 2, missed its own statutory deadline for issuing its own RFG rules. CARB observed in its October 1992 Final Statement of Reasons that EPA had been directed by statute to issue an RFG regulation by November 15, 1991, but as of October 1992 had “yet to issue final regulations.” (CX 10 at 161). CARB also noted that it “appears unlikely EPA will meet its schedule for the year 2000 regulations.” (CX 10 at 161).

b. CARB Could Have Adopted Other Specifications That Avoided Overlap with Unocal’s Patents.

4397. CARB staff prepared a document around January 30, 1991, titled, “Phase II Reformulated Gasoline Regulatory Workplan” that discussed CARB’s options, and prepared timelines and pathways, for the development of the Phase 2 regulations. CARB staff had many discussions about the issues raised in the document. (CX 785, Curtis, Tr. 5756-5757).
4398. In the early fall of 1991, Mr. Curtis knew of technically feasible options other than the regulations actually proposed by CARB staff. (Curtis, Tr. 5764-5766).
4399. In Mr. Curtis’s view, one technically feasible option was setting different fuel compositions than were set in the Phase 2 rule. (Curtis, Tr. 5764-5766).
4400. Peter Venturni, the lead manager of Phase 2, believed that a Phase 2 rule that omitted a T50 requirement, due to lack of substantial supporting evidence, would still satisfy the emission reduction requirements of the California Clean Air Act. (Venturni, Tr. 312-314).
4401. In Mr. Curtis’s view, one technically feasible option was modifying the sulfur content. (Curtis, Tr. 5764-5766). Lowering sulfur to offset relaxation of other specifications was a technique used by CARB in Phase 3. (Venturini, Tr. 851-852).
4402. In Mr. Curtis’s view, one technically feasible option was setting different levels for other fuel properties. (Curtis, Tr. 5764-5766).
4403. After CARB staff presented its proposed regulations in the technical support document and staff report in October 1991, staff presented a revised proposal “in order to reduce the costs associated with the original proposal.” Both of these staff proposals, as well as the regulations actually adopted, had technical support, according to Mr. Curtis, who conducted a technical analysis of these proposals. (Curtis, Tr. 5767).
4404. At the time of the CARB Phase 2 RFG rulemaking, CARB had the option of issuing regulations that only included a benzene specification. In 1991, CARB staff recognized that one option was “to go to the Board with only a benzene specification.” CARB staff

recognized that “[n]o additional test results [were] needed to support” that specification. (CX 785 at 007-008; Venturini, Tr. 175-179).

c. EPA’s RFG Regulations Would Have Achieved Significant Emissions Reductions in California.

4405. CARB stated in a January 1991 Regulatory Workplan that if staff could not obtain sufficient valid tests to support Phase 2 specifications in time for the statutory deadline, then staff could pursue the option of proposing “an approach similar to the one in the federal Clean Air Act.” (CX 785 at 008-009).
4406. Mr. Curtis also viewed the EPA RFG approach as a technically feasible option. (Curtis, Tr. 5764-5766; CX 785 at 008-009).
4407. Section 211(k) of the Federal Clean Air Act Amendments of 1990 had required the EPA, by November 15, 1991, to promulgate Reformulated Gasoline regulations for certain non-attainment areas in the country, “taking into consideration the cost of achieving such emissions reductions, and non air-quality and other air-quality related health and environmental impacts and energy requirements.” (42 U.S.C. § 7545(k) (1990)).
4408. CARB staff in 1991 understood that California, if declining to issue a Phase 2 rule, would still have the benefit of an EPA RFG rule. The first phase of the EPA rule would go into effect in 1995, and the second phase in year 2000. (Venturini, Tr. 181, 313; CX 52 at 029-030).
4409. CARB staff in 1991 had participated with the EPA, refiners, and other groups in a Negotiated Rulemaking Committee to help devise proposed rule provisions for the EPA Phase 1 rule. (CX 52 at 029-030). An Agreement in Principle was reached in August 1991 to have the rule specify RVP, oxygen, benzene content and toxic pollutant requirements “to be effective on January 1, 1995, and apply to the South Coast Air Basin, Ventura County, and the San Diego Air Basin . . .” (CX 52 at 029-030).
4410. If CARB had discovered in 1991 that the proposed CARB Phase 2 rule substantially overlapped with a pending Unocal patent, the EPA rules would have been a natural replacement. Refiners’ biggest obstacle to blending around the patent was the T50 requirement in the Phase 2 rule. Neither the EPA Phase 1 nor the EPA Complex Model specifically regulated T50. (CX 52 at 029-030).
4411. CARB in 1991, not knowing that the Phase 2 rule implicated a Unocal pending patent, viewed its CARB Phase 2 RFG regulation as superior to the EPA RFG rules in term advancing clean air goals. *See, e.g.*, (CX 52 at 015).
4412. The EPA RFG regulation, though not CARB’s first preference, was estimated to confer substantial benefit. CARB staff in its October 1991 Staff Report estimated that EPA

Phase 1 in 1996, in the South Coast, would achieve about 58% of the VOC emission reduction benefits of the CARB Phase 2 rule. CARB projected that EPA Phase 1 would reduce VOC's by about 35 tons per day, versus 60 tons per day for CARB Phase 2. (CX 52 at 066).

4413. CARB in its Phase 2 Staff Report also noted that EPA was proposing to issue an "EPA Complex Model" by November 30, 1992. The effective date for this EPA Complex Model was 2000. (CX 52 at 029-030).
4414. It was known in 1991 that the EPA Complex Model would be designed to regulate more properties than the EPA Phase 1 rule. The Complex Model would address sulfur, olefins, RVP, oxygen, aromatic hydrocarbons, benzene, and the 90 percent distillation temperature. (CX 52 at 029-030).
4415. EPA knew back in 1991 that this EPA Complex Model would provide greater pollution reduction benefits than EPA Phase 1. CARB's General Counsel, Michael Kenny, "knew it would be more stringent." (Kenny, Tr. 6563).

d. Neither CARB nor Unocal Believed That CARB, to Satisfy the California Clean Air Act, Had No Choice But to Issue Phase 2 as Actually Adopted.

4416. The California Clean Air Act directed that CARB not only seek emissions reductions, but also "adopt standards and regulations which will result in the most cost-effective combination of control measures . . ." (CX 1665 (Cal. Health & Safety Code § 43018(c)(1991))).
4417. The California Clean Air Act directed CARB to consider the "the effect of the standards and regulations on the economy of the state . . ." CARB construed this directive as one where CARB was to avoid conferring monopolies in CARB regulations. (Kenny, Tr. 6511-6512; CX 1665 (Cal. Health & Safety Code § 43018(e) (1991))).
4418. CARB management believed that Phase 2, if implicating the Unocal patent, would not have satisfied California Clean Air Act requirements. (CX 7063 (Sharpless, Dep. at 198); Boyd, Tr. 6706-6707, 6728, 6733-6734, 6907 (CARB Executive Officer would not have approved); Kenny, Tr. 6544 (General Counsel would not have approved); Venturini, Tr. 151, 316 (lead manager of Phase 2 would not have approved because "we'd be basically giving one entity basically a monopoly"))).
4419. CARB staff did not view the California Clean Air Act's "maximum feasible" emissions reduction language in § 43018(a) as requiring CARB to propose a rule of maximum stringency regardless of cost. (Venturini, Tr. 258-259).

4420. The California Clean Air Act contained no directives that CARB adopt a Phase 2 regulation with T50 in it. (Kenny, Tr. 6547).
4421. The California Clean Air Act contained no directives that CARB adopt a Phase 2 regulation with T50, T90, oxygenates, aromatics, olefins, or sulfur in it. (Kenny, Tr. 6547-6548).
4422. The CARB Board in 1991, for example, had issued Phase 2 mandatory specifications that provided for about 95% of the benefits of staff's October 4, 1991, proposal at about 85% of the cost. (Venturini, Tr. 108-111).
4423. CARB staff – in its most stringent rule proposal of October 1991 – also specifically gave relief on the T50 specification in reliance on refiner cost information. (CX 5 at 033; Venturini, Tr. 256-258).
4424. CARB during the Phase 2 rulemaking also made other choices to forego greater emission reduction benefits for cost reasons. (CCPF ¶¶ 1350-1435, 2124-2136).
4425. Unocal itself argued that the California Clean Air Act placed CARB under no obligation to issue so stringent a rule as was being contemplated in Phase 2. Unocal asserted in written comments and written versions of Dennis Lamb's testimony that CARB could satisfy the California CAA by not promulgating any RFG regulations at all. (CX 33 at 004-005, CX 34 at 003-004; Lamb, Tr. 2272).
4426. According to Mr. Lamb, Unocal in October and November of 1991 planned to take before the CARB Board at the November hearing the position "[t]hat the proposals were unnecessary. . . . That they didn't have to be as restrictive." (Lamb, Tr. 2272).
4427. Unocal's written comments to CARB analyzed the California CAA requirement that the regulations by year 2000 achieve reductions in VOCs of 55 percent, and oxides of nitrogen by 15% with respect to a 1987 baseline inventory. Unocal stated "Existing regulations will achieve reductions of 61% in VOCs and 42% in oxides of nitrogen by the end of that year." (CX 33 at 005; CX 34 at 003-004).
4428. Unocal further stated that [t]he Board can select any set of specifications that are cost effective and feasible and still be assured that the Clean Air Act goals will be achieved." (CX 34 at 004).
4429. Dennis Lamb on behalf of Unocal stated in his oral testimony to the CARB Board in November 1991, that "No further action is necessary to achieve [mandatory California Clean Air Act] reductions by December 31, 2000." (CX 33 at 005).

e. California Refiners are Able to Avoid the Unocal Patents Under the EPA Complex Model.

requires a T50 temperature of 215 degrees. Both of these methods require T50 temperatures that exceed the T50 flat limit of 210 degrees. (RX 1154A at 026, 029; Sarna, Tr. 6349).

4437. A major reason why a CARB Phase 2 regulation without T50 would allow more Unocal patent avoidance is that T50 has the “most pronounced impact on the total hydrocarbon emissions” in the CARB predictive model (Eskew, Tr. 2869; CX 1431). Unocal’s technical expert Mr. Stellman agrees: “T50 has the greatest impact on exhaust emissions of hydrocarbons in both the EPA Complex Model and the CARB Predictive Model if one holds all other parameters constant.” (CX 1331 at 002 (Stellman (ARCO) Rebuttal Report)).
4438. Because T50 has such a strong influence in the CARB predictive model, it is increasingly more difficult to blend around as T50 temperatures increase. The emissions response with varying T50 is exponential rather than linear; thus, the offset requirements to increase T50 from 215 to 216 degrees Fahrenheit are much greater than those required to increase from 205 to 206 degrees. (RX 1154A at 006, 038).
4439. The slope of the T50 curve in the CARB Predictive Model increases sharply for hydrocarbon emissions at 210 degrees, and even more sharply at 215 degrees. (RX 0753 at 007). The emissions response with varying T50 is exponential rather than linear; thus, the offset requirements to increase T50 from 215 to 216 degrees Fahrenheit are much greater than those required to increase from 205 to 206 degrees. (RX 1154A at 006, 038); *see also* (CX 7078 (Youngman, Dep. at 98-99)).
4440. {

} (Lieder, Tr. 4849, *in camera*). While the slope of the T50 curve is very steep at the upper end, the slope of the parameters that need to be adjusted, such as aromatics, are not as steep at the low end. So, in order to offset T50 and T90 temperatures at the high end, a refiner must lower aromatics and sulfur to a much greater extent. (Sarna, Tr. 6388).
4441. T50 is also a difficult parameter because of the variation in testing: even measuring the T50 by the ASTM D-86 method, it's plus or minus six degrees. “So even when you have a batch of gasoline, you don't know within plus or minus six degrees exactly what it's going to be, so if you're trying to predict that ahead of time, it's a very difficult thing to do.” (Sarna, Tr. 6143).
4442. There is substantial variation among T50 temperatures. The actual T50 temperatures for refiners in California varied substantially, from down around 176 degrees all the way up to 220 degrees. (Sarna, Tr. 6157; CX 7100 (demonstrative purposes only)). The non-overlapping blends were clustered either in a range of 210 to 213 degrees, or above 215

degrees. (Sarna, Tr. 6156; CX 7100 (demonstrative purposes only) (illustrating overlapping blends with red triangles and non-overlapping blends with blue squares)).

4443. The cap limit on the T50 temperature is 220° F. (RX 1154A at 006). The repeatability of analysis is about 2 °F for most refiners using an on-line analyzer for certification, but higher (9-11 °F) for refiners that do not have on-line certification. (RX 1154A at 006). Therefore, the actual operating range for control of the T50 temperature is reduced even further. (RX 1154A at 006).
4444. In the '393 trial, based upon the scatter in the T50 of the refiners' batches, Unocal's expert Dr. Teece testified that it is not possible for refiners to blend around the patents by controlling T50. (CX 1332 at 031). In fact, Dr. Teece did not expect the distribution of that scatter to change even if refiners aimed to get T50 above 210 degrees. (Teece, Tr. 7675). Thus, if a refiner is required to blend between 210 and 220 degrees, infringement is unavoidable. (Teece, Tr. 7674).
4445. In the '393 trial, the same attorneys representing Unocal in this case argued on behalf of Unocal that "the evidence will also show that, for example, if one were to try and keep their T50 at a single point throughout the entire summer, Mr. Stellman's records show, and the defendants' batches show, that in fact T50's varied widely during that period ."
4446. In the '393 trial, Unocal's attorneys argued as follows:

And then it says "Twister problem". You remember the old game Twister where you have sort of the map, and you have to try to put your hands and feet in different ways, and you get all twisted. And that's what they were talking about with regard to the refinery, that all of these requirements that they had to meet resulted in a Twister-like problem because it was so difficult to get the CARB gasoline that you were making within those requirements. And ladies and gentlemen, you also remember exhibit 3529. It's over here in the corner. You'll have it in the exhibit room. That's that great big long board which shows the T50 variation, the actual T50 variation of each one of the refineries, not a hypothetical make believe composite LP-

* * *

Exhibit 3529 was the long board, as you know, that showed the T50 variation all over the place, and they wanted to try to shoehorn it into 210 or 220. That's what they want you to believe they can do.

They can't do that. If they could have done that, they would have done it. Because they are not just trying to shoehorn that from 210 to 220. They have got 8 other properties that they have to regulate. They can't do it. If they could have done it., they would have done it.

And this is not some imaginary composite. This is their actual results of what they did in 1996 for the period that you are concerned with here.

(CX 1825 at 058-059) (emphasis added).

4447. The evidence from refiners that it is easier to avoid the Unocal patents under the EPA regulations than under the CARB regulations. Overall, more than 92 percent of the CARB gasoline fell within the numerical property limitations of one or more of the Unocal patents. (CX 1463A; Stellman, Tr. 8098-8099). The matching rate outside of California is much lower:

a. {

} (Lieder, Tr. 4805, 4814, *in camera*).

b. {

(Eizember, Tr. 3375-3376, *in camera*).

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c. {

}, *in camera*). {

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d. {

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} (Dowling, Tr. 3786-3787,

in camera).

G. Had Refiners Learned That the Unocal Research Presented to CARB, Auto/Oil and WSPA Was the Subject of a Unocal Patent for Which Unocal

Intended to Charge Royalties, the Refiners Could Have Taken a Number of Different Steps to Mitigate Unocal's Monopoly Power.

1. Refiners Would Have Informed CARB of the Potential Cost of the CARB Regulations.

4448. It is clear that, if refiners had been alerted to a material issue such as potential intellectual property enforcement against the gasolines made pursuant to the Phase 2 regulations, it is clear that refiners would have informed CARB. (CCPF ¶¶ 4449-4457).
4449. During 1991, there were regular lines of communication open between CARB and members of Auto/Oil and WSPA. Indeed, CARB met regularly with Auto/Oil and WSPA representatives. (CCPF ¶¶ 394, 1380-1393, 1439).
4450. During 1991, WSPA was actively searching for cost information, and shared that information with CARB. (CCPF ¶¶ 1934-2023). Knowledge of the Unocal patents would have been passed on to CARB through the Turner Mason cost study. (CCPF ¶¶ 1934-2023).
4451. During 1991, there were also regular lines of communication between individual refiners and CARB. (CCPF ¶¶ 394, 1380-1393, 1439).
4452. Auto/Oil, WSPA and individual refiners all knew during 1991 that CARB was interested in obtaining information related to cost, because CARB had made this point very clear. (CCPF ¶¶ 1364-1370).
4453. Refiners all testified that they would have contacted CARB had they learned of the Unocal patent application prior to their modification investments (CCPF ¶¶ 4454-4457).
4454. Had Texaco known of the Unocal patent, it would have brought the issue to the attention of CARB and the Governor. (CX 7048 (Hancock, Dep. at 263)).
4455. If Shell had known of the patent application in 1991, Shell would have alerted CARB staff that the introduction of the new cost factor needed to be incorporated in further analysis to determine what it would do to respond to the CARB gasoline requirements. (Banducci, Tr. 3490).
4456. If Exxon had known of the patent application in 1991, Exxon would have taken whatever steps it could to try and resolve the uncertainty, including contacting CARB. (Eizember, Tr. 3208).
4457. Had CARB learned of the patent application during 1991, CARB could have attempted to negotiate an agreement with Unocal to dedicate its patent to the public (as Auto/Oil

participants had done) or to agree to license its patent at much lower royalty rates. (CCPF ¶¶ 4698-4716).

