COMPLAINT COUNSEL'S
PROPOSED FINDINGS OF FACT,
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VOLUME IV

COMPLAINT COUNSEL'S PROPOSED FINDINGS OF FACT:

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 IV)

XXV. Unocal Has the Ability to Raise or Maintain Prices Above Competitive Levels and Exclude Competitors in the Technology Market.

2850. From an economic perspective, "a company has monopoly power if it's able to profitably charge prices that are significantly above competitive levels for a sustained period of time." (Shapiro, Tr. 7074). Dr. Teece agrees that an excellent definition of monopoly power is the ability to price without regard to competition or the power to set prices and exclude competitors. (Teece, Tr. 7687).

2851. {

}. (Shapiro, Tr. 7205-7206, *in camera*).

A. The Economic Theory of Opportunism Demonstrates That Unocal Has Obtained Monopoly Power.

2852. The theory of economic opportunism demonstrates that Unocal's deception provided it with incremental market power. This incremental power can be measured by specific investments and other costs imposed on CARB and the California refiners that make CARB-compliant gasoline. (CCPF ¶ ¶ 2853-2872).

2853. In this case, Unocal's market power can be measured by comparing the royalty on Unocal's patent claims *ex ante* (*i.e.*, before the deceptive conduct) and *ex post* (*i.e.*, after the effects of the deceptive conduct have been felt). The royalty on Unocal's patent claims resulting from *ex ante* competition is properly viewed as the competitive royalty rate. (CX 1720A at 013). A higher *ex post* royalty rate, reflecting whatever costs must be incurred by CARB and the California refiners to switch to a new technology, properly is seen as reflecting *ex post* market power. (CX 1720A at 013 (Shapiro Expert Report)).

2854. In some ways, the development of the CARB Phase 2 specifications is similar to the development of standards in the private standard-setting process. Once a standard has been set, some investments have been made, and products made according to the standard begin to appear on the market, then it is common practice for an entity that would have some control over critical inputs necessary for the new standardized products to engage in opportunism. (Shapiro, Tr. 7069-7070).

2855. 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 used to comply with the CARB rules. Once the rules are in place, however, the technology choices become more restricted. (Shapiro, Tr. 7070, as illustrated by CX 7097).

2856. In the later, or *ex post* phase, the choices available to CARB were more limited. One factor in the reduction in choices for CARB was the "adjustment costs." The adjustment costs are the burdens that resulted from the passage of time making it harder to turn to other means of obtaining emissions reductions. (Shapiro, Tr. 7071, as illustrated by CX 7097). In other words, "CARB's options to seek emissions reductions in other areas and CARB's flexibility generally was reduced with the passage of time." (Shapiro, Tr. 7065, as illustrated by CX 7097).

2857. *Ex post* monopoly power could also derive from unexpected benefits associated with the original specification selected: an opportunistic input supplier could capture all or part of those benefits, which would otherwise flow to the decision maker. (CX 1720A at 013 (Shapiro Expert Report)). Unocal's environmental expert, William Pedersen, testified that there were large unexpected net benefits to the CARB Phase 2 regulations. This would result in additional market power for Unocal. (Shapiro, Tr. 7385-7386).

2858. Another factor in the reduction of choices for CARB was the "specific investments"

made by refiners to implement the CARB Phase 2 rules. (Shapiro, Tr. 7064, as illustrated by CX 7097). The specific investment factor is "very much present here because of the billions of dollars that refineries as a group spent during that period of time between 1991 and 1995 specifically to comply with the CARB Phase 2 rules." (Shapiro, Tr. 7071-7072, as illustrated by CX 7097).

2859. Dr. Shapiro quantified the incremental market power that Unocal obtained through opportunistic behavior. The calculations "implement the economic theory of opportunism" and "quantify, estimate Unocal's market power given the actual costs." (Shapiro, Tr. 7088).

2860. Economic analysis demonstrates that a lower bound on Unocal's *ex post* monopoly power can be obtained by measuring the sum of the capital costs per gallon already invested by the refineries to comply with CARB's RFG rules, *k*, and the operating cost savings per gallon associated with CARB gasoline, *b*. (CX 1720A at 27 (Shapiro Expert Report)).

2861. The first factor that Dr. Shapiro considered was specific investments ("k") made by refiners to comply with the CARB Phase 2 regulations that they would not have had to incur had an alternative set of regulations been implemented. (CCPF ¶ ¶ 3803-3947). These specific investments represent an increment to Unocal's market power. (Shapiro, Tr. 7082-7083).

2862. Unocal's expected market power increase in the *ex post* period by an amount that is determined by the level of the expected specific investments as viewed from the *ex ante* period in 1991. This represents the motive for the misrepresentation. (Shapiro, Tr. 7083-7084, as illustrated by CX 7098).

2863. There are several estimates of the specific investments made by California refiners to comply with CARB Phase 2 regulations. Complaint Counsel's technical expert, Michael E. Sarna, analyzed business documents from eight refiners in California, and conservatively estimated that these eight refiners alone made $1.528 billion in specific investments to meet the CARB Phase 2 regulations. (RX 1154A at 027; CX 1720A at 039).

2864. Unocal's economic expert, Dr. Teece, estimated that the same eight refiners spent $2.714 billion on CARB Phase 2 modifications. (CX 1346 at 061).

2865. Unocal's technical expert, Mr. Richard Stellman, estimated that all California refiners spent $2.6 billion on CARB Phase 2 investments. (RX 1165A at 008).

2866. Using the most conservative estimate from Mr. Sarna, Dr. Shapiro concluded that the cost of the specific investments ("k") should be 1.83 cents per gallon. (Shapiro, Tr. 7090-7093, as illustrated by CX 7099).

2867. This may underestimate the increment because Dr. Shapiro used actual expenditures (which were available) rather than expected expenditures, which were easily ascertainable but which would likely have resulted in a greater increment because actual investments were less than anticipated. (Shapiro, Tr. 7094-7095; CX 1799A at 008-009 (Shapiro Expert Rebuttal Report)).

2868. *Ex post* monopoly power also includes unexpected *benefits* associated with the CARB specification, because an opportunistic technology (input) supplier could capture all or part of those benefits, which would otherwise flow to CARB (the decision maker). CX 1720A at 013 (Shapiro Expert Report). In other words, as Dr. Shapiro explained, "If it turns out that CARB is really doing great stuff in terms of cleaning up the air that was unexpected or if the clean air is valued more highly than it had been expected, then Unocal -- that Unocal would be in an even stronger position because the alternative, the EPA, does not involve as much cleanup." (Shapiro, Tr. 7085).

2869. Dr. Shapiro was also able to quantify the unexpected net operating cost savings from CARB Phase 2 ("b"). If it turns out that making CARB gasoline is cheaper than was expected in the *ex ante* period in 1991, that would put Unocal in a stronger position. (Shapiro, Tr. 7085, as illustrated by CX 7098). Dr. Shapiro concluded that the unexpected net operating cost savings from CARB Phase 2 were three cents per gallon. (Shapiro, Tr. 7090; CX 1720A at 030 (Shapiro Expert Report); CX 10 at 083).

2870. Taken together, the specific investments ("k") and the unexpected net operating cost savings from CARB Phase 2 ("b") add an actual realized increment of market power for Unocal of approximately five cents per gallon of gasoline made using Unocal's patented technology. (Shapiro, Tr. 7090-7091).

2871. This is probably an understatement, because there were other factors which would add incrementally to Unocal's market power but were not quantified. One such factor is the unexpected net benefits of CARB Phase 2, meaning any unexpected gain in clean air. (Shapiro, Tr. 7085, as illustrated by CX 7098). This benefit was not quantified, but appears to be a positive number because CARB produced more clean air benefits than expected. (Shapiro, Tr. 7090). A positive number for this factor means that it enhanced Unocal's market power. (Shapiro, Tr. 7084-7085).

2872. Another component is the unexpected net capital costs of the alternative regulations. For example, if the alternative regulations that CARB considered at the time was the EPA reformulated gasoline regulations, and if the EPA reformulated gasoline regulations turn out to be more expensive to implement than had been expected, that would further add to Unocal's additional power. (Shapiro, Tr. 7085, as illustrated by CX 7098). Accepting this assumption, this item has not been quantified, but appears to be a small number, perhaps one tenth of a cent per gallon. (Shapiro, Tr. 7090).

B. Direct Evidence Demonstrates That Unocal Has the Power to Raise Prices in the Technology Market.

2873. Unocal's monopoly is demonstrated through direct evidence. In particular, there is direct evidence that Unocal is charging a price for its technology that is above the competitive level. Furthermore, {

}. (CCPF ¶ ¶ 2737-2738).

1. Unocal Has Extracted Money for Its RFG Technology, Even Though the Competitive Price for Unocal's Technology Is Zero.

2874. The direct evidence of monopoly power can be measured by comparing the actual royalty rates to a competitive benchmark. The proper competitive benchmark is the royalty-free representation that Unocal made to CARB. Since Unocal is seeking royalties significantly above that level, and has received or is likely to receive these royalties, Unocal has monopoly power. Supra-competitive royalty prices are direct evidence of Unocal's monopoly power. (Shapiro, Tr. 7207, *in camera*; CX 1720 at 025 (Shapiro Expert Report), *in camera*).

a. The Competitive Price was Zero.

2875. In order to influence CARB and get its technology adopted, Unocal provided its technology on a non-proprietary basis. (CCPF ¶ ¶ 1285-1349;CX 1720A at 015 (Shapiro Expert Report); CX 29 at 001; Boyd, Tr. 6714).

2876. The representations made by the participants in the CARB Phase 2 rulemaking, and specifically by those possessing intellectual property rights, provide useful information about competitive prices in a technology market. (CX 1720A at 014 (Shapiro Expert Report)).

2877. Unocal's misrepresentation that it did not possess or would not enforce intellectual property rights related to the 5/14 Project "from an economic point of view" is "equivalent to Unocal representing that they will not be charging for that technology or that it will be available on a royalty free basis ... those terms that were represented are the competitive price." (Shapiro, Tr. 7072-7073).

2878. Therefore, direct observation of the actual technology market in operation demonstrates that the competitive price for Unocal's technology was a royalty of zero. (CX 1720A at 015 (Shapiro Expert Report); Shapiro, Tr. 7072-7073 (Unocal's statement is "really a direct observation of a competitive price, the price that was represented when the market was more competitive, and that is a – zero royalties")).

b. Unocal's Representation of a Zero Cost Royalty Makes Sense in

the Context of Technology Competition.

2879. Unocal's royalty-free representation makes economic sense because "there are many circumstances where, for various reasons, companies do provide their technology on a royalty-free basis." (Shapiro, Tr. 7073).

2880. Many companies participated in the process by which CARB designed the CARB Phase 2 regulations and provided information and input into these proposed regulations to further their own commercial or other interests. The efforts of various companies to provide and promote different technologies, in part by supplying data and other information to influence CARB's choice, reflect technology competition in action. (CX 1720A at 014 (Shapiro Expert Report)).

2881. It is not uncommon for firms to make their patented technology available on a royalty-free basis. (CX 1720A at 016-017 (Shapiro Expert Report)). In the technology competition related to the CARB Phase 2 regulations, Unocal was not the only company to make its technology available on attractive terms. (CX 1720A at 016 (Shapiro Expert Report)).

2882. 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 with anyone else who asked to receive such information. (Clossey, Tr. 5343-5344). 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).

2883. ARCO dedicated its research results to the public, in part, because it feared methanol would replace gasoline. ARCO ultimately sought a statutory invention registration for its research, which prohibits it from collecting royalties. (CX 1720A at 016 (Shapiro Expert Report)).

2884. "ARCO made a public declaration that it would not seek to protect any information developed regarding s, shared its information with its competitors and invited them to share on the same basis." Sharing took place 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)).

2885. 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).

2886. ARCO never had any plan or intention to monetize its patent applications. From an economic perspective, this is more important "than the presence or absence of patent applications, particularly if they're being done on what appears to be a defensive basis to make sure that" their "findings remain in the public domain." (Shapiro, Tr. 7186).

2887. Auto/Oil also agreed to make all of that organization's research results royalty-free and in the public domain. (CX 1720A at 016 (Shapiro Expert Report); CCPF ¶ ¶ 1439-1443, 1576-1578, 1590-1608). Unocal, of course, was a signatory to the agreement to make such research results available royalty-free. (CX 4001 at 026; Beach, Tr. 1694).

2888. In other contexts, other companies have provided technology on a royalty-free basis. For example, Texas Instruments ("TI") announced TI will provide royalty-free licenses to TI patents related to the TI proposal for a 22 megabit wireless LAN standard before IEEE. (CX 1720A at 016 (Shapiro Expert Report)). Intel announced that Intel will release its USB 2.0 enhanced host controller interface specification on a royalty-free basis. (CX 1720A at 016 (Shapiro Expert Report)).

2889. Likewise, Lucent announced that Lucent will provide digital radio broadcasters royalty-free licenses for its digital audio broadcast system. (CX 1720A at 016 (Shapiro Expert Report)). Kentron announced Kentron will provide royalty-free licenses to certain of Kentron's random access memory technologies. Kentron is working with the standard-setting organization JEDEC to develop a standard that utilizes the technologies. (CX 1720A at 016 (Shapiro Expert Report)).

c. Economic Theory Demonstrates the Rationality of Making Royalty-Free Representations.

2890. An economic model can demonstrate the economic rationality of giving away patent rights. Assume Company "U" is participating in the technology competition through which CARB is choosing its regulations. Assume that U is concerned that CARB will pick regulation *A*, but U would prefer regulation *B* because *B* would lead to lower costs in U's refinery operations. (CX 1720A at 059 (Shapiro Expert Report)).

2891. Assume also that U hopes to receive royalty income on its pending patent application. U anticipates little or no coverage of regulation *A* with its patent, but it could get very substantial coverage of regulation *B* with its patent, at least if many of its claims are accepted by the U.S. Patent and Trademark Office. Assume U believes that the probability is p that CARB will adopt regulation *B* if U sets a royalty rate of y. (CX 1720A at 059 (Shapiro Expert Report)).

2892. Assuming that U cannot engage in deception, U can either provide its technology on a non-proprietary basis or charge some positive royalty per gallon. (CX 1720A at 059 (Shapiro Expert Report)). If U believes that disclosure of its pending patent and of its intention to charge a royalty *y* would significantly reduce the probability that its preferred form of regulation would be adopted by CARB (from unity to *p* in this example), U's optimal non-deceptive strategy is to provide its technology on a non-proprietary basis. The critical level of *p* depends upon the ratio of cost savings to expected royalty income. (CX 1720A at 059, 061 (Shapiro Expert Report)).

2893. Of course, if U can engage in deceptive behavior without penalty, the payoff from a strategy of deception is greater than the payoff from either non-deceptive strategy. (CX 1720A at 061 (Shapiro Expert Report)).

d. Unocal Has Monopoly Power Because It Is Seeking, and Has Collected, Royalties Above Zero.

2894. Unocal possesses monopoly power in the relevant technology market in this case because it seeks royalties for use of its five RFG patents that are significantly above competitive levels. (Shapiro, Tr. 7205-7206, *in camera*).

2895. Unocal received 5.75 cents per gallon in royalties from litigating refiners in private litigation for gasoline produced for five months in 1996 that infringed upon Unocal's RFG patents. A jury in the United States District Court for the Central District of California determined that Unocal's '393 patent was valid and infringed, and found that ARCO, Exxon, Mobil, Chevron, Texaco, and Shell must pay a royalty rate of 5.75 cents per gallon for the period from March through July 1996 for sales of infringing gasoline in California. (Answer ¶ 68; Shapiro, Tr. 7207-7208, *in camera*; CX 1720A at 026 (Shapiro Expert Report)).

2896. Based upon the jury verdict in the ARCO v. Unocal trial, Unocal extracted an average of 1.7 cents per gallon in royalty payments for every gallon of reformulated gasoline (both infringing and non-infringing) manufactured by the six ligating refiners for the five months from March through July 1996. (CX 431 at 002).

2897. In its accounting action from the '393 litigation, Unocal will reap from the major refiners 5.75 cents per infringing gallon. (Teece, Tr. 7630).

2898. The judgment in the '393 litigation amounted to $91 million for only five months of infringement plus attorneys' fees and costs (Answer, ¶ 68). Unocal has already collected that award and is prosecuting an accounting action to obtain damages for the period from August 1, 1996 to December 31, 2000. (Answer, ¶ 70).

2899. At the established rate of 5.75 cents per gallon for supply and production of CARB gasoline, Unocal is seeking a total to between $250 and $280 million in damages for the

period between August 1, 1996 and December 31, 2000. (Strathman, Tr. 3657-3659).

2900. {

}. (CX 436 at 002, *in camera*; Strathman, Tr. 3740, *in camera*).

2901. {

}. (CX 2000 at 002-009, *in camera*; CX 2018 at 013, *in camera*; CX 2019 at 005, *in camera*; Strathman, Tr. 3708, 3711, *in camera*).

2902. {

}. (Strathman, Tr. 3728, *in camera*).

2903. {

}. (Shapiro, Tr. 7208, *in camera*; Strathman, Tr. 3634, 3637-3639; CX 435 at 001 (Unocal CEO Charles Williamson said, "We are still involved in litigation surrounding past infringement by those companies under the terms of jury award...Any license agreements with them would likely have to be negotiated in the context of those legal proceedings.")).

2904. {

}. (Strathman, Tr. 3760-3761, *in camera*).

2905. Unocal has not offered licenses for use of its reformulated gasoline patents to the litigating refiners involved in the ARCO v. Unocal case. The only overture regarding licensing Unocal's RFG patents made by Unocal to litigating refiners has been an offer to negotiate made through the press. (CX 7072 (Williamson, Dep. at 32-33); CX 2006 at 001 (Unocal CEO Mr. Williamson noted the license was only being offered to non-litigating companies "because those companies did not force us to spend millions of dollars in attorney's fees and devote countless hours of staff time to show the validity of our patent claims."); Eizember, Tr. 3321 (Unocal has never offered a license to Exxon or ExxonMobil); CX 7048 (Hancock, Dep. at 284) (Hancock, the former Fuel Quality and Regulatory Compliance Manager for Texaco has "no knowledge" of "Unocal offer[ing] the license to all refiners well below 5.75 per gallon")).

2906. The monies collected by Unocal in litigation and through licensing activities "exceed the amount Unocal would have earned in a competitive market and are monopoly overcharges." (CX 1720A at 026 (Shapiro Expert Report)).

2907. The Unocal royalties outside California are also lower than the royalty rate that Unocal

considered in 1995, after the refiners built out their refineries but while there was apparently some uncertainty about whether the CARB Phase 2 regulations would go forward. At this time, Unocal was prepared to offer .5 cents per gallon for the first four years of the CARB Phase 2 program, so as to ensure a smooth roll-out of Phase 2. (CX 2001 at 001 ("Unocal Offers License for Patent on Reformulated Gasolines"); CX 522 at 002; Lane, Tr. 3068, 3075; CX 670 at 001).

2908. {

} Dr. Teece examined 183 licenses that Unocal was involved in over a period of 40 years. (CX 1346 at 017). Many of these licenses involved royalty rates on the order of 1-15 cents per barrel, which correlates to costs of $0.00024 to $0.0035 cents per gallon (calculated based on 42 gallons per barrel). (CX 1346 at 017).

2909. This is within the range initially contemplated by the inventors years prior to the industry becoming locked in to the Unocal technology. (CCPF ¶ 646).

2910. After looking at the refiners' alternatives, Dr. Teece determined that a reasonable royalty for just the '393 patent was "in the range of 5-7.5 cents per infringing gallon," which he claims was "perhaps too conservative." (CX 1346 at 042).

2911. {

}. (Shapiro, Tr. 7208, *in camera*).

2912. Based upon the jury verdict in the ARCO v. Unocal trial, Unocal extracted an average of 1.7 cents per gallon in royalty payments for every gallon of RFG (both infringing and non-infringing) manufactured by the six ligating refiners for the five months from March through July 1996. (CX 431 at 002).

2913. According to Unocal's expert, Dr. Teece, California consumers ought to be happy to pay 4 to 5 cents per gallon in royalties to Unocal for refiners to use the patents. (CX 1332 at 038).

2914. As Dr. Shapiro explained, there is weak demand for technologies that produce near the limits set by CARB's Phase 2 regulations because, given refinery production variability and test variability, refiners may be reluctant to target production near the limits. (CX 1720A at 027 (Shapiro Expert Report)).

2915. 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 regulations and the patents.

(CX 1332 at 043). The regulations created demand for the patents. (Teece, Tr. 7700-7701).

2916. Unocal's patents overlap substantially with the CARB regulations. In order to avoid the patents, a refiner must blend one or more of its specifications above the CARB flat limit. (RX 1154A at 007 (Sarna Expert Report)).

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2917. {

}. (CX 2000 at 001, *in camera*).

2918. {

}. (CX 2000 at 002-009, *in camera*).

2919. {

}. (CX 2000 at 001, *in camera*; CX 2009 at 012, *in camera*; CX 2012 at 016-017, *in camera*; CX 2013 at 012-013, *in camera*; CX 2014 at 014, *in camera*; CX 2019 at 003-007, *in camera*; Strathman, Tr. 3704-3705, *in camera*).

2920. {

}. (CX 2009 at 012, *in camera*; CX 2012 at 016-017, *in camera*; CX 2013 at 012-013, *in camera*; CX 2014 at 014, *in camera*; CX 2019 at 003-007, *in camera*; Strathman, Tr. 3705, *in camera*; Dowling, Tr. 3779, *in camera*).

2921. {

}. (CX 2011 at 013, *in camera*; CX 2018 at 013, *in camera*; CX 2019 at 005,007, *in camera*; CX 2020 at 016, *in camera*; CX 2014 at 014, *in camera*; CX 2013 at 012, *in camera*; CX 2012 at 016, *in camera*; Strathman, Tr. 3708, 3711, *in camera*).

2922. {

}. (Strathman, Tr. 3722, *in camera*).

2923. {

}. (Strathman, Tr. 3722, *in camera*).

2924. {

}. (Dowling, Tr. 3779, *in camera*).

2925. {

}. (Strathman, Tr. 3728, *in camera*).

f. Royalties Charged By Unocal Outside California are Not the Appropriate Benchmark to Establish the Market Value of Unocal's Patented Technology.

2926. Unocal's economic expert, Dr. Teece, testified that the competitive price for licensing Unocal's patents is not zero, but rather is the price paid for licensing the patents outside California. (Teece, Tr. 7540-7541; RX 1162A at 106). This is not an appropriate benchmark for several reasons. (CX 1799A at 022 (Shapiro Expert Rebuttal Report)).

2927. First, the royalties outside California are not a good competitive benchmark because the technology market outside California is subject to very different economic factors than the technology market in California. (CX 1799A at 022 (Shapiro Expert Rebuttal Report)).

2928. Only a handful of refiners and blenders outside California have taken licenses, suggesting that most producers outside California do not find it economically attractive to license Unocal's technology at the current asking price. (CX 1799A at 022 (Shapiro Expert Rebuttal Report)).

2929. {

}. (CX 2016, *in camera*).

2930. {

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(CX 535 at 001, *in camera*).

2931. {

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(Hepper, Tr. 4072, *in camera*). {

}. (Hepper, Tr. 4072, *in camera*).

2932. {

}. (CX 535 at 001, *in camera*; Hepper, Tr. 4087-4089, *in camera*).

2933. {

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({ }, *in camera*).

2934. {

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(CX 1802, *in camera*).

2935. {

}. ({ }, *in camera*). {

}. ({ }, *in camera*). {

}. ({ }, *in camera*).

2936. {

}. (Hepper, Tr. 4072, *in camera*; { }, *in camera*).

2937. {

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({ }, *in camera*).

2938. {

}. (Strathman, Tr. 3726-3727, *in camera*).

2939. {

}. (Hepper, Tr. 4088-4089, *in camera*).

2940. {

}. (Hepper, Tr. 4073-4074, *in camera*).

2941. Tesoro was unwilling to risk the potential economic consequences of paying up to 17 cents per gallon of gasoline produced for willful infringement of the Unocal patents. For this reason, Tesoro believed it was necessary to obtain a license agreement with Unocal in order to participate in the California market with production from its Anacortes, Washington refinery. (Dowling, Tr. 3676-3677).

2942. {

}. (Shapiro, Tr. 7436, *in camera*).

2943. {

}. (CX 1799A at 013-014, 023 (Shapiro Expert Rebuttal Report); CX 1799 at 22 (Shapiro Expert Rebuttal Report), *in camera*; CX 1720A at 015-016, (Shapiro Expert Report); CX 29). Under these circumstances, Unocal showed itself willing to discount its royalties to zero in the California market to influence CARB rather than face the probability that CARB would not incorporate Unocal's research when crafting the CARB Phase 2 Reformulated gasoline regulations. (CX 1799A at 023 (Shapiro Expert Rebuttal Report); CX 1720A at 015-016, (Shapiro Expert Report)).

2944. {

}. (Shapiro, Tr. 7444-7445, *in camera*; CX 1799 at 022-023 (Shapiro Expert Rebuttal Report), *in camera*).

2945. Regardless, Unocal's royalties outside California are demonstrably tiny when measured properly. (CX 1799A at 024 (Shapiro Expert Rebuttal Report)).

