Los Angeles County
Metropolitan Transportation Authority

Biomethane Implementation Plan

APRIL 2013

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1. Introduction and Background

Metro has several adopted policies that guide sustainability and energy related actions within the agency. The Metro Sustainability Implementation Plan (MSIP) demonstrates our continuing commitment to sustainability through fiscal responsibility, social equity, and environmental stewardship. Some of the initiatives addressed in the MSIP include energy and resource conservation and greenhouse gas (GHG) management. In 2010, Metro conducted a cost-effectiveness study on GHG reduction strategies which in particular investigated the GHG impacts of Metro operations and fuel use. Metro's comprehensive Energy Conservation and Management Plan (ECMP), developed in 2011, provides a blueprint to direct Metro's overall energy management in a sustainable and cost-effective manner. Metro adopted its Renewable Energy Policy in 2011 which outlines elements to implement comprehensive renewable energy programs including the exploration of creative renewable energy resources and the establishment of a stretch goal of an additional 13% renewable energy use above the current baseline usage of 20% by 2020. A recent report to the Metro Board dated June 29, 2012 includes an outline of Metro's current progress toward achieving such a goal.

These policies and plans make energy efficiency and environmental responsibility priorities in our agency and require us to continually evaluate viable options to use more renewable energy to power transit and facilities operations. Utilizing renewable energy presents opportunities to reduce GHG emissions and meet our adopted renewable energy policy goals.

Metro currently operates the largest alternatively fueled fleet in the nation (and has 100% of its fleet transitioned to compressed natural gas, or CNG). Staff is committed to explore ways that will further improve our operations and reduce our environmental impact, specifically via cost-effective methods. Staff has identified biomethane as a potentially viable alternative to CNG. Biomethane has the same chemical make-up and can be produced with the same fuel specifications as CNG. Biomethane currently has the lowest carbon intensity among alternative fuels included in the suite of options to comply with California's Low Carbon Fuel Standard (LCFS), including CNG. The carbon intensity of a fuel is a measure of its GHG emissions over the lifecycle of production – including processes such as extraction, transportation, and combustion or use in a vehicle.

Based on our current understanding of biomethane, use of this fuel has the potential to help Metro reach our renewable energy goals, reduce our agency's GHG emissions, and generate revenue without changing our current fueling infrastructure, bus fleet, or maintenance operations. However, because of the potentially complex nature of a transition to biomethane, there is a need to conduct a more detailed analysis to better understand the feasibility of the use of biomethane as an alternative form of fuel for our fleet.

2. Summary of Biomethane as a Transportation Fuel

Biomethane refers to pipeline quality natural gas that is conditioned from biogas, a renewable resource derived from a variety of sources including landfills and wastewater treatment plants. The biogas is subsequently upgraded and all impurities are removed before delivery to an end

user or injection into an existing natural gas pipeline. The biomethane delivered to an end user such as Metro will meet the same specifications of the natural gas that is currently delivered to our agency via utility pipelines. As a result, there are few infrastructure modifications and no vehicle modifications required if we shift to this fuel. Further, the operation and maintenance of Metro's existing fleet will be unaffected by the use of biomethane.

Metro will likely be an attractive customer for biomethane producers because of the size of its fleet and the predictability of its fuel demand. For instance, transit agencies in Sweden have established themselves as "anchor customers" because of the constant high demand for fuel – this is common with transit agencies and one of the reasons that the natural gas vehicle industry continues to target transit fleets for potential conversion to CNG from diesel. Based on initial research, Metro may have sufficient demand to help spur the investment of or invest in its own biomethane production facility, depending on a variety of factors.

Based on current information, while biomethane appears to be a viable fuel option for Metro, shifting from CNG to biomethane may be more challenging. Further research and analysis are warranted regarding the implications of switching from CNG to biomethane. The following subsections outline the major issues that Metro will consider moving forward to understand the implications of switching from biomethane to CNG for its bus fleet. These issues are highlighted as follows:

