

State of California
Air Resources Board

Staff Discussion Paper

Fossil and Renewable Natural Gas as a Transportation Fuel
Updates to November 23, 2016 Discussion Paper for Working
Meeting of December 2, 2016

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PURPOSE

This discussion paper provides an overview of how natural gas used as a transportation fuel is currently treated in the Low Carbon Fuel Standard (LCFS)¹ program and continues the dialogue with stakeholders about initiatives to improve administration of current program requirements, as well as potential future regulatory changes for this fuel type. It is a working document and is expected to evolve over time based on input from stakeholders.

The first draft of this discussion paper was posted November 23, 2016 in advance of a public working meeting focused on Tier 1 pathways for fossil and renewable natural gas. This April 13, 2017 update reflects the continued development of staff's efforts in response to stakeholder feedback, identifies new feedback requests, and introduces new topics including:

- CI Application Input Value Definitions
- Standardization of natural gas fueling facility CI parameters
- Guidance on determining pipeline transmission distances
- Metering requirements
- Updates on fueling facility registration and reporting
- Considerations for harmonizing third-party verification with EPA QAP program
- Additional considerations to assure no double counting of renewable attributes.

INTRODUCTION AND GENERAL PROGRAM BACKGROUND

The LCFS is a market-based, fuel-neutral performance standard that requires reductions in the carbon intensity of California's transportation fuels over time. Each fuel's carbon intensity (CI) is calculated based on greenhouse gas (GHG) emissions per unit of fuel energy over the fuel's lifecycle—from raw material or feedstock production through end use.² Lower-CI fuels produce fewer GHGs per energy unit. Higher-CI fuels, such as traditional petroleum-based fossil fuels, produce more GHGs per energy unit.

In order to reduce GHG emissions, LCFS requires a yearly declining average CI for the pool of California's transportation fuels. Fuels that exceed the mandated average CI generate deficits and those that have CIs below the mandated average CI generate credits. The quantity of credits or deficits generated by each fuel is determined by its fuel-specific CI score relative to the declining CI standard and the quantity of the fuel used for transportation in California. Deficits created by fuels that exceed the mandated CI must be offset with credits generated by lower-CI fuels.

¹ California Code of Regulations, title 17, section 95480 et seq. Available at: <https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.

² A fuel's lifecycle emissions intensity is also referred to as its "pathway" or "carbon intensity score" in LCFS documentation. These values are usually expressed in units of grams carbon dioxide equivalent per megajoule (gCO₂e/MJ).

Transportation fuels that meet the CI target through 2020 are credit generating fuels in the LCFS. These include fossil CNG derived from North American sources, bio-CNG, bio-LNG, and bio-L-CNG. LCFS allows providers of these fuels to “opt in” to the program, and generate credits that can be sold in the California LCFS market. Fossil LNG and fossil L-CNG are not opt-in fuels, in that they must participate in the LCFS program; however, they may still be credit generators if their CI is below the compliance standard CI for a given year.

Terms and acronyms used in this discussion paper are described here for reference.

- **Biogas** is a raw gaseous mixture composed primarily of methane and carbon dioxide and derived from the anaerobic decomposition of organic matter in a landfill, lagoon, or digester.³ Biogas has the environmental attributes⁴ of biomethane but not the physical properties of pipeline quality natural gas. In addition to its use in transportation, biogas can be used as a fuel in boilers and engines to produce electrical power.
- **Biomethane (RNG)** is also referred to as renewable natural gas. Biomethane is biogas that has been upgraded to meet pipeline quality natural gas standards⁵ and contains all the renewable attributes associated with the use of a pipeline quality biogas-derived fuel as a vehicle fuel. Alternatively, biomethane can be produced from biomass through gasification to bio-syngas followed by methanation and upgrading.
- **Natural Gas (NG)** is a mixture of gaseous hydrocarbons, primarily composed of methane. This term is principally used to refer to natural gas derived from non-renewable (fossil) sources, but can also be used to describe the gas physically derived from renewable sources after it is stripped of renewable attributes.
- **Fossil NG and RNG** have very similar physical properties and can both be compressed or liquefied, then dispensed and used in vehicles as:
 - Compressed natural gas (CNG or bio-CNG),⁶
 - Liquefied natural gas (LNG or bio-LNG), and
 - Liquefied for transport and/or storage, re-gasified, compressed and dispensed to CNG vehicles (L-CNG or bio-L-CNG).
- **Renewable Attributes** mean any environmental claim that is derived from the production or use of biogas. This includes any renewable, biological, or low CI characteristic of the biogas, whether or not the attribute has any economic value.

³ LCFS regulation section 95841.

⁴ See definition below. The terms “renewable attribute” and “environmental attribute” are used interchangeably in this discussion paper.

⁵ In the LCFS regulation and U.S. EPA’s Renewable Fuel Standard (RFS), the commercial pipeline specifications applicable at the point of injection apply.

⁶ When used as CNG, natural gas (including RNG) must meet the fuel specifications found in sections 2292.5 of the California Code of Regulations.

Multiple claims on any biogas, biomethane, or associated environmental attributes would constitute double-counting prohibited by the LCFS regulation.⁷

- **Importer** means the person who owns the transportation fuel or blendstock, in the transportation equipment that held or carried the product, at the point the fuel entered California. For purposes of this definition, “transportation equipment” includes, but is not limited to, rail cars, cargo tanker trucks, and pipelines.⁸
- **Producer** means, with respect to any fuel, the entity that made or prepared the fuel. This definition includes “out-of-state” producers where the production facility is out of the State of California and the entity has opted into the LCFS pursuant to section 95483.1.⁹
- **Bio-CNG Producer** (for purposes of discussion in this paper) is the biogas upgrader.
- **Bio-LNG Producers** (for purposes of discussion in this paper) are the biogas upgrader, and the owner of the liquefaction facility that produces LNG and meets requirements under the LCFS regulation to report bio-LNG.

Current Parties Eligible to Generate Credits for Natural Gas

The Reporting Party is the initial regulated party as defined in section 95483(d) (“Regulated Parties for Natural Gas”) of the current LCFS regulation. Note that the eligibility to generate credits can be transferred to downstream parties in the fuel supply chain if both the upstream and downstream parties agree by written contract and if the downstream party also takes ownership of fuel. The exception to this arrangement is fossil CNG, where the designated credit generator (and Regulated Party) is the fueling facility owner—the final downstream entity in the fuel supply chain.

For natural gas used as a transportation fuel, the following table lists the categories of entities eligible to generate LCFS credits and shows the number of such entities currently participating in the LCFS.

⁷ LCFS regulation section 95488(e)(2): “Initial demonstrations covering biomethane conveyed to California by pipeline for the purpose of earning credits under the LCFS shall include statements from the biomethane suppliers and marketers attesting to the fact that that biomethane is not being used to earn credits under any other state or federal program, with the sole exception of the federal Renewable Fuel Standard program (RFS).” Available at: <https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.

⁸ LCFS regulation section 95481(a)(46).

⁹ LCFS regulation section 95481(a)(66).

Table 1. Eligible Parties for Natural Gas and Biomethane

Eligible Party ¹⁰	Number of Participating Entities
CNG Fueling Facilities including Public Transit Agencies	48
Bio-CNG Producers	28
LNG Producers	2
Importer/Marketers	2

1. LCFS FUEL PATHWAY EVALUATION PROCESS FOR NATURAL GAS

Current Pathway Application Process

When an eligible party listed above wishes to generate LCFS credits for NG, the first step they must take is to apply for the use of the appropriate carbon intensity score (or “pathway”).

ARB staff currently evaluates the fuel pathway application, which includes review of submitted information and review of the third-party engineering report required under U.S. EPA’s Renewable Fuel Standards (RFS) program, when available. The staff review can range from cursory, for “Lookup Table pathways,” to extensive for the most complex “Tier 2” pathways.¹¹

NG pathways vary significantly based on the source (fossil or biological), fuel form (CNG, LNG, L-CNG), transportation distances, and type of vehicle fueled (e.g., heavy duty or light duty vehicle; fuel, spark- or compression-ignition engine). The CI of these fuels also varies significantly; current approved pathway CI values for this category of fuels range from -276 gCO_{2e}/MJ to 90 gCO_{2e}/MJ.¹²

¹⁰ LCFS regulation section 95483(d).

¹¹ For more information on application requirements and pathway classifications, see Guidance Document for LCFS New Pathway Applications. Available at:

<https://www.arb.ca.gov/fuels/lcfs/fuelpathways/newpathway-01062016.pdf>

¹² LCFS Pathway Certified Carbon Intensities. Available at:

<https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm>. Also note that a change has been implemented in 2016 in the system of fuel pathway codes (FPC). Historically, FPCs indicated the fuel using a prefix (CNG- for example) but did not provide any information about the feedstock. New FPCs that have been issued in 2016 and going forward indicate the fuel and feedstock. For example, an FPC for CNG derived from North American Fossil NG will now be assigned an FPC beginning with “CNGF-,” where the “-F” indicates that the feedstock is fossil NG. Pathways for RNG made from landfill gas will be assigned an FPC with prefix “CNGLF-.”

The pathway for fossil natural gas to California for use as a transportation fuel typically involves the following steps: the gas is extracted from wells (production), upgraded to pipeline quality (purification), injected into a commercial pipeline (transport), and withdrawn from the pipeline at a fueling facility or a liquefaction facility. At a fueling facility, NG is compressed for use in CNG vehicles. At a liquefaction facility, NG is liquefied and typically distributed by truck to fueling facilities, and then dispensed to LNG vehicles. In the case of L-CNG, LNG is distributed by truck and re-gasified and compressed at a fueling facility for use in CNG vehicles.

