Western States Petroleum Association
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Catherine H. Reheis-Boyd
President

October 21, 2013

Via web and email (http: www.arb.ca.gov/listpub/comm/bclist.php)

Mr. Steve Cliff (ecliff@arb.ca.gov)
California Air Resources Board
1001 I Street,
Sacramento, CA

RE: **WSPA Comments on October 7, 2013 Refiner Workshop**

Dear Mr. Cliff:

The Western States Petroleum Association (WSPA) is a trade association that represents 27 companies that explore for, develop, refine, market and transport petroleum, petroleum products and natural gas in the Western States. Many of our members operate extensively in California and have facilities that are impacted directly by the ARB's Cap and Trade Program. WSPA members were in attendance at the workshop where the California Air Resources Board (ARB) outlined changes to the refinery benchmarking methodology and we are submitting these comments to address key issues that emerged at the October 7 event.

WSPA supports Complexity Weighted Barrel

A key change was to propose the use of the Complexity Weighted Barrel (CWB) instead of the Complexity Weighted Ton (CWT) index that was used in Europe. WSPA strongly supports that change because the CWB methodology is appropriate for facilities in California because they measure throughput(s) in barrels rather than tons.

Treatment of Allowances for Power Generated and Consumed

ARB has recognized that emissions related to electricity are significant and that the allocation methodology should be equitable to EITE facilities regardless of the source of power. Many facilities generate power with on-site CHP facilities, while others purchase power from utilities or third party CHP's. However, ARB's recommended approach referred to as the "ARB Standard approach" in the

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October 7, 2013 workshop, does not, in and of itself, insure equitable treatment of EITE facility energy-related emissions. Rather, it relies on anticipated regulatory action by the CPUC to insure that free allocations from ARB and revenue sharing required by the CPUC meet the objective of equitable treatment and that equitable treatment is extended to facilities served by Publically Owned Utilities.

While it is clear that both the ARB and the CPUC play a role in the development and implementation of the free allocation methodology, it is problematic that ARB's action will be taken before final approval of a methodology by the CPUC.

> Recommendation: In order to ensure that the ARB and CPUC methods are consistent with respect to treatment of power, WSPA recommends that ARB adopt a resolution that: i) allows ARB to confirm that ARB and CPUC regulations achieve the desired equitable resolution, ii) provides for reopening of ARB's allocation method if it is not resolved equitably, and iii) ensures that similar objectives are met for facilities connected to Publicly Owned Utilities.

Treatment of Hydrogen Plants

In the October 7, 2013 workshop, ARB proposed that on-site hydrogen plants be removed from the refinery allocation methodology and that on-site and off-site hydrogen plants be benchmarked based on the same benchmark applied to the merchant hydrogen facilities. WSPA believes it is inappropriate to benchmark based on the merchant facilities because they represent a minority of the hydrogen production[1] in California and exclusively use Pressure Swing Adsorption which is the most current and efficient approach for hydrogen purification. This contrasts with On-site (refinery) hydrogen facilities in California and elsewhere in the world which utilize both PSA and Solvent technology. Use of a single benchmark representing broad industry practice that includes refineries and merchant plants rather than from use of a small subset of operators will result in a more equitable benchmark to facilities in the State.

> Recommendation: WSPA recommends utilizing the CWB methodology for refinery benchmarking because it is appropriate for California operations. Moreover, because it was developed through years of experience with over 200 refineries worldwide, use of the methodology ensures that refineries are equitably represented. If this approach is chosen by ARB for both on-site and off-site production it would meet ARB's first goal, as stated in the workshop, of providing consistent incentives for efficient operation of hydrogen plants.
>
> A more detailed description of the background on hydrogen plant operations is provided as Attachment A.