- **Biomethane sourcing**: Biogas can be derived from a variety of sources, including but not limited to waste resources such as from landfills, wastewater treatment plants, food processing waste, and manure (e.g., at dairy farms). Biogas can also be derived from purpose grown energy crops, or agriculture and forestry residue. Biogas is generally produced via anaerobic digestion, whereby microorganisms breakdown organic matter in the absence of oxygen. Facilities that are interested in producing biogas generally introduce an anaerobic digester and a collections system.
- **Operational impacts**: For an end-user like Metro, no operational changes to its CNG fueled buses will be required. Neither the fueling stations nor the buses will require any modifications to compress or combust biomethane. The only operational impact would occur if Metro moves away from using CNG buses.
- **Fiscal impacts**: There are multiple fiscal impacts that require consideration regarding biomethane:
  - **Biomethane pricing**: Biomethane is more expensive than the natural gas that Metro currently uses. Unless we have a deal with the provider to offset this price, then it may not make sense fiscally
  - **Procurement**: includes the relationship with the utility and biogas source.
  - **LCFS revenue**: Metro is currently opted into the LCFS as an obligated party dispensing CNG. Displacing CNG with biomethane will impact the potential revenue that could be earned from credits that Metro would generate in the future.

- **Environmental impacts**: There are significant environmental benefits of using biomethane – it has the same air quality benefits as natural gas; however, it also has significant GHG reduction potential, as noted previously. Biomethane is also a renewable resource that can help Metro increase its renewable portfolio. Based on the current suspension of using biomethane to comply with Renewable Portfolio Standards (RPS) in the electricity generation sector, this may be an optimal time for biomethane producers to seek out transportation markets for their product. This could work in Metro's favor, as it would increase its renewable energy profile, while also providing an opportunity to fuel providers seeking demand for their supply.
- **Policy impacts**: Metro has established internal goals and priorities related to renewable energy consumption that will be affected by a decision to transition to biomethane. Despite the many positives associated with switching to biomethane for the bus fleet, there is also the potential that switching could have an impact on Metro's relationship with its utility providers.

Based on Metro's initial review of the potential to transition to biomethane, we outlined three potential options:

- **A rapid transition to biomethane in the next 1-2 years**: A rapid transition to biomethane will likely offer Metro the most cost competitive biomethane purchasing – and enable us to maintain the potential for revenue from the LCFS; however, the potential impacts to other operational impacts within Metro requires advance planning that will delay the implementation of a rapid transition for at least one year based on our current best estimates.
- **A scheduled transition to biomethane over a defined time period**: Although this approach minimizes impacts to Metro operations, it reduces the potential for more competitive pricing. As noted previously, Metro's fleet is particularly attractive to biomethane producers because it has high volume demand. Through a measured transition, Metro would likely need to provide the appropriate assurances to the biomethane producer with a clearly defined schedule for increased consumption. Metro could also use the measured transition approach as a way to solicit multiple bids for the procurement of biomethane – this would help introduce cost control measures and potentially offset the higher costs of not transitioning more rapidly. A slower implementation schedule would allow Metro's operations staff to plan for the transition to biomethane, while also providing our procurement team to consider bids from multiple suppliers.
- **No transition to biomethane**: In this third pathway considered, Metro could continue to run its fleet of buses using conventional natural gas. Although this is the path of least resistance, Metro has a goal of reducing the environmental footprint of its operations through the introduction of renewable energy and achieving lower emissions from buses. In order to achieve these goals through its bus operations, and assuming that there are no changes to CNG buses, then Metro will have to explore alternatives that will reduce air quality pollutants and GHG emissions.

3. Biomethane Implementation Plan

3.1. Introduction

Metro's fleet of transit buses is a major part of the agency's operations. As such, fleet operations will be an important target in Metro's strategy to improve the sustainability of our operations. Although Metro already operates the largest fleet of alternative fuel buses in the United States, we continue to seek opportunities to reduce our GHG emissions. Metro staff have conservatively estimated that a transition to 10% biomethane consumption in our fleet of transit buses will reduce our GHG emissions by 12,000 MT CO_2e annually.[1]

In Fall 2012, Metro staff initiated research into the feasibility of transitioning Metro's fleet of buses to lower emitting alternatives, with a focus on biomethane. This report outlines the initial findings of Metro's research and outlines the next steps regarding the possibility of biomethane as a fuel for Metro's transit buses.