2946. {

}. (CX 1799 at 022-023, *in camera* (Shapiro Expert Rebuttal Report)).

2947. {

}. (CX 1799 at 024, *in camera* (Shapiro Expert Rebuttal Report)).

2948. {

}. (CX 1799 at 024, *in camera* (Shapiro Expert Rebuttal Report)).

g. {

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2949. {

}. (Hepper, Tr. 4073, *in camera*).

2950. {

}. (Dowling, Tr. 3782-3783, *in camera*).

2951. {

}. (Dowling, Tr. 3783, *in camera*).

2952. {

}. ({ }, *in camera*).

2953. Unocal negotiates licenses for its reformulated gasoline patents using a "uniform licensing program." (CX 703 at 002; CX 2006 at 001; Strathman, Tr. 3703, *in camera*).

2954. Unocal's CEO announced in a press release, "We believe that the situation of every refiner, blender and importer may differ but that one uniform license will allow all licensees to use Unocal's patented gasoline formulations to their specific economic advantage." (CX 2006 at 001).

2955. {

}. (Strathman, Tr. 3728, *in camera*).

2956. {

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(Strathman, Tr. 3728, *in camera*).

2957. {

}. (CCPF ¶ ¶ 2958-2965).

2958. {

}. (CX 535, *in camera*).

2959. {

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(CX 2016, *in camera*).

2960. {

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(Hepper, Tr. 4072, *in camera*). {

}. (Hepper, Tr. 4072, *in camera*).

2961. **{**

}. (CX 535 at 001, *in camera*; Hepper, Tr. 4087-4089, *in camera*).

2962. **{**

}. (**{** **}**, *in camera*).

2963. **{**

}. (CX 1802, *in camera*).

2964. **{**

}. (**{** **}**, *in camera*).

2965. **{**

}. (Hepper, Tr. 4073, *in camera*).

2966. **{**

}. (Strathman, Tr. 3721, *in camera*; CX 2017 at 003, *in camera*; CX 2012 at 003-004, *in camera*; CX 2013 at 003-004, *in camera*; CX 2014 at 004-005, *in camera*; CX 2018 at 003-004, *in camera*; CX 2020 at 005, *in camera*).

2967. **{**

}. (Strathman, Tr. 3736-3737, *in camera*; CX 1800 at 002, *in camera*). **(**

}. (CX 1800 at 002, *in camera*). **{**

}. (**{** **}**, *in camera*).

C. Indirect Evidence of Market Power.

1. Refiners are Likely Infringing One or More of the Unocal Patents in Large Numbers.

2968. **{**

}. (Shapiro, Tr. 7206, *in camera*).

2969. **{**

}. (Shapiro, Tr. 7209, *in camera*). Dr. Teece agrees that "one useful guide to estimating Unocal's market share in the technology market is to determine the percentage of gasoline that falls within the claims of Unocal's patents." (RX 1162A at 050).

2970. **{**

}. (Shapiro, Tr. 7206, *in camera*).

2971. **{**

}. (Shapiro, Tr. 7206, *in camera*).

2972. In this case, measuring the portion of the gasoline that falls within the numerical property limitations of Unocal's RFG patents, as construed by the United States District Court for the Central District of California in the '393 trial, will demonstrate likely infringement of all five patents. This is because the facial validity of Unocal's patents causes producers to assess business risk; **{**

}; refiners use the numerical property limitations in normal business activities; and any additional, unconstrued claims are extremely unlikely to provide a means of patent avoidance for refiners. (CCPF ¶ ¶ 2740-2750, 3046-3079).

2. Unocal's Patents are Valid and Present a Business Risk to Refiners.

2973. United States Patent No. 5,288,393 (issued February 22, 1994) is valid. (JXA 3 at 003).

2974. United States Patent No. 5,593,567 (issued January 14, 1997) is valid. (JX 3A at 003).

2975. United States Patent No. 5,653,866 (issued August 5, 1997) is valid. (JX 3A at 003).

2976. United States Patent No. 5,837,126 (issued November 17, 1998) is valid. (JX 3A at 003).

2977. United States Patent No. 6,030,521 (issued February 29, 2000) is valid. (JX 3A at 003).

2978. Some California refiners have also initiated a reexamination at the Patent Office of Unocal's '393 and '126 patents at the Patent Office. (Strathman, Tr. 3661-3662).

2979. The patent examiner has issued a preliminary rejection of the ‘393 and '126 patent, and Unocal responded to that rejection. (Strathman, Tr. 3661-3664). There are no statutory deadlines for the PTO to complete the reexamination. 35 U.S.C. §§ 305, 132, and 133.

2980. Unocal may appeal from a final rejection of any claim to the Board of Patent Appeals and Interferences. 35 U.S.C. § 134(b) (2003). Unocal may then appeal a decision by the Board of Patent Appeals and Interferences to the U.S. Court of Appeals for the Federal Circuit. 35 U.S.C. § 141 (2003).

2981. Unocal believes its reformulated gasoline patent portfolio will “prevail” in the reexamination of the patents by the U.S. Patent and Trademark Office. (Strathman, Tr. 3671).

2982. If Unocal believed its patents would not withstand review by the U.S. Patent and Trademark Office, Unocal would have to retract public announcements about projected patent revenue stemming from the licensing of its reformulated gasoline patents. (Strathman, Tr. 3671).

2983. The fact that one or more of Unocal’s patents may ultimately prove to be invalid does not affect the reality of Unocal’s present market power. Unocal is currently seeking royalties based on significant current infringement of its RFG patents. Costs associated with these royalties have been and will continue to be imposed upon refiners who utilize low emissions RFG technology to produce CARB-compliant gasoline. (Shapiro, Tr. 7078).

2984. The mere possibility that one or more of the Unocal patents may be found to be invalid does not imply a lack of monopoly power in the present. (CX 1799A at 027 (Shapiro Expert Rebuttal Report); Shapiro, Tr. 7078).

2985. While the ’126 and ’393 patents were being reexamined by the U.S. Patent Trademark Office, Unocal declared “Licensing fees and judgements collected during the pendency of the reexaminations are not refundable.” (CX 614 at 026).

2986. The expected costs associated with potential Unocal royalty payments that refiners face

for the gallons of gasoline they make depends on the probability that those gallons will be found to be infringing and the probability that the patents will be upheld. The probability of infringement is very high; the probability of validity is hard to assess but will be learned over time. Until the validity of the patents is decided, Unocal has the ability to impose costs, and if the patents are upheld that power will become even greater. (Shapiro, Tr. 7398-7399).

2987. Any monopoly faces threats. It is not uncommon for uncertainty to exist as to whether a monopolist like Unocal will continue to have monopoly power in the future, because of

patent invalidity, the possibility of changes in regulations or the possibility of entry by a new product. However, uncertainties about the future do not eliminate monopoly power held in the present. (Shapiro, Tr. 7078-7079; CX 1799A at 027 (Shapiro Expert Rebuttal Report)).

2988. According to Dr. Teece, "As a business matter, it makes no sense for infringing refiners to run the risk of this potential liability solely on the hope that the patent might be held invalid, especially given the legal presumption that patents are valid." (Teece, Tr. 7696; CX 1346 at 021).

2989. Each refining company witness testified that they were taking efforts, including undertaking detailed studies, to assess ways to avoid infringement. (CCPF ¶ ¶ 3925-3941).

2990. Michael Hoffman serves as Group Vice President of BP's Global Refinery Operations. (Hoffman, Tr. 4869). Mr. Hoffman's job responsibilities at BP charge him "to manage risk." (Hoffman, Tr. 4991). The fact that the Unocal patents "might or might not be valid" is incorporated into decisions made and operation of the refinery system. (Hoffman, Tr. 4991). Mr. Hoffman has concluded that the Unocal patents other than the '393 patent pose "a high-level risk" to BP's ability "to compete and stay in business." (Hoffman, Tr. 4993).

2991. Mr. Hoffman's belief in the high-level risk associated with the Unocal patents other than the '393 patent has affected the operations of BP's Carson Refinery. Blending rules have been created to better inform BP of its risk exposure with regards to its blending overlapping the numerical limitations presented in Unocal's RFG patents. Various studies have been done to assess whether overlapping can be avoided economically. These studies include support by linear programs, results of balance, and study balances. (Hoffman, Tr. 4994).

2992. Likewise, Chevron recognized the Unocal RFG patents to be a "business risk." (Engibous, Tr. 3891-3892). Were Chevron to have known about "an unknown" risk factor, such as the Unocal RFG patents, prior to making refinery modifications to its West Coast refineries to equip them to produce CARB Phase 2 RFG, it would not have invested in the modifications because of the risk of "shaky" returns. Chevron wouldn't have invested in refinery modifications even if it had an opinion that the Unocal RFG patents would be found invalid. (Gyorfi, Tr. 5315-5316).

3. Unocal Has Claimed That Its Patents Cover the CARB Regulations.

2993. Unocal has repeatedly declared in public statements and internally that its patents cover the CARB regulations. Many of the statements that Unocal made came in the context of the issuance of the '393 patent. (CCPF ¶ ¶ 2511-2513, 2523, 2529-2542).

2994. The ‘393 patent, when originally released, had claims that were as broad, or nearly as broad, as the current breadth of the entire Unocal patent portfolio today. For example, claim 143 of the original, undisclaimed ‘393 patent had claims for RVP at 7.0 psi or below, T50 at 215 degrees or below, and olefins at 8 percent or below. Claim 88 of the original, undisclaimed ‘393 patent had claims for RVP at 7.0 psi or below and T50 at 210 degrees or below. (CX 617 at 023 (col. 22, ll. 61-64), 025 (col. 26, ll. 1-5)).

2995. **{**

}. (RX 1154 at 009, 026 (Sarna Expert Report), *in camera* (**{**

})).

2996. At the time of Unocal’s public announcement in January 1995 of the issuance of the ‘393 patent, Unocal claimed “that almost any gasoline that would be practical to make and meet CARB standards would fall within the scope of our patent, and thus require a license from us.” (CX 372 at 003 (emphasis in the original); Lane Tr. 3033-3034).

2997. Barry Lane, the author of Unocal’s January 1995 press release that publically announced the issuance of the ‘393 patent, checked with Unocal chief patent counsel Gregory Wirzbicki about the accuracy of the statements in the press release, particularly regarding the use of the word “practical” in reference to the ability of refiners to blend CARB summertime RFG outside the scope of the ‘393 patent, and was instructed by management to keep the exact language that was ultimately used in the press release. (Lane, Tr. 3033-3035).

2998. Lane explained that the word “practical” as used in statements relating to Unocal’s RFG patents meant “economical given current refinery structures.” (Lane, Tr. 3034-3035, 3084). Lane also explained that “practical” meant “cost-effective;” in other words, that refiners would not be “able to produce sufficient quantities” or in “an economic sense, the cost may be too prohibitive.” (Lane, Tr. 3034-3035, 3089-3090).

2999. Just prior to the public announcement in 1995 of the issuance of Unocal’s ‘393 patent, Michael Thacher, Unocal’s General Manager of Public Relations and Communications, noted that “Our formulations probably cover 95 percent of CARB spec fuels.” (CX 371 at 001; CX 7066 (Thacher, Dep. at 5, 22)). He continued: “While [the patent] doesn’t cover every possible formulation under CARB specifications, [it] does cover a large proportion of practical formulations” and a “lot of gasoline formulations that are practical to make.” (CX 371 at 001; CX 7066 (Thacher, Dep. at 22-23)).

3000. In March 1995, Barry Lane, Unocal's Manager of Public Relations, told an industry publication, "A refiner could possibly produce CARB 2 gasoline and not fall under our patent—there's a little window there—but it would probably not be practical to do so on a large scale...You could make a gasoline that would fall outside our patent, but refiners can't be that exact. They might slip back in under the patent" (CX 3051 at 001; Lane, Tr. 3022, 3035-3036).

3001. In Unocal's press release of January 31, 1995, announcing its RFG patents, and repeatedly thereafter, Unocal stated that the "patent covers many of the possible fuel compositions that refiners would find practical to manufacture and still comply with the strict California Air Resources Board (CARB) Phase 2 requirements in 1996." (CX 375 at 001; CX 599 at 007; CX 399 at 003).

3002. In preparation for a meeting with California Governor Pete Wilson, Unocal CEO Roger Beach was briefed that Unocal's patent covered "most gasolines that met CARB Phase 2 regulations." (CX 401 at 004 (Unocal's Governor Wilson Briefing: RFG Patent)).

3003. After it disclaimed some of the broadest claims in its '393 patent, Unocal reacquired these claims in later patents, and publicly announced that it did so. Unocal CEO and Chairman of the Board Roger Beach said the issuance of the '126 patent "represents further protection for cleaner burning gasolines that Unocal invented in 1990...In some respects, the new patent's claims are broader than those in the earlier" '393 patent. (CX 421 at 002; Lane, Tr. 3054-3057).

3004. Mr. Beach also stated, "We believe that this new patent, coupled with the claims of the earlier '393 patent, offer a significant potential revenue stream to Unocal." (CX 421 at 002; Lane Tr. 3057).

3005. Unocal projected 50% of the gasoline produced in California in 1995 would infringe the patents. That projection went up to 70% for the 1996-1997 time period; and up to 90% for 1998 forward. (CX 454 at 001; Strathman, Tr. 3629).

4. Unocal's Patents Overlap Substantially with the CARB Reformulated Gasoline Regulations.

3006. The following table indicates in bold the numerical property limits of representative claims of the Unocal patents that substantially cover the limits required by the CARB Phase 2 summertime regulation: RVP, Aromatics, Olefins, T50 (ºF), and T90 (ºF). The plain text in the table indicates three other gasoline properties that CARB also regulated: benzene, oxygen, and sulfur. Since Unocal's patent claims do not set any specific limits for these gasoline properties, any gasoline that meets the other limits of the Unocal claims is covered by those claims.

Parameter	**Representative Unocal Patent Claim Limitations**						***CARB Phase 2 Limits***		
	'126 Claim 49	'126 Claim 4	'521 Claim 1	'393 Claim 112	'866 Claim 1	'567 Claim 6	*Flat Limit*	*Avg. Std.*	*Cap Limit*
RVP	**<7.0**	**<7.5**	**<7.5**	**≤7.0**	**<7.5**	**<7.5**	***7.0***	***--***	***7.0***
Aromatics	**≥4.5**	**≥4.5**	**Any**	**Any**	**Any**	**≥4.5**	***25***	***22***	***30***
Olefins	**<8**	**<8**	**<15**	**<10**	**<10**	**<8**	***6.0***	***4.0***	***10.0***
T90 (ºF)	**Any**	**≤315**	**≤315**	**Any**	**Any**	**≤315**	***300***	***290***	***330***
T50 (ºF)	**≤215**	**≤215**	**≤215**	**≤210**	**≤210**	**<208**	***210***	***200***	***220***
Benzene	Any	Any	Any	Any	Any	Any	*1.00*	*0.80*	*1.20*
Oxygen	Any	Any	Any	Any	Any	Any	*1.8*	*--*	*2.7*
Sulfur	Any	Any	Any	Any	Any	Any	*40*	*30*	*80*

The patent claims in this chart may be found at: (CX 617 at 024 ('393 patent claims); CX 618 at 027 ('567 patent); CX 619 at 027 ('866 patent); CX 620 at 027-029 ('126 patent); CX 621 at 027 ('521 patent); CX 1796A at 004 (undisclaimed '393 claims). The CARB Phase 2 regulation specifications may be found at: (CX 866 at 006-013, 015-018 (CARB final Phase 2 regulation)).

3007. Because refiners are able to produce gasolines with higher Reid Vapor Pressures during the "winter" months, Unocal's RFG patents are generally not implicated during the winter months. (CX 375).

3008. Some of Unocal's claims cover octane and/or Research Octane Number (RON). *See, e.g,* (CX 620 at 028-029 ('126 patent); CX 621 at 027 ('521 patent)). Measures of octane include the Research Octane Number (RON) and the Motor Octane Number (MON). (CX 1709 at 012-013). The United States octane specifications refer to the average of RON and MON. (CX 1709 at 103).

3009. California state law provides for a minimum octane level of 87, for regular unleaded gasoline. (Ingham, Tr. 2709-2710). **{**

}. (Lieder, Tr. 4837-4838, *in camera*).

3010. Some of Unocal's claims also cover paraffin levels. *See, e.g.*, (CX 620 at 028-029 ('126 patent)). There are three types of hydrocarbons in gasoline: olefins, aromatics, and paraffins. The total percentage of each of these hydrocarbons in a batch of gasoline must total 100 percent. (RX 1165A at 019).

3011. Although CARB did not directly regulate paraffin levels, it regulated aromatic and olefin levels. (CX 866 at 006-019 (CARB final regulation). Since, by scientific definition, paraffins plus olefins plus aromatics make up 100% of the hydrocarbons in gasoline, CARB indirectly regulated paraffin levels in gasoline. (Wirzbicki, Tr. 964).

3012. Finally, CARB did not directly regulate T10, but industry specifications set T10 at or near the limits of the Unocal patent claims. (CX 5 at 011).

3013. The industry standard specification for gasoline contains a maximum T10 limit of 158ºF. (CX 5 at 011-012).

3014. Of Unocal's patent claims that set a T10 limit, many do so at 158ºF. *See, e.g.*, (CX 617 at 016 ('393 patent specification re A/O Ave); CX 617 at 024 ('393 patent claims); CX 618 at 027 ('567 patent); CX 620 at 028-029 ('126 patent).

3015. The following table sets forth these limitations in same representative Unocal patent claims outlined in the table above

Parameter	**Representative Unocal Patent Claim Limitations**						***CARB Phase 2 Limits***		
	'126 Claim 49	'126 Claim4	'521 Claim 1	'393 Claim 112	'866 Claim 1	'567 Claim 6	*Flat Limit*	*Avg. Std.*	*Cap Limit*
T10 (ºF)	≤158	<140	≤158	Any	≤158	≤158	No CARB limit, but ASTM standard is 158.		

Paraffins	>50	>65	>65	>75	Any	>72	No direct limit, but because paraffins + olefins + aromatics = 100%, practical limits: [≥69] [74] [≥60]
Octane	≥87	≥87	≥87	Any	≥87	≥87	No CARB limit, but regular gasoline ≥87, and premium ≥91 (formerly 92)
Research Octane #	Any	Any	>90	Any	Any	Any	No CARB limit, but tied to Octane.

CX 617 at 024 ('393 patent claims); CX 618 at 027 ('567 patent); CX 619 at 027 ('866 patent); CX 620 at 027-029 ('126 patent); CX 621 at 027 ('521 patent); CX 1796A at 004 (Unocal list of properties of undisclaimed '393 claims); CX 866 (CARB final regulation); Wirzbicki, Tr. 964).

3016. Even though the CARB Phase 3 summertime gasoline regulations relaxed some of the gasoline property limitations, including limits for RVP and the flat limits for T50 and T90, the Phase 3 regulations still have substantially the same overlap with the Unocal patent claims as the Phase 2 regulations. The following table shows that representative claims of Unocal's five patents also cover most of the gasoline fuel specifications under the CARB Phase 3 summertime gasoline regulations:

Parameter	**Representative Unocal Patent Claim Limitations**	***CARB Phase 3 Limits***

	'126 Claim 49	'126 Claim 2	'521 Claim 1	'393 Claim112	'866 Claim 1	'567 Claim 6	*Flat Limit*	*Avg. Std.*	*Cap Limit*
RVP	**<7.0**	**<7.5**	**<7.5**	**≤7.0**	**<7.5**	**<7.5**	***7.0/ 6.9***	**--**	***6.4-7.2***
Aromatics	**≥4.5**	**≥4.5**	**Any**	**Any**	**Any**	**≥4.5**	***25***	***22***	***35***
Olefins	**<8**	**<8**	**<15**	**<10**	**<10**	**<8**	***6.0***	***4.0***	***10***
T90 (°F)	**Any**	**≤315**	**≤315**	**Any**	**Any**	**≤315**	***305***	***295***	***330***
T50 (°F)	**≤215**	**≤215**	**≤215**	**≤210**	**≤210**	**<208**	***213***	***203***	***220***
Benzene	Any	Any	Any	Any	Any	Any	*0.80*	*0.70*	*1.10*
Oxygen	Any	Any	Any	Any	Any	Any	*1.8-2.2*	*NA*	*3.7*
Sulfur	Any	Any	Any	Any	Any	Any	*20*	*15*	*60/30*

(RX 190 at 010 (CARB Phase 3); CX 617 at 024 ('393 patent claims); CX 618 at 027 ('567 patent); CX 619 at 027 ('866 patent); CX 620 at 028-029 ('126 patent); CX 621 at 027 ('521 patent); CX 1796A at 004 (undisclaimed '393 claims); *see also* CX 1709 at 016 (Eskew report).

5. The Coverage Rate is a Useful Indicator of Monopoly Power.

3017. The portion of a batch of gasoline that falls within the numerical property limitations of the claims of Unocal's RFG patents, referred to as the "coverage rate," "overlap rate," or "matching rate," can give a useful indication of the demand for Unocal's technology. (CX 1720A at 027 (Shapiro Expert Report)).

3018. The coverage rate of Unocal's RFG patents over the aggregate total production of CARB-compliant gasoline can be used in the determination of Unocal's market share in the relevant technology market. While market share is not as strong an indicator of monopoly power as is direct evidence of a firm's ability to raise prices to supra-competitive levels, it is useful as an indicator of the presence or absence of market power. (CX 1720A at 027 (Shapiro Expert Report)). However, the "high coverage rate is consistent with the direct evidence of Unocal's market power and provides further evidence of that market power." (CX 1720A at 027 (Shapiro Expert Report)).

a. There are No Technology Suppliers Available to Constrain Unocal's Monopoly Pricing

3019. Current market shares are not meaningful if new entry would occur to defeat an attempt

to increase prices to a supra competitive level. Entry barrier analysis looks at whether there are suppliers that are currently outside the relevant market that can easily enter the market and supply alternative commodities or technologies to consumers in the market. Entry barrier analysis analyzes whether suppliers would have sufficient incentive and ability to enter if market prices for the commodity or technology were above competitive levels. (Shapiro, Tr. 7409).

3020. In this case, an entry barrier analysis examines whether there are suppliers of technology that would enable refiners to make CARB-compliant summertime gasoline who are not currently supplying that technology but could, and would, easily do so if prices in the market for such technology were above competitive levels. (Shapiro, Tr. 7409).

3021. There are no substitute technologies that can easily enter the relevant technology market in this case. "Prices are above competitive levels. Refiners are looking hard for... options" but "the evidence is clear that there are no such silver bullets out there. And certainly Unocal's experts have not identified any such technology." (Shapiro, Tr. 7409-7410).

3022. The "refiners have strong economic incentives to identify... or even develop" a substitute technology to avoid overlapping Unocal's RFG patents "if they could," but "those alternatives do not exist currently and there is no known prospect to suggest they are about to exist." (Shapiro, Tr. 7410).

3023. Unocal's technology is a valuable one in the sense that "there are no really good cheap substitute" technologies available to produce CARB-compliant summertime gasoline. (Shapiro, Tr. 7108).

b. Approximately 93 Percent of CARB-Compliant Gasoline Falls Within the Numerical Limitations of the Unocal Patents.

3024. In this case, the coverage rate of the production of CARB-compliant summertime RFG over the numerical property limitations contained in Unocal's RFG patents was calculated by Mr. Blake Eskew, Complaint Counsel's expert in refining economics and operations, and Richard Stellman, Unocal's expert in refinery operations, process design of refineries, and unit expansion. These two experts calculated coverage rates that were materially indistinguishable – Mr. Eskew calculated a 93 percent coverage rate, while Mr. Stellman determined the rate to be 92.7 percent. (Eskew, Tr. 2815, 2891; Stellman, Tr. 7902, 8098-8099).

3025. Mr. Stellman did his matching analysis in this case in the same manner that he did the infringement analysis in the '393 litigation. This was the methodology that was adopted by the Court. (Stellman, Tr. 7945-7946).

3026. In order to determine the coverage rate, Mr. Eskew received batch data from 12 refineries

in California. (Eskew, Tr. 2817). The twelve refineries represented seven different companies: Chevron, BP, Exxon, Shell, Valero, ConocoPhillips, and Tesoro. (Eskew, Tr. 2891; CX 1709 at 021 (Eskew Expert Report); RX 1165A at 016). The twelve refineries whose data was analyzed by Mr. Eskew represent more than 98% of California gasoline production. (CX 1720A at 027 (Shapiro Expert Report)).

3027. All gasoline considered by Mr. Eskew was certified to meet the CARB Phase 2 RFG specifications. (Eskew, Tr. 3014). None of the batch data Mr. Eskew reviewed was for aviation or racing fuel or contained kerosene. (Eskew, Tr. 3016-3018).

3028. In his analysis, Mr. Eskew compared the properties of the batches with the numerical property limitations of the claims of the Unocal patents. (Eskew, Tr. 2817). **{**

}. (Eskew, Tr. 2958, *in camera*).

3029. **{**

}. (Eskew, Tr. 2964, *in camera*). **{**

}. (Eskew, Tr. 2964, *in camera*).