[1] "Hydrogen Generation" means a unit producing hydrogen. Steam Methane Reforming, includes units producing hydrogen from steam reforming of natural gas or refinery gases. Steam Naphtha Reforming includes units producing hydrogen from steam reforming of naphtha. Partial Oxidation Units produce steam from partial oxidation of fuel oil. The primary product is hydrogen. Low btu gas or Carbon Dioxide are byproducts of these plants. The CWB factors for hydrogen purification units, such as Cryogenic Unit, Membrane Separation Unit, and Pressure Swing Adsorption (PSA) unit, as well as U71 (CO Shift & H2 Purification) and U72 (POX Syngas for H2 Generation), are allocated among Hydrogen Generation units.

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Language to Support Complexity Weighted Barrel (CWB)

Earlier this month, ARB provided a document titled "Language to support Complexity Weighted Barrel (CWB)" that describes regulatory language and definitions needed to support adoption of CWB. We support the change to CWB and acknowledge the work ARB has done to implement the CWB index in California. In reviewing the ARB document, WSPA noted technical changes in ARB's proposed definitions that are necessary to ensure equitable and clear implementation of the CWB.

In order to assist ARB in making the appropriate changes, WSPA is submitting proposed revisions in strike-out and underline format (Attachment B: Definitions Needed to Support CWB).

Review Calculation of Refinery Benchmark

In the interest of transparency, the calculation method used to allocate allowances based on the refinery benchmark must be made public. Attempts to duplicate the overall calculation method (not for individual facilities) used by ARB have failed. Specifically, the CWB benchmark for 2014 should provide 84.96% (0.944 cap * 0.9 stringency) allowances based on the 2014 cap stringency and the 10% "haircut" policy. ARB stated at the workshop that their proposed benchmark would provide only 83% when using the CWT index. Converting CWT to CWB should yield the same percentage reduction.

Recommendation: ARB should release the calculation method so that stakeholders understand the process and data used in the analysis.

WSPA appreciates the opportunity to provide comment on the Workshop. Should you have any questions, feel free to contact me at this office, or Mike Wang of my staff at (cell: 626-590-4905; email: mike@wspa.org).

Regards,

Attachment A: Treatment of Hydrogen Plants and Hydrogen Plant Benchmarking
Attachment B: Language to Support Complexity Weighted Barrel (CWB)
Attachment C: Total CWB Calculation

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Attachment B: "**Language to Support Complexity Weighted Barrel (CWB)**

Page 1

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To the equation for CWB, the CWB functions for Offsites and Non-energy utilities and Non Crude Sensible Heat need to be added.

Page 2 (E) Add, …….CWB function, however it is recognized that total process CWB, total input, and total non-crude input are used to calculate CWB for "off-sites and non-energy utilities" and "not crude sensible heat."

Page 6 – Units for sulfur recovery should be "thousands of long tons/year"

Page 8 – Units for Fuel Gas Sales Treating and Compression (hp) should be hp, not hp/year

Definitions

"Complexity weighted barrel" or "CWB" means a metric created to evaluate the greenhouse gas efficiency of petroleum refineries and related processes. The CWB value for an individual refinery is calculated using actual refinery throughput to specified process units and emission factors for these process units. The emission factor is denoted as the CWB factor and is representative of the greenhouse gas emission intensity at an average level of energy efficiency, for the same standard fuel type for each process unit for production, and for average process emissions of the process units across a sample of refineries. Each CWB factor is expressed as a value weighted relative to atmospheric crude distillation.

Process Definitions

☐ "Air separation unit" means a refinery unit which separates air into its components including oxygen. It is usually cryogenic but factor applies to all processes cryogenic or otherwise.

☐ "Alkylation/poly/dimersol" means a range of processes transforming C3/C4/C5 molecules into gasoline ~~C7/C8 molecules~~ over an acidic catalyst. This can be accomplished by alkylation with sulfuric acid or hydrofluoric acid, polymerization with a C3 or C3/C4 olefin feed, or dimersol.

☐ "Ammonia recovery unit" means a refinery unit in which ammonia-rich sour water stripper overhead is treated to separate ammonia suitable for sales or reuse in the refinery, in particular for the reduction of NOx emissions. This unit is the second stage of a two stage sour water stripping unit. The ammonia recovery unit includes, but is not limited to, the adsorber, stripper and fractionator.