Metro staff have identified two likely pathways for Metro to transition to biomethane. These pathways, intended to position Metro at the forefront of innovative GHG reduction strategies amongst transit agencies, also provide flexibility and adaptability amidst a somewhat uncertain clean fuels market. These pathways are summarized as:

- Pathway 1: Metro purchases and conditions biogas
- Pathway 2: Pipeline injection of biomethane on Metro's behalf

These pathways are introduced in more detail in the following sections. For each pathway, Metro staff has outlined the following information:

  - Overview
  - Potential Sources / Partnerships
  - Impacts on Operations
  - Potential Costs

Following the discussion of the two main pathways considered for biomethane use in our transit fleet, Metro staff have outlined some of the potential ways to offset the costs associated with a transition to biomethane.

Overview of Metro's Demand for Natural Gas

Prior to the in-depth discussion of the likely pathways for Metro to introduce biogas, we provide a brief overview of Metro's demand for compressed natural gas (CNG). Metro currently consumes about 50 million therms of CNG annually to fuel its fleet of more than 2,200 buses.

[1] Metro staff assumed 10% of conventional natural gas consumption in transit buses would be displaced by biomethane. Metro staff also accounted for the electricity that would be required to operate the biogas conditioning and upgrading equipment. GHG emissions factors for electricity and natural gas were taken from climate registry data reported online at http://www.climateregistry.org/tools/carrot/carrot-public-reports.html.

Metro has 11 divisions around Los Angeles County that have fueling infrastructure; however, only 10 of these divisions use significant quantities of CNG. The consumption of each division is about 10% of the total fleet consumption, which is equivalent to about 420,000 therms monthly.

For the sake of reference, landfill gas collected from waste facilities has a lower content of methane (CH_4) than what is required for operating buses. The landfill gas needs to be upgraded and conditioned. For the purposes of this report, we assume that biogas has a methane content of 60% and that a facility has a methane capture rate after conditioning and upgrading of 87%. In other words, if a landfill is capturing 1,000 therms, then it can produce 522 therms of natural gas for compression and use in a transit bus.

3.2. Pathway 1: Metro Purchases and Conditions Biogas

Overview

In this pathway, Metro would purchase biogas from a local or regional facility that captures methane (e.g., a landfill or wastewater treatment plant). Moreover, Metro would assume responsibility to condition and to upgrade the biogas for pipeline injection or delivery and use as a transportation fuel. Metro staff identified several sub-pathways, as described here:

- **Pathway 1a: Biogas delivery to Metro / Biogas conditioned at Metro facility.** Metro builds pipeline and conditioning facility at a Metro-owned site (e.g., Division) to dispense biomethane. Additional considerations: Other equipment needed on-site such as storage tanks, alignment/interface with bus operations (e.g., compression facilities, fueling demands).
- **Pathway 1b: Biogas conditioned at collection site / Biomethane delivered to Metro.** In this scenario, Metro would build a conditioning facility at the biogas collection site to enable pipeline injection and delivery to Metro facilities. Additional considerations: By injecting into a pipeline, Metro becomes an Energy Service Provider (ESP) or must use broker who will sell biomethane at a premium and has agreements with SoCalGas to provide energy into pipeline (storage, contracts, etc).
- **Pathway 1c: Metro procures biogas / SoCalGas conditions biogas on Metro's behalf.** This pathway is similar to Pathway 1a; however, rather than Metro assuming responsibility for conditioning and upgrading the biogas, Metro opts into a special tariff. As part of the service, SoCalGas will design, install, own, operate, and maintain a biogas conditioning/upgrading facility on or adjacent to the tariff service customer's premises and charge the tariff service customer the fully allocated cost of providing the service under a long term (10 to 15 year) agreement. SoCalGas will not own the biogas entering the facility or the processed renewable natural gas leaving the facility.

Potential Sources and Partnerships

The focus of this pathway is identifying local or regional sources of biogas which could displace Metro's current consumption of fossil-based natural gas in our fleet of transit buses. Due to cost

concerns (as discussed in more detail later), Metro staff focused research on identifying potential biogas sources in close proximity to Metro's divisions that use CNG. To help filter the potential local sources of biomethane, we assumed that a landfill would need a potential of at least 1,390 standard cubic feet per minute (scfm).[2] We identified the landfill gas facilities that met this threshold using the Waste to Biogas Mapping Tool available through the US Environmental Protection Agency's website.[3] The mapping tool provides the operating company, address, and estimated biogas capacity of landfills in a given area.