3030. Mr. Eskew's analysis concluded that for the summers of 2001 and 2002, **{ }** percent of the batches of refined CARB-compliant summertime gasoline, corresponding with 93 percent of the volume of refined CARB-compliant summertime gasoline, fell within the numerical property limitations of Unocal's RFG patents. (CX 1464A; Eskew, Tr. 2891, 2965, *in camera*; CX 1462A, *in camera*).

3031. **{**

}. (Eskew, Tr. 2958, *in camera*). **{**

}. (Eskew, Tr. 2958-2959, *in camera*).

3032. There was no significant disagreement in the results reached by the two refining experts in this case regarding the coverage rate by volume of refined CARB-compliant

summertime gasoline over the numerical property limitations of Unocal's RFG patents. Mr. Stellman's analysis yielded an overall result of 92.7 percent coverage rate, while Mr. Eskew found a 93 percent coverage rate. (RX 1165A at 017; CX 1464A).

3033. **{**

}. (Stellman, Tr. 8097-8098, *in camera*). **{**

}. (Stellman, Tr. 8098-8099, *in camera*). **{**

}:

1. **{**

}. (CX 1462A, *in camera;* RX 1165 at 038, *in camera*).

2. **{**

}. (CX 1462A, *in camera*; RX 1165 at 037, *in camera*).

3. **{** **}**. (CX 1462A, *in camera*; RX 1165 at 039, *in camera*).

4. **{**

}. (CX 1462A, *in camera*; RX 1165 at 041, *in camera*).

5. **{**

}. (CX 1462A, *in camera*; RX 1165 at 040, *in camera*).

6. **{**

}. (CX 1462A, *in camera*; RX 1165 at 043, *in camera*).

7. **{**

}. (CX 1462A, *in camera*; RX 1165 at 045, *in camera*).

8. **{**

}. (CX 1462A, *in camera*; RX 1165 at 036, *in camera;* Stellman, Tr. 8098-8099, *in camera*).

9. **{**

}. (CX 1462A, *in camera*; RX 1165 at 042, *in camera*; Stellman, Tr. 8098-8099, *in camera*).

10. **{**

}. (CX 1462A, *in camera*; RX 1165 at 044, *in camera;* Stellman, Tr. 8098-8099, *in camera*).

11. **{**

}. (CX 1462A, *in camera*; RX 1165 at 046, *in camera;* Stellman, Tr. 8098-8099, *in camera*).

12. **{**

}. (CX 1462A, *in camera*; RX 1165, *in camera*). **{**

}. (Stellman, Tr. 8097-8098, *in camera*).

3034. As Unocal's technical expert Mr. Stellman testified, he performed his overlap analysis of the numerical property limitations of the Unocal patent claims in accordance with the claims construction and infringement decisions rendered by the district court in the '393 patent litigation. (Stellman, Tr. 7945-7946; RX 1165A at 016).

3035. Complaint Counsel's expert, Mr. Eskew, did so as well. (Eskew, Tr. 3014-3019; CX 1709 at 20; CX 1798A at 003).

3036. Both Mr. Eskew and Mr. Stellman calculated percentages of total hydrocarbons (aromatics, olefins, and paraffins) in the method required by the district court. (CX 1709 at 020 (Eskew Report); CX 1796A at 189, 224 (Court's Jury Instructions); RX 1165A at 016 (Stellman Report)).

3037. With the exception of data from one refinery, Mr. Eskew calculated RVP using the same measurements adopted in the '393 infringement litigation and used by Unocal's expert, Mr. Stellman. (CX 1798A at 003 (Eskew Expert Rebuttal Report); RX 1165A at 016-017 (Stellman Report); Eskew, Tr. 3019; CX 1579 at 006 (Pleading re '393 Litigation); CX 1796A at 276-282 (Special Verdict Form)).

3038. As in the '393 litigation, the batch data included finished gasoline blends containing oxygenates (such as ethanol). (CX 1709 at 020 (Eskew Report); CX 1579 at 007-009 (Pleading re '393 Litigation)).

3039. **{**

}. (Eskew, Tr. 2955, 2967, *in camera*). **{**

}. (Eskew, Tr. 2957, *in camera*). **{**

}. (Engibous, Tr. 3968, *in camera*). ExxonMobil started producing Phase 3 gasoline in February or March 2003. (Eizember, Tr. 3195).

3040. **{**

}. (Eskew, Tr. 2968-2969, *in camera*). **{**

}. (Eskew, Tr. 2969, *in camera*).

3041. All of the batch data that Unocal's and Complaint Counsel's experts reviewed for the experts' overlap analyses covers gasoline that by definition meets the claim limitation present in Unocal's '393 patent and in many of its other patent claims. The courts have already construed the limitations "[a]n unleaded gasoline fuel suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine" as meaning unleaded "standard automotive gasoline," as opposed to "aviation fuels or racing fuels." (*Union Oil Co. of California v. Atlantic Richfield Co.*, 203 F.3d 989, 992, 995 (Fed. Cir. 2001)).

3042. All of the refiners' batch data covered "common CARB gasoline that was certified under the CARB specifications for use in California." (Eskew, Tr. 3016). None of the batch data was for aviation, jet or racing fuels. (Eskew, Tr. 3016-3018).

3043. **{**

}. (Eskew, Tr., 3016-3018, *in camera*; Engibous, Tr. 3963, *in camera*; **{** **}**, *in camera*; Eizember, Tr. 3336, *in camera*).

3044. Any gasoline certified under CARB's Phase 2 regulations is, moreover, by definition unleaded, since CARB's Phase 1 regulations had already eliminated the use of lead in gasolines. (CX 52 at 006). The gasoline certified for use under CARB's Phase 2 specifications is therefore "[a]n unleaded gasoline fuel suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine." (*Union Oil Co. of Cal.*, 208 F.3d at 992, 995).

6. The Evidence Demonstrates That Overlap With the Numerical Property Limitations of the Unocal Patents Shows Likely Infringement.

3045. Overlap with the numerical property limitations is recognized to be a good proxy for

infringement. **{**

}. (CCPF ¶ ¶ 2740-2750, 3046-3079).

a. {

}

3046. **{**

}. (Shapiro, Tr. 7213, *in camera*).

3047. **{**

}. (Unocal Motion in Limine to Exclude Evidence of Gasolines That Match the Numerical Property Limitations, at 005, *in camera*).

3048. **{**

}. (CX 1800 at 002, *in camera*; Strathman, Tr. 3736-3737, *in camera*; CX 2009 at 001, *in camera*; CX 2011 at 001-002, *in camera*; CX 2012 at 001-002, *in camera*; CX 2013 at 001, *in camera*; CX 2014 at 001-002, *in camera*; CX 2017 at 001, *in camera*; CX 2018 at 001-002, *in camera*; CX 2020 at 001, *in camera*).

3049. **{**

}. (CX 2014 at 002, *in camera*; CX 2009 at 001-002, *in camera*; CX 2011 at 002, *in camera*; CX 2012 at 002, *in camera*; **{ }**, *in camera*; CX 2013 at 001, *in camera*; Dowling, Tr. 3784, *in camera*); *see also* (CX 2018 at 002, *in camera*; CX 2020 at 002, *in camera*) (emphasis added).

3050. **{**

}. (CX 2014 at 003, *in camera)*;

see also (CX 2009 at 003, *in camera*; CX 2011 at 003, *in camera*; CX 2012 at 003, *in camera*; CX 2013 at 002, *in camera*; CX 2018 at 003, *in camera*; CX 2020 at 004, *in camera*).

3051. **{**

}. (CX 2009 at 012, *in camera*; CX 2012 at 016, *in camera*; **{** **}**, *in camera*; CX 2013 at 012, *in camera*; CX 2014 at 003, *in camera*).

3052. **{**

}. (CX 2193 at 002-011, *in camera*; Hepper, Tr. 4086-4087, *in camera*).

3053. **{**

}. (CCPF ¶ ¶ 3046-3052)

3054. **{**

}. (*Compare* (CX 2009 at 003-004, *in camera*; CX 2011 at 003-005, *in camera*; CX 2012 at 005, *in camera*; CX 2013 at 004-005, *in camera*; CX 2014 at 005, *in camera*; CX 2017 at 002-004, *in camera*; CX 2018 at 004, *in camera*; CX 2020 at 006, *in camera*;), *with* (CX 617 at 021-025; CX 618 at 027-028; CX 619 at 027-028; CX 620 at 027-029; CX 621 at 027-030; CX 1796A at 224 (Jury Instruction on Claims; RX 1165 at 014-016, note 4 (Stellman Report); CX 1579 at 006); *see also* (CX 1796A at 276-277 (Special Verdict Form); Stellman, Tr. 7945-7946).

3055. **{**

}. (CX 2014 at 005, *in camera*; CX 2013 at 004, *in camera*; CX 2012 at 005, *in camera*; CX 2009 at 003-004, *in camera*; CX 2020 at 006, *in camera*; CX 2018 at 004, *in camera*).

3056. Moreover, because the gasolines reported to Unocal are also reported to EPA and CARB for certification for ordinary street usage, they are by definition "standard" automotive gasolines that satisfy the preface of Unocal's '393 patent claims. (CX 2014 at 005, *in*

camera; CX 2013 at 004-005, *in camera*; CX 2012 at 005, *in camera*; CX 2009 at 003-004, *in camera*; CX 2010 at 004, *in camera*; CX 2020 at 006, *in camera*; CX 2018 at 004, *in camera*).

3057. **{**

}. (CX 2014 at 005, *in camera*; CX 2013 at 004, *in camera*; CX 2012 at 005, *in camera*; CX 2009 at 003-004, *in camera*; CX 2010 at 004, *in camera*; CX 2020 at 006, *in camera*; CX 2018 at 004, *in camera*; Strathman, Tr. 3717-3721, *in camera).* **{**

}. (Hepper, Tr. 4085-4087, *in camera;* CX 2193 at 012-041).

3058. **{**

}. (Strathman, Tr. 3720-3721, *in camera*).

3059. **{**

}. (CX 684 at 001, *in camera*; Jessup, Tr. 1338-1339, 1460-1461, *in camera*, 1608-1609). **{**

}. (Jessup, Tr. 1338-1339, 1460-1461, *in camera*).

3060. **{**

}. (CX 684 at 001, *in camera*; Jessup, Tr. 1460-1461, *in camera*). **{**

}. (CX 684 at 001, *in camera*).

3061. A spreadsheet that Dr. Jessup put together, entitled "UNOCAL RFG Patent Claims: All Claims for five issued patents," contains only the numerical property limitations for Unocal's patent claims. (CX 544; Jessup, Tr. 1340).

3062. **{**

}. (Hepper,

Tr. 4074-7076, *in camera*; CX 2014 at 015, *in camera*). **{**

}. (Hepper, Tr. 4075-4076, *in camera*).

3063. **{**

}. (Dowling, Tr. 3782, *in camera*).

3064. **{**

}. (CX 2013 at 001, *in camera*; Dowling, Tr. 3784, *in camera*).

3065. **{**

}. (CX 2000 at 001, *in camera;* Strathman, Tr. 3717-3719, *in camera*). **{**

}. (CCPF ¶ ¶ 3046-3052). **{**

}. (Hepper, Tr. 4088, *in camera*). **{**

}. (CX 466 at 004-005, *in camera*).

3066. **{**

}. (Hepper, Tr. 4089, *in camera*; *see also* Dowling, Tr. 3791-3792, *in camera;* **{** **}**, *in camera*).

3067. **{**

}. (Hepper, Tr. 4080, *in camera*). **{**

}. (Hepper, Tr.

4081, *in camera*).

3068. **{**

}. (Hepper, Tr. 4080, 4082-4083, *in camera*).

3069. **{**

}. (Hepper, Tr. 4082-4084, *in camera*).

3070. **{**

}. (Hepper, Tr. 4088, *in camera*). **{**

}. ({

}, *in camera*). **{**

}. (Dowling, Tr. 3791-3792, *in camera*).

3071. **{**

}. ({ **}**, *in camera*).

3072. **{**

}. (Dowling, Tr. 3789, *in camera*).

3073. **{**

}. (Dowling, Tr. 3791-3792, *in camera*).

3074. **{**

}. (CX 2010, *in camera*).

b. The Refiners Consider the Numerical Limitations of the Unocal Patents as Part of Ordinary Business Practices.

3075. **{**

}, (*e.g.*, Simonson, Tr. 6077, *in camera*; CX 830) **{** **},** (*e.g.* Engibous, Tr. 3965-3966, *in camera*) **{** **},** (*e.g.* Eizember, Tr. 3342, 3344, *in camera*; CX 2085 at 001-003) **{** **}.** (*e.g.* Hoffman, Tr. 5033, *in camera*).

3076. **{**

}. *(See, e.g.*, Engibous, Tr. 3971-3976, *in camera*, Hepper, Tr. 4080-4081, *in camera*)

3077. **{**

}. (CX 2010, *in camera*). **{**

}. (Hepper, Tr. 3941-3942, 3944-3945, 4086-4087, *in camera*; CX 2193, *in camera*).

3078. When refiners have made presentations to CARB about the difficulty of avoiding the Unocal patents, they have outlined only the numerical property limitations of the patents. (RX 753 at 004 (Chevron identified only the numerical portions of Unocal's patent claims in describing them to CARB in 1998); RX 560 at 001; CX 2090 at 003).

3079. Unocal's expert in refinery operations, process design of refineries, and unit expansion, Mr. Richard Stellman, testified that he would advise refiners to avoid the numerical limitations of all five patents, because "it makes good business sense to avoid the property claims because there is a risk of liability" if a company does not. (Stellman, Tr. 7947).

D. No Serious Dispute Exists as to the Meaning of Any Patent Claim That Unocal Contends Must Be Construed.

3080. Many of the relevant portions of the Unocal patents have been previously litigated. In the '393 litigation, the district court construed the disputed limitations of the '393 patent claims. (CX 1796A at 008-019 (Order, *Union Oil Co. Of California*, No. 95-CV-2379 (C.D. Cal. May 19, 1997); CX 1796A at 189, 224 (Court's Jury Instructions, *Union Oil Co. Of California*, No. 95-CV-2379 (C.D. Cal. Sept. 24, 1997))).

3081. In construing the claims, the district court found it appropriate to rely only on the "intrinsic evidence" of the patent record itself, without expert testimony or a hearing on the meaning of the claims. (CX 1796A at 009-010).

3082. The district court held that the "patent is unambiguous." (CX 1796A at 015). It emphasized "that the intrinsic evidence regarding the '393 patent leaves no ambiguity as to the meaning of the patent," (CX 1796A at 018), and "the claims are unambiguous and can be construed by examining the intrinsic evidence...without need for further clarification." (CX 1796A at 010, n.1).

3083. According to the district court, the "'393 patent specification describes with striking clarity the coverage of the claims." (CX 1796A at 011).

3084. The specification of the '393 patent is identical to the specifications of the remaining four Unocal patents." (JX 3A (Joint Stipulation of Law and Fact), ¶ 7 (filed Oct. 12, 2004)).

3085. The construction of the other limitations of the '393 patent was undisputed and formed the basis of the infringement judgment in that litigation. (CX 1796A at 008-019; CX 1796A at 189, 224; CX 1796A at 276-282 (Special Verdict Form); RX 816 at 002 (Judgment)). The jury was able to reach a verdict that the refiners infringed the '393 patent without requiring any additional claim construction. (CX 1796A at 276-282 (Special Verdict Form); CX 1796A at 224 (Jury Instruction on Claims Construction)).

3086. Unocal contended in the '393 accounting action that the district court had decided these claims construction issues, and stated that arguments that the '393 litigation did not do so were incorrect and "disingenuous." (CX 1579 at 007-008).

1. No Dispute Exists As To the Definition of Gasoline.

3087. Part of the preamble to the claims of all five Unocal RFG patents contains the language "an unleaded fuel suitable for combustion in an automotive engine" or "an unleaded gasoline fuel suitable for combustion in a *spark* ignition engine." (CX 617 at 021; CX 618 at 027; CX 619 at 027; CX 620 at 027; CX 621 at 027). (emphasis added).

3088. For example, claim 117, which is dependent on claim 116, states :

> 117. An unleaded gasoline fuel suitable for combustion in an automotive engine, said fuel having a Reid Vapor Pressure no greater than 7.0 psi, and a 50% D-86 distillation point no greater than 200° F, and a paraffin content greater than 85 volume percent, and an olefin content less than 4 volume percent wherein the maximum 10% distillation point is 158° F (70° C).

(CX 617 at 024 ('393 patent, col. 24, ll. 24-27)).

3089. The preface or "preamble" was the primary disputed claim in the '393 litigation. The courts in this litigation construed the preamble language in the '393 patent to mean "unleaded gasoline fuels intended for regular use in automobiles, *i.e.* traditional motor gasoline to be mass-produced at typical refineries for the general motoring public." (CX

1796A at 224; CX 1796A at 018).

3090. The district court further concluded that the preamble covered "fuels that will *regularly* be used in autos, not that conceivably could be." (CX 1796A at 014).

3091. The courts construed this language to be an additional limitation such that hydrocarbon compositions such as racing gasoline, aviation gasoline or pure streams like alkylate would not come within the meaning of the preamble language. This was consistent with Mr. Stellman's expert testimony in the '393 litigation. (RX 1165A at 013).

2. No Dispute Exists as to Measurement of Hydrocarbons.

3092. The courts in the '393 litigation construed the "volume percentages of hydrocarbons measured under the FIA standard mean the percentage that such hydrocarbons bear in relation to the total hydrocarbon content of the fuel – not based upon a percentage of the total fuel mixture – without adjustment for the presence of MTBE or oxygenates." (CX 1796A at 224).

3093. The volume percentage of hydrocarbons refers to the "volume percent" for olefins, paraffins and aromatics. (CX 1796A at 224; RX 1165A at 016, note 4).

3094. Calculating volume percentages of hydrocarbons based on total hydrocarbon content prior to the mixing of additives was "consistent with" Mr. Stellman's "opinion in the '393 litigation." (RX 1165A at 016).

3095. Mr. Eskew calculated matching rates by measuring "'hydrocarbon only' gasoline - that is, gasoline prior to the addition of oxygenates such as MTBE or ethanol." (CX 1709 at 020 (Eskew Expert Report)).

3. The Method for Calculating Reid Vapor Pressure Is Clear.

3096. This issue of which ASTM standard should be used to measure Reid Vapor Pressure for the purposes of an infringement analysis was decided by the court in the '393 litigation. There are two versions of one of the industry standards for measuring RVP: a 1989 version (ASTM D323-89) and a 1958 version (ASTM D323-58). (CX 1579 at 005).

3097. In his infringement analysis in the '393 litigation, Unocal's expert Richard Stellman used D323-58 values to determine whether gasoline meets the Reid Vapor Pressure limitations of the claims. (RX 1165 at 014-016 (Stellman Report), *in camera*; Stellman, Tr. 7945-7946).

3098. **{**

}. (RX 1165 at 016 (Stellman Expert Report), *in camera*; CX 1798 at 003 (Eskew

Expert Rebuttal Report)). **{**

}. (RX 1165 at 016 (Stellman Expert Report), *in camera*).

3099. While "Refiners previously attempted to argue that ASTM D323-58 values could not be used," the "Refiners lost and did not appeal the issue." (CX 1579 at 006 (Unocal Reply Memo in Accounting Action)). Indeed, in the '393 litigation, "The jury rejected this argument when it adopted the infringement analysis of Unocal expert Richard Stellman..." (CX 1579 at 006 (Unocal Accounting Summary Judgment Reply)).

3100. In any event, there is no significant difference between the two methods. "The vapor pressure test method for motor gasolines set forth in the 1989 version of D323 (*i.e.*, D323-89) is the same method described in the 1958 version (*i.e.*, D323-58)." (CX 1579 at 005). "[A]ny differences found between the 1989 and 1958 versions of D323 are immaterial to this case; both provide the same methodology for testing the Reid vapor pressure of a motor gasoline." (CX 1579 at 005 (Unocal Reply Memo in Accounting Action)).

4. The Addition of Ethanol to Gasoline Does Not Raise Claim Construction Issues.

3101. Finally, the '393 litigation decided the issue of whether motor gasoline made at a refinery to which ethanol is later added becomes non-infringing specialty gasoline. (CX 1579 at 007-009).

3102. The CARB regulations have required oxygenate since 1991. (CX 5 at 032-036). Prior to 2003, the most common oxygenate used by refiners was Methyl tertiary butyl ether, or "MTBE." (Venturini, Tr. 127). Since 2003, largely due to changes in CARB regulations, the oxygenate of choice for most California refiners has been ethanol. (Venturini, Tr. 94).

3103. Because it is not practical to blend ethanol at refineries, California refiners began to produce a gasoline product without ethanol at their refineries, and then ship that product to bulk terminals where the ethanol can be blended. (Venturini, Tr. 400). The gasoline product that is produced before ethanol is added is called CARBOB, or California reformulated gasoline blend stock for Oxygenate blending. (Eizember, Tr. 3195).

3104. The fact that most refiners use ethanol blending under CARB Phase 3 rules does not impact patent coverage. "Unocal['s patent] claims cover motor gasolines whether additional non-hydrocarbons are added or not." (CX 1579 at 008 (Unocal Reply Memo in Accounting Action). Indeed, an ARCO witness testified that ARCO was shipping gasoline on a pipeline "to a terminal, and [then] blending ethanol." (CX 1579 at 008 (Unocal Reply Memo in Accounting Action)).

3105. In one of Unocal's pleadings in the '393 patent litigation, Unocal stated that the argument that adding ethanol to gasoline makes the gasoline non-infringing may "be disposed of as a matter of law based on the patent specification itself and the prior rulings of the court upheld on appeal." (CX 1579 at 007; Strathman, Tr. 3612).

3106. As Unocal explained to the United States District Court for the Central District of California in a pleading in the '393 accounting action: "[W]hat is additionally clear from the trial record and verdict is that the Unocal claims cover motor gasolines whether additional non-hydrocarbons are added or not added. To that end, the patent at Column 4, line 60 specifically contemplates the addition of ethanol or oxygenates like MTBE, although they are not required by these claims. Refiners' present argument that ethanol added to refinery-made gasoline should take the gasoline out of the scope of the claims is nothing more than a re-cast of the half-hearted position at trial that reformulated gasolines, generally, are not 'standard automotive gasolines.' That argument was rejected by the jury and never appealed." (CX 1579 at 007-008).

3107. Unocal concludes that the suggestion that the blending of ethanol into motor gasoline is "a new, post-trial practice not considered by the jury is disingenuous." (CX 1579 at 008).

3108. **{**

}. (Dowling, Tr. 3776, *in camera*).

3109. **{**

}. (Dowling, Tr. 3808-3809, *in camera*).

E. Unocal's Own Expert Concedes that 50.4 Percent of the Gasoline in California Actually Infringes the '393 and Part of the '126 Patent, Without Regard to the Remaining Claims of the '126 Patent or the Other Three Unocal Patents.

3110. Unocal's expert in refinery operations, process design of refineries, and unit expansion, Mr. Stellman, concedes that, even considering a small portion of the claims of Unocal's patent portfolio, there is a large amount of infringement by CARB-compliant RFG

refiners. Mr. Stellman calculated a total infringement by these refiners of the '393 claims and the compositional claims of 40 of the claims of the '126 patent to be 50.4 percent. (RX 1165A at 017).

3111. According to Mr. Stellman ,"any gasoline meeting the requirements" of falling within the numerical property limitations set forth in the first 40 claims of the '126 patent "(as construed by the Court in the '393 litigation) and matching" the "property limitations (also as construed by the Court in the '393 litigation) infringes the first 40 claims of the '126 patent." (RX 1165A at 015).

3112. **{**

}. (Stellman, Tr. 8096-8097, *in camera*).

3113. **{**

}. (Stellman, Tr. 8097, *in camera*).

3114. Mr. Stellman believes that when a company makes, uses or sells a batch of gasoline that both falls within the property limitations expressed in the claims of Unocal's '393 or '126 patents and meets the requirements of the claims' preamble, the company will infringe one of more of the compositional claims of these patents. (RX 1165A at 013).

3115. Unocal's expert Mr. Stellman, concedes that 50.4 percent of CARB-compliant summertime RFG actually infringes the '393 patent or the first 40 claims of the '126 patent. (RX1165A at 017).

3116. **{**

}:

1. **{**

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

2. **{**

}. (RX 1165 at 037, *in camera*).

3. **{**

}. (RX 1165 at 038, *in camera*).

4. **{** **}.** (RX 1165 at 041, *in camera*).

5. **{** **}.** (RX 1165 at 040, *in camera*).

6. **{** **}.** (RX 1165 at 042, *in camera*).

7. **{** **}.** (RX 1165 at 044, *in camera*).

8. **{** **}.** (RX 1165 at 043, *in camera*).

9. **{** **}.** (RX 1165 at 039, *in camera*).

10. **{** **}.** (RX 1165 at 045, *in camera*).

11. **{** **}.** (RX 1165 at 046, *in camera*).

3117. **{** **}.** (Shapiro, Tr. 7211, *in camera*).

3118. **{** **}**. (Shapiro, Tr. 7211, *in camera*).

F. Unocal's Remaining Patent Elements are Likely to Be Satisfied By the Typical Production Activities at California Refineries.

1. Unocal's Chief Patent Counsel Believed It Inconceivable That Persons Skilled in the Art Would Have Any Doubt as to Whether Refiners Were Infringing Many of the Method and Process Limitations.