2. Refiners Would Have Altered Their Investment Plans, Which Would Have Led CARB to Take Action.

4458. If refiners had learned about the Unocal patent application prior to being locked in, they would have invested much less. In turn, CARB would have learned about this, and then would have taken steps to mitigate the effects of the patent. (CCPF ¶ 4459-4605).

a. Refiners Would Have Delayed, Limited or Cancelled Investments in Modifications to Make CARB Phase 2-Compliant Gasoline.

4459. Refiner representatives from the major California refineries testified uniformly that knowledge of the Unocal patents would have caused them to invest less in their Phase 2 modifications. (CCPF ¶¶ 4460-4573).

i. ARCO

4460. At trial, Michael Hoffman offered testimony regarding what ARCO would have done had ARCO known about the application prior to being locked into ARCO's Phase 2 investments at the ARCO Carson refinery. Mr. Hoffman has been employed by BP since BP purchased ARCO in 2000. (Hoffman, Tr. 4867). Prior to that, Mr. Hoffman worked for ARCO for 20 years in various engineering and blending positions. (Hoffman, Tr. 4867-4872).

4461. Mr. Michael Hoffman worked in various positions for ARCO and BP since 1980. Mr. Hoffman began his career in refining at ARCO's Cherry Point, Washington Refinery, ultimately being promoted to Refinery Superintendent, responsible for the operations of half of the refinery. (Hoffman, Tr. 4867). In 1991 Mr. Hoffman was transferred to manage ARCO's Wilmington Calciner, a manufacturing business in Los Angeles, California that took green coke, a refining byproduct, for processing to create a pure carbon material used in the aluminum industry. (Hoffman, Tr. 4868, 4872). As manager of the Wilmington Calciner, Mr Hoffman was considered part of ARCO's Senior Management team. (Hoffman, Tr. 4874).

4462. In the early 1990s, Mr. Hoffman was promoted to Planning and Strategic Manager for the ARCO Products Company, which was the refining and marketing arm of ARCO. (Hoffman, Tr. 4868). After several other positions in planning and management, Mr.

Hoffman was appointed the Refinery Manager for ARCO's Carson Refinery in Los Angeles, California. (Hoffman, Tr. 4869). In 2002, following BP's acquisition of ARCO, Mr. Hoffman was appointed Group Vice President of BP's Global Refinery Operations, a position which he currently holds. (Hoffman, Tr. 4867, 4869).

4463. Mr. Hoffman was responsible for making a recommendation on how the Phase 2 project would go forward to senior group management. His responsibility went beyond the development of the project execution plan, and included testing environmental assumptions, pricing mechanisms, and competitiveness. (Hoffman, Tr. 4900-4901). If ARCO had known about the Unocal patent application, that knowledge would have affected Hoffman's recommendation with respect to the CARB Phase 2 project. (Hoffman, Tr. 4903-4904).
4464. Not knowing about the Unocal patents, ARCO considered three alternatives. Under the zero investment alternative, ARCO would have produced 58,000 barrels of CARB gasoline per day under the CARB Phase 2 gasoline specifications. (Hoffman, Tr. 4979; CX 5052 at 036).
4465. Under the first alternative case, the minimal investment case, ARCO would have spent \$85-150 million in capital and produced 99,000 barrels of CARB gasoline per day. (Hoffman, Tr. 4979; CX 5057 at 036).
4466. Under the recommended case, \$430 million in investments would be required and would allow Carson to optimize the amount of CARB gasoline volumes to 142,000 barrels per day. (CX 5052 at 036; Hoffman, Tr. 4978).
4467. If ARCO had been aware of the Unocal patent and Unocal's intention to enforce the patent at the time ARCO was planning the Phase 2 modifications, that knowledge would have affected Mr. Hoffman's analysis. (Hoffman, Tr. 4917).
4468. If ARCO had been aware of the Unocal patent and Unocal's intention to enforce the patent at the time ARCO was planning the Phase 2 modifications, that knowledge would have affected the "economic evaluation of the project." It would have affected competitive context and risk because Unocal is a competitor of ARCO. It would have "threatened" ARCO's marketing strategy because of the cost disadvantage. (Hoffman, Tr. 4917-4918).
4469. If ARCO had been aware of the Unocal patent and Unocal's intention to enforce the patent at the time ARCO was planning the Phase 2 modifications, that knowledge "would have affected the risk" and added to the "uncertainty of the performance of the project, which was already quite concerning to senior management." (Hoffman, Tr. 4918).
4470. By deposition, Kenneth Riley also offered testimony regarding what ARCO would have done had ARCO known about Unocal's patent application prior to being locked into its

Phase 2 investments. Kenneth Riley is a Chemical Engineer by training with forty years of experience with ARCO in the oil industry before his retirement in 1996. (CX 7061 (Riley, Dep. at 6, 7)). During his time with ARCO, Mr. Riley held the titles of Vice President for International Marketing, Coordination, and Product Supply, Vice President of Business Management and New Ventures, and Vice President of Business Development. (CX 7061 (Riley, Dep. at 6-7)).

4471. During discovery, Mr. Riley served as ARCO's corporate representative on the topic of modifications that ARCO would have made if ARCO had known about the Unocal patent application and Unocal's intention to enforce the Unocal patent claims in sufficient time to alter AROC's plan. (CX 7061 (Riley, Dep. at 7); RX 451).
4472. Had ARCO known about Unocal's patent application and Unocal's intent to enforce the patent, ARCO would not have proceeded with the investments in making CARB Phase 2 gasoline. This is because "the risk suggested by a proprietary position by any competitor would have been unacceptably high." (CX 7061 (Riley, Dep. at 11-12)). Had ARCO chosen to not invest in CARB Phase 2 modifications, ARCO would have produced 58,000 barrels per day, instead of the 142,000 barrels it ultimately built out to produce, a difference of 86,000 barrels per day. (Hoffman, Tr. 4978-4979, CX 5052 at 036).
4473. Even without knowledge of the Unocal patent application, ARCO seriously considered the "minimal investment case." (Hoffman, Tr. 4956). Had ARCO chosen this case, ARCO would have produced 99,000 barrels per day, instead of the 142,000 barrels ARCO ultimately built out to produce, a difference of 43,000 barrels per day. (Hoffman, Tr. 4978-4979; CX 5052 at 036).
4474. The minimal capital case was attractive to ARCO because the minimal capital case allowed ARCO to "stage investments" to deal with risks and unknowns associated to ensure that ARCO would not have a "stranded investment." (Hoffman, Tr. 4956).
4475. At the time there were "a number of layers of uncertainty" associated with ARCO's build-out for the CARB Phase 2 regulations at Carson, including the effect of the various different regulations that were affecting the site of the Carson refinery in California, the impact of fuel specifications, and the "price-setting mechanism for gasoline" in California (Hoffman, Tr. 4913).

ii. Chevron

4476. At trial, Lance Gyorfí offered testimony regarding what Chevron would have done had Chevron known about Unocal's patent application prior to being locked into Chevron's Phase 2 investments. Lance Gyorfí worked for Chevron for thirty two years, from 1970 until his retirement in 2002. (Gyorfí, Tr. 5202-5204). For the seven years prior to his retirement, Mr. Gyorfí served as the Vice President of Refining for ChevronTexaco's domestic refineries. (Gyorfí, Tr. 5203-5204). In this position, Mr. Gyorfí was responsible

for the development of strategies, tactics, and investment plans to improve the financial performance of the refining system, its operations performance, and its safety and environmental performance. (Gyorfi, Tr. 5203).

4477. Mr. Gyorfi has also served as the Operations Manager at Chevron's Port Arthur, Texas Refinery and as Refinery Manager at both Chevron's Salt Lake City, Utah and Port Arthur, Texas Refineries. (Gyorfi, Tr. 5203-5204). In his capacity as a Refinery Manager, Mr. Gyorfi oversaw the implementation of strategies and specific tactics to optimize the return on investments made at Chevron's Port Arthur and Salt Lake City Refineries and maximize the operational environmental performance of these Refineries. (Gyorfi, Tr. 5204-5205). As Refinery Manager, Mr. Gyorfi served on the Refinery Leadership Committee, composed of the Vice President of Refining and all other Refinery Managers, which was responsible for the development and implementation of strategies to improve the performance of the refineries' financial and operational performance. (Gyorfi, Tr. 5204).
4478. Prior to taking senior management posts, Mr. Gyorfi worked at Chevron's El Segundo and Richmond California Refineries in roles as a refinery designs engineer, supervising process engineer, operations supervisor, and operations superintendent. (Gyorfi, Tr. 5205-5206). In these positions, Mr. Gyorfi was responsible for tasks ranging from the development of large capital projects undertaken at the El Segundo Refinery to overseeing the optimal operation of the different hydrocrackers at the Richmond Refinery. (Gyorfi, Tr. 5205-5206).
4479. The posts Mr. Gyorfi held at Chevron demanded proficiency in the use of economic analysis, including cost estimating, appropriations analysis, and investment returns analysis, in advising the corporation as to potential investments Chevron could make in the refining process. (Gyorfi, Tr. 5206-5207).
4480. Mr. Gyorfi was selected to serve as Chevron's corporate representative on the topic of modifications that Chevron would have made if Chevron had known about the Unocal patent application and Unocal's intention to enforce the Unocal patent in sufficient time to alter Chevron's Phase 2 modifications plan. (Gyorfi, Tr. 5257-5258; RX 294).
4481. During 1995, Chevron owned two refineries that regularly produced CARB gasoline, one in northern California (Richmond) and one in southern California (El Segundo). (Engibous, Tr. 3886; Gyorfi, Tr. 5215).
4482. The decisions regarding investments to produce Phase 2 CARB RFG had to be approved by the refinery leadership committee. During the early 1990s, Mr. Gyorfi served on the refinery leadership committee. (Gyorfi, Tr. 5215-5216).
4483. The Chevron refinery leadership committee considered three primary investment alternatives at the El Segundo refinery. (Gyorfi, Tr. 5216-5217). The first investment

- alternative considered at El Segundo was a zero investment case, which examined what it would mean if Chevron chose not to invest in CARB Phase 2 modifications. (Gyorfi, Tr. 5217).
4484. The second investment alternative considered at El Segundo was investing only in RFG as opposed to CARB. This involved a minimum set of investments just to achieve the branded marketing volumes for CARB gasoline. (Gyorfi, Tr. 5217). The third investment alternative considered at El Segundo was a full build-out case to make more than the branded marketing share of CARB gasoline. (Gyorfi, Tr. 5217).
4485. The refinery leadership committee considered a very similar set of investment alternatives at the Richmond refinery. (Gyorfi, Tr. 5217). The first investment alternative considered at Richmond was a no investment case. (Gyorfi, Tr. 5217).
4486. The second investment alternative considered at Richmond was a minimum investment alternative for compliance with CARB to meet branded marketing volumes in northern California. (Gyorfi, Tr. 5217). The more minimal set of investments would have invested enough to cover branded marketing plus exchanges would have produced about 180,000 barrels a day of CARB summertime gasoline between Richmond and El Segundo. (Gyorfi, Tr. 5219).
4487. The third investment alternative at Richmond was a full build-out case of compliance projects, which would involve slightly larger cases that seem to make more sense and the addition of discretionary projects on top of that. (Gyorfi, Tr. 5217). This alternative allowed for 235,000 to 250,000 barrels a day of CARB summertime gasoline between Richmond and El Segundo. (Gyorfi, Tr. 5219). This was between 55,000 and 70,000 barrels a day more than was needed to meet Chevron's marketing demand. (Gyorfi, Tr. 5287).
4488. The refinery leadership committee considered several criteria while deciding whether Chevron should invest in modifying its California refineries in the early 1990s. These criteria included whether the investment was absolutely mandatory, if it achieved the regulatory requirements, if it had an impact on environmental and safety performance, and if the rate of return was sufficient enough to take the risk of making a discretionary investment. (Gyorfi, Tr. 5220).
4489. If Chevron had known in 1991 or 1992 of Unocal's intent to charge money to make gasoline in accordance with the CARB Phase 2 regulations, several courses of action were available. (Gyorfi, Tr. 5227). Chevron could have made a very different set of investment decisions, such as making the minimum investment, not making the modifications at all, or deferring the discretionary projects since they weren't required to make CARB Phase 2 gasoline. (Gyorfi, Tr. 5227).

4490. If Chevron had known of the Unocal patent in 1991, Chevron would not have made the discretionary investments at the Richmond refinery and Chevron would have made some lesser investments at the El Segundo refinery. (Gyorfi, Tr. 5313). Chevron would have invested only what it needed to make approximately 180,000 barrels per day of CARB gasoline instead of the 235,000 to 250,000 barrels per day that Chevron's refineries have produced with the investments that were actually made. (Gyorfi, Tr. 5289-5290). Had Chevron chosen the minimum investment case, Chevron would have made between 55,000 and 70,000 fewer barrels a day of CARB Phase 2 gasoline. (Gyorfi, Tr. 5219).
4491. The Executive Committee of Chevron was the ultimate decision maker on whether to make the California refinery modifications. (Gyorfi, Tr. 5228). Ken Derr was chairman of the board at Chevron during the early 1990s, and the chairman of the executive committee. (Derr, 5129; Gyorfi, Tr. 5228).
4492. Mr. Derr testified at trial that, if Chevron had known about the Unocal patents in the early 1990s, the Executive Committee at Chevron would not have approved the Phase 2 expenditures. (Derr, Tr. 5134-5135).
4493. As Mr. Derr testified: "We would not have approved or I would not have approved a billion-dollar expenditure if I had known that there was an outstanding patent by Unocal.... [B]ecause it could have had a dramatic impact on the economics of the project." (Derr, Tr. 5135-5136).
4494. Even "half a cent to a penny" in extra operating cost to produce CARB gasoline "would have been very important" to Mr. Gyorfi's assessment. (Gyorfi, Tr. 5222). This extra operating cost would have been important because a penny a gallon for Chevron on the West Coast adds up to \$25 million a year, which would have been a huge change in the earnings for the Richmond FCC project. (Gyorfi, Tr. 5222).
4495. The discretionary investments cost about \$550 to \$560 million of the total amount spent by Chevron on the Phase 2 modifications. (Gyorfi, Tr. 5289). Chevron would not have made its discretionary investments had Chevron known about the Unocal patent and that there would be a royalty of 5.75 cents per gallon associated with infringement. (Gyorfi, Tr. 5289). The possible results of a patent and enforcement would have made the discretionary projects, which were already marginal, unattractive options. (Gyorfi, Tr. 5315-5316).
4496. At the time, even without knowledge of the Unocal patents, Mr. Gyorfi was "extremely concerned" about the assumptions that had gone into some of the discretionary projects. (Gyorfi, Tr. 5222). The refining leadership committee also had an "intense discussion" about not doing discretionary modifications at Richmond. (Gyorfi, Tr. 5218). Mr. Gyorfi personally considered making no discretionary investments to be an "absolutely" viable alternative. (Gyorfi, Tr. 5219).

4497. It is unlikely that Chevron would have made all of the investments that it did if it had known that a patent application was out there, even if its lawyers said it was unpatentable. (Gyorfi, Tr. 5315). Chevron would not have gone ahead with these investments because the refineries were under a tremendous amount of pressure from the corporation on investment performance around discretionary investments. The returns on the discretionary projects were shaky, so Chevron tried to nail down as much certainty as possible to determine the returns. Therefore, even if Chevron had felt that the patents weren't valid, the uncertainty would have caused Chevron to go back and look at its discretionary investments pretty hard. (Gyorfi, Tr. 5315).

iii. Exxon

4498. At trial, Thomas Eizember offered testimony regarding what Exxon would have done had Exxon known about the application prior to being locked its Phase 2 investments. Mr. Thomas Eizember is the Senior Business Planner in the Strategy Division of the Corporate Planning Department of the ExxonMobil Corporation. (Eizember, Tr. 3094). As Senior Business Planner, Mr. Eizember is responsible for reviewing the performance of ExxonMobil's worldwide assets, providing the planning basis for future business growth and development, identifying issues, opportunities, and challenges to the corporation, and finally making appropriate recommendations to senior management. (Eizember, Tr. 3094).