The map below shows Metro divisions that have CNG refueling infrastructure (blue markers) and the location of the landfills that met the aforementioned threshold of 1,390 scfm (red markers).

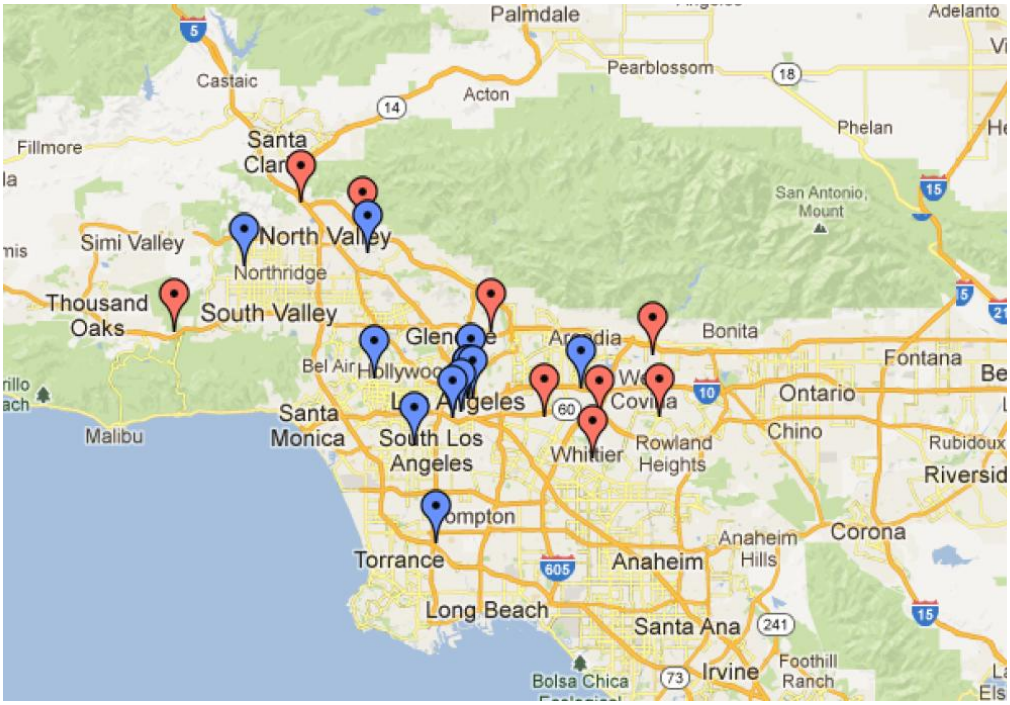


Figure 1. Metro Divisions (blue markers) and Nearby Landfills (red markers)

[2] Generally, biogas capture is measured in units of standard cubic feet per minute (scfm); this is more common than therms or other metrics.

[3] Available online at: http://epamap21.epa.gov/biogas/index.html. Accessed April 2013.

Company	Address	City	Biogas potential scfm/yr	Notes
Operating Industries Inc.	900 Potrero Grande Dr	Monterey Park	4,000	
Scholl Canyon Sanitary Landfill	3001 Scholl Canyon Rd	Glendale	6,242	
Azusa Land Reclamation Co. Landfill	1211 West Gladstone St	Azusa	2,270	
Lopez Canyon Sanitary Landfill	11950 Lopez Canyon Rd	San Fernando	2,150	Being used in microturbines; generation 6 MW
Sunshine Canyon City/County Landfill	14747 San Fernando Road	Sylmar	7,679	Partnering with DTE Energy to produce 20 MW energy (five turbines on-site planned)
Savage Canyon Landfill	13919 East Penn Street	Whittier	1,145	
Puente Hills Landfill	13130 Crossroads Pkwy South	Industry	28,220	Gas-to-energy project, produce 50 MW; biogas conditioning closed in 2007
BKK Sanitary Landfill	2210 South Azusa Avenue	West Covina	11,986	Closed; still have landfill gas collection in place
Calabasas Sanitary Landfill	5300 Lost Hills Road	Agoura	5,693	

Impacts on Operations

Transitioning Metro's bus fleet to biomethane under this pathway may require facility modifications. Although neither fueling stations nor buses will require any modifications, a biogas conditioning and upgrading facility may need to be sited on Metro property. Siting factors include size of the facility, hookups to existing utility connections and/or compression facilities, and associated storage tanks and other equipment. If for some reason the flow of biomethane or biogas is interrupted or cannot meet the demand of the bus fleet at that division, natural gas will still be available through existing utility hookups and Metro will be subsequently billed by the utility as occurs today.