3119. Mr. Wirzbicki explained to a patent examiner at the US Patent and Trademark Office that pending divisional patent application claims for Unocal's RFG patents "should not be rejected for indefiniteness because one of ordinary skill in the art can reasonably

determine whether what he or she intends to do falls within or without the claim." (Wirzbicki, Tr. 1001, 1003; CX 1791 at 079-080).

3120. Mr. Wirzbicki provided an example of claim 91 in the divisional application submitted on October 26, 1994, which read:

> A method for operating an automotive vehicle that aids in minimizing the amount of at least one gaseous pollutant selected from the group consisting of NOx, CO, and hydrocarbons in the exhaust emissions discharged into the atmosphere, the automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter, the method comprising:
>
> (1) introducing into the engine an unleaded gasoline having
> (a) a Reid Vapor Pressure less than 7.0 psi,
> (b) a 50% D-86 distillation point no greater than 210º F.,
> (c) an olefin content less than 10 vol. % ,
> (d) a 90% D-86 distillation point less than 300º F., and
> (e) an octane value of at least 87;
> ...
>
> (2) combusting the unleaded gasoline in said engine;
>
> (3) contacting at least some of the resultant engine exhaust emissions with the catalytic converter; and
>
> (4) discharging the exhaust emissions from the catalytic converter into the atmosphere.

(CX 1791 at 055-056, 080-081). Mr. Wirzbicki also summarized the claim for the examiner in his remarks. (CX 1791 at 080-081).

3121. With respect to the pending claim 91in Unocal's divisional patent application submitted on October 26, 1994, Mr. Wirzbicki stated to the patent examiner "[i]t is inconceivable that one skilled in the art of automobile combustion could have <u>any problem</u> determining whether he or she would be performing acts inside or outside the scope of such a claim." (CX 1791 at 081) (emphasis in original).

3122. Mr. Wirzbicki even asserted with respect to the pending claim 91 that "[t]he steps of the claim are so definite that a person could not be skilled in this art and at the same time legitimately assert an inability to determine the scope of claim 91." (CX 1791 at 081). He continued, "The same is true for the other claims." (CX 1791 at 081).

3123. Many of the process limitations present in the claim 91 to which Mr. Wirzbicki referred in his October 26, 1994 remarks are essentially the same as limitations in Unocal's final

’567 patent claims. (*Compare* CX 1791 at 055-056 *to* CX 618 (‘567 patent) at 027-028).

3124. The following underlined portions of the method limitations of claim 6 of Unocal’s issued ‘567 patent, as follows, are limitations that were also in claim 91 as of October 26, 1994:

> “A method for operating an automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter to yield a reduced amount of NOx, CO, or unburned hydrocarbons as compared to combusting fuel A/O AVE in said engine, the method comprising:
>
> (1) introducing into the engine an unleaded gasoline suitable for combustion in an automotive engine, having...
>
> (2) combusting the unleaded gasoline in said engine;
>
> (3) introducing at least some of the resultant engine exhaust emissions into the catalytic converter; and
>
> (4) discharging emissions from the catalytic converter to the atmosphere.

(CX 1791 at 055-056; CX 618 at 027-028) (emphasis added).

3125. On January 4, 1995, the patent examiner reviewing a divisional patent application for Unocal’s RFG patents withdrew the indefiniteness rejection in response to Mr. Wirzbicki’s arguments. (CX 1791 at 477-478).

3126. When asked simple, practical questions, each refinery representative described how the methods claimed in the unconstrued portion of Unocal’s patent claims described the methods or processes that they employ to produce CARB summertime RFG, or that consumers employ when using CARB summertime RFG. (CCPF ¶ ¶ 3127-3128). From a practical perspective, this demonstrates likely infringement.

3127. Moreover, if a court were to construe these elements, if would be likely that a court would find that the methods or processes that refiners employ to produce CARB summertime RFG, or that consumers employ when using CARB summertime RFG satisfy the method and process claims of the patent, because the testimony is derived from an individual that is one of “ordinary skill in the art.” (CCPF ¶ 3128).

3128. With respect to Unocal’s reformulated gasoline patents, one of “ordinary skill in the art” would be “somebody like an ordinary refiner, and ordinary chemical engineer with a refining background.” (Wirzbicki, Tr. 1048-1049).

1. Mr. Mark Boone holds a B.S. in chemical engineering from the University of

California at Davis. (RX 91 at 002). He has worked at the Bakersfield Refinery since 1980. His positions have included operations planner, where he ran the LP model for the refinery, blending planner, and currently manager. (RX 91 at 002; CX 7043 (Boone, Dep. at 6, 9, 14, 15, 18)). Based on his years of experience and the positions he has held, Mr. Boone has personal knowledge of the refinery's operations relative to its production of gasoline. (RX 91 at 002; CX 7043 (Boone, Dep. at 20-21)).

2. Mr. William Engibous holds a B.S. in chemical engineering from the University of Michigan. (Engibous, Tr. 3892-3893). He has worked for Chevron in various refinery planning, blending and engineering positions for 25 years, including as a manager at both of Chevron's California refineries. He has worked in these refineries for 12 years. (Engibous, Tr. 3884-3885). As operations specialist, Mr. Engibous directed the blend specialist, who was responsible for developing gasoline blend recipes and other product blending functions. (Engibous, Tr. 3886-3887).

3. Mr. Blake Eskew holds a B.S. in chemical engineering from the University of Texas. (Eskew, Tr. 2807). Mr. Eskew has worked as a process engineer at a chemical plant for the Ethyl Corporation. (Eskew, Tr. 2807). Mr. Eskew has done analyses of refineries in which gasoline blending is a very crucial piece of the refinery's operations, as well as studies relating to gasoline composition and gasoline production capability. In these studies he either ran or supervised the running of LP models that would optimize gasoline blending within a specific refinery or regional refinery model. (Eskew, Tr. 2811).

4. Mr. Michael Sarna holds a B.S. in chemical engineering from Michigan Technological University. (Sarna, Tr. 6093). Beginning in 1976, Mr. Sarna was employed at UOP, during which time he often worked on-site at refineries not only in the United States, but also in 30 foreign countries. (Sarna, Tr. 6094, 6097). Mr. Sarna also held responsibilities for working on the development of various refinery processes, including reforming, hydrocracking, hydrotreating and aromatics production processes during his time at UOP. (Sarna, Tr. 6095). Mr. Sarna has experience working on many different processes, including reforming, FCC, alkylation, hydrotreating, aromatics extraction, and isomerization. (Sarna, Tr. 6104). He was also involved in the blending of gasoline when a problem arose due to one of the units licensed by UOP. (Sarna, Tr. 6110). Mr. Sarna is now the manager of the Long Beach, CA office of the consulting firm Purvin & Gertz, Inc. (Sarna, Tr. 6113).

5. Since 1993, Mr. Victor Ibergs has been employed as the Planning Manager for Valero's Wilmington Refinery. (CX 7050 (Ibergs, Dep. at 7-8, 10)). In this capacity, Mr. Ibergs oversees all aspects of gasoline blending, including holding responsibility for the selection of crude oils, intermediate feedstocks, and other

input materials used at the refinery, establishing the operating conditions under which the refinery functions, and determining the product mix that the refinery will produce. (CX 7050 (Ibergs, Dep. at 7-8))

6. Mr. Robert Millar holds a bachelor's of chemical engineering from Case Western Reserve University. (CX 7058 (Millar Dep. at 7)). He has worked for Shell Oil since 1980. His jobs at Shell have included working as a manager of business, where he was in charge of product development, and working in the refining sector, where he reported to the refinery vice-president. (CX 7058 (Millar, Dep. at 5-7)).

7. Mr. Robert Simonson is currently employed at Valero's Benicia refinery, where he oversees blending operations by reviewing blend data and call signals on the various units involved in producing gasoline. (Simonson, Tr. 5967-5968). During his 36 year career, Mr. Simonson has held similar responsibilities for monitoring gasoline blending at Benicia, including serving as the Principal Blending Engineer. (Simonson, Tr. 5969). Mr. Simonson also held positions such as technician and control supervisor, where he was responsible for operating the logistics of half of the Benicia Refinery. (Simonson, Tr. 5970).

8. Mr. R. Steven Hancock holds a B.S. in chemical engineering from Clemson University. (RX 200A at 002; CX 7047 (Hancock Dep. at 10)). 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. (RX 200A at 002). 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. (RX 200A at 002; CX 7047 (Hancock, Dep. at 5)). In this capacity, Mr. Hancock's responsibilities included monitoring fuel quality, regulatory compliance, and intellectual property issues. (RX 200A at 002; CX 7047 (Hancock Dep. at 22)).

9. Mr. Thomas Eizember holds a B.S. in chemical engineering from the South Dakota School of Mines and Technology. (Eizember, Tr. 3095). Mr. Eizember has worked in petroleum refining for over twenty-eight years. (Eizember, Tr. 3095). This includes experience directing the operation of the Benicia refinery in the blending of gasoline and overseeing numerous portions of that refinery, including the facilities that blended gasoline. (Eizember, Tr. 3095-3096).

10. Mr. Jack Segal holds a B.S. in chemistry from Pennsylvania State University. (Segal, Tr. 5592). Mr. Segal worked for ARCO and its predecessors from 1967 through 2000, including holding positions in its analytical department, marketing support department, licensing department, and fuels department. (Segal, Tr. 5591, 5593). Therefore, Mr. Segal is one of "ordinary still in the art." (Wirzbicki, Tr. 1048-1049).

11. Vitol's Mr. Jeff Hepper holds a B.S. in chemical engineering. (Hepper, Tr. 3941). Mr Hepper has experience with blending gasoline, including oversight of Vitol's blending activities, oversight of all blending activities for a small blending company called Landsea, and direct blending experience at Mobil's Torrance refinery. (Hepper, Tr. 3940-3941).

12. Mr. Michael Hoffman's educational background is in the field of chemical engineering. (Hoffman, Tr. 4869-4870). Mr. Hoffman has worked at ARCO's Cherry Point, Washington Refinery, where he held the titles of Supervisor of the Technology Group, Supervisor in Operations, Supervisor of Storage, Handling, and Blending, and Refinery Supervisor, where he was responsible for the operations of half of the Refinery. (Hoffman, Tr. 4867-4874). While in these positions, Mr. Hoffman supervised all aspects of the blending of gasoline and diesel fuels. (Hoffman, Tr. 4870-4871). Mr. Hoffman has also worked as Manager of the Wilmington Calciner refinery (Hoffman, Tr. 4874), and Manager for ARCO's Carson Refinery in Los Angeles, California. (Hoffman, Tr. 4869).

13. Dr. Charles Lieder holds a Ph.D. in chemistry from Stanford University, and has worked for Shell Oil Company since 1974. (Lieder, Tr. 4670, 4672). During his tenure at Shell, Dr. Lieder worked in Shell's Chemical Engineering Department, in Shell Chemicals, in a Shell Refinery in Los Angeles, and as a fuels blending technical advisor. (Lieder, Tr. 4672-4673). Since 1990, Dr. Lieder has served as a Fuels Blending Technical Adviser, with primary job responsibilities that include instructing and guiding blenders as to the legal and business specifications to which they must blend gasoline on a daily basis at Shell's United States refineries. Dr. Lieder's responsibilities also include developing new methods and techniques to improve refining operations. (Lieder, Tr. 4671-4672, 4675).

2. The '126 Method Claims Describe the Most Basic Elements of Producing Commercial Gasoline.

3129. The first 40 claims of the '126 patent have been fully construed. (CCPF ¶ ¶ 3110-3118).

3130. The additional elements of the final 26 claims of the '126 patent, which Unocal's technical expert tries to ignore, describe nothing more than the most basic elements of producing gasoline. (CCPF ¶ ¶ 3131-3151).

3131. Each of the method claims in Unocal's RFG patents read as follows: "A method comprising: (1) blending at least two hydrocarbon-containing streams together to produce at least 50,000 gallons of an unleaded gasoline suitable for combustion in an automotive engine, having the following properties...; (2) commencing delivery of unleaded gasoline produced pursuant to step (1) to gasoline service stations." (CX 620 at 027-029).

3132. The claims of the ‘126 patent that remain to be analyzed for infringement – claims 41- 66 – are all method claims that claim a method of “blending at least two hydrocarbon-containing streams together to produce at least 50,000 gallons of an unleaded gasoline” of certain properties, and “commencing delivery of unleaded gasoline produced in step (1) to gasoline service stations.” Independent claim 49 is representative. (CX 620 at 027-029). It states:

> 49. A method comprising:
>
> (1) blending at least two hydrocarbon-containing streams together to produce at least 50,000 gallons of an unleaded gasoline suitable for combustion in an automotive engine and having the following properties:
> (a) a Reid Vapor Pressure less than 7.0 psi;
> (b) a 10% D-86 distillation point no greater than 158[deg] F.;
> (c) a 50% D-86 distillation point no greater than 215[deg] F.;
> (d) a paraffin content greater than 50 volume percent;
> (e) an olefin content less than 8 volume percent;
> (f) an aromatics content of at least 4.5 volume percent; and
> (g) an octane value of at least 87; and
> (2) commencing delivery of unleaded gasoline produced in step (1) to gasoline service stations.

(CX 620 at 028-029).

3133. When analyzing the language of this claim, the plain and unambiguous meaning of the words of the claim state that what is claimed is a method of producing gasoline by

a. “blending at least two hydrocarbon-containing streams together,”
b. “to produce at least 50,000 gallons of an unleaded gasoline,”
c. “suitable for combustion in an automotive engine,”
d. that the unleaded gasoline produced have certain properties, and
e. commencing delivery of this unleaded gasoline to gasoline service stations.

(CX 620 at 027-029).

a. Blending at Least Two Hydrocarbon-Containing Streams Together.

3134. The ‘393 patent teaches that blending hydrocarbon streams is the typical way in which gasoline is produced.

> That is, in a typical refinery in which gasoline is produced, it is necessary or at least desirable in most instances to blend the hydrocarbon stocks so as to produce gasolines of specified Reid Vapor Pressure, olefins content, etc. Thus, the only difference

> [between the way gasoline is traditionally produced and the way in which the claimed gasoline is produced] is that now the refinery will blend the stocks in light of the information provided herein such that the NOx, CO, and hydrocarbon emissions are reduced as much as possible or practicable . . .

(CX 617 at 014) ('393 patent, col. 3, lns. 28-36).

3135. Gasoline in California "is typically composed of a wide variety of hydrocarbon streams and it's produced by blending together numerous streams that are either produced within the refinery or purchased." (Eskew, Tr. 2827).

3136. Gasoline is blended in the refinery from a number of hydrocarbon streams produced at the refinery or purchased which have different octane values, composition and ASTM properties. (CX 5 at 013) (CARB Phase 2 Technical Support Document).

3137. **{**

}.

(Engibous, Tr. 3957-3958, *in camera*).

3138. **{**

}. (Hoffman, Tr. 5034, *in camera*; Lieder, Tr. 4792, *in camera*; Eizember, Tr. 3333-3334, *in camera*; Hepper, Tr. 4079-4080, *in camera*; **{ }**, *in camera*; Engibous, Tr. 3957-3958, *in camera*).

3139. Gasoline includes the presence of more than one hydrocarbon stream by definition. ASTM standard D-4814 defines gasoline as "a volatile mixture of liquid hydrocarbons, generally containing small amounts of additives, suitable for use as a fuel in spark-ignition, internal combustion engines." (Eskew, Tr. 2829).

b. Produce at Least 50,000 Gallons.

3140. Complaint Counsel's expert Mr. Eskew received batch data from California refiners for approximately 6,200 total batches of CARB-compliant summertime RFG. Only **{one}** of the 6200 batches was composed of less than 50,000 gallons of gasoline}. (Eskew, Tr. 2964-2965, *in camera*).

3141. **{**

}. (Eskew, Tr. 2964-2965, *in camera*)**.**

3142. The twelve refineries whose data was analyzed by Mr. Eskew represent more than 98% of California gasoline production. (CX 1720A at 027 (Shapiro Expert Report)).

3143. **{**

}. (Engibous, Tr. 3958, *in camera*).

3144. **{**

}. (Hoffman, Tr. 5034, *in camera*; Lieder, Tr. 4793-4794, *in camera*; Eizember, Tr. 3334, *in camera*; **{** **}**, *in camera*; Hepper, Tr. 4080, *in camera*).

3145. "A typical batch of motor gasoline" at a Unocal Refinery prior to the time Unocal sold its refineries was "between one and four million gallons, approximately." (Jessup, Tr. 1471).

c. Suitable for combustion in an automotive engine.

3146. The second portion of the "...produce at least 50,000 gallons of an unleaded gasoline suitable for combustion in an automotive engine..." construction in Unocal's RFG patents is identical to the preamble language used in the '393 patent and has been fully construed by the Courts and is undisputed in this case. (CX 1796A at 018, 224).

d. Having the Following Properties:

3147. The properties described in each of the '126 claims were analyzed by the refining experts in this case, who came to nearly identical results. (CCPF ¶ ¶ 3024-3047).

e. Commencing Delivery of Unleaded Gasoline Produced Pursuant to Step (1) To Gasoline Service Stations.

3148. Both the '393 and '126 patents refer to gasoline service stations. Both the '393 and the '126 patent recite: "Yet better results can be expected if at least 75%, even more preferably at least 90%, of the gasoline fuel were supplied on a given day from gasoline service stations within a given geographical area, e.g., a governmental district such as a city or county." (CX 617 at 020 ('393 patent, col. 16, lns. 18-22); CX 0620 at 025 ('126 patent, col. 16, lns. 39-43)).

3149. Both the '393 and the '126 patent recite: "Yet greater [gasoline] consumption can be attained by, for example: 1. Supplying, via gasoline service stations and the like, at least 1,000 vehicles, preferably at least 10,000 vehicles, per day with a fuel composition of the invention. 2. Supplying, via gasoline service stations and the like, at least 10,000,000

gallons (37,850,000 liters) per week of a fuel composition of the invention to automotive vehicles." (CX 617 at 020 ((‘393 patent, col. 16, lns. 48-57); CX 0620 at 026 (‘126 patent, col. 17, lns. 1-4)).

3150. Both the ‘393 and the ‘126 patent recite: "In commercial practice, it is contemplated that usual procedures will result in at least 25%, often at least 50%, and sometimes at least 75% of the daily refinery output being a fuel composition of the invention. Such output would then be delivered to gasoline service stations for introduction into automobiles, with, again, the greatest significant advantage being if all the gasoline service stations so supplied--or some significant portion thereof, e.g., at least 25%, more preferably at least 50%, and most preferably at least 75%--are located in a congested area of high population density, e.g., a city or county as described above." (CX 617 at 020 (‘393 patent, col. 17, lns. 5-16); CX 0620 at 026 (‘126 patent, col. 17, lns. 21-31)).

3151. **{**

}. (Engibous, Tr. 3962-3963, *in camera*; Hoffman, Tr. 5036, *in camera*; **{** **}**, *in camera*; Lieder, Tr. 4794, *in camera*; Eizember, Tr. 3334, *in camera*).

f. If Only the ‘393 And The ‘126 Patents Were Considered, Unocal Would Have A Substantial Overlap Rate With CARB-compliant Summertime RFG Production.

3152. **{**

}. (Eskew, Tr. 2965, *in camera*). {

}. (Eskew, Tr. 2967, *in camera*; CX 1466A).

3. The ‘866 and ‘567 Claims Describe the Most Basic Elements of Using Gasoline in California Automobiles.

3153. The ‘567 patent has 40 method claims. Independent claim 6 of the ‘567 patent is representative. It states:

6. A method for operating an automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter to yield a reduced amount of NOx, CO, or unburned hydrocarbons as compared to combusting fuel A/O AVE in said engine, the method comprising:
(1) introducing into the engine an unleaded gasoline, suitable for combustion in an automotive engine, having the following properties:
(a) a Reid Vapor Pressure less than 7.5 psi;
(b) a 10% D-86 distillation point no greater than 158[deg] F.;
(c) a 50% D-86 distillation point less than 208[deg] F.;
(d) a 90% D-86 distillation point no greater than 315[deg] F.;
(e) a paraffin content greater than 72 volume percent;
(f) an olefin content less than 8 volume percent;
(g) an aromatics content of at least 4.5 volume percent; and
(h) an octane value of at least 87; and thereafter
(2) combusting the unleaded gasoline in said engine;
(3) introducing at least some of the resultant engine exhaust emissions into the catalytic converter; and
(4) discharging emissions from the catalytic converter to the atmosphere.

(CX 618 at 027).

3154. The plain and unambiguous meaning of the words of the claim state that what is claimed is a method of:

a. operating an automobile having a spark-induced, internal combustion engine and a catalytic converter,
b. to yield a reduced amount of certain pollutants when compared to the A/O AVE fuel by
c. using gasoline with certain properties,
d. combusting the gasoline in the automobile's engine,
e. introducing some of the engine exhaust emissions into the catalytic converter, and
f. discharging emissions from the catalytic converter to the atmosphere.

(CX 618 at 027-028).

3155. The first portion of claim 1 of the '866 patent limits to "operating an automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter." (CX 619 at 027). Automobile engines have spark-induced, internal combustion engines, and all new cars introduced in California since 1975 have been equipped with a catalytic

converter. (RX 1162A at 009).

a. Operating an Automobile Having a Spark-induced, Internal Combustion Engine and a Catalytic Converter.

3156. The patents use the term "spark-induced internal combustion engine" several times in a context which the District Court in the private patent infringement litigation concluded refers to the typical or common automobile. Specifically, the court concluded that "[t]he patent discusses the fuel solely as applied to automobiles and refers to the fuel as being used by 'the motoring public.' The patent is rife with explicit discussions of the invention's use, confined to the automobile context." (CX 1796A at 011).

3157. The Unocal patents recite: "While the invention may be used to advantage even on a small volume basis, *e.g.*, a single automobile operating with a fuel composition of the invention for a week or for at least 200 consecutive miles, it is clear that the benefits offered by the invention are best taken advantage of when a large number of automobiles operating with spark induced internal combustion engines requiring a gasoline fuel are powered with the fuel of the invention." (CX 617 at 019 ('393 patent, col. 15, lns. 47-55); CX 620 at 025 ('126 patent, col. 16, lns. 3-10); CX 618 at 025-026 ('567 patent, col. 16, ln. 64 to col. 17, ln. 4)).

3158. The Unocal patents recite: "The present invention, in its broadest aspect, is founded on the discovery that, when gasoline fuels are produced, for example, by blending a plurality of hydrocarbon-containing streams together so as to produce a gasoline product suitable for combustion in an automotive spark-induced internal combustion engine, improvements in emissions of one or more pollutants selected from the group consisting of CO, NOx, and hydrocarbons upon combustion of the gasoline product in such an engine system can be attained by controlling certain chemical and/or physical properties of said gasoline product." (CX 618 at 018 ('567 patent, col. 1, lns. 50-60); CX 620 at 018 ('126 patent, col. 1, ln. 60 to col. 2, ln. 4; CX 617 at 013 ('393 patent, col. 1, lns. 47-58)).

3159. The Unocal patents recite: " In the present invention, the gasoline is formulated, usually by appropriately blending various hydrocarbon streams in a refinery, to reduce or minimize emissions of CO, NOx, and/or hydrocarbons upon combustion in a spark-induced automotive internal combustion engine." (CX 618 at 020 ('567 patent, col. 5, lns. 27-31); CX 620 at 020 ('126 patent, col. 5, lns. 35-39); CX 617 at 015 ('393 patent, col. 5, lns. 30-34)).

3160. The dictionary definition of "internal combustion engine" is: "An engine, as an automotive gasoline piston engine or a diesel, in which fuel is burned within the engine proper rather than in an external furnace, as in a steam engine." (The American Heritage Dictionary (1982 second college ed.)).

3161. The dictionary definition of "spark plugs" is: "A device inserted in the head of an internal-combustion-engine cylinder that ignites the fuel mixture by means of an electric spark." (The American Heritage Dictionary (1982 second college ed.)).

3162. A catalytic converter is "[a] reaction chamber typically containing a finely divided platinum-iridium catalyst into which exhaust gases from an automotive engine are passed together with excess air so that carbon monoxide and hydrocarbon pollutants are oxidized to carbon dioxide and water." (The American Heritage Dictionary (1982 second college ed.)).

3163. All automobiles in California manufactured after 1975 have catalytic converters. (RX 1162A at 009; 51 FR 28114 (Sale and Use of Aftermarket Catalytic Converters, August 5, 1986); 49 FR 47550 (Catalytic Converter Testing Procedures, Criteria and Workshops; Public Workshops, December 5, 1984)).

b. To Yield a Reduced Amount of Certain Pollutants When Compared to the A/O Ave.

3164. The second portion of this claim requires it to "yield a reduced amount of NOx, CO or unburned hydrocarbons as compared to combusting fuel A/O AVE in said engine." (CX 619 at 027). By definition, both EPA and CARB reformulated gasolines were seeking to reduce emissions from an Auto/Oil Average Fuel of 1991 baseline. (Jessup, Tr. 1518-1519). **{**

}. (Engibous, Tr. 3963, *in camera*; **{** **}**, *in camera*; Eizember, Tr. 3336, *in camera*).

3165. Claim 1 of the '866 patent has the same method description as the method claims of the '567 patent. (CX 619 at 027; CX 618 at 027-028).