☐ "Aromatic saturation of distillates" means the saturation of aromatic rings over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen. ~~This process includes the desulfurization step which should therefore not be accounted for separately.~~

☐ "AROMAX®" means a special application of catalytic reforming for the specific purpose of producing light aromatics.

☐ “Aromatics production” means extraction of light aromatics from reformate and/or hydrotreated pyrolysis gasoline by means of a solvent.

☐ “Asphalt production” means the processing required to produce asphalts and bitumen, including bitumen oxidation (mostly for road paving). Asphalt later modified with polymers is included.

☐ “Atmospheric Crude Distillation” means primary atmospheric distillation of crude oil and other feedstocks. The atmospheric crude distillation unit includes any ancillary equipment such as a crude desalter, naphtha splitting, gas plant and

~~**Language to Support Complexity Weighted Barrel (CWB)**~~

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wet treatment of light streams for mercaptan removal. Some units may have more than one main distillation column.

☐ “Benzene saturation” means selective hydrogenation of benzene in gasoline streams over a fixed catalyst bed at moderate pressure.

☐ “C4 isomer production” means conversion of normal butane into isobutane over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure.

☐ “C5/C6 isomer production - including ISOSIV” means conversion of normal paraffins into isoparaffins over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure. ~~Throughputs of this unit include the throughput of both once-through and recycle units.~~

☐ “Conventional naphtha hydrotreating” means desulfurization of virgin and cracked naphthas over a fixed catalyst bed at moderate pressure and in the presence of hydrogen. For cracked naphthas this also involves saturation of olefins.

☐ “Cryogenic LPG recovery” means a refinery unit in which liquefied petroleum gas (LPG) is extracted from refinery gas streams through cooling and removing the condensate heavy fractions. The processes and equipment for this unit include, but are not limited to, refrigeration, drier, compressor, absorber, stripper and fractionation.

☐ “Cumene production” means alkylation of benzene with propylene.

☐ “Cyclohexane production” means hydrogenation of benzene to cyclohexane over a catalyst at high pressure.

☐ “Delayed Coker” means a refinery unit which conducts a semi-continuous process, ~~similar in line-up to a visbreaker,~~ where the heat of reaction is supplied by a fired heater. Coke is produced in alternate drums that are swapped at regular intervals. Coke is cut out of full coke drums ~~and disposed of~~ as a product. For the purposes of analysis, facilities include coke handling and storage.

☐ “Desalination” means a refinery’s desalination of sea water or contaminated water. It includes all such processes.

☐ “Desulfurization of C4–C6 Feeds” means desulfurization of light naphthas over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.

☐ “Desulfurization of pyrolysis gasoline/naphtha” means selective or non-selective desulfurization of pyrolysis gasoline (by-product of light olefins production) and

other streams over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.

☐ “Diolefin to olefin saturation of gasoline” means selective saturation of diolefins over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen, to improve stability of thermally cracked and coker gasolines.

☐ “Distillate hydrotreating” means desulfurization of distillate ~~virgin kerosene~~ over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen.

☐ “Ethylbenzene production” means the process of combining benzene and ethylene to form ethylbenzene.

☐ “FCC gasoline hydrotreating with minimum octane loss” means selective desulfurization of FCC gasoline cuts with minimum olefins saturation, over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.

☐ “Flare gas recovery” means a refinery unit in which flare gas is captured and compressed for other uses. Usually recovered flare gas is treated and routed to the refinery fuel gas system. Depending upon the flare gas composition, recovered gas may have other uses. The equipment for this process includes, but is not limited to, the compressor and separator.