4499. Mr. Eizember has in excess of twenty-eight years experience working in petroleum refining, including thirteen and a half years experience working in various positions in Exxon's Benicia, California Refinery, and approximately twelve years in Exxon and ExxonMobil Corporate Management. (Eizember, Tr. 3095-3097).

4500. During his time at the Benicia, California Refinery, Mr. Eizember held two positions in the Refinery Coordination Group, the group that directed the operation of the refinery in the blending of gasoline and the production of other products. Mr. Eizember served as the head of the Operation Department during his tenure at Benicia, overseeing numerous portions of the Refinery including the facilities that blended gasoline. (Eizember, Tr. 3095-3096).

4501. Mr. Eizember's first assignment in Exxon corporate management involved working for the refinery planning group for Exxon's U.S. refineries. The primary focus of his attention in this role was directed towards projects associated with manufacturing EPA and CARB reformulated gasolines at U.S. refineries. (Eizember, Tr. 3096).

4502. Mr. Eizember also served as ExxonMobil's corporate representative on the topic of modifications that Exxon would have made if it had known about the Unocal patent application and Unocal's intention to enforce its patent in sufficient time to alter its plan. (RX 142; Eizember, Tr. 3395-3396).

4503. If Exxon had learned of Unocal's patent application in 1991 or 1992, this knowledge would have affected Exxon's capital investment and refinery reconfiguration planning at Benicia. (Eizember, Tr. 3206).
4504. At the screening stage of the Benicia Phase 2 modifications project, Exxon considered "lots" of options. (Eizember, Tr. 3137). However, before submitting these options to management, Exxon had to narrow the list of options. (Eizember, Tr. 3137).
4505. One case recommended by the Exxon planners was the "minimal refinery investment" option. (CX 5054 at 009; Eizember, Tr. 3148).
4506. The "minimal refinery investment" option involved using the existing facilities at the refinery, with some modifications that had to be made to the shipping facilities outside of the refinery in order to handle the gasoline that was produced in that case. (Eizember, Tr. 3148). Under that option, Exxon would assume that about \$50 million would be invested by way of payments to "third parties to increase the size of the pipelines and terminaling facilities to handle the shipping of the conventional gasoline that this case produced." (Eizember, Tr. 3148-3149). Under the "minimal refinery investment" option, Exxon Benicia would produce roughly 40,000 barrels a day of CARB gasoline and 75,000 barrels a day of conventional gasoline that would have to be shipped outside of California. (CX 5054 at 009; Eizember, Tr. 3149).
4507. The second case that the Exxon planners sent to management was called the "benzene heartcut shipment" option. (Eizember, Tr. 3150). In that case, Exxon would install some fractionating towers on a stream called reformat, which is a component that has a lot of benzene in it, and would produce a heartcut. A heartcut is a narrow fractionated stream that would contain most of the benzene and also it contained some other material that boiled very close to the boiling point of benzene. (Eizember, Tr. 3150). The benzene heartcut material would have been shipped to the Exxon Gulf Coast facilities, where Exxon could refine it and get the chemical value for the benzene. (Eizember, Tr. 3150).
4508. In order to implement the "benzene heartcut shipment" option, Exxon would have had to invest approximately \$145 million. (CX 5054 at 009; Eizember, Tr. 3150-3151). Under the "benzene heartcut shipment" option, Exxon would have been able to produce approximately 75,000 barrels per day of CARB gasoline. (CX 5054 at 009; Eizember, Tr. 3151).
4509. A third case considered by Exxon planners was the "benzene heartcut saturation" option. (Eizember, Tr. 3151; CX 5054 at 009). The "benzene heartcut saturation" case would build the reformat fractionation facilities as described with the "benzene heartcut shipment" case, but instead of modifying the shipping facilities to ship the material, Exxon would take the heartcut and run it through a benzene saturation unit. This would convert the benzene to cyclohexane, and then both the benzene and the other material in the heartcut stream would stay in the Benicia gasoline pool. (Eizember, Tr. 3151).

4510. In order to implement the “benzene heartcut saturation” option, Exxon would have had to invest approximately \$175 million. (CX 5054 at 009; Eizember, Tr. 3150-3151). Under the “benzene heartcut saturation” option, Exxon would have been able to produce approximately 75,000 barrels per day of CARB gasoline. (CX 5054 at 009; Eizember, Tr. 3151).
4511. The fourth option presented to Exxon management was the “downsized project without hydrogen” investment option. (Eizember, Tr. 3151-3152; CX 5040 at 009). That option took the “benzene heartcut saturation” case and added to it a new light cat naphtha hydrotreater, which is a piece of equipment that removes sulfur, added a cat naphtha fractionator and also included some other modifications. (Eizember, Tr. 3152).
4512. In order to implement the “downsized project without hydrogen” investment option, Exxon would have had to invest approximately \$206 million. (Eizember, Tr. 3152; CX 5054 at 009). Under the “downsized project without hydrogen” investment option, Exxon would have been able to produce approximately 100,000 barrels per day of CARB gasoline. (Eizember, Tr. 3152; CX 5054 at 009).
4513. The final option presented to management was the “full project” option. (Eizember Tr. 3152-3153; CX 5054 at 009). The “full project” option took the “downsized project without hydrogen” investment option and added to it a fourth hydrogen compressor and an expansion of the hydrogen generation plant. (Eizember, Tr. 3153).
4514. In order to implement the “full project” option, Exxon would have had to invest approximately \$265 million. (Eizember, Tr. 3153; CX 5054 at 009). Under the “full project” option, Exxon would produce approximately 110,000 barrels per day of CARB gasoline. (Eizember, Tr. 3153; CX 5054 at 009).
4515. Ultimately, Exxon planners recommended the “downsized project without hydrogen” because it was the most resilient investment when all of the potential future scenarios were considered. (Eizember, Tr. 3155).
4516. However, Exxon management gave serious consideration to other alternatives presented by the Exxon planners. In particular, Exxon management seriously considered the cases “that would have the least amount of investment in California, in particular the minimal investment case.” (Eizember, Tr. 3155-3156).
4517. Part of the anxiety of management had to do with the amount being spent on refinery modifications as compared to the amount that the refinery was worth. The Exxon planners were “recommending spending an amount of money that would double the book value of the Benicia refinery.” (Eizember, Tr. 3140).

4518. The Benicia refinery had a book value, or cost minus depreciation, of about \$200 million as of 1993 or 1994. The Exxon planners were recommending in this package pursuit of an option that was projected to cost \$206 million, doubling Exxon's investment from an accounting perspective in the California market. (Eizember, Tr. 3140).
4519. The primary profitability measure that Exxon was using at the time was return on capital employed ("ROCE"). This number was determined by dividing the after tax earnings by the capital employed. (Eizember, Tr. 3155).
4520. The ROCE for the profitability of the Benicia Phase 2 modification proposals included the book value of the refinery in the denominator of the ROCE calculation. Since Exxon planners were recommending doubling that book value, they were projecting a substantial reduction in the profitability as measured by return on capital employed. (Eizember, Tr. 3140-3141).
4521. The level of investment also made Exxon "extremely interested in where our competitive position would be in California." Exxon tracked and reported to management, the estimation of the competitor assessment as expressed by their gasoline production in California and the amount of investment that they appeared to be announcing for the CARB Phase 2 gasoline. (Eizember, Tr. 3141).
4522. Exxon's assessment of its competitive position ultimately played into its assessment of the likely profitability of the refinery after the Phase 2 investment. As Exxon's lead planner explained: "We couldn't afford to be disadvantaged by the investment." (Eizember, Tr. 3141-3142).
4523. As Exxon planners went through the planning process, management continued to provide feedback about their preference to spend less money. (Eizember, Tr. 3156).
4524. For example, after an initial presentation on the modifications, there was "renewed interest" in the minimal investment case. (CX 989 at 002; Eizember, Tr. 3157).
4525. This interest was renewed because "there was a high level of concern and anxiety about spending an additional \$200 million in facilities in California." (Eizember, Tr. 3158).
4526. After the final presentation, but prior to the final approval by Exxon management, Mr. Harry Longwell, president of Exxon Company USA, made it clear to Exxon planners that he was "very concerned about spending the amount of money he was requesting from [Exxon Headquarters in] Dallas on this project and earning the return on that investment." (Eizember, Tr. 3138-3139; CX 5054 at 001).
4527. Had Exxon known in the fall of 1992 that Unocal had a pending patent application on reformulated gasoline, Exxon would have tried to understand the potential costs associated with such a patent if a patent issued and how it might differently affect the

different options it was considering. (Eizember, Tr. 3166). Pending patent applications on technology that Exxon may use affect Exxon's planning, "[b]ecause in the process of planning it's incumbent upon [planners] to assess every possible cost that might affect the options that we're considering." (Eizember, Tr. 3164).

4528. When there is a patent that Exxon is planning on using, Exxon planners would have to include the cost of any royalties on that patent in the cost of the alternatives. If Exxon knew of a patent application, Exxon would have to assess what the costs of that patent would be and how they might apply. (Eizember, Tr. 3164-3165).
4529. In particular, the planning process at Exxon would have had to have included attempts to resolve the uncertainty that was posed by the presence of the patent application. This is because a significant part of the planning process is trying to project the outcomes of various options that are being considered under all the ranges of things that might happen in the future, the scenario analysis. (Eizember, Tr. 3206-3207).
4530. Had Exxon learned of Unocal's patent application in 1991 or 1992, Exxon would have selected the minimal investment option or one of the other options that had a lower investment than the one ultimately recommended. This is because of the uncertainty posed by a potential for a cost to be charged to manufacture CARB gasoline or the potential for Exxon to be unable to make CARB gasoline. (Eizember, Tr. 3207).
4531. Mr. Eizember testified, that while uncertainty is almost always present in planning for the future, the presence of increasing uncertainty tends to increase the desire and the attractiveness to invest as little as possible until the uncertainty can be resolved. (Eizember, Tr. 3207).
4532. Given the uncertainty, and Exxon management's expressed preference for the minimal investment options, the most likely result would be that Exxon would have chosen the minimal investment option. (Eizember, Tr. 3140-3142, 3155-3157, 3207).
4533. Under the minimal refinery investment option, Exxon Benicia would produce roughly 40,000 barrels a day of CARB gasoline and 75,000 barrels a day of conventional gasoline that would have to be shipped outside of California. (CX 5054 at 009; Eizember, Tr. 3149).
4534. Prior to the implementation of the Phase 2 projects, Exxon's California gasoline production was approximately 110,000 barrels per day. (Eizember, Tr. 3148).
4535. Thus, under the minimal refinery investment option, Exxon would have made about 70,000 barrels a day less gasoline for California and roughly 75,000 barrels a day of conventional gasoline that would be shipped out of California. (Eizember, Tr. 3149).

4536. Despite the loss of production, Exxon would still be able to supply its branded stations, since Exxon required approximately 40,000 barrels per day of California gasoline in order to supply its branded retail stations in California. (Eizember, Tr. 3149-3150).
4537. Under the benzene heartcut shipment case and the benzene saturation case, two other options that involved less investment, the reduction in volume would have been approximately 35,000 barrels per day; from 110,000 barrels per day to 75,000 barrels per day under either option. (Eizember, Tr. 3151).

iv. Shell

4538. At trial, Ronald Banducci offered testimony regarding what Shell would have done had Shell known about the application prior to being locked into its Phase 2 investments. Mr. Banducci worked for Shell for over 31 years. Between 1967 and 1986, Mr. Banducci spent all but four years on the refining side of Shell Oil Company. This involved engineering work, process design and troubleshooting, process economic evaluation, and various supervisory or management assignments. (Banducci, Tr. 3419).
4539. During his first nineteen years at Shell Oil Company, Mr. Banducci also did process economic evaluations in which he tried to determine what the optimum operating mode for a particular processing unit in the refinery might be. (Banducci, Tr. 3419-3420).
4540. In 1989, Mr. Banducci moved into the newly created position of Vice President and general manager of manufacturing oil, which is what refining was called at the time. (Banducci, Tr. 3422).
4541. During this time Mr. Banducci had responsibility for all seven of Shell's U.S. refineries, including the ones at Martinez and Los Angeles, California, and the one in Anacortes, Washington. (Banducci, Tr. 3422-3423).
4542. For his final two years at Shell, Mr. Banducci returned to Martinez and became President and CEO of the Shell Martinez Refining Company. (Banducci, Tr. 3423).
4543. In addition to the same duties and responsibilities that Mr. Banducci held in his earlier stint as refining manager, he also reported to a Board of Directors of the Shell Martinez Refining Company while he served in this position. (Banducci, 3423-3424).
4544. Mr. Banducci also served as Shell's corporate representative on the topic of modifications that Shell would have made if it had known about the Unocal patent application and Unocal's intention to enforce its patent in sufficient time to alter its plan. (RX 351).

4545. If Mr. Banducci had known of the Unocal patent application in 1991, Mr. Banducci would “absolutely” have taken it into consideration in deciding which option to choose for the Martinez and Anacortes facilities. (Banducci, Tr. 3486).
4546. Prior to making his decision about which investments to recommend to management, Mr. Banducci reviewed four options. (Banducci, Tr. 3451). First, Mr. Banducci considered a “no-capital investment” scenario, which involved looking at how the refinery would run and what its product outturn, including gasoline, would be if basically no capital was spent on it. (Banducci, Tr. 3445-3446). Under the no-capital investment scenario, it was projected that the Martinez facility would be able to produce approximately 35,000 barrels a day of CARB Phase 2 compliant gasoline. (Banducci, Tr. 3446).
4547. It was also projected that under the no-capital investment scenario the Martinez facility would be able to make approximately 50,000 to 55,000 barrels a day of non-CARB Phase 2 compliant gasoline; this would mostly be gasoline that met the EPA regulations or components that couldn’t be blended into either CARB-compliant or EPA-compliant gasoline and would need to be shipped elsewhere for further processing or blending. (Banducci, Tr. 3446-3447).
4548. The next level capital investment option considered at Martinez in 1991 involved making a hundred percent of the gasoline outturn at that refinery CARB compliant. It was projected that under this option Martinez would produce 78,000 to 80,000 thousand barrels a day of CARB Phase 2 gasoline with a capital expenditure of approximately \$300 million. (Banducci, Tr. 3447-3448).
4549. The next level premised that the Martinez refinery would produce one hundred percent CARB-compliant gasoline and would make the same volume of CARB-compliant gasoline that had been made at Martinez prior to the CARB regulations coming into effect. This scenario would have resulted in approximately 90,000 barrels a day being produced with a capital investment of \$1.1 billion. (Banducci, Tr. 3448). This option would have required what was referred to as the “residue reduction project” to allow the refinery to produce the additional amount of CARB Phase 2 gasoline. The cornerstone of this project would have been a large delayed coker. (Banducci, Tr. 3449).
4550. The fourth option that Shell considered attempted to maximize the gasoline outturn at the refinery based on the raw materials that they were running. This option would have produced about 96,000 to 100,000 barrels a day at a cost of a little over \$1.3 billion. (Banducci, Tr. 3450).
4551. Shell ultimately chose to pursue the third option, which was the one that enabled Martinez to produce the same amount of CARB-compliant gasoline as the gasoline that had been produced in the pre-CARB era while also allowing the heavy and low-valued products to be upgraded into light products. (Banducci, Tr. 3451).