Landfill gas is the most common source of RNG for transportation in the LCFS. Typical landfill gas pathways involve the following steps: collection (extraction) using a system of perforated wells under negative pressure, clean up to remove water and contaminants, purification to remove CO₂ and meet pipeline quality specifications, and injection into the commercial pipeline. In some cases, propane or utility natural gas may be blended with upgraded biogas in order to meet commercial pipeline specifications. After injection, the distribution and use steps are identical to that of fossil NG. RNG which is produced in California may also be used on-site to fuel NG vehicles. Finally, the LCFS recognizes CI reductions for transportation fuels that use RNG as a process fuel, under the condition that the RNG is provided directly to the fuel production facility.

The current pathway CI certification process requires applicants to register their facilities in the Alternative Fuels Portal (AFP). Once registered, applicants select the appropriate pathway application type (Tier 1 or 2; Method 2A/2B/Lookup), upload a completed version of the CA-GREET 2.0 workbook and a data sheet summarizing commercial operational data for 24 months¹³ along with supporting documentation including invoices and receipts. See Table 2 for a summary of the current operational data requirements for Tier 1 natural gas pathways.

¹³ For pathways with less than 24 months of operational data, a provisional CI may be considered.

Table 2. Current operational data requirements for Tier 1 NG pathway applications

<p>A Tier 1 pathway application for <u>Landfill Gas</u> includes 24 months of the following monthly operational data:</p>	Quantity of biogas captured and withdrawn from the landfill (typically measured in cubic feet per minute, logged over a time period in SCF, and converted to MMBtu)
	Methane content of biogas (in percent)
	All process energy used in biogas cleanup operations including: <ul style="list-style-type: none"> - Electricity (kwh) - Fossil NG (MMBtu) - Raw biogas or biomethane (MMBtu) - Propane or LPG (MMBtu) - Diesel (gallons)
	Pipeline transmission distance (miles)—maximum distance from source to fueling station
	Methane content (%) biomethane after upgrading
	Metered quantity of biomethane produced for pipeline injection (MMBtu)
<p>A Tier 1 pathway application for <u>CNG</u> includes 24 months of the following monthly operational data:</p>	<p><i>If Bio-CNG, these requirements are in addition to data for landfill gas pathways above</i></p> <ul style="list-style-type: none"> - Electricity (kwh) used for compression at all dispensing stations covered by the pathway, and - Metered quantity of CNG dispensed (MMBtu)
	<p>Pipeline transmission distance (miles)</p> <ul style="list-style-type: none"> - A default pipeline transmission distance of 1,000 miles is used for all fossil-based CNG pathways
	<p><i>If Bio-LNG or Bio-L-CNG, these requirements are in addition to data for landfill gas pathways above</i></p>
<p>A Tier 1 pathway application for <u>LNG</u> or <u>L-CNG</u> includes 24 months of the following monthly operational data:</p>	<p>All process energy inputs to liquefaction, and regasification-compression if L-CNG is produced, including:</p> <ul style="list-style-type: none"> - Electricity (kWh) - Fossil NG (MMBtu)
	<ul style="list-style-type: none"> - Quantity of NG used as feedstock (ft³) - Quantity of LNG (gallons of LNG) produced <p><i>If L-CNG is dispensed:</i></p> <ul style="list-style-type: none"> - Quantity of LNG used as feedstock (gallons) - Quantity of CNG produced (ft³)
	Transport mode (Rail and Heavy Duty Diesel Truck)
	Maximum distance LNG is transported to farthest station (miles)

Once the pathway has been certified, the applicant may begin reporting transportation fuel transactions in the LRT-CBTS. In order to access any credits accumulated, the applicant must also currently complete a fuel transport mode (FTM) demonstration verifying that fuel is actually being transported by the modes claimed in the pathway. The following section explores potential changes to the LCFS fuel pathway application and evaluation processes.

Potential Regulatory Amendments to Pathway Application Requirements

New Definitions for Tier 1 Pathway CI Application Input Values

For the purposes of this discussion paper, and potentially to improve clarity in application requirements, staff suggests the following adjectives to distinguish among values that would be used in determining the CI of Tier 1 pathway applications:

- **Site-specific:** an input value, or the raw operational data used to calculate an input value, which is required to be unique to the facility, pathway, and feedstock. All site-specific inputs that appear in the operational data summary form must be measured, metered or otherwise documented, and verifiable, e.g., consumption of utility natural gas or grid electricity at a fuel-production facility must be documented by invoices from the utility. Under this potential framework, an application might be rejected as incomplete if a site-specific input value cannot be determined.
- **Standard:** an input value that would not appear in the CI application operational data summary form and could not be modified to a site-specific value unless the applicant receives permission from the Executive Officer. These values are intended to be the same for all applicants of a given fuel type, and therefore would not be subject to CI conformance evaluation by ARB or third-party verifiers, e.g., the pipeline transmission distance for fossil natural gas; much of the background data used in CA-GREET, including emission factors, truck capacities, and farming inputs.

Addition of Fossil CNG to the Lookup Table

The concept of adding a Fossil CNG pathway to the Lookup Table was posed in the original version of this discussion paper and at the December 2, 2016 public working meeting for Natural Gas stakeholders. In response, staff received both oral and written feedback in support of the idea of adding the Tier 1 fuel pathway “North American NG to CNG (delivered via pipeline, compressed in CA)” to the Tier 2 Lookup Table. Since Lookup Table pathways would no longer be confined to advanced fuels, the Tier 2 Lookup Table would be referred to simply as the “Lookup Table.”

Standardize Parameters for All NG Fueling Facilities

In addition to the Lookup Table pathway for fossil CNG, staff is suggesting standardizing the fueling facility parameters for all NG pathways, whether from fossil or renewable sources, and whether dispensed as CNG, LNG, or L-CNG. The only NG fueling facility inputs that affect CI in the current Tier 1 calculator are energy use for

compression at CNG fueling facilities, and regasification plus compression if L-CNG is dispensed. To expedite review and certification of CI applications and eliminate verification checks for CI compliance at fueling facilities, staff is considering the use of standard values, which could not be altered by the applicant. This would require only verification of the quantity of CNG (therms), LNG (gallons), or L-CNG (GGE or as metered otherwise) dispensed for transportation use, and could eliminate the need for site visits of verifiers to fueling facilities.

CNG Fueling Facility Energy Consumption

Based on applications processed in 2016, CNG fueling facilities consistently use electricity for compression and other station operations with efficiency¹⁴ greater than 96 percent, as shown in Figure 1. Staff previously suggested this value could be used as a “default” efficiency, in lieu of submitting data for each station’s energy consumption. In response, one commenter noted that they would prefer to use their own data on fueling facility electricity use because they achieve higher efficiencies than the previously suggested 96% default efficiency.

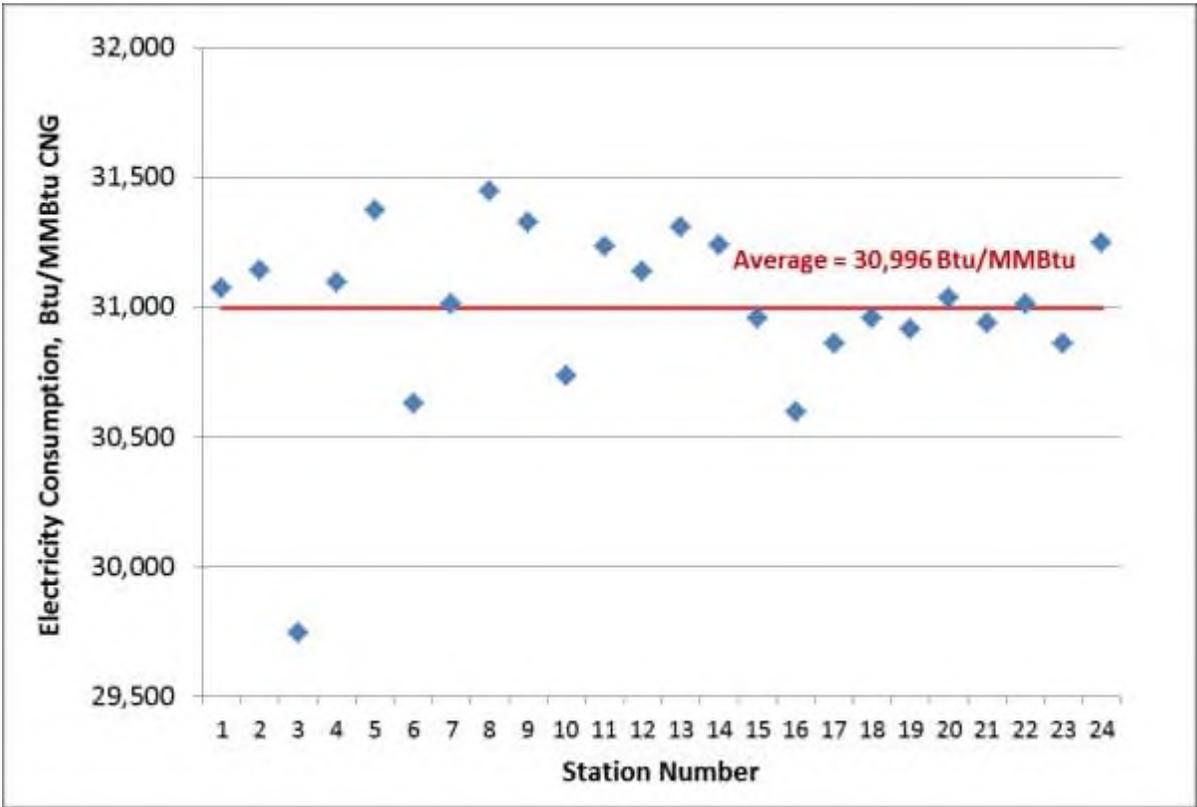


Figure 1. California CNG Fueling Facility Electricity Consumption

¹⁴ In CA-GREET, process efficiency is calculated by the quantity of fuel throughput in the process divided by the total energy consumed in that process, including the energy content of the fuel, e.g.,

$$1 \text{ MMBtu} / 1.04 \text{ MMBtu} = 96\%$$

Consideration of this and other oral and written feedback received in response to the previous suggestion has now led staff to consider standardizing this parameter. Selecting the representative average value, rather than the most conservative value, is staff's goal for any "standard" value, which the applicant would not be able to modify.