☐ “Flexicoker” means a refinery unit which conducts a proprietary process incorporating a fluid coker ~~and~~ where ~~the surplus~~ coke is gasified to produce a so-called "low BTU gas" which is used to supply the refinery heaters and surplus coke is drawn off as a product.~~.~~

☐ “Flue gas desulfurizing” means a process in which sulfur dioxide is removed from flue gases with contaminants. This often involves an alkaline sorbent which captures sulfur dioxide and transforms it into a solid product. Various methods exist with varying sulfur dioxide removal efficiencies. Flue gas desulfurizing systems can be of the regenerative type or the non-regenerative type. The processes and equipment for this process include, but are not limited to, the contactor, catalyst/reagent regeneration, scrubbing circulation and solids handling.

☐ “Fluid Catalytic Cracking” means cracking of a hydrocarbon stream typically consisting of ~~vacuum~~ gasoils and residual feedstocks over a catalyst. The finely divided catalyst is circulated in a fluidized state from the reactor where it becomes coated with coke to the regenerator where coke is burned off. The hot regenerated catalyst returning to the reactor supplies the heat for the endothermic cracking reaction and for most of the downstream fractionation of cracked products.

☐ “Fluid Coker” means a proprietary continuous process where the fluidized powder-like coke is transferred between the cracking reactor and the coke burning vessel and burned for process heat production. Surplus coke is drawn off and ~~disposed of~~ as a product.

~~**Language to Support Complexity Weighted Barrel (CWB)**~~

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☐ “Fuel gas sales treating & compression” means treatment and compression of refinery fuel gas for sale to a third party.

Hydrogen Generation” means a unit producing hydrogen. Steam Methane Reforming, includes units producing hydrogen from steam reforming of natural gas or refinery gases. Steam Naphtha Reforming includes units producing hydrogen from steam reforming of naphtha. Partial Oxidation Units produce steam from partial oxidation of fuel oil. The primary product is hydrogen. Low btu gas or Carbon Dioxide are byproducts of these plants. The CWB factors for hydrogen purification units, such as Cryogenic Unit, Membrane Separation Unit, and Pressure Swing Adsorption (PSA) unit, as well as U71 (CO Shift & H2 Purification) and U72 (POX Syngas for H2 Generation), are allocated among Hydrogen Generation units.

☐ “Hydrodealkylation” means dealkylation of toluene and xylenes into benzene over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure.

☐ “Kerosene hydrotreater” means a refinery process unit which treats and upgrades kerosene and gasoil streams using “aromatic saturation of distillates,” “distillate hydrotreating,” “middle distillate dewaxing” or the “S-Zorb™ process for kerosene and gasoil” or “selective hydrotreating of distillates.”

☐ “Lube catalytic dewaxing” means catalytic breakdown of long paraffinic chains in intermediate streams in the manufacture of lube oils.

☐ “Lube solvent dewaxing” means solvent removal of long paraffinic chains (wax) from intermediate streams in the manufacture of lube oils. Includes solvent regeneration. Different proprietary processes use different solvents, such as chlorocarbon, MEK/toluene, MEK/MIBK, or propane.

☐ “Lube solvent extraction” means solvent extraction of aromatic compounds from intermediate streams in the manufacture of base lube oils. This includes solvent regeneration. Different proprietary processes use different solvents, such as Furfural, NMP, phenol, or SO2.

☐ “Lube/Wax hydrofining” means hydrotreating of lube oil fractions and wax for quality improvement.

☐ "Lubricant hydrocracking" means hydrocracking of heavy feedstocks for the manufacture of lube oils.

☐ "Methanol synthesis" means recombination of CO2 and hydrogen for methanol synthesis. This factor is only applicable when a refinery produces hydrogen via partial oxidation.

☐ "Middle distillate dewaxing" means cracking of long paraffinic chains in gasoils to improve cold flow properties over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen. This process includes the desulfurization step which should therefore not be accounted for separately.

☐ "Mild Residual FCC" means fluid catalytic cracking when the feed has a Conradson carbon level of 2.25% to 3.5% by weight.

☐ "Naphtha/Distillate Hydrocracker" means a refinery process unit which conducts cracking of a hydrocarbon stream typically consisting of distillates and gasoils vacuum gasoils and cracked heavy distillates over a fixed catalyst bed, at high pressure and in the presence of hydrogen. The process combines

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cracking and hydrogenation reactions. Conversion of naphtha into C3-C4 hydrocarbons is included here.