4552. It was not easy for Mr. Banducci to convince management to allocate capital funds pursuant to his recommendation because the refining business had been performing so badly in the late 1980s and early 1990s and had consistently made commitments on return on investment that were not met. This put Mr. Banducci in the position of proposing a very large \$1.1 billion dollar project at Martinez and having to demonstrate why he felt that they could deliver on the return on investment that they were putting forward. (Banducci, Tr. 3467-3468).
4553. An additional one cent per gallon operating cost would have reduced the return on investment, which meant that it would have made the investment less attractive than it was in the current state. The reduction on return on investment would have been significant enough that it would have been noticed. (Banducci, Tr. 3468).
4554. As manager of all refining and then as manager of Martinez, Mr. Banducci had concerns about patented technologies held by refiners that were different from concerns that he had about other patented technologies held by nonrefiners. This was because any refiner who had patents had an inherent advantage because they could produce product into the marketplace at a lower cost, since they wouldn't charge themselves for their technology but they would charge the other refiners. (Banducci, Tr. 3480).
4555. It was a concern to Mr. Banducci if other refiners wouldn't have to pay licensing fees and therefore could operate at a lower cost because Shell would have to pay those costs. If Shell had a higher cost base than the competitor, it would disadvantage Shell in the marketplace. (Banducci, Tr. 3481-3482).
4556. In a project of this magnitude, Mr. Banducci was motivated to minimize as much of the uncertainty as possible in order to minimize the risk that the project might not deliver its promised return on investment. Mr. Banducci therefore had a strong motivation to attempt to determine what any operating cost might be, whether it's a fuel cost, a utility cost, or a licensing fee. (Banducci, Tr. 3489). If it were not possible to determine the operating cost with any certainty, Mr. Banducci would have a hard time committing himself to the project as well as a very difficult time convincing anybody above him to buy the project. (Banducci, Tr. 3489).
4557. To address the uncertainty, Mr. Banducci would have attempted to determine the cost associated with the patent by contacting Unocal to determine what their intentions might be with respect to licensing their patent rights. (Banducci, Tr. 3487-3488).
4558. If there was uncertainty about the cost of inputs, Mr. Banducci as a manager would "absolutely" be more hesitant to ask for capital funds for that project. (Banducci, Tr. 3490).

v. Texaco

4559. By deposition, R. Steven Hancock offered testimony about what Texaco would have done had Texaco known about the Unocal patent application prior to being locked in to Texaco's Phase 2 investments. Mr. Hancock was employed by Texaco from March 1967 to May 1998 as a refinery engineer, refinery technical manager, and fuel quality/regulatory compliance manager, with the exception of a tour of duty with the U.S. Navy. (RX 200A at 002; CX 7047 (Hancock Dep. at 6-8)).
4560. From June 1998 to his retirement in December 2001, Mr. Hancock served as Manager Refinery Products Issues in the Headquarters Staff Group for the Refining Section of Equiva Services LLC, a service corporation between Equilon and Motiva. (RX 200A at 002; CX 7047 (Hancock, Dep. at 5)). Equilon was a joint venture between Shell and Texaco and Motiva a joint venture between Shell, Texaco, and Saudi Aramco. (RX 200A at 002; CX 7047 (Hancock, Dep. at 5)).
4561. Had Texaco known "one of its chief competitors in California was attempting to achieve the high ground of a patent on CARB gasoline," management would have gone down the path of being unable to proceed with CARB modifications. (CX 7048 (Hancock, Dep. at 279-280)). Had Texaco known of the Unocal patent, it would have at least delayed or deferred a decision on refinery investment until they knew what the "business environment" was going to be. (CX 7048 (Hancock, Dep. at 263)).
4562. If Texaco had known about Unocal's RFG patents before March 1994, Texaco would not have invested in the Los Angeles or Bakersfield refineries for the CARB Phase 2 program. (CX 7048 (Hancock, Dep. at 258-259)). Instead, had Texaco come to a decision not to invest in the refineries, "they would have shut down Bakersfield and they would have either tried to sell or shut down Los Angeles" like they had sold or shut down seven other refineries in the decade before 1991. (CX 7048 (Hancock, Dep. at 264)). Texaco also could have converted the Los Angeles refinery into a terminal. (CX 7048 (Hancock, Dep. at 311)).
4563. Without making modifications, the Texaco refineries could have produced a very small amount of CARB Phase 2 gasoline, but not nearly enough to satisfy market demand, "so they would have had a lot of conventional gasoline that had no market." (CX 7048 (Hancock, Dep. at 311)). The bulk of production would be conventional gasoline that would have to be exported to a conventional market overseas. (CX 7048 (Hancock, Dep. at 311-312)). Exporting conventional gasoline overseas was considered and deemed "uneconomic" by Texaco, and "would have been the last nail in the coffin for Bakersfield," which would have been shut down (CX 7048 (Hancock Dep. at 311)).
4564. Similar economics would have driven Texaco to sell or convert the Texaco Los Angeles/Wilmington refinery. (CX 7048 (Hancock, Dep. at 266-267)). When faced with expensive modifications for CARB gasoline in 1991, Shell decided to sell the coking part of its former Carson refinery, shut down the gasoline producing part, scrape the process units and keep the tank farm in place. In effect, Shell changed Carson from an operating

- refinery into an operating fuels terminal. (CX 7048 (Hancock, Dep. at 266)). Texaco would have followed this route at their Los Angeles Refinery had they known about the Unocal patent. (CX 7048 (Hancock, Dep. at 266-267)).
4565. Texaco would not have made these investments in part because Texaco's management "was very risk averse when it came to capital investments. They wanted to make sure that they placed their money in the best capital projects to return the best profit to the company...Texaco management had to have certainty, business certainty of all the challenges that it faced before they would risk anything." (CX 7048 (Hancock, Dep. at 260-261)).
4566. In the 1980s Texaco suffered bankruptcy, and a \$10 billion judgement from Penzoil against it as a result of the Getty acquisition and was forced to sell off assets. (CX 7048 (Hancock, Dep. at 259)). Due to these financial strains, Texaco's profitability declined significantly compared to the other major companies. (CX 7048 (Hancock, Dep. at 260)).
4567. Texaco's refining sector, particularly its California refineries, "had been losing money for years," making management "very reluctant to invest in a CARB RFG program because they had no expectation that they would ever recover those costs in the marketplace." The refining sector was "literally" the last portion of the company to get any capital at all. (CX 7048 (Hancock, Dep. at 260)).
4568. The initial estimates for CARB compliance developed by Texaco's Refining & Marketing Division were in the \$300 to \$500 million range during the 1991-1992 time frame, "it sent a very bleak message to management that...the company would expose a great deal of company assets to extreme risk and not get anything back." (CX 7048 (Hancock, Dep. at 261)). Texaco finally made the decision to invest in a CARB compliance program "predicated on the assumption that [the] CARB program was as it was stated, there would be no revisions, there would be no surprises down the road." (CX 7048 (Hancock, Dep. at 261)).
4569. Mr. Hancock testified that he could not "understate how averse Texaco's executive management team was about business uncertainty and undue business risk, and the mere existence of a patent application would have interjected that element of business uncertainty and business risk." (CX 7048 (Hancock, Dep. at 280)).
4570. Texaco would have shut down the Bakersfield refinery and shut down or sold the Los Angeles refinery, if Texaco lacked business certainty regarding its refineries. (CX 7048 (Hancock, Dep. at 264)).
4571. The hydrocracker at Texaco's Los Angeles Refinery blew up in October of 1992, causing over \$50 million in damages and forcing the refinery to shut down for six months. Texaco management elected to make repairs, but considered shutting the refinery down at that time. (CX 7048 (Hancock, Dep. at 264-265)).

4572. Had Texaco known about the Unocal patent in 1992, its management would have decided not to invest in the refineries. Texaco management would not , “spend 50 million dollars [to repair the Los Angeles refinery’s hydrocracker] and then another \$100 or \$200 million on top of that just to stay in business.” (CX 7048 (Hancock, Dep. at 259; 265)).
4573. If Texaco had decided to cease refining at Bakersfield and Los Angeles, there would have been { } fewer barrels per day of CARB gasoline. {
 } (Lieder, Tr. 4781, *in camera*). {
 }
 (Lieder, Tr. 4781, *in camera*).

b. Dr. Teece’s Criticisms of Refiners’ Decisions as Not Realistic Is Misplaced.

4574. Refiners’ testimony that they would have reduced their production had they known about the Unocal patent is consistent with their conduct at the time the investment decisions were made. (CCPF ¶¶ 4575-4580).
4575. However, Unocal’s own technical expert provided contemporaneous business advice to invest less to California refiners, without even considering the Unocal patent. Between 1991 and 1993, Unocal’s own technical expert, Mr. Stellman advised refiners not to make 100 percent CARB because it was too expensive, without regard to the Unocal patent. (Stellman, Tr. 7942).
4576. In some cases, Mr. Stellman told refiners to only make 70 percent CARB as opposed to 100 percent. (Stellman, Tr. 7942-7943).
4577. Mr. Stellman advised Unocal at the time that “CARB gasoline production levels less than 100% of pre-CARB volumes are advantageous.... To maintain production levels of 100%, capital expenditures are 40-60 percent above those to produce at a 70-80% level. The average cost of production is lower. The probability of on-spec blending to the 8 specifications is much higher.” (CX 1554 at 034).
4578. Mr. Stellman recommended to Shell in the early 1990s that “Production of 70-80% of gasoline capacity as CARB gasoline reduces capital significantly and improves blending confidence.” (Stellman, Tr. 7943; CX 758 at 045).
4579. Although Dr. Teece testified that shutting down a refinery was not a viable option because of cleanup and remediation costs, several refineries did shut down upon the advent of the CARB Phase 2 regulations. (Teece, Tr. 7643-7645) Dr. Teece admitted that he has not conducted any study of the cleanup and remediation costs. (Teece, Tr.

7644) Nor could he identify the cleanup and remediation costs for the one refinery he identified as having shut down. (Teece, Tr. 7645-7646).

4580. Indeed, refiners for the most part considered cutting back production, not shutting down their refineries. For example, Exxon specifically considered and would have adopted plans that would have cut back production to levels that would still produce enough to supply the Exxon brand service stations. (Eizember, Tr. 3149-3150). Likewise, Chevron would have cut back production to levels and not made discretionary investments. (Gyorfi, Tr. 5219).

c. As a Matter of Course, the Refiners Would Have Informed CARB of Their Decisions Not to Invest.

4581. If refiners had decided to curtail their investments, CARB would have been informed. (CX 7048 (Hancock, Dep. at 263); Eizember, Tr. 3208; Banducci, Tr. 3490).

4582. There were regular lines of communication open between CARB and members of Auto/Oil and WSPA. Indeed, CARB met regularly with Auto/Oil and WSPA representatives. (CCPF ¶¶ 394, 1380-1393, 1439).

4583. At the time, WSPA was actively searching for cost information, and shared that information with CARB. Knowledge of the Unocal patents would have been passed on to CARB through the Turner Mason cost study. (CCPF ¶¶ 1394-1411).

4584. There were also regular lines of communication between individual refiners and CARB. (CCPF ¶¶ 378-396).

4585. Auto/Oil, WSPA and individual refiners all knew that CARB was interested in obtaining information related to cost because CARB had made this point very clear. (CCPF ¶¶ 1364-1370).

4586. Refiners were regularly communicating with CARB because CARB was providing refiners with assistance on permitting. (CCPF ¶¶ 3722-3745).

4587. Refiners also were regularly submitting reports to CARB on the progress of their modifications, and their expected production levels. (CCPF ¶¶ 4588-4592).

4588. CARB requested that ARCO provide reports concerning the progress of the modifications at the Carson refinery. “The project team led by Rick Dernbach gave CARB periodic updates as to the status” of the progress of the modifications at the Carson refinery. CARB required ARCO to give them periodic updates because “CARB was concerned about supply for California.” (Hoffman, Tr. 4920-4921).

4589. Shell believed that it was obligated to provide periodic reports to CARB on the progress of the investments the company was making, and one of the things specifically asked was to estimate the volume of CARB gasoline that was going to be produced. (Banducci, Tr. 3476). For example, Shell reported to CARB the volume of CARB Phase 2 gasoline that Shell intended to produce at its Martinez and Anacortes refineries. This was something that CARB required. (Banducci, Tr. 3475). These reports to CARB were required on a periodic basis. (Banducci, Tr. 3477).
4590. Putting aside the requirement to tell CARB about projected volumes, Shell believed that it was in Shell's own interest to report the progress and volume because establishing good relationships with all agencies that regulated Shell at its refineries was a prudent thing to do in. (Banducci, Tr. 3477-3478).
4591. If there were something about CARB's regulations that would have affected the volume that Shell would produce, Mr. Banducci would have insisted that CARB be informed. (Banducci, Tr. 3478).
4592. Chevron reported its Phase 2 production plans and intended Phase 2 production levels to CARB. (CX 1702 at 001).
4593. Exxon provided CARB with information about the progress of its Phase 2 modification efforts, including the status of any modification projects, schedules for milestones and estimated volumes. Therefore, if Exxon were to curtail its production, CARB would know about it. (Eizember, Tr. 3158).
4594. Texaco believed that oil companies were obligated by law to tell CARB, in detail, of their compliance plans. (CX 7048 (Hancock, Dep. at 263-264)).

d. If Refiners Did Not Invest in CARB Phase 2 Capability, the Supply of CARB-Compliant Gasoline Would Have Been Greatly Reduced, and the Price of Gasoline in California Would Have Increased Substantially.

4595. According to Unocal's own economic expert, if the production of Phase 2 gasoline in California were reduced by 50,000 barrels per day, the wholesale price of that gasoline would increase by 25% (16 cents per gallon). (Teece, Tr. 7602-7603).
4596. According to Dr. Teece, if Chevron had not made the investments to add 80,00 barrels per day to its refineries, this would have resulted in a 25.4% price increase for CARB gasoline. (RX 1162A at 072). Based on Dr. Shapiro's estimate of the demand elasticity, the increase would be twice as much. (RX 1162A at 072). Thus, if the refiners had not elected to make the investments they did to make Phase 2 gasoline, the price of gasoline in California "would be substantially higher than they actually were." (RX 1162A at 072).

4597. Based on the refiner testimony, there would have been a major disruption in gasoline supply in California if the refiners had cut back their investments as they described in their testimony. (CCPF ¶¶ 4798-4604).
4598. The market for Phase 2 gasoline was expected to be short of demand even without production cutbacks that would have taken place in response to Unocal's disclosure of its patent application. (CX 5054 at 006; Eizember, Tr. 3303).
4599. Had ARCO chosen the zero or minimum investment cases, ARCO would have reduced its production by 43,000 to 84,000 barrels per day. (Hoffman, Tr. 4978-4979, CX 5052 at 036).
4600. Had Chevron chosen the minimum investment case, Chevron would have made between 55,000 and 70,000 fewer barrels a day of CARB Phase 2 gasoline. (Gyorfi, Tr. 5219).
4601. Had Exxon chosen the minimum investment case or a case involving less investment, Exxon would have produced 25,000 to 60,000 fewer barrels per day of CARB Phase 2 gasoline. (CX 5054 at 009; Eizember, Tr. 3149-3152).
4602. Had Shell chosen a lesser investment option, Shell would have produced 20,000 to 65,000 fewer barrels per day of CARB Phase 2 gasoline. (Banducci, Tr. 3446-3450).
4603. Had Texaco closed the Bakersfield refinery and converted the Los Angeles refinery to a terminal, there would have been { } fewer barrels per day of CARB gasoline. (Lieder, Tr. 4781, *in camera*).
4604. As Unocal's economic expert Dr. Teece, admitted, if the gasoline supply in California were dramatically disrupted, either CARB or the governor would intervene. (CX 1332 at 042; Teece, Tr. 7680).
4605. For these reasons, CARB would have taken steps to mitigate the effects of the patent. (CCPF ¶¶ 4338-4447).

3. Refiners Could Have Implemented Alternative Refinery Modifications That Would Have Helped to Minimize Infringement of Unocal's Patents, Reducing Unocal's Market Power.

4606. Had refiners known about the Unocal patents prior to being locked in to their current plans, refiners could have selected a different modification plan that would have reduced the level of infringement. (CCPF ¶¶ 4607-4697).