3166. While claims 2-4 of the '866 patent have different, more complex method descriptions than the method claims of the '567 patent, the property claims of claims 2-4 of the '866 patent are identical to claim 1 of the '866 patent. (CX 619 at 027; CX 618 at 027-028). Claim 1 of the '866 patent is the broadest claim of the patent. (CX 619 at 027-028).

4. The '521 Claims Merely Describe Making Gasoline Under the Predictive Model.

3167. The '521 patent has 58 method claims. Independent claim 1 is representative. It states:

> 1. A process comprising blending at least two hydrocarbon streams boiling in the range of 77[deg] F. to about 437[deg] F. to produce an unleaded gasoline suitable for combustion in an automotive engine, said blending being controlled in accordance with at least one mathematical equation predicting for the produced gasoline one or more pollutants selected from

the group consisting of CO, NOx, and unburned hydrocarbons emitted in the exhaust of an automobile with a catalytic converter as a function of at least two of the following properties of the produced gasoline:
(1) the Reid Vapor Pressure;
(2) the 10% D-86 distillation point;
(3) the 50% D-86 distillation point;
(4) the 90% D-86 distillation point;
(5) the aromatics content;
(6) the olefin content;
(7) the paraffin content; and
(8) the Research Octane Number,
with the produced unleaded gasoline having:
(A) a Reid Vapor Pressure less than 7.5 psi;
(B) a 10% D-86 distillation point no greater than 158[deg] F.;
(C) a 50% D-86 distillation point no greater than 215[deg] F.;
(D) a 90% D-86 distillation point no greater than 315[deg] F.;
(E) an olefin content less than 15 volume percent;
(F) a paraffin content greater than 65 volume percent;
(G) a Research Octane Number greater than 90; and
(H) an octane value of at least 87.

(CX 621 at 027).

3168. The method described in claim one is for producing gasoline by blending at least two hydrocarbon-containing streams boiling in the range of 77 F to about 437 F. As stated above, gasoline is typically produced by blending at least two hydrocarbon-containing streams. (CCPF ¶ ¶ 3134-3139).

3169. Virtually any of the hydrocarbon streams being blended to make gasoline boil in the range of 77 F to 437 F. Similarly, William Leffler's *Petroleum Refining in Nontechnical Language* defines gasoline as "a light petroleum product in the range of approximately 80 to 400 degrees F for use in spark-ignited internal combustion engines." (RX 922 at 247; Eskew, Tr. 2829-2830). The gasoline produced is for an automobile.

3170. Unocal's patent counsel, Mr. Wirzbicki, testified that this claim "covers a method in which a predictive model is used" to produce the gasoline described in the claim. (Wirzbicki, Tr. 1135).

3171. According to Unocal's own technical expert: "The predictive model adopted by CARB in June 1994 ("PM2") is a spreadsheet containing equations showing the effects of oxygen, T-50, T-90, olefins, aromatics, sulfur and benzene using the flat or average limits of the reference fuel in the CARB regulations. It compares the emissions predicted from the reference fuel gasoline parameters . . . to the emissions from the gasoline blended by a refiner. The blended gasoline must produce emissions of NOx, Total Hydrocarbon

(THC), and Potency-weighted Toxics (PT) within a tolerance of the reference fuel for each of these types of emissions to pass the emissions reduction requirements." (RX 1165A at 007 (Stellman Expert Report)).

3172. The ASTM defines "predictive model" as "a set of three equations developed by CARB which predicts the change in exhaust hydrocarbon emissions, exhaust emissions or oxides of nitrogen, and the combined exhaust emissions of four toxic air contaminants." The equations are mathematical and emissions are predicted as a function of the properties of gasoline. Properties in the predictive model include RVP, olefins, aromatics, T50, T90, and sulfur. (Eskew, Tr. 2864). Use of the predictive model would satisfy the requirements of the '521 process elements. (CX 621 at 027).

3173. **{**

}. (Lieder, Tr. 4782, *in camera*; Simonson, Tr. 6049, 6050, *in camera*; Eizember, Tr. 3335, *in camera*).

G. California Refiners as a Whole Cannot Avoid the Unocal Patents.

3174. **{**

}. (Shapiro, Tr. 7206, *in camera*).

3175. **{**

}. (Shapiro, Tr. 7216, *in camera*; CCPF ¶ ¶ 3253-3448).

3176. **{**

}. (Shapiro, Tr. 7216-7217, *in camera*).

3177. Dr. Teece admitted that the fact that California refiners are not blending around Unocal's patents "suggests that refineries believed it is difficult or non-economic to reduce their rates of infringement. The fact that other firms are infringing so extensively indicates that the blend-around alternative is not likely to have been the lowest-cost alternative; economists routinely draw this sort of inference." (CX 1346 at 024).

3178. As Unocal's Dr. Teece admits, the "data showing high historical infringement rates indicates that it is not simple or cheap to avoid producing infringing gasoline." (Teece, Tr. 7697; CX 1346 at 021).

3179. **{**

}. (Shapiro, Tr. 7216-7217, *in camera*).

3180. Similarly, Unocal CEO Charles Williamson was told paying license fees on production of CARB-compliant summertime RFG was more cost-effective for refiners than attempting to blend around Unocal's RFG patents, paying infringement penalties, or using alternative methods to meet CARB emission requirements. (CX 7072 (Williamson, Dep. at 41)).

3181. **{**

}. (Shapiro, Tr. 7217, *in camera*).

3182. Unocal's top executives agree. Unocal CEO, Charles Williamson, declared in a March 29, 2001 press release, "If it were possible for refiners or blenders to blend around our patented formulations for less than a penny a gallon on a practical, sustained basis, we wouldn't expect them to license with us...They would choose not to infringe. Otherwise, it seems to us that reasonable business people would choose to avoid willfully infringing our patents and decide to take the course that is both economic and ethical—license." (CX 2006 at 001).

3183. As Timothy Ling, Unocal's Chief Operating Officer at the time, publicly stated in 2001, "Every refiner will be different. There are some that can blend around for less than a penny, so they're obviously not going to come in for less than a penny, but there are some that can't." (CX 534 at 002).

1. Unocal Concedes that Refiners Can Never Avoid the Patents All of the Time.

3184. **{**

}.

(Stellman, Tr. 8104-8105, *in camera*). **{**

}. (Sarna, Tr. 6258, *in camera*)

3185. As Unocal explained during the '393 litigation, in considering the '393 patent as

disclaimed (and as such, which had claims that were much less broad than the claims of the five patents relevant to this case): "Unocal will thus establish at trial that the hypothetical negotiators would have concluded in the spring of 1995 that: 1) it was possible to produce non-infringing CARB II gasoline some of the time; but, 2) it was not possible to produce non-infringing CARB II gasoline all of the time. In short, the hypothetical negotiators would conclude that the Plaintiffs could not completely and consistently avoid producing infringing gasoline." (CX 1323 at 054). Unocal was successful in establishing this fact at trial, and won a 5.75 cents per gallon judgment as a result. (CX 1720A at0 24 (Shapiro Expert Report)).

3186. Because it is not possible to produce CARB-compliant summertime RFG that always avoids infringement of Unocal's RFG patents, refiners must take a license from Unocal. As Unocal's economic expert, Dr. Teece, testified during the '393 trial: "[T]he problem is that the licensees, the potential licensees, know that they are going to be making some infringing gasoline. So they have either got to take a license or they have got to do something to stop the infringement." (CX 1336 at 012 (Dr. Teece's Trial Testimony)).

3187. Unocal's expert Dr. Teece explained that Unocal's own engineers recognized the difficulty of operating in the tight blend-space created by the intersection of Unocal's patents and the CARB regulations. (Teece, Tr. 7661-7662).

2. As a Matter of Chemistry, Refiners Cannot Avoid the Unocal Patents to Any Significant Extent.

3188. Indeed, the weight of the evidence demonstrates that refiners producing CARB summertime gasoline cannot avoid the Unocal patents to any significant extent. (CCPF ¶ ¶ 3253-3448, 3546-3626).

3189. Unocal's pending patent claims recited limits for five of those eight properties, including T50. CARB regulates Reid Vapor Pressure, Sulfur, Benzene, Olefins, T50, T90, aromatics and oxygen. (CX1709 at 015). The Unocal patents include claims that have property limitations for Reid Vapor Pressure, Olefins, T50, T90, and aromatics. (RX 1165A at 012; CX 620 at 028-029).

3190. **{**

}. (Sarna, Tr. 6257, *in camera*; RX 1154 at 040 (Sarna Expert Report), *in camera*; RX 1154A at 005 (Sarna Expert Report)).

3191. Mr. Sarna is currently the manager of the Long Beach, California office of the consulting

firm Purvin & Gertz, Inc. (RX 1154A at 044 (Sarna Expert Report); 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 (Sarna Expert Report)). Mr. Sarna has been employed at Purvin & Gertz for fourteen years. (Sarna, Tr. 6093).

3192. Prior to being employed by Purvin and Gertz, Mr. Sarna was employed at UOP, a petroleum industry technology firm. Mr. Sarna began his employment at UOP in 1976. (Sarna, Tr. 6093-6094; RX 1154A at 044 (Sarna Expert Report)).

3193. Mr. Sarna has been employed in positions relating to the oil and gas industry for 28 years. (Sarna, Tr. 6093; RX 1154A at 044 (Sarna Expert Report)). Mr. Sarna holds a bachelor of science degree in chemical engineering from Michigan Technological University. He also completed the process engineering design school given by UOP during his employment there. (Sarna, Tr. 6093-6094).

3194. While at UOP, Mr. Sarna worked on the development of various refinery processes, including reforming, hydrocracking, hydrotreating and aromatics production processes, including the manufacture of the catalysts used in those processes. (Sarna, Tr. 6094-6095).

3195. During his time at UOP, Mr. Sarna had to learn "everything", all of the details about the design and operation of the plants because of UOP's guaranteed "fix-it" policy. (Sarna, Tr. 6096). Mr. Sarna often worked on-site at refineries. His assignments ranged from one day to a year and a half working in a refinery. (Sarna, Tr. 6097).

3196. Mr. Sarna has worked in many different refineries not only in the United States, but in 30 foreign countries as well. (Sarna, Tr. 6097).

3197. Mr. Sarna has intimate knowledge of numerous different refinery units and how these units interact in the refining process. Such knowledge was an essential requirement of Mr. Sarna's responsibilities of ensuring proper function of the refineries for which he consulted. (Sarna, Tr. 6098).

3198. During his time at UOP, Mr. Sarna worked at refineries in California. (Sarna, Tr. 6098).

3199. While at UOP, Mr. Sarna's job responsibilities included writing operating manuals, both general manuals and "valve-by-valve" manuals, for specific refineries. Valve-by-valve manuals were detailed enough to explain every refining procedure undertaken at a refinery by valve number and command. (Sarna, Tr. 6098-6099).

3200. When Mr. Sarna left UOP, he held the highest position in the service department, Senior Chief Technical Adviser. In this role, Mr. Sarna was given exceedingly complicated assignments, including large projects with multiple refining units and projects that

involved disputes between refiners and UOP. (Sarna, Tr. 6101).

3201. Mr. Sarna has worked for all of the world's 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).

3202. **{**

}. (Sarna, Tr. 6257, *in camera*; RX 1154 at 040 (Sarna Expert Report), *in camera*).

3203. Mr. Sarna determined that "California refiners as a whole are not able to blend around the numerical limitations of the Unocal patents to any significant extent." (Sarna, Tr. 6134). A "significant extent" refers to the ability to blend around the numerical limitations of Unocal's RFG patents at least 20 or 30 percent of the time. (Sarna, Tr. 6138, 6435).

3204. The business of oil refining does not provide the flexibility and control required to blend around the Unocal patents. (RX 1154A at 005 (Sarna Expert Report)).

3205. California gasoline is the most difficult gasoline anywhere in the world to blend. (Sarna, Tr. 6141). The "challenges that California refiners have are a quantum difference than anywhere else." (Sarna, Tr. 6167); *see also* (Engibous, Tr. 3889; Eskew, Tr. 2874). Unocal's technical expert Mr. Stellman, formerly of PACE Consultants, agrees that blending under the CARB Phase 2 regulations is difficult. (CX 758 at 036; CX 1554 at 021).

3206. The reason that it is so difficult to blend California gasoline is because refiners have to meet very stringent RVP, sulfur, aromatics, olefins, benzene, T50 distillation temperature, T90, and oxygenate specifications. (Sarna, Tr. 6141-6142; RX 1154A at 005 (Sarna Expert Report)).

3207. Producing CARB-compliant summertime RFG and at the same time blending around Unocal's RFG patents places an additional challenge of meeting minimum constraints on several other parameters as well as the maxims set by the regulations. (RX 1154A at 005 (Sarna Expert Report)).

3208. In order to produce CARB-compliant summertime RFG that does not infringe the Unocal patents, a refiner needs to tightly control multiple parameters within a very narrow range as close to the minimum value for the parameters as possible. It is necessary to do this to avoid having to lower other gasoline parameters beyond what a refinery is capable of achieving in order to offset emissions calculated using the CARB predictive model. (RX

1154A at 005-006 (Sarna Expert Report)).

3209. As Mr. Sarna explained, there is "a very narrow window in which a refiner can produce CARB Phase 2 summer gasoline and at the same time avoid the numerical limitations of the patents." (Sarna, Tr. 6132-6133). It is nearly impossible to produce gasoline within a narrow range for several properties on a continuous basis. (RX 1154A at 006 (Sarna Expert Report)).

3210. One of the difficulties in producing CARB-compliant summertime RFG while blending around Unocal's RFG patents relates to variability within each refinery. Gasoline, like the crude oil that it is produced from, is not uniform in composition, and there is wide variation in the properties of each batch of gasoline produced in a refinery. (RX 1154A at 006 (Sarna Expert Report); Sarna, Tr. 6165). Gasoline qualities vary because refineries do not all process the same crude oils or the same blends of crude oils. (Sarna, Tr. 6165). Crude oils have hundreds, if not thousands, of different compounds contained in them, so the feedstocks to the refineries are different. (Sarna, Tr. 6165).

3211. Even if the crude oil used in a refinery was of unvarying composition, a refiner still would not be able to consistently control multiple gasoline properties within narrow ranges because of other disturbances in the processing steps within a refinery. (RX 1154A at 006-007 (Sarna Expert Report)). These potential disturbances include power failures, equipment malfunctions, fouling of heat exchangers, changes in ambient conditions, changes in activity levels of catalysts, and other disturbances that are all an inherent part of refinery operations. (RX 1154A at 006-007 (Sarna Expert Report); Sarna, Tr. 6165).

3212. There are typically multiple process units within a refinery carrying out the same function, which increases the opportunity for disturbances to occur during the refining process. (RX 1154A at 007 (Sarna Expert Report)).

3213. In order to successfully blend-around Unocal's RFG patents on a consistent basis, a refiner must be able to achieve distillation temperatures (T50 and T90) and olefin concentrations consistently above the CARB Phase 2 Flat Limits, while limiting other parameters—primarily sulfur and aromatic content—to levels significantly below the allowable CARB limits. (RX 1154A at 007 (Sarna Expert Report)).

3. Only Narrow Blending Methods Exist to Avoid the Patents.

3214. **{**

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(Eskew, Tr. 2964, *in camera*; Sarna, Tr. 6154). Utilizing the analytical work of Mr. Eskew, Mr. Sarna observed that only 7.5 percent of the batches of CARB-compliant

summertime RFG produced did not overlap with the numerical property limitations listed in Unocal's RFG patents. (RX 1154A at 007 (Sarna Expert Report)).

3215. In analyzing batches of CARB-compliant summertime RFG that did not overlap the numerical property limitations of Unocal's RFG patents, Mr. Sarna concluded that California refiners used one of four blending methods to blend around the patents. (RX 1154A at 007 (Sarna Expert Report); Sarna, Tr. 6154-6156).

3216. In all of the batch data reviewed in this case, there were only four methods that refiners used to avoid the Unocal RFG patents. None of these methods provide any meaningful opportunity for California refiners as a whole to both produce CARB-compliant RFG at volumes comparable to those currently made and avoid the claims of the patents. (RX 1154A at 007 (Sarna Expert Report)).

3217. Of the batches of CARB-compliant summertime RFG that did not overlap the numerical property limitations of Unocal's RFG patents, 99.2 percent were made by two of four methods used to avoid Unocal's patent claims. (RX 1154A at 007, 026 (Sarna Expert Report)). Only three of the approximately 6200 batches of CARB-compliant summertime RFG analyzed by refining experts in this case were produced without overlapping the numerical property limitations of the Unocal RFG patents using blend-around methods other than methods "A" and "B" described in Mr. Sarna's Expert Report. (RX 1154A at 010 (Sarna Expert Report)). Mr. Sarna concluded that these three batches did not overlap Unocal's RFG patents by clearly chance occurrences, and the methods used provide no significant means of avoiding the patents. *(*RX 1154A at 010 (Sarna Expert Report)).

3218. Mr. Sarna analyzed the two proven methods used by refiners for patent avoidance. Method A required a T50 temperature greater than 210 degrees Fahrenheit and an olefins concentration on a hydrocarbon-only basis greater than or equal to 8 percent, a T90 temperature greater than 315, and a paraffins concentration less than 80 percent. (Sarna, Tr. 6136; RX 1154A at 026 (Sarna Expert Report)).

3219. Method B required a T50 temperature of greater than 215 degrees and a paraffins concentration less than 80 percent. (Sarna, Tr. 6136; RX 1154A at 026 (Sarna Expert Report)).

3220. **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*). **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3221. There were no other proven methods to avoid the Unocal patents. (RX 1154A at 010 (Sarna Expert Report)).

3222. If a refiner is using only the flat limits to comply with the specifications for CARB Phase 2 gasoline, it's impossible to blend around the numerical limitations of the patent. (Sarna, Tr. 6144). Method A requires a T50 temperature greater than 210 degrees, while Method B 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 Expert Report); Sarna, Tr. 6349).

3223. Method A also requires a T90 temperature of greater than 315 degrees. The CARB flat limit is 300 degrees. (RX 1154A at 026, 029 (Sarna Expert Report)).

3224. Method A also requires an olefin level of greater than or equal to 8 percent. The CARB flat limit is 6 percent. (RX 1154A at 026, 029 (Sarna Expert Report); Sarna, Tr. 6349).

3225. Therefore, in order to even theoretically avoid the Unocal patents, a refiner must use the predictive model and offset high T50, T90 and olefin levels needed for patent avoidance with very low levels of other parameters. (Sarna, Tr. 6144-6145).

3226. **{**

}. (RX 1165 at 050 (Stellman Expert Report), *in camera*). **{**

}. (RX 1165 at 050 (Stellman Expert Report), *in camera*). **{**

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

3227. In order to consistently avoid the patents, California refiners as a whole would have to significantly change their gasoline pools to raise T50 and olefin levels. However, a refinery can only blend those components that it has available to it or can purchase at a reasonable cost. (RX 1154A at 006 (Sarna Expert Report)).

3228. The Predictive Model allows for offsets of parameters. (RX 1154A at 006 (Sarna Expert Report)). However, the only two remaining offsets are aromatic levels and sulfur levels. For example, one cannot offset a high T50 by lowering the T90, because, as a matter of chemistry, the practical steps available to maintain a high T50 also have the effect of raising the T90. (RX 1154A at 006 (Sarna Expert Report)).

3229. The blending components available in the refinery that have a high T50 temperature are

also the ones that have the highest aromatics concentrations and high T90 temperature, namely heavy reformate and heavy FCC gasoline. (RX 1154A at 006 (Sarna Expert Report)). Heavy FCC gasoline also has high levels of sulfur. (RX 1154A at 006 (Sarna Expert Report)). Adding incremental volumes of these components increases the gasoline aromatics concentration and T90 temperature in addition to the T50, which makes it difficult to achieve equivalent emissions using the predictive model. (RX 1154A at 006 (Sarna Expert Report)).

3230. 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 (Sarna Expert Report)); s*ee also* (CX 7078 (Youngman, Dep. at 98-99)).

3231. The slope of the T50 and T90 curves are very steep at one end but not steep at the other end. Indeed, the emissions response with varying T50 for purposes of the predictive model is not linear, but rather is exponential. (RX 1154A at 006 (Sarna Expert Report)).

3232. However, 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).

3233. The average sulfur level of CARB gasoline is already lower than the flat limit. (RX 1154A at 006 (Sarna Expert Report)).

3234. Likewise, under the predictive model, offsetting aromatics is not practical to achieve in a refinery under normal circumstances when the T50 temperature is above 210 ˚F and much more so when it is above 215 ˚F. (RX 1154A at 006 (Sarna Expert Report)).

3235. In order for a refiner to blend gasoline with a T50 temperature above 210 degrees, the refiner has to offset the higher emissions caused by the high T50 temperature with reduced aromatics and sulfur. (Sarna, Tr. 6162). Therefore, non-overlapping batches are "mostly all that have aromatics concentrations below 20 percent." (Sarna, Tr. 6162).

3236. The actual batch data from California refineries demonstrates that most of the gasoline produced was between 20 and 34-35 percent aromatics. (Sarna, Tr. 6163; CX 7102 (demonstrative purposes only)).

3237. Having gasoline below 20 percent aromatics is "very unusual" because "most refiners aren't able to make salable product" that has a "very low aromatics concentration." (Sarna, Tr. 6163). This is because aromatics are typically the compounds that have the highest octane, and octane is a required performance specification in gasoline. (Sarna,

Tr. 6163-6164).

3238. **{**

}. (Lieder, Tr. 4849, *in camera*)**.**

3239. **{**

}. (Sarna, Tr. 6292, *in camera*; CX 1797 at 006 (Sarna Expert Rebuttal Report), *in camera;* RX 1154A at 026 (Sarna Expert Report)).

3240. **{**

}. (Sarna, Tr. 6292, *in camera*; CX 1797 at 006 (Sarna Expert Rebuttal Report), *in camera*).

3241. A refiner cannot increase olefins by increasing the feed hydrotreating reactor temperature for any sustained period of time. This is because by simply increasing the temperature of the reactor in the feed hydrotreater, the catalyst will deactivate at a very accelerated rate and it will have to be shut down for either regeneration or replacement. (Sarna, Tr. 6294-6295, *in camera*).

3242. At the same time, a refiner must maintain these levels in a narrow band, which is very difficult to do. Method A requires a T50 temperature greater than 210 degrees, an olefin level of greater than 8 percent and a T90 of greater than 315 degrees. The CARB cap for T50 is 220 degrees, for olefins is 10 percent and for T90 is 330 degrees. Therefore, in order to avoid the patents using Method A, a refiner must blend its T50 between 210 and 220 degrees, and at the same time keep its olefins between 8 and 10 percent, and at the same time keep its T90 between 315 and 330 degrees. (RX 1154A at 026, 029 (Sarna Expert Report)).

3243. **{**

}. (RX 1154A at 026, 029 (Sarna Expert Report); CX 7077C (Youngman, Dep. at 49-50, 54-55, *in camera*); CX 7078C (Youngman, Dep. at 98-99, *in camera*); Eizember, Tr. 3360, *in camera*).

3244. The actual T50 temperatures for refiners in California varied substantially, from down around 176 degrees all the way up to 220 degrees. (Sarna, Tr. 6156-6157, as illustrated by CX 7100 (demonstrative purposes only)).

3245. Under either method, T50 must be controlled in a very narrow band. Unfortunately, T50 is a difficult parameter thing to control because in most places in the world people don't control T50. (Sarna, Tr. 6142-6143). Many non-California refiners lack the precise

controls necessary to avoid the patents using distillation points. (RX 280 at 006).

3246. T50 is also difficult to control because of the variation in testing: even measuring the T50 by the ASTM D-86 method, it can vary by 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; RX 1154A at 006 (Sarna Expert Report)).

3247. Indeed, 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).

3248. 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 ." (CX 1332 at 004).

3249. 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).

3250. Unocal's economic expert also argued that refiners could not blend around. Dr. Teece explained that refiners could not blend within the narrow range between 210 and 220 degrees Fahrenheit, particularly given the spread among the various points. (CX 1332 at 031 (Teece Trial Testimony)).

3251. Olefin levels vary significantly as well. The actual olefins temperatures for refiners in California varied substantially, from approximately one third of one percent up to about 11 percent on a hydrocarbon only basis. (Sarna, Tr. 6158; CX 7101 (demonstrative purposes only)). Indeed, olefin levels vary widely among and within refineries. (Sarna, Tr. 6160).

3252. According to Unocal's own economic expert, because of the inherent variability of gasoline refining, "even if refiners take steps to avoid the Unocal patents, it still can be the case that some batches will infringe." (RX 1162A at 051; Teece, Tr. 7711). Because of this, refiners would need to take a license under the Unocal patents to deal with the "prospect of having to use Unocal's patented technology on an infrequent or episodic basis." (RX 1162A at 051; Teece, Tr. 7711).

a. Refiners Uniformly Testified That They Cannot Avoid the Patents.

3253. Representatives of nine of the 13 refineries in California testified in this case, either by deposition or live at trial. Each witness buttressed the conclusion that California refiners are not able to avoid the Unocal patents. (CCPF ¶ ¶ 3174-3496).

i. BP

3254. The Carson Refinery, once referred to as the Los Angeles Refinery while owned wholly by ARCO, is the only BP refinery that produces CARB summertime gasoline sold in California. (CX 7078 (Youngman, Dep. at 12)).

