

Feedback on LCFS Workshop held September 29, 2014

CARB's efforts to develop the proposed refinery investment provisions are commendable. These provisions appear to be appropriate and consistent with the LCFS policy intent of enabling LCFS credit generation by petroleum fuel suppliers that take specific action to reduce their GHG emissions and thereby reduce the carbon intensities of their transportation fuels. These proposed provisions, combined with the innovative methods provisions, support the program's economic efficiency and overarching structure as a fuel-neutral performance standard. They advance the overall policy objectives by recognizing the potentially substantial reductions in the carbon intensity that can be achieved in California's petroleum fuel pool. In these ways the proposed refinery investment provisions should enable California to achieve deeper reductions in fuel carbon intensity (and GHG emissions) at lower costs to consumers.

Feedback on the information provided during the September 29th workshop focuses on the following aspects of the proposed refinery provisions:

1. Definition of $\Delta\text{CO}_2\text{e}$ and credit issuance mechanisms;
2. Refinery project definition and measurement of net emissions reductions;
3. Allocation of emissions reductions across refinery products;

Definition of $\Delta\text{CO}_2\text{e}$ and credit issuance mechanisms

The presentation and draft regulatory language provided at the workshop are generally straightforward, but are somewhat ambiguous on precisely how the change in emissions (" $\Delta\text{CO}_2\text{e}$ ") is to be measured. In particular, the basis (e.g., temporal, volumetric, or energy) for measuring emissions—and the change in emissions—is not specified.

One approach, which appears to be consistent with the language and intent, would be to measure the change in emissions for each compliance period (i.e., calendar year) in which the project is active. In this case, $\Delta\text{CO}_2\text{e}$ would define the change in annual emissions resulting from the project, enabling issuance of LCFS credits during each compliance period (year) that the project achieves the specified emissions reductions.

An alternate approach, which also appears to be consistent with the language and intent, would measure the change in annual emissions per unit of transportation fuels produced annually. The result could be specified in the same units adopted to specify fuel CI under the program (i.e., $\text{gCO}_2\text{e}/\text{MJ}$), which would enable LCFS credits generated under the refinery investment provisions according to the quantity of fuels produced and reported by the refinery in the online LRT. A benefit of this approach is its consistency with the structure and reporting systems used for the balance of the program. It also explicitly ties LCFS credit generation to the supply of low carbon transportation fuels, rather than to equivalent annual emissions reductions. To be clear, the underlying basis for the credit generation would be the same in both cases—emissions reduced by a refinery project—but the mechanics of credit issuance would be different. In the first case, credits would likely be issued in bulk on a quarterly, semi-annual, or annual basis; in the second case, credits would be issued through the LRT as transportation fuels are supplied.

A third approach, which might also be interpreted as consistent with the draft language, would measure $\Delta\text{CO}_2\text{e}$ over the expected life of a refinery project and issue LCFS credits at the beginning of a project in proportion to the total reduction expected over the project life. My sense is that this is not consistent with the intent underlying the proposals and is less consistent with the broader policy design. In any case, the regulatory language should be revised to clarify the temporal, volumetric, or energy basis used to measure $\Delta\text{CO}_2\text{e}$ and the associated mechanisms for credit generation.

Refinery project definition and measurement of net emissions reductions

The presentation indicates that emissions reductions for credit generation under the refinery provisions are to be measured on a project-specific basis. This appears to be sensible and appropriate; however, the implications of this approach hinge on how “projects” are defined, including how the system boundaries are defined to measure emissions reductions resulting from the project. In particular, the project definition should arguably be broad enough to capture net emissions impacts across the refinery and closely coupled industrial facilities. At the same time, it should arguably be constrained to specific refinery investment decisions or refinery projects, rather than creating a long-term liability for refineries that pro-actively invest in emissions reductions.

As discussed at the workshop, the system boundaries for measuring a refinery project should be sufficiently broad to capture net changes in refinery emissions resulting from the project across all refinery operations. This limits the potential for excess credits to be generated by projects that reduce emissions in one area of a refinery while simultaneously allowing emissions to increase in some other area(s). As such, it seems to be appropriate and consistent with the intent of these proposed provisions to adopt a system boundary that captures emissions impacts across all refinery operations. This also appears to be consistent with the comments made during the workshop.

Comments made at the workshop also suggested that the boundaries should be sufficiently broad to reflect project impacts on emissions from sources of key refinery inputs, even if those impacts are not realized strictly within the refinery facility footprint. An example noted at the workshop was the use of biogas rather than natural gas to satisfy refinery energy inputs. This example raises some complex questions regarding the nature of refinery investments and refinery projects, which staff will need to sort through.