With this principle in mind, staff believes electricity consumption of 30,996 Btu/MMBtu (equivalent to 97% process efficiency input to CA-GREET) is likely more representative of the average energy use at California fueling facilities based on the 24 stations shown in Figure 1.

Staff is requesting feedback on the use of the average shown in Figure 1 as the standard value for fueling facility energy consumption in all CNG pathways.

Pipeline Transmission Distances for NG pathways

To expedite review and certification of CI applications and simplify verification checks for CI compliance, staff is considering defining allowable approaches to determine transmission distance for gaseous fuel. Table 3 below provides a summary of pipeline transmission distances staff suggests might be used for all fossil NG and RNG pathways.

For fossil NG to CNG and LNG, staff has estimated that NG is transmitted approximately 1000 miles by pipeline from NG fields and processing facilities to endpoints in California, and suggests using this distance—as a standard value that cannot be altered—for all fossil NG pathways.

For RNG to CNG pathways, staff suggests developing a common methodology for calculating pipeline transmission distance from an RNG processing facility to California CNG fueling facilities. Applicants would continue to use the coordinates of the processing facility as the start-point of this transportation leg, but would use a common endpoint in mapping the distance. To determine the endpoint, staff is considering coupling the list of CNG fueling facilities with the volume throughput data from the 2017 Q1 reporting cycle (available after June 30, 2017) to determine a volume-weighted RNG centroid. This centroid would be used as the transmission pipeline endpoint when determining the distance input value. This centroid location would be published in the regulatory text and clearly referenced in the instructions for the pathway application forms.

RNG to LNG (or L-CNG) pathways would continue to use the distance from the coordinates of the processing facility to the specific liquefaction facility purchasing the renewable attributes of the gas.

Transport of LNG by truck is shown in the right-hand column of Table 3. A volume-weighted average based on two years of sales records could be used for LNG distribution by truck from liquefaction facilities to fueling facilities. Alternatively, the applicant could choose to use a more conservative value, such as the distance to the farthest fueling facility, in order to minimize the risk of exceeding the certified CI as a result of changes in the supply chain.

Finally, staff suggests clarifying that pipeline and driving distances between two locations may be determined using a publicly available web-based driving distance estimation.

Staff is seeking stakeholder feedback on the distances suggested in Table 3.

Staff is specifically interested in feedback and alternate suggestions for: the common pipeline transmission endpoint for RNG to CNG pathways; the potential standardization of fossil transmission distance at 1000 miles; and the use of web-based driving distance estimates to represent transmission distance between two discrete points.

Are there challenges or complications with these approaches that staff should consider?

Table 3. Draft summary of natural gas transmission and transport distances for use in LCFS pathway applications

Pathway	Processing facility <u>TO</u> CA CNG fueling facility via pipeline	Processing facility <u>TO</u> liquefaction facility via pipeline	Liquefaction facility <u>TO</u> LNG fueling via truck
NG to CNG	Standard (1000 mi)	N/A	N/A
RNG to CNG	From the specific processing facility location to a common endpoint in California	N/A	N/A
NG to LNG	N/A	Standard (1000 mi)	Weighted average distance from the specific liquefaction facility to each fueling facility
RNG to LNG	N/A	From the specific processing facility location to the specific liquefaction facility	Weighted average distance from the specific liquefaction facility to each fueling facility

Potential Simplification of the Tier 1 Calculator for Landfill Gas Pathways

To facilitate pathway CI application, evaluation, and verification for landfill gas to CNG/LNG/L-CNG, staff is considering further simplification to the Tier 1 pathway application by combining the input form for summarized monthly operational data with the CA-GREET calculations, as a replacement for the CA-GREET 2.0 Tier 1 Calculator. Similar to the current Tier 1 Calculator, these fillable forms would provide

automated calculations using factors from the version of CA-GREET incorporated by reference in LCFS regulation, but increase simplicity and transparency of these calculations.

Details of the draft simplified CI calculator are provided in Appendix B, and an example version for landfill gas pathways with working automated calculations is posted for stakeholder review and feedback.¹⁵ The form collects summarized operational data; this operational data is automatically translated to the user-defined inputs needed for the CI calculation. Using life cycle inventory data and emission factors from CA-GREET, the sheet will perform calculations to estimate CI.

This will allow staff to automate any unit conversions that are currently performed by applicants, in order to simplify the application process and facilitate a direct comparison of the inputs to meter readings, data loggers, invoices, and other types of records. This form will offer a simplified, transparent and standardized method of demonstrating how operational data affects CI, and may be useful to producers on an ongoing basis to monitor variations and mitigate risk of exceeding their certified CI.

Staff is seeking input on development of the updated simplified CI calculator for landfill gas pathways posted April 13, 2017. Please download the form or review the details provided in Appendix B and provide feedback.

Mandatory Metering of Captured Biogas

Staff is considering a new requirement to require direct metering of the volume and percentage methane concentration of biogas captured from the landfill or digester. These measured values would not be used to calculate CI, but rather as a check to ensure that total biomethane sales do not exceed the biogas captured. Acceptable equipment would include any device that can measure flow on a dry basis¹⁶ with accuracy range of +/- 5%, and record measurements at least hourly. This equipment would be required to be installed, in working order, and calibrated according to manufacturer specification in order for RNG pathways to be certified and to receive positive verification statements.

Other Potential Changes to Pathway Application Requirements

Staff is considering removing the requirement to submit most supporting documentation. Instead, the documentation supporting the operational data would be maintained according to recordkeeping requirements and would be reviewed and validated by an independent third-party verifier before a pathway could be certified.

¹⁵ Revised draft simplified CI calculator for landfill gas pathways available for download at: http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/ci_calculator-lfg-updated.xlsm. Note that another draft version will be developed and posted for stakeholder review after staff receives feedback from stakeholders and adapts a new version of the CA-GREET model from the 2016 version of the Argonne GREET model.

¹⁶ Flow measurement equipment must include measurement for temperature, pressure and moisture to enable reporting of gas flow on a dry basis at 60 °F and 1 atm.

Staff is also considering including the FTM Pathway Demonstration in the initial validation prior to CI certification.

No changes are being suggested for the staff pathway evaluation process; however, once the Tier 1 application data is submitted as part of a complete pathway application, staff would review the simplified form and application for completeness. If the application is complete, applicants would be advised to proceed with the validation step prior to certification by the Executive Officer. If the application package is deficient, the application would be rejected and deleted from the AFP, requiring the applicant to re-apply with complete and updated information.

2. REPORTING REQUIREMENTS

After an entity has been approved to use an LCFS pathway to generate credits for natural gas as a transportation fuel, they must report the quantity of fuel dispensed to begin to receive credits.

Existing Reporting Requirements

Regulated parties must register in the LCFS Reporting and Credit Bank & Transfer System (LRT-CBTS) to establish a reporting account.¹⁷ This process is simple and primarily includes providing the organization name, organization address, organization federal employer identification number (FEIN), and account administrator(s) information. A fuel provider for fossil CNG, bio-CNG, bio-LNG, and bio-L-CNG may elect to opt into the LCFS as a regulated party pursuant to section 95483.1. A fuel provider for fossil LNG or fossil L-CNG is a regulated party.

Prior to reporting for credits, the fuel production facility and relevant fuel pathways need to be registered in the Alternative Fuel Portal (AFP). For bio-CNG, bio-LNG, and bio-L-CNG pathways, the production facility location is where the biomethane is produced, (e.g., the biogas upgrading facility). For fossil LNG and L-CNG pathways, the production facility is the liquefaction plant. For fossil CNG pathways, there is no production facility to be registered in the AFP.

Regulated parties are subject to the reporting requirements set forth in section 95491(a) and the recordkeeping requirements set forth in section 95491(b) through (e) of the LCFS regulation. Pursuant to section 95483, upon transfer of fuel ownership, a regulated party must provide the subsequent owner of the fuel Product Transfer Documents (PTD) with the information specified in section 95491(c)(1).