☐ "

Naphtha Hydrotreater" means a refinery process unit which treats and upgrades a hydrocarbon stream typically consisting of naphtha/gasoline and lighter streams. It includes the following process units; Benzene Saturation, Desulfurization of C_4-C_6 Feeds, Conventional Naphtha Hydrotreating, Diolefin to Olefin Saturation of Gasoline, FCC Gasoline Hydrotreating with Minimum Octane Loss, Olefinic Alkylation of Thiophenic Sulfur, Selective Hydrotreating of Pyrolysis Gasoline/Naphtha Combined with Desulfurization, Pyrolysis Gasoline Desulfurization, Reactor for Selective Hydrotreating and S-Zorb™ Process.

Naphta hydrotreater" means a refinery process unit which treats and upgrades a hydrocarbon stream typically consisting of naphtha/gasoline and lighter streams using "benzene saturation," "desulfurization of C4–C6 feeds," "conventional naphtha hydrotreating," "diolefin to olefin saturation of gasoline," "FCC gasoline hydrotreating with minimum octane loss," "olefinic alkylation of thio sulfur," and/or "desulfurization of pyrolysis gasoline/naphtha," is a "reactor for selective hydrotreating" and may also use the "S-Zorb™ process for naphta/distillates."

☐ "Olefinic alkylation of thio sulfur" means a gasoline desulfurization process in which thiophenes and mercaptans are catalytically reacted with olefins to produce higher-boiling sulphur compounds removable by distillation. This does not involve hydrogen.

☐ "Other FCC" means early catalytic cracking processes on fixed catalyst beds, including Houdry catalytic cracking and Thermofor catalytic cracking.

☐ "Oxygenates" means ethers produced by reacting an alcohol with olefins.

☐ "Paraxylene production" means physical separation of paraxylene from mixed xylenes.

☐ "Propane/Propylene splitter (propylene production)" means a refinery unit that conducts separation of propylene from other mostly olefinic C3/C4 molecules generally produced in an FCC or coker. Its product is propylene and must be chemical or polymer grade. "Chemical" and "polymer" are two grades with different purities.

☐ "POX syngas for fuel" means production of synthesis gas by gasification (partial oxidation) of heavy residues. This includes syngas clean-up.

☐ "Reactor for selective hydrotreating" means a special configuration where a distillation/fractionation column contains a solid catalyst that converts diolefins in FCC gasoline to olefins or where the catalyst bed is in a preheat train reactor vessel in front of the column.

☐ "Reformer - including AROMAX" means a refinery unit which increases the octane rating of naphtha by dehydrogenation of naphthenic rings and paraffin isomerisation over a noble metal catalyst at low pressure and high temperature. The process also produces hydrogen. Different configurations of the process are possible.

☐ "Residual FCC" means fluid catalytic cracking when the feed has a Conradson carbon level of greater than or equal to 3.5% by weight.

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☐ "Residual hydrotreater" means a refinery unit which conducts desulfurization of residues over a fixed catalyst bed at high pressure and in the presence of hydrogen. It results in a limited degree of conversion of the residue feed into lighter products.

☐ "Residual Hydrocracker" means a refinery unit which conducts hydrocracking of residual feedstocks. Different proprietary processes involve continuous or semicontinuous catalyst replenishment. The residual hydrocracker unit must be designed to process feed containing ~~at least 50% mass of~~ vacuum ~~residue~~ residuum ~~(defined as boiling over 550°C)~~ for it to qualify as a residual hydrocracker for the purposes of complexity-weighted barrel throughputs.

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☐ "S-Zorb™ process for kerosene and gasoil" means desulfurization of gasoil using a proprietory absorbtion process. This process does not involve hydrogen.

☐ "S-Zorb™ process for naphtha/distillates" means desulfurization of naphtha/gasoline streams using a proprietary fluid-bed hydrogenation adsorption process in the presence of hydrogen.