Metro will likely have to incorporate on-site storage of biogas to accommodate a consistent flow of biogas. Under current conditions, when demand for natural gas ceases at a Metro facility, the flow from the pipeline ceases as well. This is optimal considering the non-linear nature of bus fueling operations. However, under the proposed pathway, the flow of biogas from the source and biomethane from the conditioning facility is constant. There is no off switch, although some landfills may have mechanisms for diverting captured biogas (note: generally, wastewater treatment plants do not). Therefore, the excess biomethane would need to be used or stored. Other options for this excess gas are co-generation plants and storage tanks. Currently, some biogas conditioning facilities have microturbines or fuel cell plants built in to utilize excess biogas. There will be additional costs and operational considerations such as heat and electrical

output as part of these scenarios, but benefits include electrical generation and useful heat output.

Potential Costs

The cost elements that we must consider for Pathways 1a, 1b, and 1c are generally similar, but have some differences.[4] Metro staff have identified the following cost elements:

- Biogas procurement
- Costs of biogas conditioning facility
- Potential pipeline costs
- SoCalGas tariff (applies only to Pathway 1c)

Biogas Procurement

For the sake of reference, natural gas spot prices are currently around $4/MMBtu today. Metro staff anticipate that we should be able to enter into a contract to procure biogas for less than the SoCal Border Wholesale Market price. The commodity cost of biogas (i.e., excluding any clean-up costs or delivery charges) from a landfill operation should be lower than the commodity cost of natural gas spot prices for several reasons.:

- Biogas has a lower methane content, thereby lowering the value of the fuel. Generally, landfill biogas has around 60% methane and requires conditioning and upgrading for consumption in a transit application or for pipeline injection. If Metro were to bear the costs of conditioning and upgrading the fuel (see next subsection), then Metro staff anticipate that we should be able to purchase the biogas at a significant discount.
- Metro is in a position to provide landfills with a revenue stream that are otherwise flaring captured gas. In California, landfills are required to capture biomethane. Landfills can use the captured gas or flare it. Today, the regulatory environment in Southern California makes it difficult for biogas collection facilities to use the gas in energy production. In the past, facilities have simply combusted the captured biogas in reciprocating engines; however, due to air quality regulations, it is increasingly expensive and often cost-prohibitive to install engines that meet emission requirements. Furthermore, landfills are prohibited from injecting biogas into the pipeline.[5] As a result, many landfills are simply flaring the captured product.
- Metro is also in a strong bargaining position because it has a large and consistent demand for natural gas to fuel our transit bus fleet. In other words, Metro can use a significant amount of biogas that landfills are producing, thereby limiting the administrative barriers of having multiple purchasers of biogas from a single source.
- Metro would also be in a position to work with the landfill producer to share the revenue associated with LCFS credits (discussed in more detail in the following section).

[4] It is important to note that we assume that any facility which Metro partners with will already have biogas recovery equipment installed.

[5] The CEC and CPUC are seeking to resolve the issue of biomethane quality for injection into the pipeline per Assembly Bill 1900.

- A landfill biogas to transit fuel project would be an appealing and innovative strategy to reduce transit-related *and* regional greenhouse gases while making use of the country's landfills.

Costs of Biogas Conditioning Facility

There are two main cost components for a biogas conditioning facility: 1) the initial capital costs of the facility and 2) the ongoing maintenance costs of a biogas conditioning facility.

- We estimate capital costs of about $3-5 million for a medium- to large-sized (i.e., about 1,400 scfm) biogas conditioning facility at a landfill or on-site at one of Metro's divisions.
- We estimate ongoing operational costs for the biogas conditioning facility of about $1-1.5 million annually

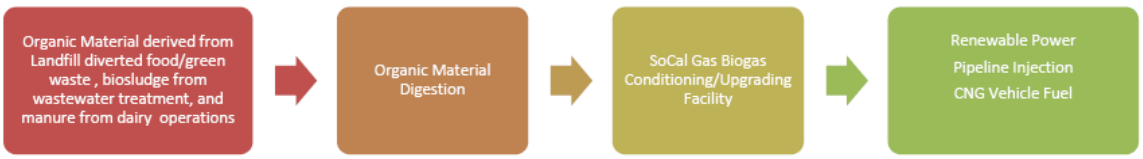
As noted previously, it is likely that Metro – in coordination with its biogas supplier – will have to install a storage facility because of the constant production of biogas from landfills. Conditioned biomethane can be stored in tanks designed for pressurized gas at an additional cost. For example, a 5,000 PSIG 3-pak storage tank costs about $75,000 and holds 36,000 scfm of gas.