¹⁷ Refer to the LCFS Regulatory Guidance 16-05 for more information on how to opt in, register and generate credits. Available at: https://www.arb.ca.gov/fuels/lcfs/guidance/regguidance_16-05.pdf

The primary parameters reported quarterly are the amount of natural gas dispensed, CI value (fuel pathway), and the vehicle application¹⁸ (e.g. light/medium duty, heavy duty). The reporting party must report the amount of fuel dispensed at each individual fueling facility for each applicable FPC on a quarterly basis.¹⁹

The final quarterly reports must be submitted in the LRT-CBTS by the deadlines specified in section 95491(a)(1)(A). An annual compliance report for the prior calendar year must be also submitted in the LRT-CBTS. In order to generate credits, the fuel provider must submit quarterly and annual reports.²⁰

Reporting units for CNG and L-CNG are currently standard cubic feet (scf) – though staff is considering changing these reporting units (see below) – and for LNG the reporting units are gallons. Reporting parties that use their utility bills for reporting of fossil CNG are reminded that the amount of the fuel on the utility bill is reported as a higher heating value (HHV) and must be converted to lower heating value (LHV) using the following equation:

$$\text{LHV} = \text{HHV} \times 0.903$$

Special Considerations for Reporting of Renewable Natural Gas

RNG may be transported to California through the interstate NG pipeline transmission system. Because tracking the physical molecules of biomethane through the commercial pipeline system is not possible, an energy balance system is used to track the ownership of the renewable attributes of the fuel. The renewable nature of the gas is considered by ARB to be separable from the physical gas at the injection point (and the injected gas is then considered to be indistinguishable from fossil gas). When fossil gas is withdrawn from the pipeline for final use in California, the renewable attribute is “reattached” on an energy-equivalent basis. The reporting party retains its own purchase invoices and contracts, and the contracts and invoices documenting the terms of the sale from the biogas producer to the marketer or other purchasing entity. This gas is now recognized in the LCFS program as RNG. Distribution channels are identical to those described above for NG to CNG, LNG or L-CNG. In the event that a landfill is adding any non-biogas derived components to its RNG stream before metering the quantity injected to the pipeline, the energy value of the additive must be subtracted from the total quantity (MMBtu) injected into the pipeline as RNG in order to report the correct quantity of RNG in the LRT-CBTS.

¹⁸ The vehicle application determines the Energy Economy Ratio (EER) used in the credit calculation, which accounts for the difference in alternative vehicle (such as natural gas, hydrogen, or electric) powertrain efficiency relative to conventional gasoline and diesel vehicles they replace. Biomass-based diesel is considered a heavy-duty diesel replacement with EER equal to 1 and therefore vehicle type does not need to be tracked or reported. See EER values for each vehicle-fuel combination in Table 4 of the LCFS regulation.

¹⁹ Entities may not report and generate credits based on transactions that precede the quarter in which they opt in.

²⁰ Note that even if no fuel was provided, a quarterly report with zero amounts must be submitted to remain in good standing in the system.

Potential Reporting Implementation Improvements

Staff is considering implementing the following administrative improvements for the Q1 2017 reporting cycle.

Registration for NG Reporting Parties in the LRT-CBTS

With increased interest in participation from natural gas providers and fleets, it has become important to enhance the registration process for fueling facilities to improve the data quality and prevent potential double counting of fuel dispensed at individual stations. Further, the point of crediting for fossil NG at the station, discussed above, encourages reporting at the station level.

To facilitate this process, the registration of fueling facilities is now provided in the LRT-CBTS, instead of the AFP. Reporting parties are to register all their fueling facilities²¹ in LRT-CBTS using the template shown in Appendix A. Upon the fueling facility registration, the system will generate a unique LCFS Fueling Facility ID that is to be used by reporting parties when reporting fuel transactions in the LRT-CBTS for Q1 2017 and onward.

For CNG fueling facilities, the LCFS ID is based on the utility meter number. As part of the fueling facility registration process, a copy of the most recent utility bill, showing the fueling facility address, its dedicated NG transportation fuel utility meter number, and the utility company name, as shown on the utility bill, will need to be uploaded with the registration form.

For fueling facilities that dispense LNG and L-CNG, the LCFS ID will be based on the facility ID number used by the LNG fuel provider to identify the LNG/L-CNG facility for their accounting purposes. As part of the registration process, a copy of the most recent dispenser reading record will need to be uploaded with the registration form. The dispenser reading record should clearly show whether the fuel is dispensed in GGE and/or DGE; this allows staff to determine whether the NG fuel is dispensed as LNG, or if it has been regasified and compressed for dispensation as L-CNG to CNG vehicles.

If there are any changes to a reporting party's list of registered stations, (e.g., the reporting party will be providing fuel to a new station or will no longer be providing fuel to a station that is registered to them), the facility registration would need to be updated in LRT-CBTS prior to quarterly reporting.

An updated template for quarterly reporting of the fuel dispensed at individual fueling facilities for the upload to LRT will be provided in mid-April 2017.

Staff believes that providing fueling facility specific information will help ensure that the fuel for which credits were claimed is used for transportation in California.

²¹ For registration purposes, "Fuel Supply Equipment" (FSE) is a collective term encompassing fuel supply equipment at fueling facilities for NG and hydrogen and charging facilities for electricity.

Reporting Limited to Dispensed Amounts at Fueling Facilities

There are a number of transaction types (such as Production, Import, Purchased/Sold with Obligation) that are currently used to report the amount of NG fuel transacted in the LRT-CBTS. However, these transactions represent upstream activities and do not necessarily show how much fuel was actually dispensed at the fueling facility as required to be reported per section 95491(a)(3)(C)1.

Staff proposes to eliminate all upstream transaction types for NG in the LRT-CBTS and, instead, have only one transaction type – “Natural Gas Vehicle (NGV) Fueling.” “NGV Fueling” would apply to the quantity of fuel dispensed for transportation use. This adjustment would not affect who is eligible to report or generate credits for a specific quantity of fuel, but would ensure that reporting of upstream production is linked to actual fuel amount dispensed at a fueling facility. In other words, the credit generating party would track transfers through the supply chain, and ultimately attest that accurate fuel volumes with the appropriate FPCs are reported at the fueling facility level. Staff believes this would streamline reporting and verification and ensure that the fuel for which credits were claimed was used for transportation in California.

Potential Regulatory Amendments to Reporting Requirements

Fuel Reporting Units for CNG & L-CNG Reporting

Currently, reporting units for CNG and L-CNG are standard cubic feet (scf); however, the volumes of CNG and L-CNG used for transportation at fueling facilities are metered by utilities in units of therms based on Higher Heating Value (HHV), which requires reporting parties to convert to scf using standard conversion factors in CA-GREET and identified in the LCFS regulation.

In order to simplify the reporting process, staff is considering requiring the amount of fuel dispensed at all fueling facilities to be reported in therms based on HHV as shown on utility bills. The amount of fuel reported in therms would then be converted in the LRT-CBTS from therms (HHV) to mega joules (MJ) on a LHV basis.

Staff believes that this change would reduce potential errors and inconsistencies in reporting due to conversions, improve accuracy of fuel quantities reported, and make fuel quantities reported easily verifiable.

Reporting Total Fuel Amount Dispensed

Currently, the amount of CNG fuel reported quarterly is the amount dispensed at the fueling facility per FPC. Staff is suggesting that the total amount of CNG dispensed (fossil NG and RNG) at the fueling facility per quarter also be reported, as measured by the utility meter and reported on the utility bills. Staff believes that this requirement will facilitate energy balance accounting and improve data accuracy.

Potential New Requirements for Tracking the Renewable Attributes of RNG

Allowing biomethane to generate LCFS credits by demonstrating an energy balance for the RNG injected into the pipeline system has proven challenging for ARB staff to verify without additional regulatory clarity to ensure consistency.

Renewable gas accounting has been demonstrated in most cases by contracts and invoices of both gas and renewable attribute sales throughout the supply chain. When title to gas or attributes changes parties multiple times, the traceability may be compromised, and the risk that one or more entities in the supply chain are unaware of LCFS compliance requirements increases. The following actions could help ensure that each entity in the supply chain understands and clearly accepts responsibility for accurate accounting. The role each entity plays is illustrated for a common supply chain in Figure 2 in the verification section.

To mitigate the risk of double counting biomethane renewable attributes, staff is considering proposing the following regulatory requirements:

- The biomethane importer or other party reporting and generating credits for biomethane would be required to maintain records of quarterly attestations of no double counting of either biogas or biomethane renewable attributes and the MMBtu transferred by all entities in the renewable attribute chain-of-custody. This documentation is consistent with U.S. EPA RFS quarterly notarized affidavits under the Quality Assurance Plan (QAP) program.
- The biomethane importer would be required to maintain agreements with all entities in the renewable attribute chain-of-custody for access by ARB and the importer's third-party verifier to records, facilities, and personnel for purposes of reviewing conformance with LCFS. This would include access to unredacted contracts.
- In cases where the Producer sells biomethane to more than one entity, recordkeeping requirements would include a monthly energy balance and sales accounting by the Producer at the upgrade facility. These records—covering total quantities of gas whether or not they are used for transportation in California—would be subject to review by third-party verifiers and ARB. This requirement is consistent with the QAP program, under which the producer (biomethane upgrader) hires the QAP auditor.
- Consistent with the fuel obligation transfer period under consideration for other fuels,²² staff is considering a requirement whereby renewable attributes associated with biomethane injected into the common carrier pipeline in a given quarter could only be carried over to the following quarter to be reported as dispensed bio-CNG, bio-LNG, or bio-L-CNG. This would mean that if RNG with renewable attributes is procured in one calendar quarter, the renewable

²² See staff discussion papers for Ethanol (January 31, 2017 meeting) and Biomass-based Diesel (February 10, 2017 meeting). Available at: https://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/lcfs_meetings.htm

attributes would have to be attached to natural gas sold in California as RNG no later than the end of the following calendar quarter. After that period is over, any unmatched renewable attributes would expire.

Staff is requesting stakeholder feedback on whether the requirements described above would sufficiently limit the risk of double counting and harmonize with U.S. EPA's QAP program for the RFS.

Is the two-quarter time period for energy balancing of renewable attributes appropriate?

ARB is working with U.S. EPA RFS program staff on developing requirements to ensure that reported quantities of RNG correctly net additions of fossil NG or other fossil-based additives such as propane to increase the heat content of RNG. We seek stakeholder input on that issue.

Third-party Designee

The current LCFS regulation designates CNG station owners to be eligible to generate credits for fossil NG dispensed at these fueling facilities. Historically, some of these entities have not opted in to the LCFS program to generate credits due to limited resources and low financial incentive for the small amount of NG provided.