☐ "Selective hydrotreating of diolefins distillates" means selective saturation of diolefins in
C4 streams for alkylation over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen,
"Selective hydrotreating of distillates" means selective hydrotreating to produce a low contaminant distillate.or hydrotreatment of distillates for conversion of diolefins to olefins.

☐ "Solvent deasphalter" means a refinery unit which utilizes a solvent, such as propane, butane or a heavier solvent, to remove asphaltines from a residual oil stream and produces asphalt and a deasphalted gas oil. conducts separation of the lighter fraction of a vacuum or cracked residue by means of a solvent such as propane, butane or heavier.

☐ "Special Fractionation" means fractionation processes excluding solvents, propylene and aromatics fractionation, which are accomplished by a deethanizer, depropanizer, deisobutanizer, debutanizer, deisopentanizer, depentanizer, deisohexanizer, dehexanizer, deisoheptanizer, deheptanizer, naphtha splitter, alkylate splitter or reformate splitter. Production of solvents, propylene and aromatics are excluded from "Special Fractionation" but included elsewhere.

☐ "Standard FCC" means fluid catalytic cracking when the feed has a Conradson carbon level of less than 2.25% by weight.

☐ "Sulfur Sulfur Recovery (recovered)" means a process where hydrogen sulfide is removed from the process and converted to elemental sulfur. Typical units used in this process include: Sulfur Recovery Unit, Tail Gas Recovery Unit, and H2S Springer Unit. sulfur produced by partial oxidation of hydrogen sulfide into elemental sulfur.

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☐ "Sulfuric acid regeneration" means a catalytic process in which spent acid is regenerated to concentrated sulfuric acid. The equipment for this process includes, but is not limited to, the combustor, waste heat boiler, converter, absorber, SO3 recycle, gas cleaning including electrostatic precipitator and amine regenerator.

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☐ "Thermal Cracking" means thermal cracking of distillate feedstocks. A thermal cracking unit may include a vacuum flasher. Units that combine visbreaking and thermal cracking of distillate generate a contribution for both processes based on the residue and the distillate throughput respectively.

☐ "Toluene disproportionation/transalkylation means a fixed-bed catalytic process for the conversion of toluene to benzene and xylene in the presence of hydrogen.

☐ "Vacuum Distillation" means distillation of atmospheric residues under vacuum. The process line up must include a heater. Some units may have more than one main distillation column.

☐ “Visbreaker” means a refinery unit which conducts mild thermal cracking of residual feedstocks to produce some distillates and reduce the viscosity of the cracked residue. It may include a vacuum flasher. Units that combine visbreaking and thermal cracking of distillate generate a contribution for both processes based on the residue and the distillate throughput respectively.

☐ “VGO Hydrotreater” means a refinery unit which conducts desulfurization of a hydrocarbon stream typically consisting of vacuum and cracked gasoils usually destined to be used as FCC feed, over a fixed catalyst bed at medium or high pressure and in the presence of hydrogen.

☐ “Wax deoiling” means solvent removal of lighter hydrocarbons from wax obtained from lube dewaxing. Different proprietary processes use different solvents, such as MEK/toluene, MEK/MIBK, or propane.

☐ “Xylene isomerization” means isomerization of mixed xylenes to paraxylene.

Attachment A: Treatment of Hydrogen Plants and Hydrogen Plant Benchmarking

The benchmark for hydrogen plants should be based on all hydrogen plant operations in California. Specifically, the benchmark should include facilities that are associated with refinery operations and independent "merchant" plants that sell hydrogen to refineries. This "inclusive" approach would represent that greatest number of facilities and therefore is the most representative of the overall breadth of hydrogen plant operations. The inclusive approach would also result in the "fairest" and most equitable benchmark for the reasons detailed below.

