Los Angeles County
Metropolitan Transportation Authority

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Metro

August 6, 2015

TO: **BOARD OF DIRECTORS**

THROUGH: **PHILLIP A. WASHINGTON** PAW
CHIEF EXECUTIVE OFFICER

FROM: **BRYAN PENNINGTON** BNP
EXECUTIVE DIRECTOR, ENGINEERING & CONSTRUCTION

SUBJECT: **RESPONSE TO APRIL 30, 2015 ITEM #40 MOTION ON CLEAN FUEL AND BIOMETHANE UTILIZATION**

ISSUE

During the April 30, 2015 Board Meeting, Directors Garcetti, Knabe, Ridley-Thomas, DuBois, and Dupont-Walker submitted a Motion that was approved by the full Board to direct the CEO on a number of items related to Metro's activities on clean fuel and biomethane utilization (Attachment A). Specifically, the Motion requested:

a. Report back on current Low Carbon Fuel Standards (LCFS) market conditions and identify opportunities to maximize revenue opportunities that can be used for operations and maintenance needs;
b. Hire experts to advise the agency on how to best monetize the credits in a way that maximizes revenues and minimize risk; the experts should have the following minimum qualifications:
   1. Successful sale of LCFS credits to credit buyers;
   2. Successful sale of LCFS credits with a minimum aggregate value of $5 million;
   3. Experience working with the California Air Resources Board on LCFS administration and implementation;
   4. Experience working with low carbon fuel producers on marketing, distribution, and credit monetization from the sale of low carbon fuels in California;
c. Adopt as a policy that all monetized credits be used for all bus and rail maintenance and operations needs and sustainability related infrastructure; and
d. Report back with an update on the above by July 2015.

This document provides the required report back on the above issues.

BACKGROUND

Metro has adopted several policies that guide energy related actions at our agency. The comprehensive Energy Conservation and Management Plan (ECMP), developed in 2011, provides a blueprint to direct Metro's overall energy management and use in a sustainable, cost-effective, and efficient manner. In September 2011, the Metro Board adopted the Metro Renewable Energy Policy, which outlines elements to implement a comprehensive renewable energy program including the exploration of creative sources of renewable energy.

A report to the Metro Board dated June 29, 2012 includes an outline of Metro's current progress in achieving such goal. In that report, staff states that using biogas, a renewable energy source, will significantly accelerate Metro's achievement of its renewable energy goals while achieving significant offsets in the agency's carbon footprint.

In July 2013, the Board adopted the Metro Biomethane Implementation Plan (Plan) that provides two options for procuring biomethane. In May 2014, the Board approved staff's recommendation for the purchase of biomethane from available sources. Under this plan, staff has been developing a Request for Proposal (RFP) that includes, at a minimum, the following objectives:

- Supply Metro with biomethane at the lowest cost feasible;
- Supply Metro with the maximum feasible volumes of biomethane; and
- Assist Metro to manage and maximize the value of environmental commodities.

In the same May 2014 authorization, staff was also allowed to engage in the sale of LCFS credits. The LCFS Market Analysis and Revenue Optimization Plan (Plan) that was included in that authority identifies an approach that will ensure Metro gets the maximum possible value from these LCFS environmental commodities. As a matter of policy under this authority, proceeds generated from LCFS transactions are already allocated for the implementation, operations, and maintenance of sustainability related infrastructure projects.

Putting into context LCFS market drivers and recent developments as well as forecasts for the market through 2020, the Plan recommends that Metro begins engaging in small volume trades. In consultation with various experts in the environmental commodities industry who are intimately familiar with LCFS transactions (including Metro's expert LCFS consultant at the time), staff determined that Metro already has the internal tools, capacity, and experience to implement environmental commodities transactions. This experience most recently includes activities related to the South Coast Air Quality Management District's RECLAIM (REgional CLean Air Incentives Market) Program.

In the Fourth Quarter 2014, Metro conducted a test sale through the Air Resources Board exchange of 15,000 credits that generated $390,000. Metro received all of these proceeds as no broker fees had to be paid. As sustainability related infrastructure projects are identified, the capital funding processes will be used to initiate and request utilization of these funds for these purposes. A portion of operations and maintenance of existing sustainability related infrastructure installations such as green buildings, renewable energy, and energy efficiency projects can also be drawn from these funds to maintain the infrastructure in a state of good repair. Examples of sustainability related infrastructure projects already programmed are shown in Attachment B.