To enhance participation and provide flexibility, staff is considering providing greater clarity about how CNG station owners can, at their option, contractually designate a third party to manage LCFS credit generation for them. These third parties would be referred to as “designees.”

An entity that chooses to act as a designee would become a regulated party and could act on behalf of parties that are not yet registered in LCFS as well as entities that are already reporting parties in the LRT-CBTS. In either case, the designee would need to have a written contract with the owners of each reported fueling facility, and these agreements would need to be provided to ARB and the verifier. The enhanced registration requirement for individual facilities would also apply to designees. The CNG station owner, however, would ultimately be responsible for ensuring compliance with the requirements of this rule for their facility data. In addition, the CNG station owner would retain its ability to perform any activities required under this rule, including signing documents and attestations without the approval of their designee.

Staff believes that providing flexibility—by allowing other entities that may be interested in reporting and aggregating credits on behalf of CNG station owners—would encourage participation in LCFS program, including transit agencies and small fleet owners. So far, we have received positive feedback from stakeholders on this concept.

Fuel Application Reporting

Reporting requirements include selecting the quantity of fuel dispensed to each vehicle application. For CNG used in light/medium-duty vehicles (LDV/MDV), Table 4 of the LCFS Regulation indicates that the EER is 1; CNG or LNG dispensed to heavy-duty vehicles with compression ignition engines (HDV-CIE) also use an EER of 1, while CNG or LNG used in heavy-duty vehicles with spark ignition engines (HDV-SIE) must use an EER of 0.9, resulting in fewer credits per unit of fuel.

However, the LCFS regulation does not currently prescribe how to track the amount of the fuel dispensed into each application. Because public CNG and LNG stations may dispense into any vehicle and do not track the actual vehicle types, these stations typically report using the most conservative EER (0.9). On the other hand, for fueling facilities that serve a dedicated fleet, the fleet operator may be able to provide supporting evidence that only one vehicle type is fueled, allowing them to report the actual EER.

Stakeholders have suggested the amount of fuel dispensed during each fueling event can be relied upon to distinguish the vehicle application at public fueling stations. For fueling transactions above a threshold amount, an HDV is assumed and for transactions below the threshold, LDV/MDV is assumed. However, this threshold value ranges from 15 to 30 gallons GGE. Because there does not seem to be any established threshold, staff suggests that no documentation will be required from reporting parties that select the HDV-SIE application to use the conservative EER, while reporting parties that select either LDV/MDV or HDV-CIE applications will be required to submit documentation to substantiate their claim. For HDV-CIE documentation, the ARB Executive Order for engine emission certification will be accepted.

Staff believes that this requirement would reduce potential errors and inconsistencies in reporting vehicle application and thus would improve accuracy of credit calculations.

Staff is requesting stakeholder feedback on what documentation is available to substantiate the type of vehicle application.

3. VERIFICATION

A successful GHG reduction program requires a system to monitor, report, and verify GHG emissions to aid implementation and tracking of the effectiveness of emission reduction strategies. Historically the LCFS has relied upon a robust reporting program that supports the veracity of generated LCFS credits through ARB staff evaluation of fuel CI through the fuel pathway application process and by conducting spot-checks on the reporting of quarterly fuel volumes.²³

²³ LCFS Data Management System. Available at: <https://www.arb.ca.gov/fuels/lcfs/reporting%20tool/datamanagementsystem.htm%23lrc-cbts>.

ARB is now considering supplementing the work of ARB staff with a verification system that would include independent third parties engaged by entities reporting to ARB under the LCFS. Conceptually, these verifiers would perform GHG accounting checks in a role similar to the independent, objective evaluations of organizations' financial reports by financial auditors. ARB has extensive experience with an analogous system under the regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR) pursuant to the California Global Warming Solutions Act of 2006 (AB 32) and through the verification of GHG compliance offset projects under ARB's Cap-and-Trade Program.^{24, 25} ARB's experience implementing MRR and the Cap-and-Trade Compliance Offset Program has demonstrated that mandatory third-party verification is valuable in creating a credible and durable GHG trading system.

This section provides an overview of existing LCFS verification provisions and potential amendments. Discussion of potential amendments includes considerations for harmonizing LCFS verification with the voluntary QAP program under U.S. EPA RFS, additional considerations for assuring no double counting of renewable attributes, and verification scope for retail fueling facilities and liquefaction facilities.

Existing Verification Provisions

Existing verification provisions were added in the 2015 LCFS readoption. These provisions are currently being used to support ARB compliance audits and enforcement activities and do not require third-party verification consistent with international standards.²⁶

Section 95491(d) Verification of Pathway, CI, Report

“All data and calculations submitted by a Regulated Party for demonstrating compliance or claiming credit are subject to verification by the Executive Officer or a third party approved by the Executive Officer.”

Section 95491(e) Access to Records

“Pursuant to H&S section 41510²⁷ the Executive Officer has the right of entry to any premises used, leased, or controlled by a Regulated Party, a Reporting Party, a verifier, or an applicant, in order to inspect and copy records relevant to the determination of compliance. Scheduling of access shall be arranged in advance

²⁴ AB 32 explicitly supported verification calling for ARB to “adopt regulations to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance...” Health and Safety Code (H&SC) section 38530(a). Program information on MRR verification is available at: <https://www.arb.ca.gov/cc/reporting/ghg-ver/ghg-ver.htm>.

²⁵ Offset Verification Program. Available at: <https://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm>.

²⁶ ISO 14064-3: Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions; ISO 14065: Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition.

²⁷ California Code of Regulations, Health and Safety Code 41510: <http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=41001-42000&file=41500-41514.10>.

where feasible and must not unreasonably disturb normal operations, provided, however, that access shall not be unreasonably delayed.”

Potential Amendments to Verification

Staff’s verification white paper²⁸ provides the framework for the development of an LCFS verification program and overarching considerations that will inform potential amendments to the LCFS regulation. ARB staff is considering mandatory verification of various program aspects including, but not limited to:

- fuel pathway carbon intensities,
- reported fuel quantities (for both high and low carbon fuels), and
- chain-of-custody information (for some feedstocks and finished products).

The objective of such a verification program is to ensure integrity in the LCFS credit market through assurance of GHG reduction claims in the LCFS. In pursuit of this objective, the guiding principles when designing a verification program must include:

- (1) ARB retention of sole authority over the LCFS program, including verification requirements, as bestowed through the State’s legislative and regulatory process;
- (2) Continual improvement in the detection, prevention, and correction of errors or fraud;
- (3) Identification and implementation of cost reducing strategies, while maintaining verification rigor;
- (4) Policy consistency with other ARB verification programs; and
- (5) Consideration of the unique attributes of fuel carbon intensities and fuels marketing structure.

The degree of ARB oversight, verifier competency and training, and conflict of interest requirements are expected to be consistent with ARB’s Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR)²⁹ and Cap-and-Trade Compliance Offset Verification Programs,³⁰ while seeking to harmonize, where possible, with existing verification and certification programs, most notably U.S. EPA’s RFS QAP Program.

Verification responsibility and scope would depend on the natural gas supply chain that generates LCFS credits. Current supply chains for natural gas differ depending

²⁸ Staff White Paper: Framework for Development of a Low Carbon Fuel Standard Verification Program. Available at: https://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/verification_whitepaper_102116.pdf

²⁹ AB 32 explicitly supported verification calling for ARB to “adopt regulations to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance...” Health and Safety Code (H&SC) section 38530(a). Program information on MRR verification is available at: <https://www.arb.ca.gov/cc/reporting/ghg-ver/ghg-ver.htm>.

³⁰ Offset Verification Program. Available at: <https://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm>.

on source (fossil, landfill/upgrader, anaerobic digester) and fuel form (i.e., CNG, LNG, L-CNG).

Entities Responsible for Verification

Under the potential changes to the reporting requirements, where only one transaction type would be reported in the LRT-CBTS – Natural Gas Vehicle (NGV) Fueling, the credit-generating party would be responsible for both reporting and verification. The Reporting Party would need to monitor transfers through the supply chain and ultimately attest that accurate fuel quantities with the appropriate FPC codes are reported. For credits to remain valid, reporting parties would be responsible for ensuring LCFS requirements are met along the supply chain, including annual CI and transaction verifications. This could be accomplished through contracts between entities along the supply chain.

Verification flexibility can be accommodated for the variety of supply chains, recognizing that currently there are many biomethane upgraders, few biomethane importers/marketers, few liquefaction facilities, many fueling facility owners, and few QAP providers. Flexibility for each entity in the supply chain to hire their own verification body would be allowed and the reporting party's verifier would be required to accept the associated verification results.

In general, LCFS verification sampling requirements would be based on source of feedstock, risk of error or fraud, and the CI sensitivity of site-specific inputs to the CA-GREET model. To support more efficient and robust verification audits of fuel pathways, staff is considering a requirement that each entity responsible for validation or verification develop and maintain a "monitoring plan" and require other entities in the supply chain to also have a monitoring plan.

Fuel Pathway Monitoring Plans

As discussed in staff's October 2016 verification white paper, the monitoring plan is a road map intended to demonstrate (to the verifier and ARB) how a responsible entity monitors reported fuel quantities and monitors operations that affect the site-specific CI values. A monitoring plan would prompt entities responsible for verification to explain their supply chains, data management systems, key personnel responsibilities, and training, operational procedures, and recordkeeping. A well-documented monitoring plan aids in audit planning as it helps verifiers and ARB staff understand how the entity intends to maintain conformance with LCFS requirements.