The CA-CWB factors for hydrogen plants express emission intensity of worldwide hydrogen plants relative to atmospheric crude distillation; including feedstock conversion to hydrogen, fuel for the reforming furnace, imports or exports of thermal energy across unit boundaries and power. These factors should continue to be used in calculating total CWB for a refinery. ARB should recognize that the inventory of on-site hydrogen plants, both worldwide and in California, includes various technologies.

Feedstocks for on-site hydrogen plants are metered and reported under the MRR, but fuel metering for the MRR may, in some cases, be metered upstream and include emission sources in other units. Feedstocks and fuel for off-site hydrogen plants are normally supported by financial transaction meters. Hence, because some hydrogen plant metering may not exactly match MRR requirements, only an "inclusive" approach that includes all hydrogen plants will be consistent with the approach used by ARB for all other facilities.

Imports and exports of thermal energy between a hydrogen plant and the rest of the refinery can include multiple levels of steam (e.g., High pressure, medium pressure, low pressure), steam to drive condensing or letdown turbines, low pressure steam from letdown turbines, and boiler feedwater (de-aerated and/or preheated). The utility balance is an important part of the equation in determining the net energy use and net emissions profile for any given hydrogen plant, but the data and analysis required to support the utility balance for an on-site hydrogen plant normally requires some degree of manual readings and engineering estimates. The CWB factor for steam methane reforming (SMR) hydrogen plants is consistent with natural gas feed and fuel. In practice, SMR hydrogen plants process both heavier feeds (containing ethane, propane, butane, etc.) and lighter hydrogen rich feeds. Because of this, equally efficient plants may have varying (i.e. higher or lower) emissions relative to the CWB factor and benchmark.

In contrast to the "inclusive" process, excluding hydrogen plants from the refinery CWB could potentially be inequitable to refineries unless the supporting analysis provides assurance that the reduction in CWB, benchmark emissions, and allocations are exactly equal to the addition of benchmark emissions and allocation resulting from hydrogen operations. Such equality is at this time difficult to prove and may not be supported by metering as described above[1]. If the reduction in CWB is not offset by an equal increase associated with hydrogen operations, then ARB would be effectively applying a stricter and inequitable stringency factor (more stringent than 90%) than that used for other sectors.

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[1] As stated earlier, a detailed analysis to support an exclusive approach would need to include factors for offsites and non-energy utilities and sensible heat of non-crude feeds as well as consistent treatment of thermal energy and power

We understand that the policy goal of treating hydrogen separately was to provide consistent incentives between on-site and off-site hydrogen production and to avoid over-allocation to off-site hydrogen that would occur if off-site hydrogen were allocated using CWB. To meet both of these goals ARB has proposed a more stringent benchmark for hydrogen that appears to be consistent only with the most efficient merchant plants. This approach would be a significant departure from the intent of using the Solomon factors, supported by broad international experience, for the benchmarking of refinery units. This is so because hydrogen units within the refinery are integrated into refinery operations. For example, a refinery may choose to have its hydrogen unit make extra steam rather than making steam elsewhere in the refinery. In such an instance, the emission of their hydrogen unit might be higher than if the plant stood alone.

Attachment C: CWB Calculation

(B) *Total facility CWB.* The total facility CWB production must be calculated according to the following formula.

$CWB = \sum CWB_{Factor} * Throughput + CWB_{Off\text{-}Sites\ and\ Non\text{-}Energy\ Utilities} + CWB_{Non\text{-}Crude\ Sensible\ Heat}$

Where:
"CWB" = The total amount of complexity weighted barrels from a petroleum refinery.
"CWB_{Factor}" = The CWB factor for each process found in Table 1 of this section.
"Throughput"= The reported value for each CWB function identified in Table 1 of this section reported pursuant to section 95113(l)(43)(A).

"$CWB_{Off\text{-}Sites\ and\ Non\text{-}Energy\ Utilities}$" = 0.327 * Total Input + .0085 * $\sum CWB_{Factor}$ * Throughput

"$CWB_{Non\text{-}Crude\ Sensible\ Heat}$" = 0.44 * Non-Crude Input Barrels