That said, there are other types of refinery inputs that seem to naturally fit within the scope of the proposed refinery investment provisions. These include refinery inputs that are necessary for refinery operations, that are carbon intensive to produce (and therefore might represent candidates for emissions reduction projects), and that are produced by closely coupled industrial processes that exist within the physical footprint (and / or ownership structure) of some—but not all—refineries. Hydrogen production is a relevant example in this context. Hydrogen is a necessary input for a variety of refinery processes; hydrogen production is emissions-intensive; technologies are available to substantially reduce emissions from hydrogen production; and some refineries produce hydrogen on site while others purchase hydrogen from facilities that are closely coupled, but independently owned and operated. In this context, it seems appropriate to consider projects that reduce emissions from hydrogen production (at units that supply refineries regulated under the CA-LCFS) to be within the scope of the refinery investment provisions, even if the hydrogen production facility is beyond the physical footprint of the refinery or is owned and operated by a separate company.

Excluding projects that reduce emissions from hydrogen production based on facility ownership, for example, appears to be inconsistent with the LCFS policy design. It would not be consistent with policy's structure as a performance-based instrument regulating lifecycle emissions. It would also tend to disadvantage refineries that have historically adopted a partnership model to development, relative to those that adopted a more consolidated ownership model (e.g., refineries that own their own hydrogen production facilities could benefit under the LCFS for low carbon hydrogen production projects). Differentiating the treatment of regulated parties in this way might arguably "pick winners and losers" in a way that is both inappropriate and inconsistent with the purpose of the LCFS and unhelpful for motivating emissions reductions.

One way in which the boundary for analysis should arguably be limited within the refinery investments provisions is with respect to the emissions impacts of projects not taken to reduce emissions under the refinery investment provisions. In principle, a refinery might make one investment specifically to reduce emissions, and qualify that project for policy incentives available under the LCFS, and make separate investments, affecting separate aspects of refinery operations, which increase emissions and fuel CI. These investments could be undertaken separately, for unrelated purposes, reflecting different decision processes, and be separated in time by several years. Confounding the treatment of such independent investment decisions, by making credit generation under the refinery investments provisions contingent on emissions impacts from future projects, seems potentially problematic for several reasons.

Generally speaking, refinery investments that increase emissions and fuel carbon intensities should be reflected in compliance obligations under the C&T program and in the average CI of CARBOB and diesel fuel used in California. These existing mechanisms should rightfully discourage increases in refinery emissions and should ensure that any potential increases are properly taken into account under both the C&T program and the LCFS. Importantly, however, the quantity of LCFS deficits generated by individual refineries are not currently impacted by refinery decisions to undertake CI-increasing projects. Instead, such projects would arguably impact the average CI contribution of crude oil refining on CARBOB CI, and associated LCFS deficit generation, across all refineries.

This policy treatment may not be optimal in terms of providing strong incentives for refinery investments, but it doesn't seem appropriate for the refinery investment provisions to impact the broader treatment of refineries under the LCFS. In particular, tying credits generated under the refinery investment provisions to CI impacts of other, unrelated refinery projects arguably exposes refineries to additional scrutiny and creates additional liabilities for those refineries that leverage incentives provided by the refinery investment provisions to undertake emission-reducing projects.

For example, a refinery could undertake a project to capture CO₂ emissions from a refinery process for geologic sequestration and subsequently undertake a project that enables the refinery to shift its crude mix or its product slate in response to evolving market conditions. The former project could substantially reduce refinery emissions, reduce fuel carbon intensities, and advance California's climate policy objectives. The latter project might increase emissions elsewhere at the refinery; however, it seems unlikely that decisions regarding a CO₂ capture project would be directly related to decisions regarding shifts in market conditions that impact the refinery's crude mix or product slate. In such cases, it doesn't seem to be useful or appropriate to discount the quantity of LCFS credits issued in response to the CO₂ capture project because the refinery subsequently undertook a project related to its crude mix or product slate.

A regulatory approach that makes LCFS credit generation (under the refinery investment provisions) contingent on subsequent investment decisions in this way could create additional barriers to achieving emissions reductions and even create perverse incentives that contradict the purpose of the LCFS. Creating such a dependency would create additional uncertainty regarding the future value of policy incentives, reducing the ability of LCFS policy incentives to help motivate capital intensive investments in emissions reductions.