As envisioned by staff, the monitoring plan would initially be submitted to ARB as a necessary component of a fuel pathway application. However, once a fuel pathway CI value is approved and subsequently used by fuel providers in commerce, it is likely that entities will change their practices and procedures (e.g., feedstock procurement practices, feedstock sourcing, data management systems). In these cases, responsible entities would be required to update and retain their monitoring plans, making them available upon request by ARB or third-party verifiers. Errors in the plan itself would not be subject to enforcement and not result in credit adjustment by ARB, nor an adverse verification statement by the verification body. The entity's actual

practices (not the monitoring plan) would be evaluated relative to LCFS regulatory requirements and result in the final verification statement, whether positive or adverse.

Staff plans to draft a monitoring plan template for stakeholder feedback that will include prescribed elements, some of which would be fuel-specific. Staff proposes that a monitoring plan include existing recordkeeping and CI application requirements and harmonize with U.S. EPA RFS requirements when appropriate. Furthermore, additional application-specific monitoring requirements may be required by ARB as needed to substantiate site-specific information for Tier 2 fuels. Potential general monitoring plan requirements based on CI complexity are summarized below.

Table 4. Potential Monitoring Plan Requirements

	Lookup Table Pathways	Tier 1 Pathways	Tier 2 Pathways
CI Complexity Levels	Based on generic pathway description	Producer-specific CI(s) based on limited variables included in simplified CI calculator	Producer-specific CI(s) based on variables available in CA-GREET model
Potential Contents of Applicant's Compliance Risk Identification and Monitoring Plans	<ul style="list-style-type: none"> • Description and schematic of operations including meter locations • Data collection system description • Description of how reporting errors are controlled, detected, and corrected 	Plus, <ul style="list-style-type: none"> • Energy or material balance procedures • CI uncertainty based on sensitivity to expected variations in producer-specific CI inputs 	Plus, ARB-imposed application-specific CI monitoring requirements to substantiate low CI practices (if needed)

Staff reviewed the voluntary QAP program under RFS,³¹ national biomethane registries in Europe, and the International Sustainability & Carbon Certification (ISCC) System's procedures recognized under the European Renewable Energy Directive (EU RED) for auditing biomethane injected into a commercial pipeline. Because most biomethane used for transportation fuel in California is also generating Q-RINs under the RFS QAP program, staff is focusing on harmonizing with QAP. Biomethane registries and certification consistent with EU RED requirements are discussed briefly under additional considerations to assure no double counting of renewable attributes.

³¹ Under the RFS program, biomethane derived from landfills, municipal wastewater treatment facility digesters, agricultural digesters, and separated municipal solid waste digesters, along with biogas from the cellulosic components of biomass processed in other digesters meets the requirements to generate D3 RINs for biogas (CNG, LNG). U.S. EPA Approved Pathways for Renewable Fuel. Available at: <https://www.epa.gov/renewable-fuel-standard-program/approved-pathways-renewable-fuel>.

Considerations for Harmonizing LCFS Verification with the Voluntary QAP Program under U.S. EPA RFS

Stakeholders support harmonization with the QAP program for RNG. Under QAP, the producer (biogas upgrader) is responsible for hiring the QAP provider who audits the full supply chain: landfill gas collection to biogas upgrading, injection of biomethane into the carrier pipeline, nomination to a marketer or supplier, potentially through intermediary marketers, to the fuel dispensing company.

Figure 2 illustrates the entities involved in a common pathway in which biomethane is produced at a landfill and injected into a commercial pipeline, the energy balance approach to allocating renewable attributes, and key meter locations. The renewable attributes are assigned to an equivalent quantity of gas (MMBtu basis) extracted from the commercial pipeline, compressed at a station in California, dispensed into vehicles, and reported as bio-CNG.

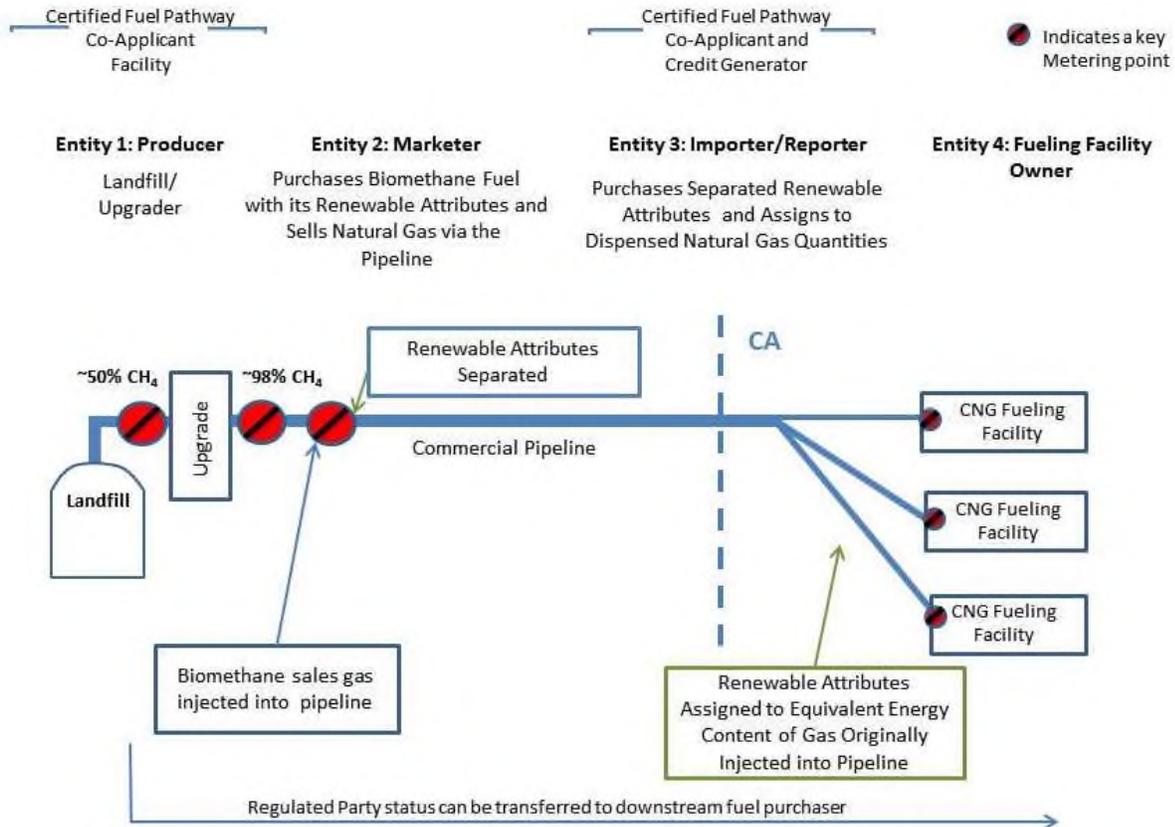


Figure 2. Example of Supply Chain for Bio-CNG from a Landfill

The supply chain is established with contracts that define type of transaction, business partners, and quantities under contract. The QAP provider receives quarterly notarized affidavits from each entity in the supply chain showing the quantity of biomethane transferred (MMBtu) and imbalances that may carry over to the next

quarter—reconciling the transfer of renewable attributes between entities. A list of fueling facilities is provided with the dispensing company’s quarterly affidavit to demonstrate use as a transportation fuel. Staff review of the QAP audit process at the landfill biogas upgrading facility and for transactions of physical gas and renewable attributes down the supply chain to the CNG/LNG dispensing company indicates that the same reviews will also satisfy LCFS requirements, with some additional verification requirements unique to LCFS.

Risk of double counting biogas renewable attributes is mitigated with QAP audit/LCFS verification responsibility assigned to the biogas upgrader (producer). The total biomethane quantity injected into the pipeline would be audited as well as all the upgrader’s contracts with downstream parties. This would include contracts to all parties in supply chains claiming biomethane inside or outside of California for transportation fuel as well as any parties in supply chains that may be claiming renewable attributes for other purposes such as green gas or renewable electricity. However, biogas upgraders are not currently active in LCFS reporting and credit generation. Rather, they are considered co-applicants and provide information for fuel pathway applications.

Risk of double counting or double claiming may also be mitigated when a biomethane importer procures all the pipeline-injected biomethane with its renewable attributes from the upgrader. Stakeholder feedback indicates that biomethane marketers may maintain agreements with *all entities* in the renewable attribute supply chain to prove compliance.

The biogas upgrader is visited twice a year under QAP, with quarterly desk audits of transactions to assure Q-RINs are based on correct quantities of bio-CNG and bio-LNG, with no double counting. QAP providers have developed their own affidavit templates for parties in the biomethane supply chain to confirm title transfers (chains of custody from the landfill/upgrading facility through intermediate parties to the fueling facilities). The information included is similar to ARB’s initial pathway demonstration (Fuel Transport Mode) guidance in the AFP, supply chain attestation requirements,³² and ongoing PTD requirements.

Annual verification site visits to the LCFS reporting entity to review supporting records for reported fuel quantities, unredacted contracts, and data management practices would be additional to current QAP practices. Site visits for any intermediary entity may be needed to review objective evidence to support affidavits/attestations. As described previously, the biomethane importer may be required to maintain agreements with all entities in the renewable attribute chain-of-custody for access by ARB and the importer’s third-party verifier to records, facilities, and personnel for purposes of reviewing conformance with LCFS.

³² LCFS regulation section 95488(e)(2): “Initial demonstrations covering biomethane conveyed to California by pipeline for the purpose of earning credits under the LCFS shall include statements from the biomethane suppliers and marketers attesting to the fact that that biomethane is not being used to earn credits under any other state or federal program, with the sole exception of the federal Renewable Fuel Standard program (RFS2).”