Potential Pipeline Costs

The costs of building a pipeline can vary significantly depending on where the pipeline being installed. We use a general estimate of pipeline construction of $1 million per mile. Assuming that the delivery of biogas to Metro requires a pipeline, that there are no major configuration changes required at Metro Division facilities, and based on the proximity of landfills to Metro's facilities, we estimate potential costs of $2 million to $10 million.

Tariff through SoCalGas

SoCalGas has requested approval from the California Public Utilities Commission to establish a new tariff to offer Biogas Conditioning/Upgrading Services. Under this service, SoCalGas, will design, install, own, operate, and maintain a biogas conditioning/upgrading facility on or adjacent to the tariff service customer's premises and charge the tariff service customer the fully allocated cost of providing the service under a long term (10 to 15 year) agreement (as shown in the diagram below). SoCalGas will not own the biogas entering the facility or the processed renewable natural gas leaving the facility. SoCalGas' role will be to process the tariff service customer's biogas and condition/upgrade it to the gas quality level(s) contractually specified by the tariff service customer. SoCalGas will conduct an initial technical and economic feasibility analysis of the design, installation, operation and maintenance of the gas conditioning equipment. A site assessment and detailed information about the quality and quantity of biogas are included in this analysis as well. The potential tariff service customer will pay for this initial feasibility analysis. Approval for this tariff is expected by August 2013.



The deal is structured so that the tariff customer pays no capital costs upfront. The capital costs may include laying pipeline, building the facility, and projected operations and maintenance over the lifetime of the project. The tariff customer pays a monthly bill for the life of the project, with a CPI escalator (2-3%). The tariff customer also must pay for electricity to run the facility. In previous scenarios, the cost of electricity is about 2/3 of the entire cost to the tariff customer.

SoCalGas staff has provided Metro with rough estimates of the costs of these services. In order to take 1,400 scfm of raw biogas (estimated demand in previous section) and upgrade it to natural gas quality for expected biomethane output of about 375,000 MMBtu/Year costs about $165,000 per month over 15 years ($29.7 million). In addition, the parasitic load for the biogas conditioning facility is about 5.5 million kWh per year or an additional $660,000 annually in electricity costs. Therefore, the total monthly cost of dispensing biomethane is approximately $220,000 plus the cost of purchasing the raw biogas and associated pipeline extension costs. As a reference, the average monthly cost of dispensing CNG at a given bus division ranged from about $150,000 to $240,000.

3.3. Pathway 2: Biomethane Injected into Pipeline on Metro's Behalf

Overview

In this pathway, rather than dealing with a local provider of biogas, Metro would contract with a 3rd party Energy Service Provider (ESP) because SoCalGas does not offer biomethane. In this case, the biomethane would still be delivered to Metro via the natural gas transmission and delivery system of SoCalGas. As part of its contract with an ESP, Metro would stipulate a percentage of biomethane as part of the pro forma. This biomethane, like the natural gas, would be injected into the pipeline on Metro's behalf. Elements of this pathway include contracts terms with an ESP and administrative agreements with utility.

Potential Partnerships

SoCalGas maintains a list of participating ESPs pre-approved to supply "Core" customers such as Metro.[6] If Metro were to form an agreement with a non-listed ESP, that entity would have to go through an approval and agreement process with SoCalGas which can take several months.

In this scenario, Metro enters into an agreement with an ESP which can provide biomethane for injection directly into the pipeline. One of the primary differences between this pathway and the previously discussed pathway is the source of biogas. There are currently restrictions on injecting landfill-derived biogas into pipelines in California; however, these restrictions do not exist in other states. In other words, a biogas producer in another state (e.g., Texas or Washington) can capture landfill gas, condition it and inject it into the pipeline locally and have this gas delivered to California for use by a customer such as Metro.