During the April 16, 2015 System, Safety, Security and Operations Committee meeting, staff provided an update on its biomethane procurement. The update reviewed our LCFS credit efforts and how biomethane can possibly increase the agency's ability to produce more LCFS credits. A Board Box was provided to the Board on April 29, 2015 as requested by Supervisor Knabe and Director Dupont-Walker requested staff to provide the background to Metro's biomethane program and details on how we are participating in the State's LCFS program (Attachment C).

DISCUSSION

Following Metro's first successful LCFS credit transaction in the Fourth Quarter 2014 (15,000 credits @ $26/credit), LCFS credits continued to trade at record lows near $20/credit. Regulated fuel producers and importers have had little to no trouble meeting carbon intensity (CI) reduction requirements that have been frozen by a court decision since 2013, resulting in significant surpluses of credits being generated. CI of any fuel is the amount of carbon dioxide emitted by burning the same fuel. The lower the CI, the cleaner the fuel, and therefore the less impact of the use of the fuel to greenhouse gas emissions generation.

In March 2015 (prior to the adoption of the April 30, 2015 Board Motion Item #40) Metro's expert consultant completed a report for staff that outlines the current state of the LCFS credit, the market forces that currently influence this illiquid market, and the outlook for this market given Metro's current activities to procure biomethane (Attachment 2). Items of particular importance to this report back include:

Transition to Biomethane. As Metro transitions to biomethane, we need to consider the reporting obligations associated with it. The regulated party for biomethane is technically the producer or importer of the fuel, rather than the entity that has dispensed the fuel into a vehicle. Our current biomethane procurement (to be awarded in the Fall 2015) includes provisions for our agency to retain at least the current LCFS credits we generate through our dispensing of fossil natural gas.

Changes to the Carbon Intensity of Fossil Natural Gas. Until we complete our biomethane procurement, Metro will continually use fossil natural gas as fuel for our buses. However, revisions to the California GREET model (CA-GREET), which the Air Resources Board uses to assess the CI of transportation fuels, have yielded a higher CI for fossil natural gas. As the regulation becomes more stringent because of these changes, it appears that the credits generated by fossil natural gas consumption will decrease significantly.

Additional reporting obligations. As the regulations and sources of LCFS credits evolve to include electric fuel sources in the future, Metro can potentially increase its LCFS credit revenue generation capability as we expand our electric vehicle charging infrastructure, introduction of electric buses, and propulsion power for our expanding rail network. For now, these new opportunities are seen to enhance rather than substitute our LCFS credit generation from our dispensing of fossil natural gas.

In their July 23, 2015 meeting, our Board recently authorized the execution of the Sustainability Project Assistance Services contract. Staff is in the process of developing a Task Order for the selection and continuation of expert services to assist Metro in tracking LCFS and other environmental commodities transactions.

Our previous LCFS expert contract has already expired. In the meantime, staff continues to monitor LCFS rule-making and LCFS credit pricing; as well as continuing with the biomethane procurement for award in Fall 2015.

Staff is developing an implementation plan to deliver sustainability related infrastructure that was previously enumerated, including associated capital costs and operations and maintenance. This will be a demonstration of how life-cycle costing can be implemented in capital projects to cost-effectively deliver infrastructure while ensuring a state of good repair throughout the asset's life.

NEXT STEPS

Staff will periodically report to the Board on the preceding efforts. Staff will continue its biomethane procurement and will report back at the conclusion of the process.

ATTACHMENT

A. Copy of Item #40 Motion from the April 30, 2015 Board Meeting
B. Examples of Sustainability Related Infrastructure in Operations Projects
C. April 29 Board Box: Biomethane and LCFS Credits
D. LCFS Update (Spring 2015)

Prepared by: Cris B. Liban, EO, Projects Engineering
Environmental Compliance and Sustainability, (213) 922-2471

Attachment A. Copy of Item #40 Motion from the April 30, 2015 Board Meeting

ITEM 40

MOTION BY:
MAYOR ERIC GARCETTI, SUPERVISOR DON KNABE, SUPERVISOR MARK RIDLEY-THOMAS, DIRECTOR DIANE DUBOIS AND DIRECTOR JACQUELYN DUPONT-WALKER

MTA Board Meeting

April 30, 2015

Low Carbon Fuel Standard Revenue Opportunities

A low-carbon fuel standard (LCFS) is a rule that aims to reduce emissions in transportation fuels as compared to conventional fossil fuels, such as gasoline and diesel.

LCFS also seeks to reduce greenhouse gas emissions (GHG) by fostering innovation in low carbon transportation fuels.

California's LCFS was created as part of the implementation of California's Global Warming Solutions Act of 2006 (AB32).

The program, which is administered by the California Air Resources Board (CARB), also established a market where producers and developers of low carbon intensity transportation fuels may accumulate and sell credits to regulated entities who produce and sell transportation fuels that exceed permissible carbon intensity levels.