4607. At trial, Complaint Counsel's technical expert, Michael E. Sarna provided testimony regarding changes that refiners could have made in order to reduce the overlap with the numerical limitations of the five Unocal patents.
4608. Michael E. Sarna has been employed in positions relating to the oil and gas industry for 28 years. (Sarna, Tr. 6093; RX 1154A at 044).
4609. Mr. Sarna is currently manager of the Long Beach, California office of the consulting firm Purvin & Gertz, Inc. (RX 1154A at 044; Sarna, Tr. 6092). Purvin & Gertz is an engineering consulting firm that specializes in matters related to oil refining and marketing of petroleum products, as well as petrochemicals and power generation. (Sarna, Tr. 6092-6093; RX 1154A at 044). Mr. Sarna has been employed at Purvin & Gertz for fourteen years. (Sarna, Tr. 6093).
4610. Mr. Sarna holds a bachelor of science degree in chemical engineering from Michigan Technological University. Prior to his employment at Purvin & Gertz, Mr. Sarna worked for a firm called UOP, starting in 1976. (Sarna, Tr. 6093-6094). UOP performs research and development into the processing of crude oil into refined products and also the production of petrochemicals. It does research and development, it files for patents, and it licenses those patents to oil refiners and operators of petrochemical plants. (Sarna, Tr. 6093).
4611. Mr. Sarna also completed the process engineering design school given by UOP during his employment there. (Sarna, Tr. 6093-6094). The process design school at UOP involved instruction in design of all the various pieces of equipment that go into various refinery equipment. (Sarna, Tr. 6094).
4612. Mr. Sarna served as a development engineer in the research and engineering department of UOP, then moved into the technical service department at UOP. (Sarna, Tr. 6094-6095). In these roles, Mr. Sarna was responsible for periodically inspecting refining plants during the construction period, going through various testing procedures on it after construction was completed, training the operators and engineers at the plant site, assisting them in introducing oil into the plant for the very first time, fine-tuning the operation and eventually performing the guarantee test. (Sarna, Tr. 6096).
4613. During this time at UOP, Mr. Sarna had to learn "everything," all of the details about the design and operation of the plants. It was critical for the people in the technical service department to have complete understanding because of UOP's mandatory fix-it guarantee. Since there was no limit on liability, if a plant didn't work right, it would cause the company a severe financial loss. (Sarna, Tr. 6096).
4614. During his time at UOP Mr. Sarna often worked on-site at refineries. His assignments ranged from one day to a year and a half working in a refinery. Mr. Sarna has worked in

many different refineries not only in California, but in other parts of the United States and in 30 foreign countries as well. (Sarna, Tr. 6097).

4615. Mr. Sarna had to have intimate knowledge of all the different refinery units and how they worked together in order to ensure that the refinery met the guarantees. (Sarna, Tr. 6098).
4616. Part of Mr. Sarna's responsibility was to actually write the operating manuals, including both general manuals and "valve-by-valve" manuals for specific refineries. Valve-by-valve manuals were manuals so detailed that they explained every procedure, not just in general, but which valve by number had to be turned on certain occasions to perform certain functions. (Sarna, Tr. 6098-6099).
4617. Before Mr. Sarna left UOP, he had risen to the highest position in the service department, which was senior chief technical adviser. In this job, he was given more difficult assignments, including large projects with multiple refining units and projects that involved disputes between refiners and UOP. (Sarna, Tr. 6101).
4618. Mr. Sarna left UOP in 1991 and began working at Purvin & Gertz within a week after that. (Sarna, Tr. 6113). Mr. Sarna has done work for all of the major oil companies at one time or another, including Unocal. He has also done work adverse to the interests of the major oil companies in California. (Sarna, Tr. 6115).
4619. In order for refiners to have made changes to their plans, refiners would have had to know that they should not reduce olefin levels and T50 temperature as much as they were planning to in the absence of the patent application. This is because T50 and olefins are the most critical to achieve any reasonable amount of avoidance of the numerical limitations of the patents. (Sarna, Tr. 6201-6202).
4620. Each refiner's strategy for modifying its facilities to produce CARB Phase 2 gasoline varied depending on crude slates, product slates, and existing equipment. (RX 1154A at 010).
4621. To increase patent avoidance and still comply with the CARB Phase 2 regulations, refiners could have reduced the T50 temperatures of their pools, but not as much as they did in their original project. This would have required a slightly different modification. (Sarna, Tr. 6204-6205).
4622. Refiners incorporated significant contingency into their modifications that resulted in average gasoline specifications that fell below the CARB Phase 2 flat limits by a wide margin. (RX 1154A at 010).

4623. Refineries could have done things to avoid the Unocal patents and at the same time make CARB Phase 2 gasoline had they known about the patents in sufficient time. (Sarna, Tr. 6186).
4624. During the initial stages of the modification planning process the predictive model was not yet developed, but refiners knew that such a model was on its way. (RX 1154A at 011). Taking into account the principles of equivalent exhaust emissions offered by the predictive model, refiners would have understood that operating on a continual basis with higher olefins concentrations and T50 distillation temperatures was feasible. (RX 1154A at 011).
4625. In general, refiners could have changed the way in which refiners treated the feed to the FCC unit and not treated the gasoline from the FCC unit to conserve olefins. (Sarna, Tr. 6187).
4626. {

} (Sarna, Tr. 6318, *in camera*).

4627. Refiners could have also done other things to increase the T50 of the gasoline by, for example, making TAME instead of MTBE and then alkylating the light gasoline olefins to make heavy alkylate. Refiners could have also used the catalytic condensation process to take light olefins from the FCC unit and make a heavy olefin which would satisfy the requirement of blending around the patents to both increase olefins and increase T50. (Sarna, Tr. 6187).
4628. Refiners could have also made modifications to fractionation sections, made changes in the offsites, utilities and tanks, removed pentanes from gasoline and purchased additional alkylate. (Sarna, Tr. 6187).
4629. The options for refiners described below are practical because “many refiners, not just in California but all over the world, have done similar things many times.” (Sarna, Tr. 6422).

a. ARCO’s Carson Refinery.

4630. Had ARCO known prior to July or August 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, ARCO could have made adjustments that would have enabled a better rate of blend-around. (RX 1154A at 013; Sarna, Tr. 6203-6204, as illustrated by CX 7108).

4631. In order to end up with a relatively higher T50 so as to increase blend around, ARCO could have converted its MTBE plant to a TAME plant to take C5 olefins from the FCC unit and convert them to TAME, which is heavier than MTBE. The C5 olefins that weren't converted into the TAME could then be put into the alkylation unit to make a heavier alkylate. (Sarna, Tr. 6203, as illustrated by CX 7108).
4632. ARCO also could have modified the catalytic condensation unit that it had to operate on the C4 olefins coming from the FCC unit. This would have converted the low-boiling C4 olefins to a very heavy poly-gasoline. Poly-gasoline has a fairly high octane, and a very high T50 temperature of approximately 255 to 260 degrees Fahrenheit. Poly gasoline also has a high T90 temperature and a very high olefin level of about 98 percent. (Sarna, Tr. 6203-6204, as illustrated by CX 7108).
4633. This modification would both increase the olefin levels and increase the T50 temperature. (Sarna, Tr. 6204, as illustrated by CX 7108).
4634. ARCO Carson also could have removed some of the pentanes from one of the columns that it had modified during the Phase 2 program. Because pentanes have a very low T50, removing them helps to increase the T50 temperature. (Sarna, Tr. 6204, as illustrated by CX 7108).
4635. In order to end up with a relatively higher olefin level to increase blend around, ARCO could have made more significant modifications to the FCC feed hydrotreater so as not to treat the FCC gasoline as hard. This would allow ARCO to treat only the very heavy part of the gasoline and therefore saturate fewer olefins. (Sarna, Tr. 6205-6206, as illustrated by CX 7108).
4636. If ARCO had known about Unocal's patent application, it could have taken a different position toward olefin destruction. (Hoffman, Tr. 4911-4912).
4637. At the time, the strategy on olefins at that part of the CARB Phase 2 project was "olefin destruction." Olefins are toxic, and reducing them "improved the performance of the fuel." (Hoffman, Tr. 4905-4906).
4638. There was discussion and analysis concerning the benefits of preserving versus destroying olefins in the refinery processes at Carson. While going through the CARB Phase 2 project, it was optimized to the known fuel specifications. (Hoffman, Tr. 4906).
4639. If ARCO had known of Unocal's pending patent application, an option would have been to "[f]urther sulfur reduction to offset increases in toxics generated" by the increase in olefins. This strategy is different in that it doesn't include olefin destruction. (Hoffman, Tr. 4912).

4640. If ARCO had known of Unocal's pending patent application, the fractionation control would have been "quite different" because the project was optimized to the specifications known at the time. (Hoffman, Tr. 4912).

b. Chevron's El Segundo Refinery.

4641. Had Chevron planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Chevron could have made adjustments that would have enabled a better rate of blend-around. (RX 1154A at 015; Sarna, Tr. 6213-6214, as illustrated by CX 7110).

4642. Chevron El Segundo could have adjusted the level of T50 to increase blend around by adding a fractionating column to remove some of the pentanes. Installing a depentanizer after the naphtha splitter and rejecting pentanes could raise the T50 temperature of the gasoline pool further. In addition, the pentanes from the alkylation unit could also be sold rather than blending to gasoline. (RX 1154A at 015; Sarna, Tr. 6214, as illustrated by CX 7110).

4643. In order to further increase T50 temperature to increase blend around, Chevron El Segundo could have forgone modifying the FCC gasoline hydrotreater and instead put in a rerun column so that only the very heaviest portion of the FCC gasoline would actually go through the hydrotreater. The other parts would go directly to the gasoline pool. (Sarna, Tr. 6214, as illustrated by CX 7110).

4644. Chevron El Segundo could also have increased T50 to increase blend around by installing a catalytic condensation unit to take the C4 olefins from the FCC unit and the coker unit to produce a heavy olefin polymer gasoline. This would have the effect of increasing both T50 temperature and olefin level. (Sarna, Tr. 6214, as illustrated by CX 7110).

4645. The MTBE unit operation could have been discontinued and the C4 olefins charged to the catalytic condensation unit. Modifications to the FCC in conjunction with the use of catalyst additives could have been carried out to produce additional volumes of light olefins. MTBE could be purchased to balance the loss in refinery oxygenate production. (RX 1154A at 015).

4646. Chevron El Segundo could have adjusted the level of olefins to increase blend around by installing a new cat poly unit to take the C4 olefins and make a C8 olefin, which would have helped not only to increase the olefin levels, but also to increase the T50. (Sarna, Tr. 6216, as illustrated in CX 7110).

4647. In order to increase olefin levels, Chevron El Segundo could have foregone hydrotreating as much of the olefin. The Chevron El Segundo refinery was already severely

hydrotreating the feed to the FCC unit. The installation of a hydrotreater to process the depentanizer bottoms stream destroyed olefins and contributed to a further reduction in gasoline sulfur content. (Sarna, Tr. 6216, as illustrated in CX 7110; RX 1154A at 015).

4648. In order to preserve olefins a gasoline rerun column could have been installed to isolate the heavy portion FCC gasoline cut. The bottoms from the rerun column would contain the heaviest portion of the FCC gasoline that has the least amount of olefins and greatest amount of sulfur, which could then be processed in the hydrotreater without a significant loss of olefins. The overhead from the rerun column, which contains a higher concentration of olefins and lower sulfur content, could then be blended directly to gasoline with no loss of olefins. (RX 1154A at 015).

c. Chevron's Richmond Refinery.

4649. Had Chevron planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Chevron could have made adjustments that would have enabled a better rate of blend-around at the Richmond refinery. (RX 1154A at 016; Sarna, Tr. 6221, as illustrated in CX 7112).
4650. Chevron Richmond could have adjusted the level of T50 to increase blend around by installing a depentanizer column in the naphtha fractionation area to remove some pentanes. Installing depentanizer columns downstream of the naphtha prefractionation tower and also in the hydrocrackers to reject pentanes and form light naphtha could raise the T50 temperature of the gasoline pool. (RX 1154A at 017; Sarna, Tr. 6221, as illustrated in CX 7112).
4651. In addition, pentanes from the alkylation unit could be sold rather than blending to gasoline. Additional volumes of alkylate could have been purchased to replace the loss in gasoline volume from removal of pentanes, which would also increase the T50 and T90 temperatures. (RX 1154A at 017; Sarna, Tr. 6221, as illustrated in CX 7112).
4652. Chevron Richmond could have adjusted the level of olefins to increase blend around by modifying the existing catalytic polymerization to convert the C4 olefins produced in the FCC unit and the coking unit to produce a heavy olefin poly-gasoline. Because the heavy olefin poly-gasoline has a T50 temperature greater than 255 degrees, that would help to increase the T50. Furthermore, because heavy poly-gasoline contains about 98 percent olefins, the level of olefins in the gasoline pool would increase. (Sarna, Tr. 6222, as illustrated in CX 7112).
4653. The FCC unit at Chevron Richmond could have been configured to produce a greater volume of light olefins through the use of catalyst additives. The tetramer unit could have been modified and expanded to produce a heavy olefinic gasoline from C4 olefins. The MTBE unit could have been shutdown and the C4 olefins charged to a tetramer unit.

Volumes of MTBE could have been purchased to balance the loss of production from the refinery MTBE unit. (RX 1154A at 016).

4654. These steps would have helped the Chevron Richmond refinery produce gasoline that avoided to a significant extent the numerical limitations of the Unocal patents because the alternative modifications would have “resulted in a lesser reduction in T50 temperature and a lesser reduction in olefins than what they actually did.” (RX 1154A at 016-017; Sarna, Tr. 6222, as illustrated in CX 7112).

d. Exxon’s Benicia Refinery.

4655. There were modification options that Exxon considered and could have made that would have assisted the Benicia refinery in avoiding the numerical property limitations of the Unocal patents. (Eizember, Tr. 3178).

4656. Had Exxon been aware of the Unocal patent application and known that it taught that having a relatively lower T50 would be claimed, Exxon could have taken steps to raise the T50 in its gasoline pool. In 1991, there were technical modification alternatives available to Exxon that would have allowed Benicia to comply with the CARB regulations while maintaining a higher T50 in the gasoline pool as compared to the T50 that resulted from Benicia’s actual modifications. (Eizember, Tr. 3173).

4657. For example, Exxon could have implemented the “benzene heartcut shipment” option that it proposed to management, whereby the benzene heartcut would be hauled to the Gulf Coast while retaining the raffinate in the Gulf Coast rather than return it to Benicia. (CX 5054 at 009; Eizember, Tr. 3154, 3174).

4658. If Exxon had not had to maintain the low T50, Exxon could have left the raffinate (the part of the heartcut that’s not benzene) in the Gulf Coast and used it in gasoline there and not incurred the shipping cost back to California. (Eizember, Tr. 3154).

4659. When Exxon pursued the option to fractionate T90, that had the effect of lowering T50 by removing heavy material from the pool. Had Exxon expanded Benicia’s hydrocracker and hydrocracked that T90 heavy material back into a boiling range between the T50 and the T90, it would not have had as depressing an effect on the T50. In the early scoping there was consideration of an expansion of the Benicia hydrocracker. (Eizember, Tr. 3174).

4660. Exxon could have considered the use of different oxygenates other than MTBE. For example, Exxon could have expanded the Benicia alkylation plant, not built the MTBE plant and imported MTBE. If Benicia had chosen to pursue that option, that would have resulted in an increase in the average T50 of the Benicia gasoline pool. (Eizember, Tr. 3174-3175; 3179).

4661. When planning the Phase 2 modifications at Benicia, Exxon did not try to raise the level of olefins in Benicia's gasoline pool because Benicia's olefin level pre-modifications was higher than the olefin level in the specification, so Exxon was looking for ways to reduce it. (Eizember, Tr. 3177).
4662. In fact, when planning the Phase 2 modifications at Benicia, Exxon was not trying to maintain an olefin level that was at the higher end of the allowable level under the CARB regulations because Exxon was targeting for a lower average level and thought that reducing olefins was consistent with the general direction of the regulations. (Eizember, Tr. 3177-3178).
4663. In 1991, there were technical modifications available to Exxon, and that Exxon considered, that would have allowed Benicia to comply with the CARB regulations while maintaining a higher olefin level in the gasoline pool as compared to the olefin level that resulted from Benicia's actual modifications. (Eizember, Tr. 3176).
4664. One option for Exxon Benicia was not to saturate the dimate, which is a 100 percent olefin stream saturated to a paraffin. (Eizember, Tr. 3176).
4665. Another option for Exxon was to expand or increase the severity of the Benicia cat feed hydrotreater so that Exxon did not need to install the cat naphtha hydrotreaters that it did. The effect of installing those cat naphtha hydrotreaters reduced olefins in the gasoline pool. (Eizember, Tr. 3176).
4666. Finally, Exxon could have considered options that had the ability to reduce sulfur substantially below the CARB required level. Had Exxon chosen those options and generated a lower sulfur level, that would have provided Benicia more flexibility in making trade-offs under the predictive model. In particular, this would have allowed Exxon to produce a gasoline pool with a relatively higher T50 and a relatively higher olefins level and still meet the CARB standards. (Eizember, Tr. 3178).
4667. Had Exxon planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Exxon could have taken steps to decrease the level of patent overlap. In particular, Exxon could have taken steps to have higher T50 and have higher olefins in their gasoline pool, and directionally that would have helped them to blend around the patents. (Sarna, Tr. 6226-6231, as illustrated in CX 7114).
4668. To account for a relatively higher T50, Exxon could have not built the benzene saturation unit and instead sent the mid-cut from the heartcut fractionation unit off and sold it to petrochemical companies as a benzene concentrate. (Sarna, Tr. 6227, as illustrated in CX 7114).