Staff anticipates that QAP providers approved by U.S. EPA to audit biogas (CNG, LNG) will apply to ARB for accreditation as LCFS verification bodies with a natural gas specialization. Accrediting current biogas QAP providers for verification of any LCFS natural gas credit generation would recognize existing fuel-specific expertise and facilitate continuity of audit services. ARB staff is considering reviewing each QAP provider's general and fuel-specific audit plans modified to include additional LCFS requirements as a condition of final ARB accreditation. U.S. EPA requires approval of general and fuel-specific audit plans prior to recognition of QAP providers and ARB staff believes this is a prudent requirement to include for LCFS verification body accreditation. ARB review and approval of general and fuel-specific audit plans would ensure auditors understand program differences and apply consistent procedures during LCFS validation and verification. In addition, ARB staff will select a subset client-specific audit plans each year for performance review, as is the practice for MRR verification oversight.

ARB staff will provide verification training and oversight to ensure all verification requirements, especially those requirements unique to the LCFS program, are understood and implemented consistently by ARB-accredited verification bodies. LCFS requirements that are not part of QAP audits include the following:

- CI validation and verification at landfill upgrading facilities using the simplified CI calculator,
- CI validation and verification at liquefaction facilities using the simplified CI calculator, and
- any unique LCFS requirements for demonstrating relationships to fueling facility data (e.g., CNG/LNG/L-CNG fueling quantities for individual facilities, fossil and renewable natural gas allocations to total dispensed fuel at each facility, and vehicle application type).

Refer to the staff discussion paper for livestock manure-to-RNG³³ pathways for site-specific CI data pertaining to manure management operations, avoided methane emissions, biogas capture, production and upgrading that will require verification.

³³ See ARB staff discussion paper for Renewable Natural Gas from Dairy and Livestock Manure, April 13, 2017. https://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/041717discussionpaper_livestock.pdf

Should ARB require potential verification bodies submit general and fuel-specific audit plans for ARB review and approval as part of its accreditation process?

Would annual verification site visits to the LCFS reporting party be necessary to review supporting records for reported fuel quantities, unredacted contracts, and data management practices? Note this would be additional to current QAP practices.

Are there scenarios when the LCFS reporting party has contracts that link back to more than one biogas upgrading facility/landfill where the reporting party would prefer their own verification?

Would liquefaction facility owners want to take responsibility for part or all of the verification of bio-LNG and bio-L-CNG supply chains?

Additional Considerations to Assure No Double Counting of Renewable Attributes

Because significant quantities of renewable natural gas supplies within the LCFS program originate from out of state locations, which may be subject to other environmental programs such as renewable electricity programs, staff remains concerned about the potential for double counting of renewable attributes. Given the complex marketing structure of renewable natural gas, there is a risk that entities may double count renewable attributes.

To address this concern, staff believes that safeguards should be considered as a prudent proactive measure. One option to address double counting would be the creation of a biomethane registry or evaluation of certification systems that could also be recognized under the U.S. EPA's RFS program.

For example, national biomethane registries have evolved in some countries to assure renewable attributes from biomethane injected into commercial pipelines are not double counted, facilitating separation of the renewable attributes from the physical gas. Austria, Germany, United Kingdom, Denmark, Switzerland, Finland, France, and Netherlands have biomethane registries. These registries generate Guarantees of Origin (GoO) which confirm the particular biomethane plant operator as well as the quantities and quality of biogas upgraded and injected into commercial pipelines. The GoO can be transferred multiple times before being used by a final owner and cancelled in the registry.³⁴

While we recognize that a biomethane registry could be useful, such an approach for the LCFS program may be costly and complex due to the level of effort involved and the need for cooperative support by private parties and government agencies. Staff believes the suggestions listed to improve transparency and the regulatory changes

³⁴ Biosurf Fueling Biomethane D3.1, Comprehensive guidelines for establishing national biomethane registries. August 1, 2016. Available at: <http://www.biosurf.eu/wordpress/wp-content/uploads/2015/07/BIOSURF-D3.1.pdf>

under consideration would sufficiently mitigate the risk of double counting renewable attributes.

Currently, all certified FPCs are published on ARB's LCFS website and each indicates the fuel producer, facility name and, when landfill biogas is sourced, the name and location of the associated landfill.³⁵ This information could be combined with information in the U.S. EPA's Landfill Methane Outreach Program (LMOP)³⁶ to facilitate internet searches by parties interested in determining whether multiple renewable attribute claims exist for these landfill biogas upgrade projects. But, since ARB does not release the final amount of gas claimed from each point of origin on our website, the current system is not a substitute for a full registry.

As another option to consider, the European Commission has recognized ISCC's energy balance approach to certifying individual entities along the supply chain³⁷ under the EU RED and could also potentially meet LCFS verification requirements, assuming the same LCFS additions related to CI and vehicle application type (also needed for QAP audits) are incorporated.

Staff is seeking feedback on whether additional requirements should be considered to assure no double counting of renewable attributes.

Should biogas source information be published more prominently by ARB to facilitate internet searches by parties interested in whether renewable attribute claims exist for these landfills?

Would detection of double claims by other parties be facilitated by publishing the quantity of biomethane (MMBtu) consumed as transportation fuel in California from each landfill each year and including U.S. EPA's published LMOP landfill and energy project data for a sense of total production from the landfill in question?

Should ARB require landfills and energy projects applying for fuel pathways to provide data in the voluntary LMOP database?

Verification scope for RNG from biomethane injected into a commercial pipeline was discussed in the prior section on harmonization with the QAP program. The following section covers verification scope for retail fueling facilities and liquefaction facilities (fossil NG and RNG).

³⁵ LCFS Pathway Certified Carbon Intensities. Available at: <https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm>

³⁶ U.S. EPA Landfill Methane Outreach Program (LMOP). Available at: <https://www.epa.gov/lmop>

³⁷ ISCC International Sustainability & Certification, ISCC 201.3 Biogas and Biomethane. PDF available for download at: <http://www.iscc-system.org/en/certification-process/isccsystemdocuments/iscc-guidance-documents/>.

Considerations for Third-Party Verification Scope for Retail Fueling Facilities and Liquefaction Facilities—Fossil NG and RNG

The verification scope for information from retail fueling facilities is the same whether natural gas is reported as fossil or biological origin. Table 5 describes verification points for CNG, LNG, and L-CNG from fossil natural gas and RNG. Staff does not consider verifier site visits to retail fueling facilities necessary, because objective evidence is expected to be available at the reporting party's location of central data management and can be provided to the verifier during a desk audit.

- For CNG-only fueling facilities, total dispensed CNG quantities will be verified based on utility statements for dedicated transportation fuel meters. The total quantities dispensed for each facility will be used to assure the sum of fossil and bio-CNG is not over-reported. There are no CI verification points for entities reporting only Lookup Table pathways.
- For facilities that provide only LNG or provide both LNG and L-CNG, dispensing records will show DGE or GGE dispensed to distinguish LNG from L-CNG, respectively. Total LNG quantities (DGE plus GGE or biological plus fossil) can be cross-checked via bills of lading, invoices, and receipts. The liquefaction facility CI and fuel transport distance is discussed in the fuel pathway evaluation chapter.
- Vehicle application type will be determined based on an ARB-approved protocol developed with stakeholder input (for more details see Reporting Section under Fuel Application Reporting).

The scope of verification for liquefaction facilities would include an initial validation of the CI application, an annual CI verification, and an annual verification of quarterly LNG production and use as a transportation fuel in California, consistent with other liquid fuels. See Table 6.

Verification scope for livestock manure-to-RNG pathways will be discussed further following stakeholder feedback on the livestock discussion paper.

Do stakeholders have concerns regarding staff's thinking that verifier site visits to retail fueling facilities would not be needed, since relevant records can be reviewed at a location of central data management?

Should annual verification of liquefaction facility CI and LNG volumes include a site visit to the liquefaction facility each year? Why or why not?

Table 5. Summary of Potential Requirements for Fossil NG and RNG CI Determination, Reporting Requirements, and Verification Points for Fueling Facilities

Entity	Potential Future Requirements
CNG Compression and Fueling Facility Owner or Designee	Initial CI Determination <ul style="list-style-type: none"> All station parameters are standardized- notably, a compression efficiency of 97% is proposed
	Fuel Volume Reporting and Credit Creation <ul style="list-style-type: none"> Bio-CNG: Not applicable, as this entity does not report in the LRT-CBTS. Fossil CNG: Report Quarterly to LRT <ul style="list-style-type: none"> Fuel Pathway Code (FPC) Fuel quantities per fueling facility Transaction Date(s), Transaction Type (NGV fueling) Required to produce and retain Product Transfer Documents (PTD), Bills of Lading (BOL), invoices, and other supporting documents (not uploaded in LRT-CBTS)
	Third-Party Verification Points <p>For Initial Validation of CI (Desk Audit):</p> <ul style="list-style-type: none"> Verify facility locations and meter IDs from utility statements <p>For Ongoing Verification of CI (Desk Audit):</p> <ul style="list-style-type: none"> Verify updates to facility locations and meter IDs from utility statements <p>For Ongoing Verification of LRT-CBTS reports (Desk Audit):</p> <ul style="list-style-type: none"> Compare utility statements against reported fuel quantities.
LNG and L-CNG Fueling Facility Owner or Designee	Initial CI Determination <ul style="list-style-type: none"> No CI impact.
	Fuel Volume Reporting and Credit Creation <ul style="list-style-type: none"> Report quarterly to LRT: Not applicable, as this entity does not report in the LRT. Liquefaction facility owner is the reporting party.
	Third-Party Verification Points <p>For Initial Validation of CI (Desk Audit):</p> <ul style="list-style-type: none"> Confirm locations Verify that appropriate leak detection and repair practices are in place Review dispensed quantities of LNG (DGE) and L-CNG (GGE). If discrepancies found, confirm existence/absence of regasification equipment (possible site visits selected based on quantities dispensed) Review allocation methodology to establish type of vehicle fueled <p>For Ongoing Verification of CI (Desk Audit):</p> <ul style="list-style-type: none"> Review updates to fueling facility registrations. Review contracts, invoices, and bills of lading to cross check information from the liquefaction facility Review and match quantities of LNG and L-CNG dispensed with those reported in the LRT-CBTS by the reporting party (liquefaction facility). Review supporting records for vehicle application type <p>For Ongoing Verification of LRT-CBTS reports: Not a reporting party.</p>