After converting its entire fleet of buses to natural gas (CNG), a low carbon intensity fuel, MTA voluntary joined the LCFS program and has generated and accumulated more than 200,000 credits under the program.

LCFS credits trade at market prices based on supply, demand and perception of regulatory risk.

LCFS credits have traded as high as $85 per credit and as low as $15.

Today the market is between $20 and $25 per credit.

Unfortunately, MTA has lost an opportunity to potentially generate millions from sales of credits at higher prices because the agency has lacked the expertise to monetize the accumulated LCFS credits in a timely fashion.

Not adopting a strategy for monetizing credits as they were accrued has arguably cost MTA millions as the price of credits has dropped.

MTA needs to focus and develop a strategy to routinely monetize its credits and avoid the risk of holding large accumulated positions in the credits.

MTA may benefit from contracting with outside experts who have experience generating LCFS credits from natural gas vehicle fuel, selling LCFS credits and advocating before the California Air Resources Board with respect to administration of LCFS rules and regulations.

WE THEREFORE MOVE THAT the CEO:

A. Report back on current LCFS market conditions and identify opportunities to maximize revenue opportunities that can be used for operations and maintenance needs.

B. Hire experts to advise the agency on how to best monetize the credits in a way that maximizes revenues and minimize risk; the experts should have the following minimum qualifications:

   1. Successful sale of LCFS credits to credit buyers.

   2. Successful sale of LCFS credits with a minimum aggregate value of $5 million.

   3. Experience working with the California Air Resources Board on LCFS administration and implementation.

   4. Experience working with low carbon fuel producers on marketing, distribution and credit monetization from the sale of low carbon fuels in California.

C. Adopt as policy that all monetized credits be used for all bus and rail maintenance and operations needs. & sustainability infrastructure.

D. Report back with an update on the above by July 2015.

Related

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Attachment B. Examples of Sustainability Related Infrastructure in Operations Projects

Attachment B: Examples of Sustainability Related Infrastructure in Operations Projects

updated: 7/31/2015

Sustainability Program Components
A. Energy Efficiency and Renewable Energy
1. Supply Side Management Projects
a. PV PPA Project - Div. 11 & 22 (roof replacement)
b. PV PPA Project - roof replacement at 2 SCE divs.
c. Roof mounted PV systems at 6 DWP divs.
d. Super Struct. PV system over Bus Yards at 6 divs.
e. Install 45 MW of PV panels
2. Demand Side Management Projects
a. Comprehensive ECM's - Div. 3, 7, 9, 11, 15, & 22
b. Comprehensive ECM's at remaining 10 divisions
c. HVAC upgrades at Div. 30
d. HVAC upgrades at all (15) remaining divisions
e. Gateway Building Lighting Retrofits
f. Gateway Parking Lamp Replacement
g. Lamp Replacements in MRL Stations
3. Program Design Projects
a. LEED-EB certifications - all facilities
B. Water Conservation, Solid Waste and Recycling
1. Water Conservation Projects
a. Recycled Water
b. Water Storage - Cisterns
c. Water Recycling Systems - Bus/Carwash
d. Water Recycling Systems - Steam Bays
e. Low Impact Development - Division 4
f. Low Impact Development - Divisions 9, ???
2. Solid Waste Reduction Projects
3. Recycling Projects
a. Cardboard Compactor Purchase, Installation, & Training
b. Recycling Infrastructure Improvements
c. Expanded Recycling Infrastructure along ROW
C. Climate Change/Adaptation
1. Climate Resiliency Projects
a. Resiliency Assessments (16 Div + Gateway)
b. Pilot Studies
c. Overhead Catenary Line Sagging Solutions
d. Heat Island Strategies - Green roofs
e. Back Up Power Solutions (17 locations, yearly cost)
f. Heat Island Strategies - Permeable Parking Lot expansion
g. Heat Illness Safety Training

Note: Per sustainability-related infrastructure procedure, operations and maintenance costs will be included in the costing of a project. These costs will be included in future requests for funding for these capital projects.

Attachment C. April 29 Board Box: Biomethane and LCFS Credits

Metro

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April 29, 2015

TO: BOARD OF DIRECTORS

THROUGH: STEPHANIE WIGGINS
INTERIM DEPUTY CHIEF EXECUTIVE OFFICER

FROM: BRYAN PENNINGTON
EXECUTIVE DIRECTOR, ENGINEERING AND CONSTRUCTION

SUBJECT: BIOMETHANE AND LCFS CREDITS

ISSUE

During the April 16, 2015 System, Safety, Security and Operations Committee meeting, staff provided an update on its biomethane procurement. The update also included a discussion on Low Carbon Fuel Standard (LCFS) credits and how biomethane can possibly increase the agency's ability to produce more LCFS credits. Supervisor Knabe and Director Dupont-Walker requested staff to provide, through a Board Box, the background to Metro's biomethane program and details on how we are participating in the State's LCFS program.