4669. To further account for a relatively higher T50, Exxon could also have not fractionated the FCC gasoline and sent the bottom portion to the hydrocracker. Instead, Exxon could have put that directly into gasoline. (Sarna, Tr. 6227, as illustrated in CX 7114).
4670. To compensate for the higher T50, Exxon could have expanded its FCC feed hydrotreater so as to treat all of the VGO and desulfurize it to a greater extent, reducing both the sulfur and aromatics in the FCC gasoline. This would have also had the effect of conserving olefins. (Sarna, Tr. 6228, as illustrated in CX 7114).
4671. Another thing Exxon could have done to increase T50 would have been to take some of the C5 olefins from the FCC unit and modify their existing MTBE unit to a TAME unit. This TAME unit would allow Exxon to convert some of the C5 olefins to TAME while sending other C5 olefins to the alkylation unit. (Sarna, Tr. 6228-6229, as illustrated in CX 7114).
4672. In order to raise the level of olefins to better avoid the Unocal patents, Exxon could have increased the severity of and expanded the FCC feed hydrotreater, which would have eliminated (or nearly eliminated) the need to do anything to hydrotreat the FCC gasoline. (Sarna, Tr. 6230, as illustrated in CX 7114).
4673. In addition, Exxon could have used its existing FCC gasoline hydrotreater to hydrotreat only the very heaviest portion of the FCC gasoline, so as not to destroy as many olefins. Exxon could also have modified its dimerization unit to take the C4 olefin cut and produce a C8 olefin, which would have the effect both of increasing T50 and also increasing olefins. (Sarna, Tr. 6230, as illustrated in CX 7114).
4674. Exxon could also have increased their ability to avoid the patents by taking off some of the C5s built into the C5/C6 column that Exxon built in the original modification and selling those instead of putting them in gasoline. (Sarna, Tr. 6231, as illustrated in CX 7114).

e. Mobil's Torrance Refinery.

4675. Had Mobil planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Mobil could have taken steps to decrease the level of patent overlap. In particular, Exxon could have taken steps to have higher olefins in the Torrance gasoline pool, and directionally that would have helped them to blend around the patents. (RX 1154A at 022; Sarna, Tr. 6235-6236, as illustrated by CX 7116).
4676. To increase avoidance Mobil could have installed a small catalytic condensation unit that would have allowed the Torrance refinery to produce additional olefins. Torrance then could have used a portion of the light olefins that were going to the alkylation unit to make a high-octane olefinic polymer gasoline, and that would have increased the overall

olefin concentration in the Torrance gasoline pool. (RX 1154A at 022; Sarna, Tr. 6235-6236, as illustrated by CX 7116).

f. Shell's Martinez Refinery.

4677. Had Shell planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Shell could have taken steps to decrease the level of patent overlap. (Sarna, Tr. 6329-6335, as illustrated by CX 7118).
4678. In order to improve T50 temperatures for patent avoidance, Shell could have alkylated the C5 olefins in the FCC unit in order to produce a heavy alkylate at a much higher T50. Shell Martinez also could have removed some pentanes, and could have modified the dimerization unit to feed C4 olefins and produce a heavy olefinic gasoline component. (Sarna, Tr. 6329-6330, as illustrated by CX 7118).
4679. In order to increase the relative levels of olefins, Shell Martinez could have modified and expanded the FCC feed hydrotreater instead of building a new FCC gasoline hydrotreater. The effect of this change would have been to achieve the same level of sulfur reduction without the loss of the olefins. (Sarna, Tr. 6335, as illustrated by CX 7118).
4680. Shell Martinez also could have made changes to the utilities and off-sites, removed pentanes, and purchased additional alkylate and MTBE to increase blend around. (Sarna, Tr. 6329-6330, as illustrated by CX 7118). The alkylation unit could have been modified to process all of the C5 olefins and lesser volumes of C4 olefins, which would increase the T50 distillation temperature. The pentanes from the alkylation unit could then be sold instead of blending to gasoline resulting in a further increase in T50 temperature. The Dimersol unit could have been modified and expanded, instead of being idled, and charged with C4 olefins, which would have contributed to an increase in gasoline olefins content and also a higher T50 temperature. (RX 1154A at 023).

g. Texaco's (Shell's) Wilmington Refinery.

4681. Had Texaco planners known prior to the fourth quarter of 1993 that Unocal had a patent application and that they would have to maintain relatively higher levels of olefins and T50 temperatures, Texaco could have taken steps to decrease the level of patent overlap. (Sarna, Tr. 6339-6341, as illustrated by CX 7106).
4682. In order to maintain relatively higher T50 temperatures, Texaco Wilmington could have sent parts of the C5 olefins produced in the FCC unit to the alkylation unit and changed the alkylation unit modification to accept those heavier olefins. This would have resulted in an alkylate that was heavier, and thus limited the reduction in T50 from the actual modifications. (Sarna, Tr. 6339-6340, as illustrated by CX 7106).

4683. Texaco Wilmington could also have removed some pentanes, and that would have helped to not reduce the T50 so much. (Sarna, Tr. 6340, as illustrated by CX 7106).
4684. Texaco Wilmington could have also built a new catalytic condensation unit and created a heavy olefin that has a T50 temperature greater than 255 degrees, which is higher than its current C3/C4 olefins. This step would have both raised the T50 temperature and conserved olefins. (Sarna, Tr. 6340, as illustrated by CX 7106).
4685. Texaco Wilmington could have maintained a relatively higher olefin level by revamping the FCC feed hydrotreater to operate at a higher severity. This would remove more sulfur, and that would have allowed Texaco to put all of the FCC gasoline directly into the gasoline pool. (Sarna, Tr. 6340, as illustrated by CX 7106).

h. Valero's (Ultramar's) Wilmington Refinery.

4686. Prior to 2001, the Valero Wilmington refinery was owned by Ultramar. (Simonson, Tr. 5979). Ultramar might have approached the olefins and aromatics balances differently in upgrading the refinery for CARB Phase 2 if it had known Unocal filed a patent application. At the time the CARB rules were initially going into effect, there was a feeling that aromatics and olefins were going to be bad things in the overall pool and should be controlled. On some of the claims, those materials may provide room to avoid overlap. Valero might have expanded their reformer capacity. (CX 7050 (Ibergs, Dep. at 100-101)).
4687. Valero would have been less concerned about the amount of aromatics and olefins that were in the overall gasoline pool if it had known about Unocal's pending patent application. (CX 7050 (Ibergs, Dep. at 102)).
4688. If Valero had been less concerned about the amount of aromatics and olefins, it probably wouldn't have configured that unit for use in olefin saturation. At that point Valero may or may not have used that unit for any purpose. (CX 7050 (Ibergs, Dep. at 102)).
4689. If Valero was not as concerned with olefins, it may have made different decisions regarding the building of the new, larger naphtha hydrotreater. If it had followed that route, going back to numbers that they had originally tossed out, that portion of the work was on the order of \$95 million. If all Valero was doing was putting in a fractionator, it would have been \$10 million, maybe on the order of \$85 million. (CX 7050 (Ibergs, Dep. at 103)).
4690. Valero is not using the hydrotreater to necessarily reduce benzene. As part of the fractionation of material is going into the reformer, they are removing the materials that turn into benzene in the reformer and not sending them into the unit. Without the hydrotreater, they would have put in a fractionator in front of the existing naphtha

hydrotreater to separate out the light gasoline streams, and send the reformer feed fraction through the reformer. (CX 7050 (Ibergs, Dep. at 103-104)).

4691. The hydrotreater also reduces sulfur. But typically, depending on any particular crude slate, the lighter the hydrocarbon fractions are, the less sulfur is in them. (CX 7050 (Ibergs, Dep. at 104)).
4692. Valero at one time had an old naphtha hydrotreater that was a feed pretreater for the reformer unit. This was converted for use for saturation of olefins, and incidentally also removed sulfur in some of the FCC gasoline stream. (CX 7050 (Ibergs, Dep. at 104)).
4693. Valero would not have installed this naphtha hydrotreater if it had wanted to allow higher olefins in the gasoline pool. Looking at the total picture of what was going on, Valero had a small naphtha hydrotreater that was pretreating feed for the reformer. Valero thought managing olefins was going to be a concern. Because there was a need to manage the olefins, people realized that the small naphtha hydrotreater already in place could be used for an olefin treater, and another naphtha hydrotreater could be built to generate feed for the FCC unit or the reformer unit. If Wilmington was going to deal with olefins, Valero was going to end up building another process unit. An alternative could have been to keep the existing naphtha hydrotreater as it was and build another process unit to function as an olefin treater, which looks very much the same in terms of the equipment that's there. One way or the other, if Valero was saying it was going to saturate olefins, it needed to build another process unit. (CX 7050 (Ibergs, Dep. at 104-105)).
4694. Valero Wilmington would not have been concerned about olefins, and would not have been looking to saturate olefins. Therefore, Valero Wilmington would not need a process unit to saturate olefins and Valero possibly would not have built a larger naphtha hydrotreater. (CX 7050 (Ibergs, Dep. at 107)).
4695. Valero Wilmington would have made a different decision if it had known about the '393 patent because the patent's claims on paraffins, aromatics, and olefins would have created an incentive to keep olefins in the gasoline pool. Valero was building a unit to remove olefins from the gasoline pool. (CX 7050 (Ibergs, Dep. at 107)).
4696. Knowledge of the '393 patent would have alerted Valero Wilmington to take a closer look at how it viewed olefins and aromatics overall. When looking at the design of the units from the terms of the CARB predictive model, initially Valero thought aromatics and olefins were not good because it lacked information that there may be some benefits to having aromatics and olefins in the gasoline pool. (CX 7050 (Ibergs, Dep. at 108)).
4697. Valero Wilmington might have considered options related to a recognition that aromatics and olefins had some benefits in addition to the detriments that are indicated in the CARB predictive model. (CX 7050 (Ibergs, Dep. at 109)).

4. Refiners Could Have Negotiated a Less Expensive Royalty with Unocal.

4698. Had refiners known in 1991 or 1992 that Unocal was seeking a patent on the research presented at Auto/Oil and WSPA, and that Unocal intended to seek royalties on that patent, Unocal and the refiners could have negotiated a royalty, where the benefits from Unocal's opportunism would be absent. (CCPF ¶¶ 4699-4716).
4699. Refiners all testified that, had they learned about the Unocal patent prior to being locked in to their investments, they would have contacted Unocal to learn what Unocal intended to charge (if anything) for the patent. (Gyorfi, Tr. 5227; CX 7048 (Hancock, Dep. at 261-262); Banducci, Tr. 3487-3488; Eizember, Tr. 3208).
4700. However, if the negotiations for the license took place prior to the time when CARB was locked in to specific Phase 2 regulations and prior to the time that refiners were locked in to their investments, the bargaining power would be very different. It is well established in the economic literature on bargaining that "the outcome of negotiations tends to favor firms with greater 'bargaining power.'" (CX 1346 at 011). Thus, in a hypothetical negotiation between Unocal and the California refiners, "Unocal could be expected to extract the 'lion's share' of the gains from trade." (CX 1346 at 011).
4701. If royalty negotiations took place prior to the point when refiners had made specific investments, then Unocal would not be able to gain opportunistically from these investments. Indeed, refiners would have had many options to limit the amount of infringement, and would also have had the option to invest less (or not at all) in Phase 2. (CCPF ¶¶ 4458-4697).
4702. In this case, Dr. Shapiro demonstrated that opportunism can create monopoly. In this case, in the initial phase, or *ex ante* phase, CARB had a number of options in terms of how it would write its rules, and the technology that would be needed would be different depending upon how CARB writes its rules. Once the rules are in place, the technology choices become more restricted. (Shapiro, Tr. 7070-7071, as illustrated by CX 7097).
4703. One factor in the reduction of choices for CARB is the "specific investments." That factor is "very much present here because of the billions of dollars that refineries as a group spent during that period of time between [19]91 and [19]95 specifically to comply with the CARB Phase 2 rules." (Shapiro, Tr. 7071-7072, as illustrated by CX 7097).
4704. {
} (CX 1720 at 027, *in camera* (Shapiro Expert Report)).

4705. Dr. Teece's estimate of the specific investments spent by refiners to comply with the CARB Phase 2 regulations is similar to that of Dr. Shapiro. These amounts are shown in Table 2 of Dr. Teece's expert report in the '393 litigation. (CX 1346 at 061). That table shows the amount of monies spent by each refinery to comply with the Federal EPA standard and how much each spent to comply with CARB Phase 2. (CX 1346 at 061).
4706. In the '393 litigation, Dr. Teece testified that the refiner sunk costs impacted the royalty Unocal could command for its patent. According to Dr. Teece, "the economic cost of abandoning the California market and California investments means that, in the context of the (hypothetical) negotiation [between Unocal and the refiners], Unocal has greater 'bargaining power' relative to the other oil companies." (CX 1346 at 011). As of 1995, the "sheer size of the California market, coupled with the size of the oil companies' investments in refineries and in the distribution system, makes it impracticable for other oil companies to simply 'walk away' from the California market." (CX 1346 at 010).
4707. Thus, the value of the Unocal patents "is amplified if you are in an industry circumstance where there's a lot of fixed investment." (CX 1332 at 017). Further, Dr. Teece testified that because the refiners "have made billions of dollars of upgrades, but they haven't taken into account the fact that [Unocal's] patent is out there. So they are stuck, and they're going to have to take the license [from Unocal]." (CX 1332 at 051; Teece, Tr. 7706-7707). Thus, the only viable option for refiners is to take a license from Unocal. (Teece, Tr. 7665, 7707).
4708. If Unocal had disclosed its patents prior to the point where refiners were locked in to their Phase 2 investments, there would be no specific investments for Unocal to opportunistically exploit. Indeed, refiners would have had many options that would have reduced the level of infringement. (CCPF ¶¶ 4606-4697). Refiners also would have had the option of not investing. (CCPF ¶¶ 4458-4573). Before these specific investments are made, Unocal has less bargaining power.
4709. The other factor in the reduction in choices to CARB is the "adjustment costs." These costs are caused by the fact that the passage of time has made it harder to turn to other industries as a way of obtaining emissions reductions, because the California State Implementation Plan has been put in place. (Shapiro, Tr. 7071, as illustrated by CX 7097).
4710. According to Unocal's own expert, asking CARB to relax the Phase 2 regulations to allow the refiners to avoid the Unocal patents was not a viable option in 1995. (CX 1332 at 032; Teece, Tr. 7655-7656). According to Dr. Teece, it would be "very hard" for CARB to roll back the Phase 2 regulations. (CX 1332 at 032). As Dr. Teece admitted, given the perceived public benefits of the Phase 2 regulations and the statements of public officials, the CARB Phase 2 regulations would not be relaxed in any significant way. (Teece, Tr. 7677).

4711. Dr. Teece agrees that “the adoption of a standard can affect the bargaining position of the parties.” (RX 1162A at 028). Even though a technology may be only slightly better than alternatives before the standard is adopted, “once the patented technology is adopted as a standard, firms may commit to the standard and invest in complementary assets” and become locked in. (RX 1162A at 028).
4712. The value of a patent that is important for regulatory compliance is amplified in an industry in which there are a lot of fixed investments. (Teece, Tr. 7704-7705).
4713. Dr. Teece testified that one principle that applies to the value of Unocal’s patents is the “confluence of intellectual property and regulation,” which according to Dr. Teece, states that “you have intellectual property, but it doesn’t stand alone. It’s very important for regulatory compliance, and when you have the confluence of intellectual property and a regulatory mandate, then intellectual property takes on special value.” (CX 1332 at 017). Dr. Teece admitted that the CARB regulations are a “big factor” affecting the value and use of Unocal’s patents because of the confluence of CARB regs and the patents. (CX 1332 at 043). The regulations created demand for the patent. (Teece, Tr. 7700-7701).
4714. Dr. Teece further stated that patents have more value if they are broad or if “you have some technology that’s critical for regulatory compliance.” (CX 1332 at 034).
4715. Dr. Teece concluded that “When you have a broad patent and where it’s critical for regulatory compliance? I believe that in that circumstance, the value can be high. (CX 1332 at 034).
4716. If Unocal had disclosed its patents prior to the point where CARB was locked in to the specifics of its Phase 2 investments, there would be no adjustment costs for Unocal to opportunistically exploit. In particular, refiners could have informed CARB about Unocal’s patents so that CARB could take steps to mitigate the effects of the patent. (CCPF ¶¶ 4448-4457). Indeed, if the refiners chose not to invest and so informed CARB, there would be “political intervention” that would have solved the supply problem that would be created, presumably by allowing CARB to change its regulations. (CCPF ¶¶ 4458-4605). Without the adjustment costs facing CARB, Unocal has less bargaining power.

**UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION**

DOCKET NO. 9305

PUBLIC VERSION

**IN THE MATTER OF
UNION OIL COMPANY OF CALIFORNIA**

**COMPLAINT COUNSEL’S PROPOSED
FINDINGS OF FACT**

(VOLUME VI)

XXVIII. Unocal’s Actions In This Case Are Likely To Harm Consumers.

4717. Unocal’s opportunistic behavior and deceptive conduct have, or will, harm the motorists and the producers of gasoline in California. (CCPF ¶¶ 4718-4762).

A. Unocal’s Deception Has Harmed the Consumers in the Technology Market.

4718. Unocal’s deception has harmed consumers in the technology market – the refiners and blenders who make CARB summertime RFG – because there is a significantly higher price for the technology used to comply with CARB’s Phase 2 regulations, as reflected in the per-gallon royalty fees Unocal has obtained. (CX 1720A at 032 (Shapiro Expert Report)). This higher price for technology has manifested itself in a number of ways. (Shapiro, Tr. 7097).

4719. Refiners may be forced to make royalty payments to Unocal, whether by license or as mandated by the Court, in the future. Whatever royalties are collected would be “additional costs borne by refiners that would be above competitive levels and would be an impact of the deceptive conduct.” (Shapiro, Tr. 7097).

4720. In addition to amounts paid to Unocal under the patents, refiners may incur costs stemming from efforts to blend around the patents. The total harm to competition in the technology market may be higher than the royalties paid to Unocal if refiners also incur

(Shapiro, Tr. 7398). The total impact of these royalties could be approximately \$160 million per year. (Shapiro, Tr. 7098). The royalties potentially owed Unocal for past infringement by California refiners could be as high as \$1.9 billion. (CX 1720A at 026 (Shapiro Expert Report)).

4728. Unocal's patents have created "a new business" for Unocal. (CX 441 at 002; CX 7072 (Williamson, Dep. at 12-13)). Unocal has publicly announced that "pursuing and negotiating licensing agreements for reformulated gasoline patents with refiners, blenders and importers" is a "strategic focus" of the company. (CX 614 at 005; CX 7072 (Williamson, Dep. at 28)).
4729. Unocal has formally announced that it has projected license fee revenues of \$75 to \$150 million per year. (CX 441 at 003; CX 7072 (Williamson, Dep. at 16-17); Strathman, Tr. 3626; CX 610 at 068).
4730. Unocal has projected various annual rates for its patent royalties. One projection presented at a July 18, 2000, Unocal Board Meeting assumed an average rate of 2.5 cents per infringing gallon, and recognized revenue potential for Unocal estimated at \$178 million dollars annually. (CX 635 at 001; Strathman, Tr. 3699-3700, *in camera*; CX 468 at 002 (assuming revenues of \$200 million per year in doing tax analysis)).

B. Unocal's Deceptive and Exclusionary Conduct Has Raised, And Continues To Raise, the Price of CARB Summertime Reformulated Gasoline.

4731. While the direct effects of Unocal's deception occur in the technology market in a number of forms, there are also effects felt in the downstream market for CARB gasoline. This is typical in economics; if input prices go up, then downstream product prices often go up as well. (Shapiro, Tr. 7067-7068). "That is to say, the higher costs here that refiners are incurring will lead to higher gasoline prices." (Shapiro, Tr. 7067).
4732. The monopoly overcharges in the technology market imposed by Unocal's patents pass through to higher gasoline prices and thereby harm California motorists. (CX 1720A at 032 (Shapiro Expert Report); Shapiro, Tr. 7098). As discussed below, Dr. Shapiro and Unocal's Dr. Teece both testified that a large portion of royalty payments paid by refiners would be passed through to gasoline consumers. (CCPF ¶¶ 4733-4752).
4733. Economists use the term "pass-through rate" to describe the portion of an increase in input costs that flows through to downstream prices. A pass-through rate of one indicates that 100% of the increased cost flowed through to downstream prices. Pass-through rates less than one indicate that less than 100% of the increased input cost flowed through. (CX 1720A at 033 (Shapiro Expert Report)).
4734. Pass-through rates may differ depending upon the nature of the input cost that has increased. Pass-through rates for fixed cost increases are typically less than those for

variable cost increases. Generally, the pass-through rate for higher input costs depends upon how much *marginal* costs are affected, and the ratio of the elasticities of supply and demand. (CX 1720A at 033 (Shapiro Expert Report)).

4735. Unocal's per-gallon royalties increase the marginal cost of refining gasoline that is within the scope of Unocal's patent claims. Dr. Teece agrees that marginal cost increases are the most relevant cost concept for pass-through analyses in the petroleum refining industry. (CX 1346 at 051-052).
4736. Many studies indicate that the pass-through rate of marginal cost increases in refining to gasoline consumers approaches 90 percent. The most pertinent study by Borenstein, Cameron, and Gilbert, found that the pass-through rate of crude oil price increases to retail gasoline prices to be 0.81. (CX 1720A at 033 (Shapiro Expert Report, *citing* Severin Borenstein, A. Colin Cameron, and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes," *Quarterly Journal of Economics*, February 1997, pp. 305-309)).
4737. Other relevant studies have found the pass-through rate of crude oil price increases to pump price increases to be 0.88 for branded wholesale gasoline and 0.91 for unbranded wholesale gasoline; 1.00; and 0.92. (CX 1720A at 033-034 (Shapiro Expert Report, *citing* Severin Borenstein and Andrea Shepard, "Sticky Prices, Inventories and Market Power in Wholesale Gasoline Markets," working paper, February 1997; Hayley Chouinard and Jeffrey A. Perloff, "Gasoline Price Differences: Taxes, Pollution Regulations, Mergers, Market Power, and Market Conditions," working paper, September 2002; and Michael Burdette and John Zyren, "Gasoline Price Pass-Through," January 2003)).
4738. Assuming an 80 percent pass-through rate (.8) of costs associated with royalties charged by Unocal, California motorists could pay an additional \$130 million per year for CARB compliant gasoline. (Shapiro, Tr. 7099; CX 1720A at 034 (Shapiro Expert Report)).
4739. Unocal's economic expert, Dr. Teece, acknowledged that the bulk of Unocal's royalties in California will be passed through to California motorists in the form of higher gasoline prices and testified that the pass-through rate is about 90 percent. (Teece, Tr. 7522; Shapiro, Tr. 7099; CX 1346 at 050-051). To determine the pass-through rate, Dr. Teece had his staff conduct a study of the behavior of U.S. gasoline prices and volumes from which he estimated that the price elasticity of consumer demand for gasoline is quite inelastic at -.25. (CX 1346 at 031). This inelastic demand allows refiners "to 'pass-through' virtually all of a cost increase in the form of retail price increases." (CX 1346 at 031, 049).
4740. According to Dr. Teece, even though refiners "were not historically paying the royalty... one can estimate the 'pass-on' by performing an econometric analysis of the relationship between the price of crude oil and the price of refined gasoline." (CX 1346 at 049).

4741. Dr. Teece studied the statistical relationship between changes in crude prices and changes in wholesale gasoline prices and concluded that “nearly all (92%) of the cost of crude oil – the largest cost component for gasoline – is passed through to wholesale prices” for gasoline. (CX 1346 at 049-050). The results of this study were consistent with those of a published study, which found an 88% pass-through rate. (CX 1346 at 050).
4742. Based on these studies, Dr. Teece concluded that “about 90% of the additional costs associated with complying with any royalty license from Unocal would be reflected in the wholesale gasoline prices.” (CX 1346 at 050).
4743. Dr. Shapiro and Dr. Teece agree that should refiners pay royalties to Unocal for Unocal’s RFG patents, royalty costs would be passed on to consumers. (Shapiro, Tr. 7099; CX 1346 at 050-051; Teece, Tr. 7522). As Dr. Teece explained in his expert report, “Had the infringing oil companies paid Unocal a reasonable royalty on their historic sales of infringing RFG, this would have increased their costs. Competitive factors and the profit motive would together have caused the licensees to raise their RFG prices in an effort to cover those higher costs.” (CX 1346 at 009).
4744. According to Dr. Teece, the level of Unocal royalties that would be passed on to consumers depends on three factors: (1) the level of infringement; (2) the degree to which the marginal refiner infringed; and (3) whether the royalties are paid as a lump sum or as a running royalty. (Teece, Tr. 7523-7524). There is evidence in the record providing information about each of these factors. Unocal’s own expert, Mr. Stellman, determined the level of infringement for the ’393 patent and the first 40 claims of the ’126 patent, both on an industry-wide and individual refiner basis. (RX 1165 at 036-047, *in camera*). Unocal’s own licensing documents show that {
} (CX 2009 at 004-005, *in camera*; CX 2011 at 005, *in camera*; CX 2014 at 006, *in camera*; CX 2018 at 005, *in camera*; CX 2020 at 007, *in camera*; CX 2017 at 004, *in camera*; CX 443 at 007, *in camera*; Strathman, Tr. at 3719, *in camera*).
4745. Dr. Teece presented two possible methodologies to estimate the amount of additional costs from Unocal royalties that would be passed on to consumers: one using marginal cost pricing and one using average cost pricing. (CX 1346 at 050). Though he determined that marginal costs are relevant in determining prices in the refining industry, “for completeness,” Dr. Teece performed both a marginal cost and an average cost analysis. (CX 1346 at 051).
4746. Since “extremely detailed refinery-specific cost data” was not available, and because “accounting data is often misleading [and] . . . a poor shadow of marginal costs,” Dr. Teece opined that “it would be reasonable to assume that all refineries currently operating in California have roughly similar marginal costs on average (ignoring infringement).” (CX 1346 at 051-052). Thus, “it is not appropriate to single out a

particular refinery and identify it as ‘the marginal refinery’ for the entire period in question. Rather, the marginal refiner is likely to change its identity from time to time depending on market conditions.” (CX 1346 at 052; Teece, Tr. 7623-7624). Further, since refiners differ in their infringement rate, “a reasonable conclusion is that the refinery with the worst infringement rate over the time period under study is the ‘unique marginal producer.’” (CX 1346 at 052). In his marginal cost analysis, Dr. Teece did not define a particular existing refinery to serve as a “unique marginal producer,” but instead determined that the refinery with the worst infringement rate could serve as the “unique marginal producer.” (CX 1346 at 052; Teece, Tr. 7623-7624).

4747. According to Mr. Stellman, the refinery with the worst infringement rate { E } (RX 1165 at 043, *in camera*). Based on Mr. Stellman’s calculations and Dr. Teece’s conclusion “that the refinery with the worst infringement rate over the time period under study is the ‘unique marginal producer,’” the amount of royalties that would be passed through to consumers can be calculated by multiplying the infringement rate for the “unique marginal producer” ({ }) by the pass-through rate (Shapiro’s 80%), which results in a pass-through to consumers of { } of any royalties assessed by Unocal. (CX 1346 at 052).

4748. According to Dr. Teece, a second “more theoretically correct” marginal cost analysis “recognizes that which refinery is the ‘marginal producer’ can vary from time to time.” (CX 1346 at 053). “This approach suggests that, on any given day, **any** infringing refiner can be thought of as the ‘marginal producer.’” (CX 1346 at 054 (emphasis in original)). To determine the effect of Unocal royalties on gasoline prices, therefore, one would multiply the probability that at least one refiner in California will be infringing by the royalty rate and by the pass-through rate. (CX 1346 at 054). One can estimate the probability that any one refiner is infringing at any given time by using historical infringement rates. (CX 1346 at 054). In this case, Mr. Stellman determined that the highest infringement rate {

} (RX 1165 at 043, 036-048, *in camera*).

Based on combinatorial probability theory used by Dr. Teece, the probability of a refiner infringing the Unocal patents at any given time must be greater than { } (CX 1346 at 053-054). The amount of any Unocal royalties that would be passed through to consumers under this approach would be greater than that estimated under the “unique marginal producer” approach. (CX 1346 at 053-055).

4749. According to Dr. Teece, an average cost pricing approach would show the “absolute minimum” effect on consumer prices. (CX 1346 at 055). Under this approach, the amount of pass-through for royalties charged by Unocal would be the average infringement rate multiplied by the pass-through rate. (CX 1346 at 049, 055). Applying Mr. Stellman’s industry average infringement rate of 50.4% (RX 1165A at 017) and Dr.

Shapiro's conservative 80% pass-through rate (CX 1720A at 034) results in an estimated 40.32% of any Unocal royalties being passed on to consumers.

4750. Even if Unocal were to impose royalties on only a small amount of the overall Phase 2 RFG production, the price of gasoline would be significantly impacted. As Dr. Teece recognized, because refiners must "check whether or not an entire batch – roughly, a day's production from a refinery – is infringing, rather than trying to determine whether a particular gallon or barrel or tanker-truck-load of gasoline is infringing, ... infringement, when it occurs, is significant relative to the overall size of the market." (CX 1346 at 021). One batch of gasoline is a "significant fraction" of the overall daily production of CARB Phase 2-compliant gasoline in California. (CX 1346 at 021; Teece, Tr. 7649). One batch may be as much as 5-10% of a given day's production. (CX 1346 at 021; Teece, Tr. 7649). Even "small batches from small refiners are roughly 3-5% of daily statewide production." (CX 1346 at 021; Teece, Tr. 7649). "Quantities of this magnitude have a significant effect on the overall market, both in terms of price and availability of gas." (CX 1346 at 021; Teece, Tr. 7649-7650).
4751. As Dr. Teece testified, under the same analysis as passing on any royalty costs, any costs incurred by the refiners to blend around the Unocal patents would be passed on to consumers. (Teece, Tr. 7709).
4752. As explained by Dr. Shapiro, it is highly likely that the potential liability facing litigating refiners has already elevated retail gasoline prices in California. (CX 1720A at 034 (Shapiro Expert Report)).
4753. Suppliers and producers recognize that the Unocal patents are affecting California motorists. (CCPF ¶¶ 4754-4762).
4754. Importers have chosen not to import gasoline as a result of the Unocal patents. (CCPF ¶¶ 2930-2932, 3662-3683).
4755. Refiners have expressed concerns that increased costs associated with liability of Unocal royalties provides a "disincentive" to increase reformulated gasoline production for sale in California. (RX 280 at 008).
4756. As BP/ARCO explained in an internal email: "On the Unocal patent, it has reduced production of RFG and CARB gasoline because of the uncertainty and your issue of gouging. Another way of looking at it is because of the unreasonably high royalty, it has restricted supply." (RX 1054 at 001).
4757. Timothy Ling, Unocal's Chief Operating Officer at the time, publicly stated in 2001: "I think there are companies last summer that missed out on significant margin opportunities for fear of producing under the patent." (CX 534 at 002; Strathman, Tr. 3617).

4758. California regulators have taken note of the impact that the Unocal patents could have on supply. CARB believes that the Unocal patents are affecting gasoline supply. (Boyd, Tr. 6752-6753).
4759. CARB's sister agency, the California Energy Commission, also evinced continued concern about the potential impact of the Unocal patents in different settings, including in hearings on a proposed California Strategic Fuel Reserve, effects of the phase-out of MTBE, and others. The Unocal patents are "of concern to the California Energy Commission." (Boyd, Tr. 6753-6755).
4760. For example, one CEC report stated: "The Unocal patents are a significant additional burden on California's ability to meet growing demands for transportation fuels while improving air quality." (CX 1717 at 130; Boyd, Tr. 6747).
4761. At a public workshop on April 24, 2003, the CEC was informed by Stillwater Associates that "Unocal's gasoline patents reduce gasoline supply." (Boyd, Tr. 6746).
4762. At a CEC meeting, the CEC was informed that "the Unocal patents scare blenders to death." (CX 2150 at 268-269; Boyd, Tr. 6749). Another report identified the Unocal patents as a "significant barrier for imports." (CX 1224 at 015; Boyd, Tr. 6750-6751).