3255. At trial, two BP/ARCO witnesses offered testimony regarding the Carson refinery's ability to avoid the patents. These two witnesses were Michael Hoffman, who testified live, and Gary Youngman, who testified by deposition.

3256. Since the time that BP purchased ARCO in 2000, Mr. Hoffman has been Group Vice President of BP's Global Refinery Operations. (Hoffman, Tr. 4867, 4869). Prior to that, Mr. Hoffman worked for ARCO for 20 years in various engineering and blending positions. (Hoffman, Tr. 4867-4872). Mr. Hoffman is trained as a chemical engineer, and has served as the Refinery Manager for ARCO's Carson Refinery in Los Angeles, California. (Hoffman, Tr. 4869).

3257. Mr. Youngman also has a Bachelor of Science Degree in Chemical Engineering, and has been employed in the refining industry since 1968-- nearly 37 years. (RX 92 at 002; CX 7077 (Youngman, Dep. at 13)). Since 1998, Mr. Youngman has been Lead Engineer in the Optimization Group at the Carson Refinery. (RX 92 at 002; CX 7078 (Youngman, Dep. at 5); CX 7077 (Youngman, Dep. at 9, 14, 17)). Mr. Youngman's job responsibilities include keeping up to date with clean fuels regulations and aiding in the development of a refinery strategy to comply with regulations. (CX 7077 (Youngman, Dep. at 17); RX 92 at 002). Mr. Youngman also testified as BP/ARCO's corporate representative on issues regarding blending around the Unocal patent portfolio. (RX 451 at 003; CX 7078 (Youngman, Dep. at 6)).

3258. **{**

}. (Hoffman, Tr. 5018-5019, *in camera*; CX 7078C (Youngman, Dep. at 101-102, *in camera*, 104, *in camera*)).

3259. **{**

}. (Hoffman, Tr. 5021, *in camera*). **{**

}. (Hoffman, Tr. 5056, *in camera*).

3260. **{**

}. (CX 7078C (Youngman, Dep. at 53-54, *in camera*)).

{

}. (Hoffman, Tr. 5009-5010, *in camera*).

3261. There have been a number of studies conducted relating to Carson's ability to avoid the numerical limitations of Unocal's patents. In 1998 and 1999 an initial analysis was done to determine ARCO's ability to reduce overlap around the blending rules of the first

patents. When ARCO became a part of BP, another study was conducted for all of the U.S. refiners through its technical center. A further study was conducted to support the refinery manager meeting conducted by Hoffman in 2001. (Hoffman, Tr. 4994-4995).

3262. **{**

}. (Hoffman, Tr. 5010-5012, *in camera*).

3263. BP remains unaware of 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)).

3264. **{**

}. (CX 7077 (Youngman, Dep. at 49-50); CX 7078C (Youngman, Dep. at 56, *in camera*)).

3265. **{**

}. (CX 7077C (Youngman, Dep. at 49-50, 54-55, *in camera*); CX7078C (Youngman, Dep. at 98-99, *in camera*)).

3266. **{**

}. (CX 7077C (Youngman, Dep. at 49-50, 54-55, *in camera*); CX7078C (Youngman, Dep. at 98-99, *in camera*)).

3267. **{**

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

}. (RX 1165 at 50, *in camera*).

3268. BP believes that it is difficult to blend in the range between 215 and 220 degrees because the T50 curve in the CARB predictive model is "steep," meaning the curve increases a lot as the steep end goes up. (CX 7078 (Youngman, Dep. at 98-99)). In other words, there are substantial offsets required in order to blend in the required range.

3269. **{**

}. (CX 7078C (Youngman, Dep. at 70, *in camera*)).

3270. **{**

}. (CX 7078C (Youngman, Dep. at 70, *in camera*, 73-74, *in camera*)).

3271. **{**

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

3272. **{**

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

3273. **{**

}. (CX 7078C (Youngman, Dep. at 75, *in camera*)).

3274. **{**

}. (Hoffman, Tr. 5019, *in camera*).

3275. **{**

}. (Hoffman, Tr. 5019, *in camera*; CX 7077C (Youngman, Dep. at 56-57, *in camera*); CX 7078C (Youngman, Dep. at 79, *in camera*)).

3276. **{**

}. (Hoffman, Tr. 5019-5020, *in camera*).

3277. **{**

}. (Hoffman, Tr. 5020, *in camera*).

3278. **{**

}. (Hoffman, Tr. 5020, *in camera*).

3279. **{**

}. (CX 7077C (Youngman, Dep. at 51-52, 54-55, *in camera*)).

ii. Chevron

3280. Chevron has two refineries in California: one at Richmond in Northern California and one at El Segundo in Southern California. (Engibous, Tr. 3886).

3281. At trial, Mr. William Engibous of Chevron testified to Chevron's inability to blend around the Unocal patents. Mr. Engibous is trained as a chemical engineer, and has worked for Chevron in various refinery planning, blending and engineering positions for 25 years. He has been a manager at both Chevron California refineries, and has worked in these refineries for 12 years. (Engibous, Tr. 3884-3885, Tr. 3892-3893). Mr. Engibous is Chevron's corporate representative on issues regarding blending around the Unocal patent portfolio. (Engibous, Tr. 3926; RX 105 at 003-004).

3282. **{**

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(Engibous, Tr. 3963, *in camera*).

3283. **{**

}. (Engibous, Tr. 3956, *in camera*).

3284. **{**

}. (Engibous, Tr. 3957, *in camera*).

3285. **{**

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(Engibous, Tr. 3967, *in camera*).

3286. **{**

}. (Engibous, Tr. 3972-3973, *in camera*). **{**

}. (Engibous, Tr. 4056-4057, *in camera*).

3287. **{**

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

3288. **{**

}.

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

3289. **{**

}. (Engibous, Tr. 4003-4005, *in camera*).

3290. **{**

}. (Engibous, Tr. 3971, *in camera*).

3291. Chevron launched its '126 patent study after it had a better understanding of the Unocal '126 patent claims. (Gyorfi, Tr. 5308). Chevron gathered its best operational and analytical minds to see if there was a way to avoid the numerical property claims of the '126 patent. (Gyorfi, Tr. 5308).

3292. This study concluded that there were no feasible investments that could be made to avoid the numerical claims of the Unocal '126 patent. (Gyorfi, Tr. 5308-5309). Once Chevron had looked at the '126 patent and discovered that there was no way, "feasible or not", to blend around the numerical claims, it did not make any sense to spend any resources to perform a similar analysis on the other patents. (Gyorfi, Tr. 5312).

3293. The blending methods available to avoid the Unocal patents would require a major change to the refinery pool at Chevron in order to blend in that range. 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 (Sarna Expert Report)).

3294. 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 (Sarna Expert Report)). To avoid the patents, Chevron would have to blend all of its gasoline in the range between 215 degrees and the CARB cap of 220 degrees. (Sarna, Tr. 6136; RX 1154A at 026, 029 (Sarna Expert Report)).

3295. **{**

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

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

3296. **{**

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

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

3297. **{**

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

3298. **{**

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

iii. Shell.

3299. Shell Oil Company currently operates three refineries that regularly produce CARB gasoline: Martinez in Northern California, Wilmington (also known as Los Angeles) in Southern California, and Bakersfield in the Central Valley of California. (Lieder, Tr. 4737-4738).

3300. At trial, Dr. Charles Lieder of Shell testified regarding Shell's inability to blend around the Unocal patents. In addition, Mark Boone, Robert Millar, Bruce Irion and R. Steven Hancock gave testimony by deposition.

3301. Dr. Lieder holds a Ph.D. in chemistry from Stanford University, and has worked for Shell Oil Company since 1974. (Lieder, Tr. 4670, 4672). During his tenure at Shell, Dr. Lieder worked in Shell's Chemical Engineering Department, in Shell Chemicals, in a Shell Refinery in Los Angeles, and as a fuels blending technical advisor. (Lieder, Tr. 4672-4673). Since 1990, Dr. Lieder has served as a Fuels Blending Technical Adviser, with primary job responsibilities that include instructing and guiding blenders as to the legal and business specifications to which they must blend gasoline on a daily basis at Shell's United States refineries. Dr. Lieder's responsibilities also include developing new methods and techniques to improve refining operations. (Lieder, Tr. 4671-4672, 4675).

3302. **{**

}. (Lieder, Tr. 4783-4784, *in camera*).

3303. Mr. Boone has a Bachelor of Science Degree in Chemical Engineering, and has worked

at the Shell Bakersfield Refinery since December 29, 1980. (RX 91 at 002). Mr. Boone is currently employed as a manager of Shell Oil Products U.S.' Bakersfield Refinery and is responsible for leading the short term planning group for both the Bakersfield and Martinez Refineries. (CX7043 (Boone, Dep. at 6, 9, 18); RX 91 at 002). From 1985 to 2000, Mr. Boone served as an Operations Planner at the Bakersfield Refinery, with responsibilities to oversee and plan operations activities. (CX7043 (Boone, Dep. at 14-15); RX 91 at 002).

3304. Mr. Millar has a Bachelor of Science Degree in Chemical Engineering, and has been employed by Shell or parts of its predecessor companies since 1980. Mr. Millar has worked at the Shell Los Angeles/Wilmington refinery since 1996. Mr. Millar has responsibilities for operations planning at the Shell Los Angeles/Wilmington refinery. (RX 85 at 001; CX 7058 (Millar, Dep. at 5)).

3305. Mr. Irion graduated with a Bachelor of Science Degree in Chemical Engineering, and has been working for Shell Oil at the Martinez Refinery since 1990. (CX 7051 (Irion, Dep. at 5); RX 215 at 002).

3306. Among his different capacities while with Shell, Mr. Irion served as Manager of Strategic Planning for the Martinez Refinery till January 2000, a job in which he developed business plans, monitored changing fuel regulations, looked at economics for proposed refinery modification, and completed other tasks associated with long-term planning for the Refinery. (CX 7051 (Irion, Dep. at 8-9)). Part of Mr. Irion's job responsibilities from 1994 to 2000 included coordinating gasoline implementation and compliance issues for the Martinez Refinery, which consisted of putting into place procedures and practices to ensure that the refinery complied with EPA and CARB regulations for reformulated gasoline. (CX 7051 (Irion, Dep. at 10); RX 215 at 002).

3307. Mr. Irion is currently the Manager of Plan and Improve for Shell's Martinez Refinery, with responsibilities to manage the Long-term Planning Group and the Process Engineering Projects Improve Group, which oversees process design for major projects at the Martinez Refinery. (CX 7051 (Irion, Dep. at 6)).

3308. Mr. Hancock received a Bachelor of Science Degree in Chemical Engineering in 1966, and was employed by Shell or the prior owners of its refineries starting in 1967 (except for a tour of duty with the U.S. Navy in 1969-70). (RX 200A at 002; CX 7047 (Hancock, Dep. at 7)).

3309. Mr. Hancock has served in a large number of engineering and blending positions, including Chief Process Engineer at Texaco's Los Angeles Refinery and 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 was a joint venture between Shell, Texaco, and Saudi Aramco. (RX

200A at 002; CX 7047 (Hancock, Dep. at 5)).

3310. As Manager Refinery Products Issues, Mr. Hancock was designated by Equiva management to serve as the contact engineer for intellectual property issues, including issues related to Unocal's reformulated gasoline patents. (CX 7047 (Hancock Dep. at 22)).

3311. {
}. (Lieder, Tr. 4781, *in camera*).

3312. {
}. (Lieder, Tr. 4781, *in camera*).

3313. {
}. (Lieder, Tr. 4781, *in camera*).

3314. {
}. (Lieder, Tr. 4781, *in camera*). {
}. (Lieder, Tr. 4782, *in camera*).

3315. {
}. (Lieder, Tr. 4781, *in camera*).

3316. {
}. (Lieder, Tr. 4783, *in camera*). **{**
}. (Lieder, Tr. 4783-4784, *in camera*).

3317. {
}. (Lieder, Tr. 4788-4789, *in camera*). **{**
}. (Lieder, Tr. 4789, *in camera*). **{**
}. (Lieder, Tr. 4789, *in camera*). **{**
}. (Lieder, Tr. 4790, *in camera*).

3318. {

}. (Lieder, Tr. 4789, *in camera*). **{**

}. (Lieder, Tr. 4789, *in camera*). **{**

}. (Lieder, Tr. 4789, *in camera*).

3319. {

}. (Lieder, Tr. 4789, *in camera*). **{**

}. (Lieder, Tr. 4789, *in camera*).

3320. {

}. (Lieder, Tr. 4791, *in camera*).

3321. As of September 2003, the Los Angeles and Bakersfield Refineries in their current configurations with all of these modifications and latest equipment changes can still not blend around the 700 plus claims of the five Unocal patents and maintain production required by the market. (CX 7048 (Hancock, Dep. at 255-256)).

3322. 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 or effectiveness." (CX 7048 (Hancock, Dep. at 255-256)).

3323. 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)).

3324. **{**

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

3325. **{**

}. (Lieder, Tr. 4794-4795, *in camera*)**. {**

}. (Lieder, Tr. 4794-4795, *in camera*).

3326. **{** **}.** (RX 1165 at 050, *in camera*). **{** **}.** (RX 1165 at 050, *in camera*).

3327. **{** **}.** (RX 1165 at 050, *in camera*).

3328. Shell has concluded that the Martinez Refinery "cannot blend gasoline to meet the CARB Phase 2 specifications and simultaneously avoid matching any of the numerical property ranges of any of the claims" of the Unocal patents. (CX 7047 (Hancock, Dep. at 127)).

3329. The Martinez Refinery cannot avoid matching the claims of any of the five Unocal patents. (CX 7051 (Irion, Dep. at 59-60, 83)).

3330. It is not possible for Shell to do a cost analysis of blend around at the Martinez Refinery because it is unable to blend around. "I don't believe we can blend around them, so it's not a matter of cost." (CX 7051 (Irion, Dep. at 61)).

3331. **{** **}.** (RX 1165 at 050, *in camera*). **{** **}.** (RX 1165 at 50, *in camera*).

3332. **{** **}.** (RX 1165 at 050, *in camera*).

3333. Shell has concluded the Los Angeles Refinery "cannot produce gasoline that complies with CARB Phase 2 regulations and avoids matching the property ranges" of the '521, '567, '866, and '126 Unocal patents. (CX 7047 (Hancock, Dep. at 130-131)).

3334. It is very difficult to blend around the claims of the '866 and '521 Unocal RFG patents and produce the volumes of gasoline that Shell Wilmington historically produces. (CX7058 (Millar, Dep. at 55-56)).

3335. In 1998, the capital project was implemented to assist Shell in blending around both the '393 patent and the '866 patent. This "became prohibitive" because the "blending window" for the '866 patent was so tight that the volumes of gasoline that could be produced "would be substantially reduced." (CX7058 (Millar, Dep. at 38-39)).

3336. Because the "blending window" of the Unocal '866 patent is "so difficult," Wilmington's production of California gasoline would have been "substantially reduced," to avoid the claims of the '866 patent. (CX7058 (Millar, Dep. at 44)).

3337. At the Wilmington Refinery, Shell did not have the ability to blend fuels that avoided the claims of the '866 patent at the volumes needed to "satisfy" Shell's market share and "remain viable" prior to the implementation of the 1998 capital project. (CX7058 (Millar, Dep. at 26)).

3338. The "feasibility range" in which California gasoline that did not match the Unocal '866 patent could be made had "substantially narrowed" because "the numerical claims of the '866 patent substantially reduced that window" in the blending rules for CARB-compliant gasoline. (CX7058 (Millar, Dep. at 44-45)).

3339. The Unocal '521 patent is much more difficult to blend around than the Unocal '866 patent or the '393 patent. If Wilmington were to consistently blend around the '521 patent, the amount of gasoline produced would have been "substantially reduced." (CX7058 (Millar, Dep. at 50)).

3340. **{**

}. (Lieder, Tr. 4795, *in camera*). **{**

}. (Lieder, Tr. 4795, *in camera*).

3341. **{** **}.** (RX 1165 at 050, *in camera*). **{**

}. (RX 1165 at 50, *in camera*).

3342. **{**

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

3343. The Texaco (now Shell) Bakersfield refinery cannot avoid the Unocal patents because the Bakersfield aromatics are very high and the refinery has virtually no olefins. The only strategy available to Bakersfield is to operate at a T50 temperature above 215 degrees, and in order to do that they would have had to lower the aromatics concentration to an impractical level. (Sarna, Tr. 6343-6344, as illustrated by CX 7119).

3344. Mark Boone and Mark Georgen "did a short analysis" of blending around all five Unocal RFG patents at the Bakersfield Refinery in 2000, concluding that "for the Bakersfield plant, we couldn't find any way to blend around all five patents." (CX 7043 (Boone, Dep. at 65-66)).

3345. Mark Boone and Mark Georgen's analysis of the Bakersfield Refinery's ability to blend around the five Unocal RFG patents led them to the "fairly obvious" conclusion that "there was no way around" the five patents and they were "essentially confirming [their]

thoughts when [they] saw... all the values or the claims in all the other patents." (CX 7043 (Boone, Dep. at 66)).

3346. The Bakersfield Refinery could not blend around the five Unocal RFG patents even if it employed new technology at the refinery. (CX 7043 (Boone, Dep. at 67)).

3347. The Bakersfield Refinery cannot routinely, "day in, day out" "blend around all the claims" of the '521, '567, '866, and '126 Unocal patents. (CX 7047 (Hancock, Dep. at 130)).

3348. Since the Bakersfield Refinery "felt there wasn't anything [it] could do to blend around" the Unocal patents, with the exception of the '393 patent, it did not invest in refinery modifications to blend around the patents. (CX 7043 (Boone, Dep. at 67)).

3349. Refinery modifications made at the Bakersfield Refinery since 1997 to conform to CARB Phase 3 specifications have not assisted the refinery in blending around any of the patents. (CX 7043 (Boone, Dep. at 68)).

3350. **{**

}. (Lieder, Tr. 4796, *in camera*).

3351. **{**

}. (Lieder, Tr. 4796, *in camera*).

3352. **{**

}. (Lieder, Tr. 4796-4797, *in camera*).

3353. **{**

}. (Lieder, Tr. 4797, *in camera*)**.**

3354. **{**

}. (Lieder, Tr. 4797, *in camera*).

3355. **{**

}. (Lieder, Tr. 4797, *in camera*).

3356. **{**

}. (Lieder, Tr. 4798, *in camera*).

3357. **{**

}. (Lieder, Tr. 4798, *in camera*).

3358. **{** **}.** (Lieder, Tr. 4798, *in camera*).
{

}. (Lieder, Tr. 4798, *in camera*).

3359. **{**

}. (Lieder, Tr. 4799, *in camera*).

3360. **{**

}. (Lieder, Tr. 4799, *in camera*).

3361. **{**

}. (Lieder, Tr. 4799, *in camera*).

3362. **{**

}. (Lieder, Tr. 4799, *in camera*).

3363. **{**

}.

(Lieder, Tr. 4799, *in camera*).

3364. **{**

}. (Lieder, Tr. 4799, *in camera*).

3365. **{**

}. (Lieder, Tr. 4799, *in camera*).

3366. **{**

}. (Lieder, Tr. 4799, *in camera*).

3367. **{**
}. (Lieder, Tr. 4799-4800, *in camera*).

3368. **{**
}. (Lieder, Tr. 4800, *in camera*).

3369. **{**
}. (Lieder, Tr. 4800, *in camera*).

3370. **{**
}. (Lieder, Tr. 4800, *in camera*).

3371. **{** **}.** (Lieder, Tr. 4800, *in camera*).

3372. **{**
}. (Lieder, Tr. 4800, *in camera*).

3373. **{**
}. (Lieder, Tr. 4800, *in camera*).

3374. **{**
}. (Lieder, Tr. 4800-4801, *in camera*).

3375. **{**
}. (Lieder, Tr. 4801, *in camera*).

3376. **{** **}.** (Lieder, Tr. 4801, *in camera*).

3377. **{**
}. (Lieder, Tr. 4801, *in camera*).

3378. **{**
}. (Lieder, Tr. 4801, *in camera*).

3379. **{**
}. (Lieder, Tr. 4802, *in camera*).

3380. **{**

}. (Lieder, Tr. 4802, *in camera*).

3381. **{**

}. (Lieder, Tr. 4802, *in camera*).

3382. **{**

}. (Lieder, Tr. 4802, *in camera*).

3383. **{**

}. (CX 7048C (Hancock, Dep. at 212, *in camera*)).

3384. **{**

}. (CX 7048C (Hancock, Dep. at 212, *in camera*)).

3385. **{**

}. (CX 7048C (Hancock, Dep. at 212, *in camera*)).

3386. **{**

}. (CX 7048C (Hancock, Dep. at 214, *in camera*)).

3387. **{**

}. (CX 7048C (Hancock, Dep. at 214, *in camera*)).

3388. **{**

}. (CX 7048C (Hancock, Dep. at 214, *in camera*)). **{**

}. (CX 7048C (Hancock, Dep. at 214-215, *in camera*)). **{** **}**. (CX 7048C (Hancock, Dep. at 215, *in camera*)).

3389. **{**

}. (CX 7048C (Hancock, Dep. at 215, *in camera*)). **{**

}. (CX 7048C (Hancock, Dep. at 215, *in camera*)).

3390. **{**

}. (CX 7048C (Hancock, Dep. at 216, *in camera*)).

3391. **{**

}. (CX 7048C (Hancock, Dep. at 223-224, *in camera*)).

3392. **{**

}. (CX 7048C (Hancock, Dep. at 224, *in camera*)).

3393. **{**

}. (CX 7048C (Hancock, Dep. at 224, *in camera*)).

3394. **{**

}. (CX 7048C (Hancock, Dep. at 224, *in camera*)).

3395. **{**

}. (CX 7048C (Hancock, Dep. at 224, *in camera*)).

3396. **{**

}. (CX 7048C (Hancock, Dep. at 224-225, *in camera*)).

3397. **{**

}. (CX 7048C (Hancock, Dep. at 225, *in camera*)).

3398. **{**

}. (CX 7048C (Hancock, Dep. at 225, *in camera*)).

3399. **{**

}. (CX

7048C (Hancock, Dep. at 226, *in camera*)).

3400. **{**

}.

(CX 7048C (Hancock, Dep. at 226, *in camera*)).

3401. Shell management, including David Jacober, Vice President of Business Management for the Deer Park Refinery in Houston, believe that the Shell refineries do not find the business means justified, or find it technically and commercially viable to blend around all of the claims in all of Unocal's patents. (CX 7052 (Jacober, Dep. at 15, 55)). It is "technically not viable, or there is no business justified means to ever be able to blend gasoline outside the patents three through five." (CX 7052 (Jacober, Dep. at 55)).

iv. Valero.

3402. Valero currently operates two refineries that regularly produce CARB-complaint gasoline: Benicia in Northern California, and Wilmington in Southern California. (Simonson, Tr. 5967).

3403. The Benicia refinery was acquired by Valero from ExxonMobil in mid-May 2000. (Simonson, Tr. 5967-5968).

3404. **{**

}. (Simonson, Tr. 6017, *in camera*).

3405. **{**

}. (Simonson, Tr. 6017, *in camera*).

3406. **{**

}. (Simonson, Tr. 6017, *in camera*).

3407. **{**

}. (Simonson, Tr. 6017, *in camera*).

3408. At trial, Robert Simonson of Valero testified regarding Valero Benicia's inability to blend around the Unocal patents. In addition, Victor Ibergs gave testimony by deposition regarding Valero Benicia's inability to blend around the Unocal patents. (CCPF ¶ ¶ 3409-3448)

3409. Mr. Simonson is Senior Manager of Products Optimization at Valero's Benicia Refinery. In his current position, Mr. Simonson oversees blending operations by reviewing blend data and call signals on the various units involved in producing gasoline, the major

product of both the Benicia and Wilmington Refineries. (Simonson, Tr. 5968) Mr. Simonson held similar responsibilities for monitoring gasoline blending in previous positions at the Benicia Refinery during his 36 year career, including serving as the Principal Blending Engineer. (Simonson, Tr. 5969).

3410. Mr. Simonson's experience in refining extends to refinery planning and economic evaluation of product blending and product shipping activities. (Simonson, Tr. 5970). During his 36 years at Benicia, Mr. Simonson held positions as a technician and control supervisor, responsible for operating the logistics of half of the refinery, positions in the planning and economics group, where he generated daily blend recipes and coordinated the sampling, testing, and shipping of refinery products, positions in the refinery's quality control lab, and a position as the equipment team leader on oil movement, blending, logistics, and dock facilities at the Benicia Refinery. (Simonson, Tr. 5969-5970).

3411. **{**

}. (Simonson, Tr. 6030-6031, *in camera*).

3412. Mr. Ibergs began working at the Wilmington Refinery in 1989 in the project engineering department. (CX 7050 (Ibergs, Dep. at 9-10)). Since 1993, Mr. Ibergs has been employed as the Planning Manager for Valero's Wilmington Refinery, holding positions in both the operations and planning organizations for the Refinery. (CX 7050 (Ibergs, Dep. at 8, 10)).