BACKGROUND

Metro has adopted several policies that guide energy related actions at our agency. The comprehensive Energy Conservation and Management Plan (ECMP), developed in 2011, provides a blueprint to direct Metro's overall energy management and use in a sustainable, cost-effective, and efficient manner. In September 2011, the Metro Board adopted the Metro Renewable Energy Policy, which outlines elements to implement a comprehensive renewable energy program including the exploration of creative renewable energy resources. This policy also establishes a Metro renewable energy stretch goal of an additional 13% renewable energy use above our current baseline usage of 20% by 2020. As of 2013, our agency has achieved 20.14% energy use from all renewable sources. Since then, we have completed additional renewable energy installations at the El Monte Station and the McArthur Park Station; completing solar installations at Division 13 and the Monrovia Yard; as well as considered pilots for wayside energy storage installation at the Gold Line and wind energy along the Red Line between Universal City and Hollywood/Highland Stations. Using biomethane, a fuel from a renewable energy source, will significantly accelerate Metro's achievement of its renewable energy goals while achieving significant offsets in the agency's carbon footprint without fiscal and infrastructural impacts.

Metro is currently opted into the California LCFS program as a regulated entity. The LCFS requires a 10% reduction in the carbon intensity of gasoline and diesel used in on-road transportation applications by 2020. At this time, Metro has generated 318,234 LCFS credits earned through the dispensing of CNG for use in its transit fleet bus. Staff estimates that Metro will earn approximately 500,000 credits between now and 2020, assuming no changes in our transit bus fleet or shift in the type of fuel we use. The California Air Resources Board (CARB) is considering allocation of LCFS credits for electrified rail or "fixed guideways"; and if this occurs, Metro can earn additional credits. Because of a number of outstanding technical issues at the state policy level, it is challenging to predict at this point the exact amount of possible LCFS credits from this potential source.

A 2011 Board Motion directed the CEO to develop a strategy and timeline to transition to super low/zero emissions buses from current CNG fleet. Committing to a future use of lower carbon intensive fuel with the intent of using existing CNG fleet will create some ramifications in fulfilling the intent of Metro's super low/zero emission buses efforts. However, since biomethane is the same fuel grade natural gas as the one that we now currently use (but from renewable sources such as landfills, wastewater treatment plants, and dairies), if used for our fleet Metro has the ability to offset our agency-wide carbon emissions by about 45% (considering agency-wide emissions) or about 78% (considering our bus fleet's carbon emissions) when fully implemented.

In July 2013, the Board adopted the *Metro Biomethane Implementation Plan* that provides two options for procuring biomethane. In May 2014, the Board approved staff's recommendation for the purchase of biomethane from available sources. Under this plan, staff has been developing a Request for Proposal (RFP) that includes, at a minimum, the following objectives:

- Supply Metro with biomethane at the lowest cost feasible;
- Supply Metro with the maximum feasible volumes of biomethane; and
- Assist Metro to manage and maximize the value of environmental commodities.

In the same May 2014 authorization, staff was also allowed to engage in the sale of Low Carbon Fuel Standards. The process was outlined in the Board approved *LCFS Market Analysis and Optimization Plan*. Proceeds generated from LCFS transactions are to be allocated for the implementation, operations, and maintenance of sustainability related infrastructure projects. As sustainability related infrastructure projects are identified, the capital funding processes will be used to initiate and request utilization of these funds for these purposes. A portion of operations and maintenance of existing sustainability related infrastructure installations such as green buildings, renewable energy, and energy efficiency projects can also be drawn from these funds to maintain the infrastructure in a state of good repair.

DISCUSSION

The biomethane RFP process is underway and is following this timeline:

- April 16: Completed Initial Procurement Documents
- May 20: Issue Biomethane Solicitation
- July 13: Proposal Due Date
- October 22: Board Approval of Award

Staff has also determined that there are a number of local and international vendors who are interested in participating in this procurement; most of them are from out of state. Local output of biomethane production is already being used for local purposes.

LCFS credits are sold through the Air Resources Board exchange. In November 7, 2014, staff completed a test sale of LCFS credits that generated $390,000 in revenue to Metro.