XXIX. The Proposed Remedy Is Needed to Relieve the Competitive Harm Caused by Unocal's Conduct.

4763. Complaint Counsel's proposed remedy restores competition in the technology market by requiring Unocal to make its technology available at the competitive price, which is zero. (Shapiro, Tr. 7101; CX 1720A at 035 (Shapiro Expert Report)). By doing so, the proposed remedy returns the CARB summertime RFG technology market to its competitive baseline. (CX 1799A at 029 (Shapiro Expert Rebuttal Report)).
4764. The proposed remedy merely requires Unocal to make good on the representations it made to CARB during the process by which CARB Phase 2 rules were formulated and prior to the time at which refiners made substantial investments to comply with those regulations. (CX 1799A at 029 (Shapiro Expert Rebuttal Report); Shapiro, Tr. 7100). Competition is restored since the remedy returns the RFG technology market to the competitive benchmark that is based on observed real-world *ex ante* competition. (CX 1799A at 029-030 (Shapiro Expert Rebuttal Report)).

A. The Proposed Remedy Will Deter Deceptive Conduct.

4765. The proposed remedy is well-designed not only to restore competition but also to deter companies from engaging in misleading and deceptive conduct. (CX 1799A at 030 (Shapiro Expert Rebuttal Report)).

4766. Allowing Unocal to charge a positive amount after it represented that it would not do so “gives an incentive to engage in this type of deceptive conduct, disrupts the competitive process and harms consumers.” (Shapiro, Tr. 7415).
4767. Requiring Unocal to make good on its representations is a means of insuring that Unocal cannot benefit from its misleading and deceptive conduct. The proposed remedy returns the RFG technology market to the competitive baseline. (CX 1799A at 029- 030 (Shapiro Expert Rebuttal Report)).

B. The Proposed Remedy Will Not Have Adverse Effects on Innovation.

4768. Complaint Counsel’s proposed remedy “will not have any deterring effects on other companies who might engage in innovation or obtain patents. The remedy is triggered by the deception, not the presence of a patent.” (Shapiro, Tr. 7101).
4769. Complaint Counsel’s proposed remedy “is not a way of undermining legitimate patents. This is a way of fixing a problem associated with deception.” (Shapiro, Tr. 7102).
4770. Complaint Counsel’s proposed remedy will not “undermine innovation incentives, but it will deter misleading, deceptive conduct in the future.” (Shapiro, Tr. 7102).
4771. Any concerns about disclosures of patents in standard-setting organizations are not relevant here, since this case is not about a disclosure requirement, but rather is about affirmatively deceptive and misleading conduct. The proposed remedy returns the RFG technology market to the competitive baseline. (CX 1799A at 029-030 (Shapiro Expert Rebuttal Report)).

C. The Proposed Remedy Will Not Cause Any Harm If The Patents Are Later Found to be Invalid or Not Infringed.

4772. The proposed remedy is “very well tailored to deal with uncertainties about the future infringement rates of the Unocal RFG patents,” including patent validity and infringement rates. (CX 1799A at 029 (Shapiro Expert Rebuttal Report)).
4773. If the patents all turn out to be invalid, then the remedy will be redundant. Unocal’s market power would evaporate and the remedy would not further affect the relevant markets. (Shapiro, Tr. 7101).
4774. The remedy will work effectively, and not over-correct for the harm to competition caused by Unocal’s deception. Regardless of how infringement rates may shift in the future, the proposed remedy will not go “too far” and do more than restore competition in the RFG technology markets. The proposed remedy returns the RFG technology market to the competitive baseline. (CX 1799A at 029-030 (Shapiro Expert Rebuttal Report)).

4775. “On the other hand, if Unocal’s patents are upheld and difficult to get around... then this remedy will have teeth and it will appropriately ... limit [Unocal’s] monopoly power.” (Shapiro, Tr. 7101).

D. The Harm to Consumers Is Ongoing.

4776. In the absence of the proposed remedy, consumers will continue to be harmed in numerous ways. Consumers in the technology market (the refiners) will continue to face royalty charges and damage claims from Unocal. Unocal is seeking a 5.75 cent per gallon royalty from four of the largest refiners in California, which results in claims for damages between \$250 and \$280 million for alleged infringement between July 1996 and 2000. (Answer ¶ 70; Strathman, Tr. 3657-3659). Unocal has sued Valero for infringement of the ‘393 and ‘126 patents. This suit seeks damages of 5.75 cents per gallon for all infringing gallons and treble damages for willful infringement. (CX 1720A at 032 (Shapiro Expert Report)). The refiners (including Valero) sued for patent infringement account for approximately three-quarters of California’s gasoline supply. (CX 1720A at 032 (Shapiro Expert Report)).

4777. Unocal is likely to impose future royalty costs on refiners, which could be approximately \$160 million per year. (Shapiro, Tr. 7098; CX 1720 at 031, *in camera* (Shapiro Expert Report)). The royalties potentially owed Unocal for past infringement by California refiners could be as high as \$1.9 billion. (CX 1720 at 025, *in camera*; CX 1720A at 026 (Shapiro Expert Report)).

4778. Refiners may incur additional costs caused by refiners efforts to blend around the patents, which could exceed { } and in many cases { } (Simonson, Tr. 6040, 6046, 6077, *in camera*; Lieder, Tr. 4796-4799, *in camera*; CX 7078C (Youngman, Dep. at 76-77, *in camera*)).

4779. Two economists who testified in this case agree that a large portion of the royalty or other charges imposed on refiners will be passed on to California motorists in the form of increased gasoline prices. (Shapiro, Tr. 7099; CX 1720A at 034 (Shapiro Expert Report); CX 1346 at 050-051; Teece, Tr. 7522; CCPF ¶¶ 4731-4762).

E. There Is A Strong Likelihood of Recurrence.

4780. A violation of the antitrust laws occurs each time Unocal receives licensing revenue or enforces its patent against refiners making, using or selling CARB summertime gasoline. Given Unocal’s existing license agreements and ongoing enforcement litigation, the conduct is recurring and will continue to recur in the absence of an injunction.

**UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION**

DOCKET NO. 9305

**IN THE MATTER OF
UNION OIL COMPANY OF CALIFORNIA**

**COMPLAINT COUNSEL'S
PROPOSED CONCLUSIONS OF LAW**

1. The Commission has jurisdiction over the subject matter of this proceeding and over Respondent Union Oil Company of California.
2. Union Oil Company of California is a public corporation organized, existing, and doing business under, and by virtue of, the laws of California. Its office and principal place of business is located at 2141 Rosecrans Avenue, Suite 4000, El Segundo, California 90245. Since 1985, Union Oil Company of California has done business under the name “Unocal.”
3. Unocal is, and at all relevant times has been, a corporation as “corporation” is defined by Section 4 of the Federal Trade Commission (“FTC”) Act, 15 U.S.C. § 44; and Unocal is, and at all relevant times has been, engaged in commerce as “commerce” is defined in the same provision.
4. Unocal has violated Section 5 of the FTC Act, as amended, 15 U.S.C. § 45, by engaging in conduct constituting unfair methods of competition (*see* ¶¶ 5-13, below).
5. There are two relevant lines of commerce in which to evaluate Unocal’s conduct: one involving technologies used in the production and supply of CARB-compliant “summer-time” gasoline to be sold in California, and one involving the downstream goods market for CARB-compliant “summer-time” gasoline to be sold in California. The relevant product markets are:
 - a. CARB Technology Market. The market for technology required for the production and supply of CARB-compliant summertime gasoline.
 - b. CARB Gasoline Market. The market for gasoline produced in compliance with the CARB summertime regulations and made available for sale in California.

6. The geographic market for the CARB Technology Market identified in ¶ 5(a) above is worldwide in scope.
7. The geographic market for the CARB Gasoline Market identified in ¶ 5(b) above is the state of California.
8. Unocal has willfully engaged in anticompetitive and exclusionary acts and practices, undertaken since the early 1990's and continuing today, whereby it has wrongfully obtained monopoly power in the CARB Technology Market, which acts and practices constitute unfair methods of competition in violation of Section 5 of the FTC Act.
9. Unocal has willingly engaged in anticompetitive and exclusionary acts and practices, undertaken since the early 1990's and continuing today, with a specific intent to monopolize the CARB Technology Market, resulting in a dangerous probability of monopolization in the aforementioned market, which acts and practices constitute unfair methods of competition in violation of Section 5 of the FTC Act.
10. Unocal has willfully engaged in anticompetitive and exclusionary acts and practices, undertaken since the early 1990's and continuing today, with specific intent to monopolize the CARB Gasoline Market, resulting in a dangerous probability of monopolization in the aforementioned market, which acts and practices constitute unfair methods of competition in violation of Section 5 of the FTC Act.
11. Unocal has willfully engaged in anticompetitive and exclusionary acts and practices, undertaken since the early 1990's and continuing today, whereby it has unreasonably restrained trade in the CARB Technology Market, which acts and practices constitute unfair methods of competition that harm consumers in violation of Section 5 of the FTC Act.
12. Unocal has willfully engaged in anticompetitive and exclusionary acts and practices, undertaken since the early 1990's and continuing today, whereby it has unreasonably restrained trade in the CARB Gasoline Market, which acts and practices constitute unfair methods of competition that harm consumers in violation of Section 5 of the FTC Act.
13. The foregoing conduct by Unocal has materially caused or threatened to cause substantial harm to competition and will, in the future, materially cause or threaten to cause further substantial injury to competition and consumers, absent the issuance of appropriate relief in the manner set forth in the attached Order.
14. The threatened or actual anticompetitive effects of Unocal's conduct include, but are not limited to, the following:

- a. increased royalties (or other payments) associated with the use of technology to refine, produce, and supply low emissions, reformulated gasoline for the California market;
 - b. increases in the price of low emissions reformulated gasoline in California;
 - c. reductions in the manufacture, output, and supply of low emissions reformulated gasoline for the California market; and
 - d. decreased incentives, on the part of refiners, blenders, and importers, to produce and supply low emissions, reformulated gasoline to the California market.
14. The Order entered herein is necessary and appropriate to remedy the violations of law found to exist.

**UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION**

DOCKET NO. 9305

**IN THE MATTER OF
UNION OIL COMPANY OF CALIFORNIA**

**COMPLAINT COUNSEL'S
PROPOSED ORDER**

Upon Consideration of all of the evidence on the record in this matter:

I.

IT IS ORDERED that, as used in this Order, the following definitions shall apply:

- A. "Respondent" means Union Oil Company of California, its directors, officers, employees, agents, representatives, successors, and assigns; its joint ventures, subsidiaries, divisions, groups and affiliates controlled by Union Oil Company of California, and the respective directors, officers, employees, agents, representatives, successors, and assigns of each.
- B. "Action" means any lawsuit or other action, whether legal, equitable, or administrative, as well as any arbitration, mediation, or any other form of private dispute resolution, in the United States or anywhere else in the world.
- C. "License Agreement" means any contract, agreement, arrangement or other understanding between Respondent and any other party or parties that requires, calls for, or otherwise contemplates, payment of fees, royalties or other monies, in cash or in kind, associated with the manufacture, sale, distribution, or use of Warmer Weather CARB Gasoline.
- D. "Person" means both natural persons and artificial persons, including, but not limited to, corporations, unincorporated entities, and governments.
- E. "Relevant U.S. Patents" means all current or future United States patents that claim priority back to U.S. Patent Application Number No. 07/628,488 filed December 13, 1990, or to any other U.S. patent application filed by or on behalf of Respondent before January 31, 1995.

F. “Warmer Weather CARB Gasoline” means gasoline that is to be sold in California, or to be imported into or exported from California, and that:

1. is CaRFG Phase 2, within the meaning of Cal. Code Regs. tit. 13, § 2260(6.6),
2. is CaRFG Phase 3, within the meaning of Cal. Code Regs. tit. 13, § 2260(6.7),
3. complies with the CARBOB limits, within the meaning of Cal. Code Regs. tit. 13, § 2260(6.8),
4. complies with Reid Vapor Pressure standards applicable during the warmer weather months identified by Cal. Code Regs. tit. 13, § 2262.2, 2262.4, or
5. complies with a subsequent regulation of the California Air Resources Board that addresses the same subject matter as Cal. Code Regs. tit. 13, § 2260(6.6), (6.7), or (6.8), or § 2262.2, 2262.4, including, but not limited to, a subsequently amended version of Cal. Code Reg. tit. 13, § 2260(6.6), (6.7), or (6.8), or § 2262.2, 2262.4.

II.

IT IS FURTHER ORDERED that Respondent cease and desist any and all efforts it has undertaken, and not undertake any new efforts, by any means, either directly or indirectly, in or affecting commerce as “commerce” is defined in Section 4 of the Federal Trade Commission Act, 15 U.S.C. § 44, including, without limitation, the threat or prosecution of, or assertion of any affirmative defense in, any Action, pursuant to which Respondent asserts, or has asserted, that any person, by manufacturing, selling, distributing, or otherwise using any Warmer Weather CARB Gasoline, infringes any Relevant U.S. Patents. Respondent shall dismiss or cause to be dismissed, with prejudice, all such prosecutions and all such affirmative defenses within thirty (30) days from the date this Order becomes final.

III.

IT IS FURTHER ORDERED that Respondent cease any and all efforts by any means, either directly or indirectly, in or affecting commerce as “commerce” is defined in Section 4 of the Federal Trade Commission Act, 15 U.S.C. § 44, to collect any fees, royalties or other payments, in cash or in kind, for the practice of any of the Relevant U.S. Patents in the manufacture, sale, distribution or other use of any Warmer Weather CARB Gasoline, including fees, royalties, or other payments, in cash or in kind, to be collected pursuant to any License Agreement.

IV.

IT IS FURTHER ORDERED that:

- A. Within thirty (30) days after the date this Order becomes final, Respondent shall distribute a copy of this Order and the complaint in this matter to:
1. any person that Respondent has contacted regarding possible infringement of any of the Relevant U.S. Patents,
 2. any person against whom the Respondent is, or was, in any Action regarding possible infringement of any of the Relevant U.S. Patents,
 3. any licensee or other person from which Respondent has collected any fees, royalties or other payments, in cash or in kind, for the practice of the Relevant U.S. Patents in the manufacture, sale, distribution or other use of any Warmer Weather CARB Gasoline, and
 4. any person that Respondent has contacted with regard to the possible collection of any fees, royalties or other payments, in cash or in kind, for the practice of the Relevant U.S. Patents in the manufacture, sale, distribution or other use of any Warmer Weather CARB Gasoline.
- B. Within ten (10) days after the date this Order becomes final, Respondent shall distribute a copy of this Order and the complaint in this matter to every officer and director of Respondent, and to every employee or agent having managerial responsibility for any of Respondent's obligations under this Order.
- C. For a period of five (5) years after the date this Order becomes final, Respondent shall furnish a copy of this Order and the complaint in this matter to each new officer and director of Respondent and to each new employee or agent of Respondent who will have managerial responsibility for any of Respondent's obligations under the Order. Such copies must be furnished within thirty (30) days after each such person assumes his or her position as officer, director, employee, or agent. For purposes of this paragraph IV.C., "new employee or agent" shall include, without limitation, Respondent's employees and agents whose duties change during their employment or agency relationship to include managerial responsibility for any of Respondent's obligations under this Order.

V.

IT IS FURTHER ORDERED that:

- A. Respondent shall, within sixty (60) days after the date this Order becomes final, submit to the Commission a verified written report setting forth in detail the manner and form in which it intends to comply, is complying, and has complied with this Order.
- B. Respondent shall, one year from the date this Order becomes final and annually thereafter for five (5) years, submit a verified written report to the Commission setting forth in detail the manner and form in which Respondent has complied and is complying with the Order.

VI.

IT IS FURTHER ORDERED that, for the purpose of determining or securing compliance with this Order, and subject to any legally recognized privilege, and upon written request with reasonable notice to Respondent, Respondent shall permit any duly authorized representative of the Commission:

- A. Access, during office hours of Respondent and in the presence of counsel, to all facilities and access to inspect and copy all books, ledgers, accounts, correspondence, memoranda, and all other records and documents in the possession or under the control of Respondent related to compliance with this Order; and
- B. Upon five (5) days' notice to Respondent and without restraint or interference from Respondent, to interview officers, directors, or employees of Respondent, who may have counsel present, regarding such matters.

VII.

IT IS FURTHER ORDERED that Respondent shall notify the Commission at least thirty (30) days prior to any proposed (1) dissolution of Respondent, (2) acquisition, merger, or consolidation of Respondent, or (3) any other change in Respondent that may affect compliance obligations arising out of this Order, including but not limited to assignment, the creation or dissolution of subsidiaries, or any other change in Respondent.

VIII.

IT IS FURTHER ORDERED that this Order will terminate twenty (20) years after the date it becomes final.

By the Commission.

ORDERED:

D. Michael Chappell
Administrative Law Judge

Date: _____, 2005