[6] The list is available at http://www.socalgas.com/for-your-business/natural-gas-services/energy-service-providers/customer-core-list-of-esps.shtml.

This would require an agreement between the biomethane injector (Metro) and SoCalGas in order for this to occur, as well as an interconnection fee which can cost up to $2 million depending on where a local connection capable of receiving pipeline quality gas exists in relation to the site. At many sites, this local connection already exists due to previous installations of biogas conditioning and injection programs.

If Metro contracts with an ESP to inject biomethane into the pipeline on its behalf, there are protocols that must be followed, as outlined by SoCalGas. Generally, these include a number of contracts including a Master Services Agreement, ESP Agreement, Storage Contract, and others.

As part of the pro forma, Metro should insist on a minimum percentage of biomethane (equal to or greater than fuel demand of one bus division) to be injected into pipeline on our behalf. It is also recommended that Metro stipulate a percentage of ownership of RINs and LCFS credits as part of this deal.

Additionally, under Pathway 1, if Metro is injecting the biomethane into the pipeline rather than dispensing it at its bus divisions, it is recommended that Metro go through an experienced broker with contracts with SoCalGas already in place to buy, sell, and inject pipeline quality gas on the behalf of its customers.

Impacts on Operations

In Pathway 2, there are no impacts on operations or modifications to existing facilities. Further, there would be no discernible difference between the natural gas that would be delivered to Metro's facilities.

Potential Costs

If Metro were to contract with an ESP to inject biomethane on its behalf, Metro staff are operating under the assumption that the long-term contract with the ESP would link to the SoCal Border Wholesale Market price for natural gas. Apart from this, Metro does not anticipate any additional costs to procure biomethane.

3.4. Revenue/Cost Offsetting Potential

There are two fundamental strategies that Metro can employ to help offset the potential costs of transitioning to biomethane, particularly as they apply to Pathway 1 (and each subpathway):

- Revenue from regulatory markets i.e., LCFS market and the RFS2 market
- Grants from funding agencies e.g., CEC or SCAQMD

Revenue from Regulatory Markets

Low Carbon Fuel Standard

Metro currently has a LCFS credit balance of about 150,000 credits. At this point in time, Metro has not taken the steps to monetize these credits. However, credits are currently trading for

about $35-40/credit. Based on Metro's initial conversations with brokers and other market participants, it may be challenging to sell the entire balance of Metro's credits in the near-term future as a financing mechanism. In other words, the potential value of Metro's current account balance is upwards of $6 million; however, that is dependent on Metro's ability to move a large volume of credits.

The carbon intensity of biomethane is considerably lower than conventional fossil-based CNG. As a result, the consumption of biomethane as a transportation fuel has the potential to earn a significant number of LCFS credits.

As noted previously, Metro already has a credit balance of 150,000 LCFS credits based on its use of CNG in its fleet of transit buses. Biomethane in the transportation sector has significant potential to generate credits. Today, Metro earns credit as the owner of the fueling station that dispenses CNG. However, the entity that generates the credit for biomethane is the producer. In order for Metro to earn additional credits, we would have to enter an agreement with the biogas provider indicating what is called an obligation with transfer.

The table below highlights the potential LCFS credit generating opportunities under various scenarios:

- Under the business-as-usual (BAU) scenario, Metro continues to earn credits by dispensing natural gas.
- For Pathway 1, Metro staff assumed a 100% transition to biomethane by 2015 from a local in-state landfill. We assumed a carbon intensity of about 11 g/MJ.
- For Pathway 2, Metro staff assumed a 100% transition to biomethane by 2015 from an out-of-state landfill. We assumed a carbon intensity of about 29 g/MJ.

Year	CNG (BAU)	Pathway 1: Biogas (in California)	Pathway 2: Biogas (out-of-state)
2013	90,000		
2014	88,000		
2015	83,000	348,000	264,000
2016	79,000	343,000	260,000
2017	73,000	337,000	254,000
2018	67,000	331,000	248,000
2019	61,000	325,000	242,000
2020	53,000	317,000	233,000
Total (2015-2020)	**416,000**	**2,001,000**	**1,501,000**

Federal RFS2 Market: RIN Generation

Biogas also has the potential to generate Renewable Identification Numbers (RINs), the currency that the US Environmental Protection Agency (EPA) uses to administer the Federal Renewable Fuel Standard (RFS2). In order to generate RINs, the facility producing biogas needs to register as a RIN-generating entity with the US EPA. Biomethane is categorized as an Advanced Biofuel under the EPA's RFS2 program and can generate RINS in this category. Today, biodiesel and sugarcane ethanol are the most common fuels used to comply with the RFS2 requirements of the Advanced Biofuel category.