Table 6. Summary of Potential Requirements for Fossil NG and RNG CI Determination, Reporting Requirements, and Verification Points for Liquefaction Facility

Entity	Potential Future Requirements
LNG Liquefaction Facility	<p>Initial CI Determination</p> <ul style="list-style-type: none"> • NG and electricity process energy inputs • Total LNG produced • Weighted average of truck transport distances to LNG stations
	<p>Fuel Volume Reporting and Credit Creation</p> <ul style="list-style-type: none"> • For fossil and bio-LNG and L-CNG Report Quarterly to LRT <ul style="list-style-type: none"> • Fuel Pathway Code (FPC) • Fuel quantities per fueling facility • Transaction Date(s), Transaction Type (NGV fueling) • Aggregator indicator (if transaction is an aggregated amount) • Required to produce and retain Product Transfer Documents (PTD), Bills of Lading (BOL), invoices, and other supporting documents (not uploaded in LRT-CBTS)
	<p>Third-Party Verification Points</p> <p>For Initial Validation of CI (Site Visit):</p> <ul style="list-style-type: none"> • Review of recordkeeping practices and data management systems. • Confirm facility geographic location and physical configuration per process flow diagram • Validate operational data submitted for the initial CI determination from source records • Review process energy inputs (i.e., natural gas, electricity) • Review facility-wide energy balance to support LNG production quantities. • Verify that appropriate leak detection and repair practices are in place. • Review Bills of Lading (BOL) to support final use, modes of transportation, and distance traveled. • Review contracts and affidavits for entities in biomethane supply chain, if applicable. <p>For Ongoing Verification of CI (Site Visit):</p> <ul style="list-style-type: none"> • Confirm there are no changes since the validation. • Review supporting records for CI summary data from prior calendar year • Confirm meter calibrations per manufacturer’s specifications. <p>For Ongoing Verification of LRT-CBTS reports (Same Site Visit as CI):</p> <ul style="list-style-type: none"> • Review accuracy of reports for Fuel Volume Reporting and Credit generation (see above for specific reporting requirements). • Review FPC allocation methodology. • Review contracts and invoices to support quantities of fuel dispensed by fueling facility and type of fuel dispensed (i.e., LNG, L-CNG) per fueling facility • Review contracts and affidavits for entities in biomethane supply chain

APPENDIX A

LRT FORM FOR NG FUELING FACILITY REGISTRATION

Natural Gas (CNG, LNG, L-CNG) Fueling Facility List

Reporting Party Company Information	Fueling Facility Information						Natural Gas (NG) Fueling Supply Equipment	
FEIN ⁽¹⁾	Fueling Facility Name ⁽²⁾	Street Number & Name ⁽³⁾	City ⁽³⁾	Zip Code ⁽³⁾	Longitude ⁽⁴⁾	Latitude ⁽⁴⁾	CNG Utility Meter # ⁽⁵⁾ / LNG Facility ID ⁽⁷⁾	CNG Utility Name ⁽⁶⁾ / LNG Facility Owner ⁽⁸⁾

NOTES:

- (1) The Federal Employer Identification Number (FEIN) of the Reporting Party.
- (2) The name of the fueling facility.
- (3) The address of the fueling facility, including street number and name, city, and zip code.
- (4) Report Latitude and Longitude in units of Decimal Degrees, carried to a minimum of 6 decimal places after the decimal point. West Longitude and South Latitude should be written with a negative sign. Use either Google Earth or GPS meter.
- (5) Meter number is the dedicated NG transportation fuel utility-meter number, as it appears on the utility bill used for withdrawals of NG dispensed as CNG. As part of the Fueling Facility registration process, a copy of the most recent utility bill will need to be uploaded with this form.
- (6) The name of the utility company listed on the utility bill.
- (7) The Fueling Facility ID number used by the LNG fuel provider to identify the LNG/L-CNG fueling facility for their accounting purposes. As part of the Fueling Facility registration process, a copy of the most recent dispenser reading record will need to be uploaded with the registration form. The dispenser reading record should clearly show whether the fuel is dispensed in GGE, DGE, or both.
- (8) The name of the owner of the LNG/L-CNG fueling facility.

APPENDIX B

DRAFT SIMPLIFIED CI APPLICATION DATA SUMMARY FORM

This Appendix includes an overview of the inputs fields in the draft data summary form for Tier 1 landfill gas pathway applications.

The draft data summary form is available on the LCFS Meetings page:
http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/lfg-pods_updated.xlsm

Note that another draft will be developed and posted for stakeholder review after staff receives feedback from stakeholders in response to the operational data inputs discussed in this paper and adapts a new version of the CA-GREET model from the 2016 version of the Argonne GREET model.

This form would potentially replace the existing Tier 1 calculator in pathway application packages. All data entered in this form would be subject to verification unless specifically exempted. The form would require the applicant to add facility information and verifiable feedstock production, operational energy use and fuel production data used in calculating the CI of RNG pathways.

The top of the form requires inputs related to facility identification, including the applicant's company name, location of the landfill, location(s) of CNG fueling facilities in California and, if applicable, location of LNG production, and location of LNG/L-CNG fueling facilities in California. The estimated CI results for landfill gas to CNG, LNG and L-CNG, respectively, are displayed here after the data is entered and user clicks the Calculate button; these results are not final until staff has reviewed and the CI has been certified by the Executive Officer.

Inputs for the Biogas Processing Facility

The process sections labeled "Biogas Feedstock" and "Inputs to Biogas processing" show the necessary inputs for inlet raw landfill gas and upgrading facility energy use. In this section of the input form, the applicant first selects the regional mix for feedstock production from the pull down menu. If user-defined electricity mix is selected, the applicant would specify the mix for the particular region. The applicant then fills out the monthly total inlet raw landfill gas and monthly average methane concentration. Staff is considering mandatory metering of biogas quantity and monitoring of methane concentration of biogas captured from the landfill.

Next, the applicant would enter the monthly energy usage data at the biogas processing plant. The energy types include fossil natural gas, diesel, propane, other fuel, and grid electricity. Natural gas would be reported in higher heating value (HHV) as shown on the utility invoices without adjustment. Propane and diesel fuel would be reported in gallons and supported by invoices or purchase records. The form will automatically adjust these values to the lower heating value (LHV) used in CA-GREET calculations. If other sources of electricity (e.g., on-site solar or wind) or thermal energy (e.g., LPG, biomass) are used, the applicant should specify the units, supported by appropriate invoices; a new pop-up window enables the applicant to enter fuel properties, emission factors and the specific source of energy supplied to the facility.

The next step is entering the pipeline transmission distance of the biomethane to CNG fueling facilities located in California (or to the suggested centroid coordinates), or to the specified LNG plant, if applicable. Staff is suggesting new guidelines for determination of pipeline transmission distances as discussed in the main body of this document.

The quantity of “biomethane product gas” entered in the operational data summary form would correspond to the quantity of biomethane (in MMBtu) injected into the pipeline and must be supported by utility invoices. However, since this quantity may include propane or other fossil additives blended with biomethane to meet pipeline specifications, the use of any non-renewable gas must be explicitly disclosed through invoices and added to the process energy inputs to biogas processing. The quantity entered in the summary form would include only the biomethane quantity; any fossil inputs should be subtracted from the actual quantity injected into the pipeline that was purchased by the local utility or other party. Staff believes that this reporting is most consistent with quantities reported for RIN generation under the RFS, which is based on the Btu of the pipeline quality biogas after treatment, and prior to any blending with non-renewable fuel or injection into a pipeline.

Staff requests feedback on the benefits and drawbacks of the approach to reporting biomethane product gas.

Inputs for the Liquefaction Facility

The process section labeled “Inputs for LNG” shows the necessary inputs for LNG production. This data is provided by the facility that performs the liquefaction. The applicant first selects the regional electricity mix for fuel production from the pull down menu. If user-defined electricity mix is selected, the applicant would specify the mix for the particular region. The applicant then fills out the monthly total natural gas consumed as feedstock and total LNG production. Next, the applicant would enter the monthly energy usage and production data for the plant.

The energy types include fossil natural gas and grid electricity. Data entered in these fields must correspond to invoices for total NG consumed (as feedstock and for process energy), electricity consumption, and LNG produced. Natural gas would be reported in higher heating value (HHV) as shown on the utility invoices without adjustment. The sheet automatically calculates emissions from natural gas combusted for use as process energy, as the difference between total natural gas consumed and the energy content in LNG produced.

Transport distance (miles) from the liquefaction facility to California fueling stations should be entered by mode (heavy duty diesel or LNG-fueled truck).

Finally, the LNG producer is required to provide an affirmation that all delivery trucks and storage tanks are equipped with boil-off recovery; however, the amount of NG recovered is a standard value which would not be subject to verification.

Inputs for Fueling Facilities

For all NG pathways, staff is considering applying standard parameters for all fueling facility energy use and emissions, which would eliminate the need for any such input fields in the data summary form. All data entered into the form would be considered subject to verification.

After all required data has been entered the form would calculate and display the CI for each pathway at the top of the form.