3413. In his capacity as Planning Manager for the Wilmington Refinery, Mr. Ibergs oversees all aspects of gasoline blending, including holding responsibility for the selection of crude oils, intermediate feedstocks, and other input materials used at the Refinery, establishing the operating conditions under which the Refinery functions, and determining the product mix that the Refinery will produce. (CX 7050 (Ibergs, Dep. at 7-8)).

3414. **{**

}. (Simonson, Tr. 6031, *in camera*).

3415. **{**

}. (Simonson, Tr. 6031, *in camera*).

3416. **{**

}. (Simonson, Tr. 6036, *in camera*)**.**

3417. **{**

}. (Simonson, Tr. 6036, *in camera*).

3418. **{**

}. (Simonson, Tr. 6037, *in camera*).

3419. **{**

}. (Simonson, Tr. 6038, *in camera*).

3420. **{**

}. (Simonson, Tr. 6038, *in camera*).

3421. **{**

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

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

3422. **{**

}. (Simonson, Tr. 6039, *in camera*).

3423. **{**

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

3424. **{**

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

3425. **{**

}. (Simonson, Tr. 6077, *in camera*).

3426. **{**

}. (Simonson, Tr. 6040-6041, *in camera*).

3427. **{**

}. (Simonson, Tr. 6040-6041, *in camera*).

3428. **{**

}. (Simonson, Tr. 6041, *in camera*).

3429. **{**

}. (Simonson, Tr. 6041, *in camera*).

3430. **{**

}. (Simonson, Tr. 6041-6042, *in camera*).

3431. **{**

}. (Simonson, Tr. 6042-6043, *in camera*).

3432. **{**

}. (Simonson, Tr. 6043, *in camera*).

3433. **{**

}. (Simonson, Tr. 6043-6044, *in camera*).

3434. **{**

}. (Simonson, Tr. 6044, *in camera*).

3435. **{**

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

3436. **{**

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

3437. Valero believes that it is "impossible" to blend gasoline and avoid overlap with all of the patent claims at the Valero Wilmington refinery. (CX 7050 (Ibergs, Dep. at 52)).

3438. Valero's strategy relating to the Unocal patents is based on a study that was done to look at where the claims were and what Valero's blending component pool would allow them to do. (CX 7050 (Ibergs, Dep. at 75)). However, because of Valero's configuration and blending pool, it was not practical to go any further than that. Valero is avoiding the claims they can avoid, and accepting the ones it felt nothing could be done about. (CX 7050 (Ibergs, Dep. at 75)).

3439. Valero has concluded that the claims of the patents are so broad and restrictive that Valero doesn't think it feasible even to bring some production outside the claims of the Unocal patents. (CX 7050 (Ibergs, Dep. at 70)).

3440. Valero does not think it is possible to reduce the levels of production that fall within the numerical property ranges of the Unocal patents, or reduce the overlap from the current overlap on certain patents at all. (CX 7050 (Ibergs, Dep. at 70)).

3441. Valero does not think it is possible to reduce overlap because reduction of any type would mean throwing away some portion of the refinery production. "So while theoretically there may be some narrow area that some minute fraction of the production could fall through and avoid claims, the major bulk of the production would not." (CX 7050 (Ibergs, Dep. at 71)).

3442. To make this very narrow range work Valero "may be taking the primo components", and while Valero may have "made that narrow piece maybe better, they've made everything else worse." (CX 7050 (Ibergs, Dep. at 71)).

3443. Valero does not believe that there is any alternative technology, other than that in the Unocal patents, that would enable Valero or others to refine, produce or supply CARB-compliant summertime gasoline at comparable or lower cost and comparable or higher effectiveness. (CX 7050 (Ibergs, Dep. at 95)).

3444. The blending methods available to avoid the Unocal patents would require a major change to the refinery pool at Valero Wilmington in order to blend in that range. 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 (Sarna Expert Report)).

3445. 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 (Sarna Expert Report)). To avoid the patents, Chevron would have to blend all of its gasoline in the range between 215 degrees and the CARB cap of 220 degrees. (Sarna, Tr. 6136; RX 1154A at 026, 029 (Sarna Expert Report)).

3446. {

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

3447. **{**

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

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

3448. Looking at all the claims of the Unocal RFG patents, Valero has concluded that it's not possible "to come up with a solution that avoids all the claims and blends complying gasoline." (CX 7050 (Ibergs, Dep. at 69)).

v. ExxonMobil.

3449. "In order to complete the merger, [ExxonMobil] sold the refinery that Exxon had previously owned in Benicia, California, in northern California." (Eizember, Tr. 3098).

3450. This refinery was sold to Valero Energy Corporation. (Eizember, Tr. 3102).

3451. ExxonMobil retained the previous Mobil refinery in Torrance, in southern California in the Los Angeles area. (Eizember, Tr. 3098).

3452. Prior to the merger between Exxon and Mobil, Exxon produced gasoline for sale in California primarily at the refinery in Benicia, California. (Eizember, Tr. 3101).

3453. Prior to the merger between Exxon and Mobil, Mobil produced gasoline for sale in California primarily at the refinery in Torrance, California. (Eizember, Tr. 3101-3102).

3454. After the merger between Exxon and Mobil, ExxonMobil produced gasoline for sale in California at both Benicia and Torrance until the sale of Benicia was final. ExxonMobil continues to produce gasoline for sale in California primarily at the Torrance refinery. (Eizember, Tr. 3102).

3455. At trial, Mr. Thomas Eizember offered testimony regarding the ExxonMobil's inability to avoid the patents. Mr. Thomas Eizember holds a Bachelor of Science degree in Chemical Engineering. Mr. Eizember has in excess of 28 years experience working in petroleum refining, including 13 and a half years experience working in various positions in Exxon's Benicia Refinery. (Eizember, Tr. 3095-3097).

3456. 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). Mr. Eizember served as the manager of the Technical Division during his time at Exxon's Baton Rouge Refinery. (Eizember, Tr. 3096-3097).

3457. **{**

}. (Eizember, Tr. 3357, *in camera*).

3458. **{**

}. (Eizember, Tr. 3345, *in camera*).

3459. **{**

}. (Eizember, Tr. 3347, *in camera*).

3460. **{**

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

}. (RX 1165 at 050, *in camera*; Stellman, Tr. 8088-8089, *in camera*; RX 1165 at 048, *in camera*).

3461. **{**

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

3462. **{**

}. (Stellman, Tr. 8087-8088, *in camera*; RX 1165 at 048, *in camera*).

3463. **{**

}. (Stellman, Tr. 8088-8089, *in camera*; RX 1165 at 048, *in camera*).

3464. **{**

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(Stellman, Tr. 8089-8090, *in camera*; RX 1165 at 048, *in camera*).

3465. **{**

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(Stellman, Tr. 8090-8091, *in camera*; RX 1165 at 049, *in camera*).

3466. **{**

}. (Stellman, Tr. 8091, *in camera*; RX 1165 at 049, *in camera*).

3467. **{**

}. (Stellman, Tr. 8094, *in camera*; RX 1165 at 049, *in camera*).

3468. **{**

}. (Sarna, Tr. 6254-6255, *in camera*). **{**

}. (Sarna, Tr. 6255, *in camera*).

{

}. (Sarna, Tr. 6255-6256, *in camera*).

3469. **{**

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

3470. **{** **}.** (Eizember, Tr. 3363, *in camera*).

3471. **{**

}. (Eizember, Tr. 3340, *in camera*).

3472. **{**

}. (Eizember, Tr. 3363, *in camera*).

3473. **{**

}. (Eizember, Tr. 3363, *in camera*).

3474. **{**

}. (Eizember, Tr. 3366-3367, *in camera*).

3475. **{**

}. (Eizember, Tr. 3367-3368, *in camera*).

3476. **{**

}. (Eizember, Tr. 3364, *in camera*).

3477. **{**

}. (Eizember, Tr. 3368, 3584, *in camera*).

3478. **{**

}. (Eizember, Tr. 3368-3369, *in camera*).

3479. **{**

}. (Eizember, Tr. 3370, *in camera*).

3480. **{**

}. (Eizember, Tr. 3370-3371, *in camera*).

3481. **{**

}. (Eizember, Tr. 3371, *in camera*).

3482. **{** **}.** (Eizember, Tr. 3374-3375, *in camera*).

3483. **{**

}. (Eizember, Tr. 3386, *in camera*).

3484. **{**

}. (Eizember, Tr. 3386, *in camera*).

3485. **{**

}. (RX 1154 at 007 (Sarna Expert Report), *in camera*).

3486. **{**

}. (RX 1154 at 007 (Sarna Expert Report), *in camera*).

3487. **{** **}.** (RX 1154 at 007 (Sarna Expert Report), *in camera*). **{** **}.** (RX 1154 at 007 (Sarna Expert Report), *in camera*).

3488. **{** **}.** (Sarna, Tr. 6283; RX 1154 at 009, *in camera* (Sarna Expert Report)).

3489. **{** **}.** (Sarna, Tr. 6255, *in camera*). **{** **}.** (Sarna, Tr. 6258, *in camera*).

3490. **{** **}.** (RX 1154 at 008 (Sarna Expert Report), *in camera*).

3491. **{** **}.** (RX 1154 at 008 (Sarna Expert Report), *in camera*; Eizember, Tr. 3372-3373, *in camera*). **{** **}.** (Eizember, Tr. 3372-3373).

3492. **{** **}.** (RX 1154 at 007 (Sarna Expert Report), *in camera*). **{** **}.** (RX 1154 at 007 (Sarna Expert Report), *in camera*).

3493. **{** **}**. (RX 1154 at 007-008 (Sarna Expert Report), *in camera*). **{** **}.** (Sarna, Tr. 6254, *in camera*).

3494. **{**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*).

3495. **{**

}. (Sarna, Tr. 6258-6259, *in camera*).

3496. **{**

}. (Sarna, Tr. 6259, 6283, *in camera*).

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3497. **{**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*). **{**

}. (Sarna, Tr. 6261, *in camera*)**. {**

}. (Eskew, Tr. 2973-2974, *in camera*).

3498. **{**

}. (Eizember, Tr. 3333, *in camera*; RX1154 at 008 (Sarna Expert Report), *in camera*).

3499. **{**

}. (Sarna, Tr. 6260, *in camera*; Eizember, Tr. 3372-3373, *in camera*). **{**

}. (Eizember, Tr. 3372-3373, *in camera*).

3500. **{**

}. (Sarna, Tr. 6314, *in camera*).

3501. While Unocal's technical expert Mr. Stellman suggests that other refiners could increase avoidance by shipping more product out of California, he did not consider the economics of such a plan. (Stellman, Tr. 7952-7953). The undisputed evidence on this point shows that such a suggestion is not feasible for economic reasons. (CCPF ¶ ¶ 3497-3509).

3502. In the year 2000, approximately 1,050,000 barrels of gasoline were produced a day in the state of California. Of that, 159,000 barrels a day, about 15 percent or less, were shipped to other states. (Eskew, Tr. 2879**).**

3503. **{**

}. (Eskew, Tr. 2973-2974, *in camera*).

3504. **{**

}. (CX 1798 at 004 (Eskew Expert Rebuttal Report); Stellman, Tr. 8095, *in camera*).

3505. **{**

}. (Stellman, Tr. 8095, *in camera*).

3506. Unocal's economic expert, Dr. Teece, agrees that refiners cannot avoid Unocal's patents by downgrading CARB Phase 2-compliant gasoline and shipping it to nearby states. Because one batch of gasoline "would amount to between one-third and two-thirds of total Nevada/Arizona daily consumption" (CX 1346 at 021-022), if California refiners exported into those states, the price for gasoline in those markets would collapse. (Teece, Tr. 7650; CX 1332 at 022). There would be a similar price impact if refiners tried to

export into the Pacific Northwest. (CX 1332 at 023). Thus, if refiners tried to avoid the patents by exporting to nearby states, it would reduce refinery profits by 58 to 61 cents per gallon. (RX 1162A at 068-069; CX 1346 at 032).

3507. Unocal's economist, Dr. Teece, believes that refiners could downgrade CARB Phase 2-compliant gasolines that fell within the numerical limitations of the patents to conventional gasoline and export it to the Gulf Coast, but they would face a price penalty of about 13 to 15 cents per gallon as well as shipping costs from 8 to 10 cents per gallon. (Teece, Tr. 7654; CX 1332 at 023). In addition, to import into California Phase 2-compliant gasoline that does not fall within the patents would cost an additional 8-10 cents per gallon. (Teece, Tr. 7654-7655; CX 1332 at 023-024). Thus, the total cost of avoiding the Unocal patents through this means is from 29 to 35 cents per gallon. (Teece, Tr. 7657).

3508. **{**

}. (Lieder, Tr. 4801, *in camera*).

3509. **{**

}. (Lieder, Tr. 4801, *in camera*). **{**

}. (Lieder, Tr. 4801, *in camera*).

b. {}.

3510. **{**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*; Sarna, Tr. 6261, *in camera*).

3511. **{**

}. (Sarna, Tr. 6261-6262, *in camera*). **{**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*).

3512. **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*; Sarna, Tr. 6262, *in camera*)**. {**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*). **{**

}. (RX 1154 at 008

(Sarna Expert Report), *in camera*).

3513. **{** **}.** (RX 1154 at 008 (Sarna Expert Report), *in camera*; Sarna, Tr. 6262, *in camera*). **{**

}. (Sarna, Tr. 6262, *in camera*).

3514. **{**

}. (Sarna, Tr. 6262-6263, *in camera*).

3515. **{** **}.** (Sarna, Tr. 6313-6314, *in camera*).

c. { }.

3516. **{**

}. (Sarna, Tr. 6263-6264, *in camera*; RX 1154 at 008 (Sarna Expert Report), *in camera*). **{**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*).

3517. **{**

}. (Sarna, Tr. 6263, *in camera*).

3518. **{**

}. (Sarna, Tr. 6264, *in camera*)**. {**

}. (Sarna, Tr. 6264-6265, *in camera*).

3519. **{**

}. (Sarna, Tr. 6266, *in camera*).

3520. **{**

}. (Sarna, Tr. 6265, *in camera*). The Valero Wilmington refinery has an "olefin treater," which specifically destroys olefins, as well as a naptha hydrotreater which saturates olefins as part of the desulfurization process. (CX7050 (Ibergs, Dep. at 104-105)).

d. { }.

3521. **{**

}. (Sarna, Tr. 6267, *in camera*; RX 1154 at 008 (Sarna Expert Report), *in camera*). **{**

}. (Sarna, Tr. 6269, *in camera*; RX 1154 at 008 (Sarna Expert Report), *in camera*).

3522. **{**

}.

(Sarna, Tr. 6267, *in camera*).

3523. **{**

}. (Sarna, Tr. 6267, *in camera*)**. {**

}. (RX 1154 at 008 (Sarna Expert Report), *in camera*).

3524. **{**

}. (Sarna, Tr. 6267-6268; RX 1154 at 008, *in camera* (Sarna Expert Report)).

e. { }.

3525. **{**

}. (Sarna, Tr. 6278-6279, *in camera*; RX 1154 at 009 (Sarna Expert Report), *in camera*).

3526. **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*). **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3527. **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3528. **{**

}. (Sarna, Tr. 6278-6279, *in camera*; RX 1154 at 009 (Sarna Expert Report), *in camera*).

3529. The hydrotreatment of the FCC gasoline saturates olefins. (Eskew, Tr. 2847).

f. { }.

3530. **{**

}. (RX 1154 at 009, *in camera* (Sarna Expert Report); Sarna, Tr. 6280, *in camera*). **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3531. **{**

}. (Sarna, Tr. 6279, *in camera*). **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3532. **{**

}. (Sarna, Tr. 6279, *in camera*).

g. { }.

3533. **{**

}. (Sarna, Tr. 6280, *in camera*; RX 1154 at 009 (Sarna Expert Report), *in camera*).

3534. An isomerization unit is a plant that takes normal C5 and normal C6 paraffins and converts them to iso-C5 and iso-C6 paraffins. (Sarna, Tr. 6280).

3535. **{**

}. (Sarna, Tr. 6280, *in camera*).

h. {

3536. **{**

}. (Sarna, Tr. 6281, *in camera*; RX 1154 at 009 (Sarna Expert Report), *in camera*).

3537. **{**

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

}. (RX 1154 at 009 (Sarna Expert Report), *in camera*).

3538. **{**

}. (Sarna, Tr. 6281, *in camera*).

3539. **{** **}.** (RX 1154 at 009 (Sarna Expert Report), *in camera*; Eizember, Tr. 3372-3373, *in camera*).

{

}. (Eizember, Tr. 3372-3373, *in camera*)

3540. **{**

}. (Sarna, Tr. 6281, *in camera*).

3541. **{**

}. (Lieder, Tr. 4802, *in camera*).

3542. **{**

}. (Lieder, Tr. 4802, *in camera*).

3543. **{**

}. (Lieder, Tr. 4802, *in camera*).

3544. **{** **}.** (Lieder, Tr. 4802, *in camera*).

H. Refiners Cannot Switch to Other Technologies to Substantially Avoid the Unocal Patents.

3545. Engineers at each of the refineries have studied whether any of the refineries can, through operational steps or capital investment, substantially avoid the Unocal patents. No such steps have been identified. (CCPF ¶ ¶ 3602-3612).

1. Refiners Cannot Reduce Likely Infringement by Trying Harder.

3546. Unocal has suggested that refiners could avoid the patents by trying harder. This contention is not supported by the evidence. (CCPF ¶ ¶ 3547-3561).

3547. Refiners have uniformly testified that they have studied the patents, and are not aware of any steps that would allow them to substantially avoid the patents. (CCPF ¶ ¶ 3546-3626, 3174-3448).

3548. Moreover, refineries are under instructions to avoid the Unocal patents where possible, but have not been able to figure out how to avoid the patents. (CCPF ¶ ¶ 3316-3317, 3550).

3549. **{**

}. (Hoffman, Tr. 5021, *in camera*). **{**
}. (Hoffman, Tr. 5056, *in camera*). The refinery personnel at Carson have "done all the analysis to understand the economic impacts of meeting the blending rules and have not been able to make blending changes that result in fewer overlaps." (Hoffman, Tr. 5001-5002).

3550. **{**

}. (Lieder, Tr. 4844-4855, *in camera*). **{**

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

3551. **{**

}. (Engibous, Tr. 4044, *in camera*). **{**

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

3552. **{**

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

3553. Prior to the merger between Exxon and Mobil, Exxon produced gasoline for sale in California primarily at the refinery in Benicia, California. (Eizember, Tr. 3101). Prior to the merger between Exxon and Mobil, Mobil produced gasoline for sale in California primarily at the refinery in Torrance, California. (Eizember, Tr. 3101-3102).

3554. After the merger between Exxon and Mobil, ExxonMobil produced gasoline for sale in California at both Benicia and Torrance until the sale of Benicia was final. ExxonMobil continues to produce gasoline for sale in California primarily at the Torrance refinery. (Eizember, Tr. 3102).

3555. **{**

}. (Eizember, Tr. 3370, *in camera*).

3556. **{**

}. (Eizember, Tr. 3370-3371, *in camera*).

3557. **{**

}. (Eizember, Tr. 3347, *in camera*, 3371, *in camera*).

3558. **{**

}. (Eizember, Tr. 3374-3375, *in camera*).

3559. **{**

}. (Stellman, Tr. 8105, *in camera*). **{**

}. (CCPF ¶ ¶ 3497-3545).

}. (Eizember, Tr. 3347, *in camera*).

3560. **{**

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

3561. Unocal's expert who claims that trying will solve the problem, Mr. Stellman, has not analyzed the economics associated with any of the steps he suggests that could improve blend around. (Stellman, Tr. 7948).

2. Importing Alkylate to Reduce Likely Infringement Levels is Infeasible and Uneconomic.

3562. Unocal's expert, Mr. Stellman, suggests that refiners can increase blend around ability by importing alkylate. Mr. Stellman does not know how much importing more alkylate will increase blend around, and cannot say whether it will be 2 percent, 20 percent or 90 percent. (Stellman, Tr. 7947-7948).

3563. The product of the alkylation unit is referred to as alkylate. There are different types of alkylates, such as C3 alkylate, C4 alkylate, C5 alkylate. These refer not to the carbon number of the alkylate but rather to the carbon number of the feedstock to the alkylation unit. (Eskew, Tr. 2850).

3564. Alkylate product is the combination of light olefin material with isobutane. Alkylate has a high octane content along with other desirable properties. The feedstocks to an alkylation unit, in particular the live olefins, "are lower in value from the gasoline of alkylate that's produced." Alkylate is a high-quality blending component used in gasoline production. (Eskew, Tr. 2850-2851).

3565. The primary feed to the alkylation unit is the C3, C4 and sometimes C5 olefins. In the alkylation unit, these olefins are combined with isobutane to form molecules that are in the range of gasoline, such as C7, C8, C9 molecules. (Eskew, Tr. 2849-2850).

3566. The alkylate is a very desirable gasoline component. Octane can range from the low 90s, 91 up to 94-95. It has typically a vapor pressure of around 6. It's a fairly heavy component in terms of its boiling ranges, with a T50 in the 215 range. Alkylate has no aromatics, no benzene, no olefins, and typically very low sulfur. (Eskew, Tr. 2861-2862).

3567. Importing alkylate alone will not help refiners. The T90 distillation temperature of C4 alkylate is only about 255 degrees, which is much lower than the requirement of 315 in order to blend a batch of gasoline around the patents. (Sarna, Tr. 6275-6277, *in camera*). **{**

}. (Hoffman, Tr. 5020, *in camera*).

3568. Alkylate is essentially 100 percent paraffin. (Stellman, Tr. 7948). {

}. (Eizember, Tr. 3367-3368, *in camera*).

3569. Mr. Stellman has not analyzed the economics associated with importing additional alkylate to achieve better blend-around. (Stellman, Tr. 7948). However, Mr. Stellman concedes that alkylate is "very much" a valuable blend stream. (Stellman, Tr. 7948). For example, **{**

}. (Simonson, Tr. 6022, *in camera*).

3570. Finally, the supply of alkylate can be an issue. **{**
}. (Eskew, Tr. 2851, *in camera*). **{**

}. (Lieder, Tr. 4797, *in camera*).

3571. Witnesses representing California's largest refineries all testified that they considered, but rejected, the idea of importing additional alkylate for the purpose of increasing patent avoidance. (CCPF ¶ ¶ 3562-3580).

3572. **{**

}. (Hoffman, Tr. 5020, *in camera*). **{**

}. (Hoffman, Tr. 5020, *in camera*).

3573. **{**

}. (Simonson, Tr. 6040-6041, *in camera*). **{**

}. (Simonson, Tr. 6040-6041, *in camera*).

3574. **{**

}. (Simonson, Tr. 6041, *in camera*). **{**

}. (Simonson, Tr. 6026, *in camera*).

3575. **{**

}. (Simonson, Tr. 6041-6042, *in camera*).

3576. **{**

}. (Lieder, Tr. 4796, *in camera*). **{**

}. (Lieder, Tr. 4796, *in camera*).

3577. **{**

}. (Lieder, Tr. 4796-4797, *in camera*). **{**

}. (Lieder, Tr. 4797, *in camera*). **{**

}. (Lieder, Tr. 4797, *in camera*).

3578. **{**

}. (Lieder, Tr. 4798, *in camera*).

3579. **{**

}. (Lieder, Tr. 4798, *in camera*).

3580. **{**

}. (Eizember, Tr. 3363, *in camera*). **{**

}. (Eizember, Tr. 3364, *in camera*).

3. Importing Iso-Octane to Reduce Likely Infringement Levels is Infeasible and Uneconomic.

3581. Refiners also analyzed the use of iso-octane to increase blend around, and concluded that it was infeasible and uneconomic. (CCPF ¶ ¶ 3582-3594).

3582. **{**

}. (Hoffman, Tr. 5020, *in camera*).

3583. **{**

}. (Simonson, Tr. 6027, *in camera*). **{**

}. (Simonson, Tr. 6027, *in camera*).

3584. **{**

}. (Simonson, Tr. 6042-6043, *in camera*).

3585. **{**

}. (Lieder, Tr. 4798, *in camera*). **{**

}. (CX 7048C (Hancock, Dep. at 221-222, *in camera*)).

3586. **{**

}. (Lieder, Tr. 4799, *in camera*). **{**

}. (CX 7048C (Hancock, Dep. at 217-218, *in camera*)).

3587. **{**

}. (Lieder, Tr. 4799, *in camera*). **{**

}. (CX 7048C (Hancock, Dep. at 218, *in camera*)).

3588. **{**

}. (Lieder, Tr. 4799, *in camera*).

3589. **{**

}. (Lieder, Tr. 4799, *in camera*).

3590. **{**

}. (CX 7048C (Hancock, Dep. at 218, *in camera*)).

3591. **{** **}.** (CX 7048C (Hancock, Dep. at 218, *in camera*)).

3592. **{** **}.** (CX 7048C (Hancock, Dep. at 219, *in camera*)).

3593. **{** **}.** (CX 7048C (Hancock, Dep. at 220, *in camera*)).

3594. **{** **}.** (CX 7048C (Hancock, Dep. at 221, *in camera*)). **{** **}.** (CX 7048C (Hancock, Dep. at 221, *in camera*)).