Potential Grant Funding

Metro staff have identified two potential sources of grant funding to help offset the additional costs of delivering and conditioning biogas that we would incur if we pursued Pathway 1:

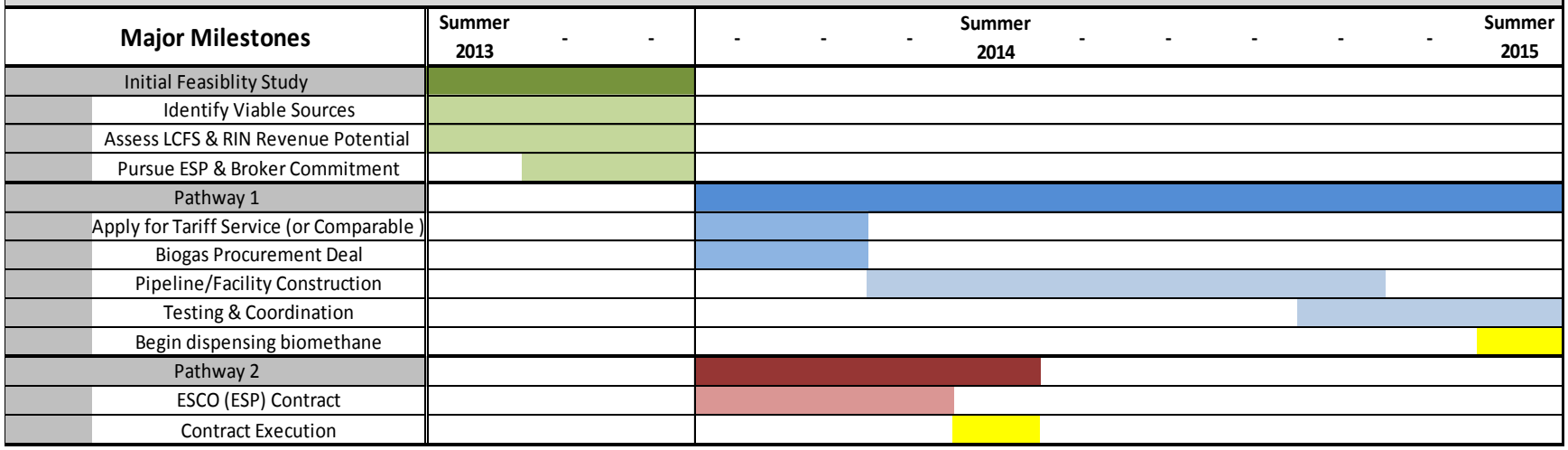
- Metro could collaborate with a partner and apply for money under the CEC's Alternative and Renewable Fuel and Vehicle Technology Program (funded via AB 118). Biomethane as a transportation fuel has received a significant amount of funding to date, which is likely to continue in the coming years.
- Metro could also seek opportunities to fund a biomethane project through the Clean Fuels Program, administered by SCAQMD's Technology Advancement Office.

4. Next Steps

The near-term focus of Metro staff is to conduct the following outreach:

- Engage potential local suppliers in substantive discussions regarding the potential to provide biogas to Metro. These discussions need to address the following items:
  - What is the potential supply to Metro? And what is the length of contract that the landfill can guarantee delivery of the biogas? Furthermore, what price is the biogas supplier seeking?
  - Would biogas conditioning occur at the landfill for injection? Or on-site at one of Metro's facilities?
  - What is the arrangement regarding LCFS credits or RINs?
- Based on the outcome of conversations with local suppliers regarding the potential to supply biogas to Metro, determine feasibility of Pathway 1. If Pathway 1 (and its sub-pathways) are not viable, then Metro can immediately engaged with a short list of ESPs that would be willing to supply us with biomethane.

Anticipated Timeline for Biomethane Implementation



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