Limiting the scope of “project” definitions adopted under the proposed refinery investment provisions to those changes in refinery operations tied to an investment in reducing emissions, or to decisions taken concurrently with such an investment, would provide stronger incentives to invest in emissions reductions. It would provide greater certainty regarding the value to be realized by such projects. Under this approach, emissions increases at refineries would still be captured in updates to the CI contribution of refinery processes to the LCA for petroleum fuels and in C&T compliance obligations. This mechanism should arguably discourage ‘backsliding’ and provide coherent incentives to expand reductions in refinery emissions.

Allocation of emissions reductions across refinery products

The draft regulation language and workshop presentation slides state that LCFS credits generated under the refinery investment provisions will be calculated as the product of the total emissions reduction and the percentage of transportation fuels produced within the refinery product mix. This reflects the notion that emissions reductions achieved at the refinery will be notionally allocated across all refinery products (including both transportation fuels and non-transportation fuel products) and that LCFS credits will only be generated for those emissions reductions that are notionally allocated to transportation fuel products. The slides elaborate this further by stating that “Credit will be allocated [and issued under the refinery investment provisions] to transportation fuels as a ratio of all refinery products”. This aspect of the proposal was also touched on during the workshop discussion, which reflected the intent that LCFS credits would not be generated in proportion to the full quantity of emissions reductions at the refinery, but would be reduced by the factor “T”, limiting credit generation to only those emissions reductions allocated to transportation fuel products. This approach appears to be problematic in that it is inconsistent with emission accounting adopted in the balance of the LCFS program.

To appreciate the inconsistency, it is useful to consider the policy treatment of an ethanol plant as an analogue to the refinery, noting that part of the rationale for the refinery investment provisions is to recognize refinery investments to reduce emissions in a manner similar to that provided for investments in emissions reductions at biofuel production facilities. Consider, for example, the treatment of an ethanol plant that undertakes a capital project to switch from coal to natural gas in supplying plant energy requirements. The LCFS credit generation potential of this project is not defined in proportion to fuel ethanol within the plant’s product slate (including non-fuel co-products such as DDGS, corn oil, etc.), but reflects the full emissions reduction. In other words, 100% of the emissions reduction is notionally allocated to transportation fuel products.

One way to think of this is in terms of the underlying lifecycle assessment methodologies that dictate this approach in the biofuels context, and which appear completely applicable to the refinery context—the use of system expansion for co-product accounting. Considering the ethanol plant analog, switching from coal to natural gas might arguably reduce the carbon intensity of both ethanol and animal feed co-

products. System expansion is typically implemented without any allocation; however, if emissions reductions were notionally allocated to non-fuel co-products (e.g., animal feed) then this would provide an incremental emissions benefit in the co-product market, which would then be assigned back to the ethanol product via system expansion. Similarly, a project that reduces refinery emissions might arguably reduce the emissions intensity of both transportation fuel products and non-transportation fuel co-products; however, an LCA of the impact on transportation fuel carbon intensity (conducted in a manner consistent with the balance of the LCFS) would generally credit the full emissions reduction to the transportation fuel via system expansion. Adopting a regulatory approach that limits the quantity of credits generated by refinery investments by notionally allocating a portion of the emissions reduction to non-fuel co-products would therefore be inconsistent with the LCA methodologies adopted in the balance of the regulation for petroleum alternatives.

Another relevant example in this context relates to the “innovative methods” provisions of the LCFS. According to these provisions, LCFS credits are generated for 100% of emissions reductions realized by implementing an innovative method of crude oil production. This is consistent with the notion that 100% of the emissions benefits are being allocated to transportation fuel petroleum products. Such allocation might be appropriate according to a number of technical rationale—including but not limited to those underlying the use of system expansion discussed above. All of these rationale appear equally appropriate for the refinery investments provisions as the innovative methods provisions. Adopting a regulatory framework that limits the quantity of credits generated by refinery investments by notionally allocating a portion of the emissions reduction to non-fuel co-products would therefore be inconsistent with the LCA methodologies adopted in the innovative methods provisions of the regulation.

Taken together, these examples and the underlying methodological rationale suggest that LCFS credit generation under the proposed refinery investment provisions should reflect 100% of the emissions reductions realized by projects undertaken by the refinery.

One potential issue with this approach might relate to refineries for which transportation fuels represent a very small portion of their product slate. It is not obvious that this should be problematic, but if it is a source of concern (and if it is a factor underlying the current proposal) then it may be appropriate for this concern to be discussed explicitly to explore policy alternatives capable of addressing the concern in a manner that is more consistent with the balance of the program.