4. Importing Iso-Octene to Reduce Likely Infringement Levels is Infeasible and Uneconomic.

3595. **{** **}.** (Simonson, Tr. 6028, *in camera*). **{** **}.** (Simonson, Tr. 6028, *in camera*). **{** **}.** (Simonson, Tr. 6028, *in camera*).

3596. **{** **}.** (Simonson, Tr. 6043, *in camera*).

3597. **{**

}. (Lieder, Tr. 4800, *in camera*). **{**

}. (Lieder, Tr. 4800, *in camera*).

3598. **{**

}. (Lieder, Tr. 4800, *in camera*). **{**

}. (Lieder, Tr. 4800, *in camera*).

3599. **{**

}. (Lieder, Tr. 4800-4801, *in camera*).

3600. **{**

}. (CX 7078C (Youngman, Dep. at 56-57, *in camera*, 112-113, *in camera*)).

3601. **{**

}. (Eizember, Tr. 3368, 3584, *in camera*).

5. Refiners Cannot Take Operational Steps to Increase Olefin Levels to a Point Where They Can Consistently Avoid the Patents.

3602. Unocal's expert, Mr. Stellman, testified that refiners could increase blend around by increasing olefin levels. Mr. Stellman provided no testimony about the extent of this purported increased blend around, nor did Mr. Stellman provide any economic analysis. (CCPF ¶ ¶ 3603-3612).

3603. **{**

}. (Sarna, Tr. 6253-6254, *in camera*; RX 1154 at 040 (Sarna Expert Report), *in camera*).

3604. **{**

}. (Simonson, Tr. 6030, *in camera*).

3605. **{**

}. (Simonson, Tr. 6044, *in camera*). **{**

}. (Simonson, Tr. 6044, *in camera*).

3606. Increasing the olefin content at Valero Wilmington wouldn't be feasible because "in a real refinery there's a mix of components that have to balance with each other. It is impossible to adjust just one property and not affect other properties along with that one." (CX 7050 (Ibergs, Dep. at 68-69)). In the process of increasing olefin content, Valero also would be changing other properties, and in some cases bumping up against CARB predictive model limitations. (CX 7050 (Ibergs, Dep. at 69)).

3607. **{**

}. (Lieder, Tr. 4799, *in camera*). **{**

}. (Lieder, Tr. 4799, *in camera*).

3608. **{**

}. (Lieder, Tr. 4799, *in camera*). **{**

}. (Lieder, Tr. 4799, *in camera*).

3609. **{**

}. (Lieder, Tr. 4800, *in camera*). **{**

}. (Lieder, Tr. 4800, *in camera*).

3610. **{**

}. (Lieder, Tr. 4800, *in camera*).

3611. **{**

}. (Hoffman, Tr. 5047, *in camera*).

3612. **{**

}. (CX 7078C (Youngman, Dep. at 56-57, *in camera*)).

6. On Line Analyzers.

3613. **{**

}. (Sarna, Tr. 6316-6317, *in camera*; Sarna, Tr. 6148-6150).

3614. **{**

}. (Sarna, Tr. 6316-6317, *in camera*.)

3615. For example, if a refinery's T50 pool is 195 or 200 degrees, controlling the T50 within a narrow range will not help at all to blend around the limitations of the patents. In fact, it may hinder the ability to blend around. (Sarna, Tr. 6149).

3616. **{**

}. (Simonson, Tr. 6018, *in camera*; Eizember, Tr. 3373, *in camera*). **{**

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

3617. **{**

}. (Engibous, Tr. 4003-4005, *in camera*).

7. CARB's Phase 3 Regulations Have Not Allowed Refiners to Avoid the Unocal Patents on a Consistent Basis.

3618. Unocal's expert, Mr. Stellman, has argued that the changes from Phase 3 may help refiners improve blend around, although Mr. Stellman does not know whether it would be by 2 percent, 20 percent or 90 percent. (Stellman, Tr. 7952).

3619. Stellman did not consider actual Phase 3 data in rendering his opinions on whether Phase 3 will assist in blend around. (Stellman, Tr. 7952).

3620. **{**

}. (Eskew, Tr. 2968-2969, *in camera*).

3621. **{**

}. (Eskew, Tr. 2969, *in camera*).

3622. Under Phase 3 the number of batches of gasoline that overlapped with the patents is approximately between 87 or 88 percent. This is a slight change from 2001 and 2002, but it is not a significant change. (Sarna, Tr. 6147).

3623. **{**

}. (Sarna, Tr. 6287, *in camera*).

3624. **{**

}. (Sarna, Tr. 6288-6289, *in camera*).

3625. One reason that the Phase 3 rules have not drastically affected blend around is that the reduction in sulfur from 40 ppm to 20 ppm makes blending around the patents in Phase 3 more challenging, because sulfur was a primary offset that refiners could use. (Sarna, Tr. 6148).

3626. **{**

}. (Engibous, Tr. 3973, *in camera*). **{**

}. (Engibous, Tr. 3971, *in camera*). **{**

}. (Engibous, Tr. 3972, *in camera*).

8. Even if Refiners Were Able to Avoid the Patents More Frequently, Unocal Would Still Have Monopoly Power.

3627. If refiners are able to achieve lower infringement rates in the future, it does not necessarily follow that Unocal's market power will have been reduced. The harm from Unocal's deception is the sum of royalties actually paid (the monopoly overcharge), plus the costs incurred to reduce infringement rates. (CX 1799A at 024-025 (Shapiro Expert Rebuttal Report)).

3628. As Unocal's economist admitted, whether or not the infringement rate of Unocal's patents drops in the future, historic infringement rates will allow Unocal to extract royalties for CARB Phase 2-compliant gasoline produced during that time period. (Teece, Tr. 7630-7632).

3629. Although no operational changes have been identified that would allow refiners to consistently avoid the Unocal patents, any such changes would likely add costs to refining because it would cause refiners to produce gasoline at sub-optimal efficiency. (CCPF ¶ ¶ 3602-3612).

3630. "Optimization is trying to call refinery signals, component qualities to capture the last marginal barrel into the product." (Simonson, Tr. 5970). It is in a refiner's interest to try to blend as closely as possible to a specification, like octane, because octane costs money for a refiner to put in. (Banducci, Tr. 3540).

3631. Optimization is related to the amount of gasoline produced. "Typically the better you optimize, the more gasoline you're going to make, the closer you run to specification." (Simonson, Tr. 5971).

3632. Giveaway is the margin "between the actual spec and the actual quality of the product" when the spec is released. Capturing that margin makes it possible to optimize and make additional products. (Simonson, Tr. 5971).

3633. Distillation temperatures, such as T50 and T90, are all giveaway parameters because distillation is typically "synonymous with volume." A greater volume of product is made by maximizing distillations. (Simonson, Tr. 5972).

3634. If refiners were operationally able to blend around by increasing their T50 levels above 210 or 215 degrees, there would be substantial give-away, and potential increased costs and decreased volume. (CCPF ¶ ¶ 3214-3252).

3635. Blend-around costs "are one component of the costs imposed on refiners by Unocal's monopoly power. These are costs that would not be incurred if the technology market was operating competitively." (Shapiro, Tr. 7399).

I. Refiners Cannot Avoid the Unocal '393 and the '126 Patents.

3636. Even if only the '393 patent and the '126 patent were at issue, refiners could not consistently avoid these patents. (CCPF ¶ ¶ 3637-3654).

3637. Chevron launched a '126 patent study after it had a better understanding of the Unocal '126 patent claims. (Gyorfi, Tr. 5308). Chevron gathered its best operational and analytical minds to see if there was a way to avoid the numerical property claims of the '126 patent. (Gyorfi, Tr. 5308). This study concluded that there were no feasible investments that could be made to avoid the numerical claims of the '126 patent. (Gyorfi, Tr. 5308-5309).

3638. Once Chevron had looked at the '126 patent and discovered that there was no way, "feasible or not", to blend around the numerical claims, it did not make any sense to spend any resources to perform a similar analysis on the other patents. (Gyorfi, Tr. 5312).

3639. In order to avoid the claims of the Unocal '393 and '126 patents, a refiner must keep olefins above 8% or keep T50 above 216 degrees. (RX 1165A at 056) (Stellman Expert Report). "There are other blend spaces that avoid the patents but are infeasible for a variety of reasons." (RX 751 at 005).

3640. Refiners cannot consistently blend their T50 above 215 degrees. (CCPF ¶ ¶ 3226, 3238, 3265, 3269).

3641. Refiners cannot consistently blend their olefin levels above 8 percent. (CCPF ¶ ¶ 3226, 3434, 3444, 3605).

3642. Even if the claims were limited to only the '393 and first 40 (compositional) claims of the '126 patents, refiners could not consistently avoid those patents. (CCPF ¶ ¶ 3636-3654).

3643. A number of the first 40 claims of the '126 patents are very broad. For example, claim 4 of the '126 patent, which is a compositional claim, claims gasoline with a RVP less than 7.5 psi, T50 greater than 215 degrees, T10 less than 140 degrees, T50 less than 215 degrees, T90 no greater than 315 degrees, paraffins greater than 65 percent, olefin content less than 8 percent, aromatics of at least 4.5 and octane value of at least 87. (CX 620 at 27).

3644. A refiner producing CARB-compliant gasoline cannot avoid this claim by raising RVP above the claimed level, because the maximum RVP allowed by CARB (7.0) is less than

the RVP claimed in the patent. (RX 1154A at 29 (Sarna Expert Report)).

3645. A refiner producing CARB-compliant gasoline cannot avoid this claim by lowering octane below the claimed level, because the minimum octane of gasoline offered for sale in California is 87. (Ingham, Tr. 2709-2710). Avoiding the patents by going to 86 octane gasoline is not a feasible solution because such a gasoline can damage the engines of many cars. (Sarna, Tr. 6432).

3646. A refiner producing CARB-compliant gasoline cannot avoid this claim by lowering aromatics below the claimed limit. **{**

}. (Sarna, Tr. 6301, *in camera*, as illustrated in CX 7102).

3647. A refiner producing CARB-compliant gasoline cannot avoid this claim by lowering paraffins below the claimed limit. There are three types of hydrocarbons in gasoline: olefins, aromatics, and paraffins. The total percentage of each of these hydrocarbons in a batch of gasoline must total 100 percent. (RX 1165A at 019). In order to have paraffins less than 65 percent and to avoid claim 4 of the '126 patent, the combination of olefins and aromatics must be greater than 35 percent (*i.e*., 100% - 65% = 35%).

3648. The CARB Phase 2 flat limit on aromatics was 25 percent, and the cap limit was 30. The CARB flat limit on olefins was 6 percent, and the cap limit was 10 percent (RX 1154A at 029 (Sarna Expert Report)). To avoid this paraffin claim, a refiner must blend both aromatics and olefins above the flat limit and near the cap limit. (CCPF ¶ ¶ 2995, 3643, 3647).

3649. For reasons similar to the reason that refiners cannot consistently blend their T50 above 215 degrees, refiners cannot consistently blend their T90 above 315 degrees. (CCPF ¶ ¶ 3227-3252). The CARB flat limit on T90 is 300 degrees, while the cap is 330 degrees. (RX 1154A at 029 (Sarna Expert Report); Sarna, Tr. 6388). The slope of the T50 and T90 curves are very steep at one end but not steep at the other end. However, 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; RX 1154A at 029 (Sarna Expert Report)).

3650. Refiners cannot consistently blend their olefin levels above 8 percent. (CCPF ¶ ¶ 3240-3242, 3251).

3651. Although refiners may have improved their ability to avoid the Unocal '393 patent, this does not mean that refiners will be able to avoid all five patents easily. (CCPF ¶ ¶ 3637-

3654).

3652. First, the disclaimed version of the ‘393 patent has fewer broad claims. Mr. Stellman admits that it is a lot easier to blend around the '393 patent than is some of the other claims in the other patents. (Stellman, Tr. 7953).

3653. One of the reasons that the infringement rate decreased for the '393 patent from 1996 to 2002 was because the octane on premium gasoline was reduced from 92 to 91. (Stellman, Tr. 7953). The switch to 91 octane “basically got the refiners away from the more difficult claims to get around in a 92 octane.” (Stellman, Tr. 7953-7954).

3654. Another reason that refiners were better able to avoid the ‘393 patents is because they got better at blending CARB-compliant gasoline. By the third year or so that the refiners were blending CARB-gasoline, they were gaining more experience in blending CARB-compliant gasoline. This additional experience could be a factor in the decreased infringement rate for the Unocal ‘393 patent. (Stellman, Tr. 7954).

J. Unocal Has a Dangerous Probability of Success in Achieving Monopoly Power in the Market for CARB Phase 2-Compliant Summertime Gasoline.

1. Unocal Intended to Monopolize the Downstream Market.

3655. Starting as early as 1989, and continuing through 1995, Unocal had a plan to obtain licensing fees for its patents by influencing the regulators. (CCPF ¶ ¶ 463-472).

3656. Prior to 1997, Unocal owned and operated refineries in California as a vertically integrated producer, refiner, and marketer of petroleum products. (Answer ¶ 13; JX 3A at 002). In March 1997, Unocal completed the sale of its west coast refining, marketing, and transportation assets to Tosco Corporation. (Answer ¶ 13).

3657. Therefore, between 1989 and 1995, when Unocal was developing and executing its plan to force its competitors to purchase patent licenses from it, Unocal participated in the downstream California reformulated gasoline market.

3658. Unocal’s plan to obtain patent royalties was specifically directed at its competitors at the time, namely other refiners. (CCPF ¶ ¶ 481-507, 563-607, 623-663).

3659. This point is confirmed in internal Unocal memoranda from December 1990, which tout the benefits using its research to “influence regulators” and tap the “competitive advantage” and “licensing” potential of Unocal’s “patent for low emissions fuels, based on the 5/14 project.” (CX 210 at 003-004). The authors of this document were inventors Peter Jessup and Michael Croudace. They wrote: “Once the patent is issued then Unocal can seek licensing agreements with our competitors . . . These licensing agreements could be worth 10's of millions of dollars every year, far more than any other competitive

advantage could yield." (CX 210 at 004).

3660. Drs. Jessup and Croudace suggested to Unocal management that Unocal "Show Emissions Work To Regulators – Make Unocal Specifications Required In The Industry." (CX 203 at 012).

3661. Unocal recognized that having regulations that overlap with the Unocal patents would be worth "far more than could be gained from any other competitive advantage." (CX 210 at 002; Jessup, Tr. 1214-1215).

2. Suppliers Have Chosen Not to Import CARB-Compliant Gasoline Because of the Unocal Patent Claims.

3662. Vitol, SA is primarily an oil trading company, although it also operates refineries. (Hepper, Tr. 3939-3940, 3945). Vitol sells gasoline in almost all of the major markets of the world. (Hepper, Tr. 3941). It trades in approximately 40 million barrels per year in the United States alone. (Hepper, Tr. 3941).

3663. Vitol imports a very limited amount of gasoline into the CARB summertime market because it is more costly to import into the CARB market than into other U.S. markets. (Hepper, Tr. 3941).

3664. It is more costly for Vitol to import gasoline into the CARB market than to other U.S. markets because:

> (1) "CARB gasoline is one of the most difficult gasoline specifications to meet in the world,"
>
> (2) transporting oil to California from Europe is more expensive than transport to the U.S. East Coast, and
>
> (3) "the chances of having to pay Unocal under our license [for the Unocal RFG patents] is significantly higher in California than it is . . . east of the Rockies."

(Hepper, Tr. 3941-3942).

3665. Vitol has decided not to import gasoline into the CARB summertime market in several instances because of the likelihood of having to pay royalties to Unocal for the reformulated gasoline patents. (Hepper, Tr. 3939-3942, 3944-3945).

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}. (CX 2015, *in camera*).

3667. **{**

}. (Hepper, Tr. 4076, *in camera*).

3668. **{**

}. (Hepper, Tr. 4077, *in camera*).

3669. As 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).

3670. CARB's sister agency, the California Energy Commission ("CEC"), also has publicly expressed concerns about how the Unocal patent may affect competition in the California gasoline market. (CX 1717; CX 1224).

3671. In 2003 the CEC, pursuant to statutory directives, explored the feasibility of a state-sanctioned strategic petroleum reserve for California. CEC held hearings, performed studies, and hired consultants. (Boyd, Tr. 6745).

3672. CEC at a public hearing on a potential California strategic fuel reserve in April 2003 presented the findings of Stillwater Associates, a consulting firm commissioned by CEC to study the issues. One finding of that study presented to the public in slides was that "Unocal's gasoline patents reduce gasoline supply." (Boyd, Tr. 6744 - 6746 (CARB Executive Boyd served as one of the CEC Commissioners who approved the Report)).

3673. CEC presented to the public as CEC's own report a detailed Stillwater Associates study entitled "California Strategic Fuels Reserve" that found, based on interviews with industry participants and other sources, that "[t]he Unocal patents are a significant additional burden on California's ability to meet growing demands for transportation fuels while improving air quality. The licensing fees and punitive damages are such that incidental importers will not dare to attempt to blend finished gasoline, while refineries who blend outside the patent's envelope lose capacity by diverting products from the gasoline pool and in doing so actually increase evaporative emissions." (CX 1717 at 130; Boyd, Tr. 6745-6747, 6841-6844).

3674. CEC staff reviewed the Report and issued it as a study that CEC staff endorsed. (CX 1717; Boyd, Tr. 6745-6547, 6841-6844).

3675. The CEC at its California strategic fuel reserve hearings in April 2003 also received

comment from small blenders that the Unocal patents "scares them to death." (CX 2150 at 268-269; Boyd, Tr. 6745-6749).

3676. The CEC in March 2002 also issued a study of the potential effects on gasoline supply and prices of the eventual phase out of MTBE. CEC presented to the public as its own report a Stillwater Associates report entitled "MTBE Phase Out in California." (CX 1224; Boyd, Tr. 6749-6751).

3677. The March 2002 CEC Report "MTBE Phase Out in California" repeatedly characterized Unocal patents as a barrier to entry for suppliers of gasoline to the California market. The Report stated that "Inadequate logistics and commercial factors such as lack of liquidity in forward markets and restrictions imposed by the Unocal patents constitute significant barriers for imports." (CX 1224 at 015; Boyd, Tr. 6749-6751).

3678. The March 2002 CEC report further stated that "[c]oncerns about violating the Unocal patents currently prevent traders, foreign suppliers or California's remaining independent marketers from attempting to import components and blend finished gasoline. After the introduction of CARB Phase 3 and the elimination of MTBE as primary blending component, these difficulties will significantly increase." ..The California refiners control, either through outright ownership or long-term leases, virtually all of the available terminal capacity in the State. The refiners are also the only ones capable of blending around the Unocal patents . . . This means that the shortfall will primarily affect the independents" (CX 1224 at 017; Boyd, Tr. 6749-6751).

3679. The March 2002 CEC report further stated that "[O]ne of the main barriers to imports of finished products and to the participation of others than the major refiners in the importation of blend stocks to produce finished gasoline is the Unocal patent. Even though Unocal's patents have held up in courts so far, the US Patent Office, in a highly unusual step, is currently in the process of reexamining the validity of these patents. The State of California is taking an active role in helping to redress a situation that is clearly harmful to the State in that blending around the patent reduces gasoline production and increases air pollution." (CX 1224 at 066).

3680. The March 2002 CEC report also stated that "[i]n addition to physical barriers such as the unavailability of tankage, there are commercial barriers that prevent an adequate flow of imported gasoline or blending components, notably California's unique specifications, illiquid markets, lack of hedging mechanisms, and restrictions imposed by the Unocal patents." (CX 1224 at 078-079; Boyd, Tr. 6749-6751).

3681. The March 2002 CEC report recommended, among other things, a "[r]esolution of the Unocal patent(s) currently under review by the Patent Office, and/or settlement of suits brought by several majors so that refiners can again blend in components currently diverted from the gasoline pool to avoid patent infringement." (CX 1224 at 017). "The State of California, on behalf of its gasoline consumers, should take an active role in

resolving the Unocal patent issues." (CX 1224 at 080; Boyd, Tr. 6749-6751).

3682. Michael Scheible, then Deputy Executive Director of CARB, also has testified at CEC hearings, taking the position that Unocal patents were affecting gasoline supply. (Boyd, Tr. 6751 - 6753).

3683. The California Energy Commission as of summer 2004 was delaying issuing final recommendations regarding the Unocal patents, in part awaiting the results of the instant FTC action against Unocal. (Boyd, Tr. 6753-6754).

3. Unocal Royalties Will Raise the Price of CARB-Compliant Summertime Gasoline.

3684. Unocal will be able to increase prices in the technology market. (CCPF ¶ ¶ 3685-3695). Dr. Shapiro has estimated that approximately 80% of these costs will be passed on to consumers, and that California motorists will pay $130 million per year for RFG as a result of increased prices due to the Unocal patents. (Shapiro, Tr. 7099; CX 1720A at 034).

3685. Dr. Teece has estimated an even higher pass-through rate of 90%. (Teece, Tr. 7522; Shapiro, Tr. 7099; CX 1346 at 050-051).

3686. Unocal's power over price is underscored by Unocal's position in the '393 litigation that, if refiners are forced to pay royalties on its patents, the prices to California consumers will increase. Unocal economic expert Dr. Teece explained in his expert report in the '393 litigation: "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 these higher costs." (CX 1346 at 009).

3687. Using Dr. Teece's analysis, Unocal argued to the Court that "had the Plaintiffs taken a license, rather than infringed Unocal's patent during most of 1996, their costs would have increased." (CX 1323 at 058; CX 1827 at 009-010).

3688. Unocal took the position that ARCO, Chevron, Exxon, Mobil, Shell and Texaco (the companies against whom Unocal had successfully litigated) account for approximately 75% of the gasoline sold in California. (CX 1323 at 058; CX 1827 at 009-010).

3689. Unocal argued that ARCO, Chevron, Exxon, Mobil, Shell and Texaco "would have attempted to raise their gasoline prices in an effort to cover the higher costs" if ARCO, Chevron, Exxon, Mobil, Shell and Texaco had paid royalties to Unocal for the Unocal patent claims. (CX 1323 at 058; CX 1827 at 009-010).

3690. Unocal took the position that, as "a smaller player in the gasoline market, Unocal would

then have been able to raise its prices to match the price increases of the major oil companies." (CX 1323 at 058; CX 1827 at 009-010). "The increased revenue caused by those increased prices would have been profit for Unocal – profit which it has been denied because of Plaintiffs' infringement." (CX 1827 at 009-010).

3691. It was Unocal's litigation position that "approximately 90 percent of a royalty rate would have been passed on to consumers, given the relatively inelastic demand in California." (CX 1323 at 058). Unocal argued that the "most theoretically correct analysis concludes that prices are likely to rise whenever any firm has an infringing batch of gasoline." (CX 1323 at 058).

3692. Unocal explained that Unocal's position "is based on the economic reality that had Plaintiffs not infringed Unocal's patent but had instead paid Unocal royalties, the price of gasoline would have increased and Unocal therefore would have received higher prices for the gasoline it sold in California." (CX 1827 at 005-006).

3693. Efforts to avoid the Unocal patent claims would also increase prices: "Had Plaintiffs elected not to sell infringing gasoline, they would have incurred costs in avoiding the patent; those costs too would have been passed on in part to consumers and Unocal would have been able to raise its prices to match." (CX 1827 at 012).

3694. Unocal told the Court: "After performing a detailed economic analysis that demonstrated both an inelastic demand and supply for gasoline in California, Dr. Teece concluded that Unocal would have been able to increase its prices had Plaintiffs paid a reasonable royalty." (CX 1827 at 013).

3695. Unocal estimated that the "lost profits" Unocal suffered because Unocal was not able to raise Unocal gasoline prices amounted to $62.4 million through March 1, 1997. (CX 869 at 009).

4. Unocal is Still Seeking to Collect Royalties from the Time When Unocal Was in the Refining Business.

3696. An accounting action is still ongoing in the United States District Court for the Central District of California to determine damages for infringement of the '393 patent by ARCO, Exxon, Mobil, Chevron, Texaco, and Shell for the period from August 1, 1996, through December 31, 2000. The court ruled in August 2002 that the 5.75 cents per gallon royalty fee awarded by the jury would apply to all infringing gasoline produced and/or supplied in California. (Answer ¶ 70). Unocal is now seeking between $250 and $280 million for infringement between July 1996 and 2000 from the refiners against whom Unocal has successfully litigated. (Strathman, Tr. 3659).

3697. When Unocal has licensed companies, Unocal has specifically reserved the right to seek damages for past infringement. (CX 2013 at 003; CX 2020 at 004-005).

5. Unocal Was a California Refiner until 1997.

3698. Unocal participates in the downstream market because the Unocal patents are on gasoline. Unocal has "'compositional' claims [that] claim a specific composition of gasoline." (RX 1165A at 012).

3699. As Dr. Teece explained in the '393 litigation, the compositional patent claims in the '393 patent represent "a new product." (CX 1332 at 034). He explained that the '393 patent is "a product patent." (CX 1332 at 039).

3700. The '393 patent and the first 40 claims of the '126 patent are made up exclusively of compositional claims. (RX 1165A at 012).

3701. **{**

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(Stellman, Tr. 8096, *in camera*; RX 1165 at 047, *in camera*).

3702. Refiners cannot avoid the claims of the '393 patent as disclaimed and the first 40 claims of the '126 patent (i.e., only the compositional claims). (CCPF ¶ ¶ 3636-3654).