In January 2015, Metro's LCFS credit balance is 318,234 credits with a potential value of $7,001,148 (based on a March 2015 price of $22/credit). No additional sales are contemplated at this time. This is because although the near-term outlook for the LCFS credit market indicates that credits will likely continue to trade in the $22/ton to $85/ton range, the post-2015 outlook for the LCFS program indicates that credits will likely increase in value. For instance, most analysts currently suggest that the pathway towards compliance in the 2017-2020 timeframe will require significant use of banked credits from previous years due to the forecasted limited availability of alternative fuels to achieve the program's ultimate goal of a 10% carbon intensity reduction.

NEXT STEPS

Staff will continue its implementation of the biomethane procurement and will continue to monitor for optimized sale of LCFS credits per the board approved *LCFS Market Analysis and Optimization Plan.*

ATTACHMENT

May 2014 Board Report on Carbon Credit Transactions and Biomethane Implementation

Metro

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Metropolitan Transportation Authority

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EXECUTIVE MANAGEMENT COMMITTEE
MAY 15, 2014

SUBJECT: CARBON CREDIT TRANSACTIONS AND BIOMETHANE IMPLEMENTATION

ACTION: ENGAGE IN CARBON CREDIT TRANSACTIONS AND PURSUE BIOMETHANE IMPLEMENTATION

RECOMMENDATION

Authorize the Chief Executive Officer (CEO) to:

1. engage in the sale of Low Carbon Fuel Standard (LCFS) credits by approving the LCFS Market Analysis and Revenue Optimization Plan; and

2. pursue Pathway 2 in the Biomethane Implementation Plan (i.e., contracting with a third party energy provider to procure for biomethane or renewable natural gas (RNG) for a test period).

ISSUE

On February 27, 2014, Metro Board of Directors approved a motion by Director Ridley-Thomas on Sustainability-Related Infrastructure, Operations and Maintenance. This Board Report is a response to Section 1 of the Motion to: a) determine the optimum amount of revenue and most cost-effective strategy for the sale of Low Carbon Fuel Standard credits; and b) explore incorporating biomethane into Metro's fleet.

Metro has generated over 240,000 Low Carbon Fuel Standard (LCFS) credits with the potential to earn an additional 500,000 credits by 2020 due to its dispensing and consumption of compressed natural gas (CNG) as a transportation fuel. The value of these credits has ranged from $25 to $85 per credit during the period ending March 2014. To date, Metro has not engaged in any transactions to monetize these credits.

Additionally, staff has identified biomethane, or renewable natural gas (RNG), as a potentially viable bus fuel alternative to traditional natural gas. RNG has the same chemical make-up and can be made to have the same fuel specifications as traditional natural gas, but has the lowest carbon intensity among identified alternative fuels and is available in large enough volumes to at least partially serve Metro's bus fueling needs. This is an opportunity for Metro to fulfill its environmental and sustainability commitments at no additional commodity cost.

DISCUSSION

LCFS Market Strategy

In 2011, Metro opted into the California Air Resources Board's (CARB) LCFS program as a regulated entity. LCFS requires a 10% reduction in the carbon intensity of all fuels used in on-road transportation applications by 2020. As a regulated party, Metro earns credits by dispensing and consuming CNG for its bus fleet. Metro has earned over 240,000 credits at the end of 2013, and is projected to earn an additional 500,000 credits by 2020. To date, Metro has not engaged in any LCFS credit transactions to monetize these credits.

The LCFS Market Analysis and Revenue Optimization Plan identifies an approach that will ensure Metro gets the maximum possible value from these environmental commodities. Putting into context LCFS market drivers and recent developments as well as forecasts for the market through 2020, the Plan recommends that Metro begins engaging in small volume trades via a Request for Quotes (RFQ) process. After conducting these test sales over a span of 6-12 months, staff will conduct a review of sales to determine if Metro could have earned more revenue by contracting with a broker, minus broker fees. Staff will provide annual reports to Metro's Board on all LCFS activity and projections. Staff has the internal capacity and experience to implement LCFS carbon credit transactions.

Biomethane Implementation Strategy

In June 2013, the Metro Board adopted the Biomethane Implementation Plan which includes two pathways for biomethane or RNG transition: 1) Metro procures raw biomethane and conditions it to be dispensed as a bus fuel; and 2) processed and refined RNG is delivered to Metro by a third party via existing pipelines with no changes to infrastructure or operations. After extensive research, staff determined that Metro pursues Pathway 2 by contracting with a third party energy provider to procure for RNG but for a test period. If the project is proven to be cost-effective, a longer term contract should be pursed. Metro can always switch back to CNG at any time with negligible transactional and no capital cost.

In the recommended Pathway 2, third party RNG will be supplied to Metro facilities via existing utility pipelines. This third party provider must be registered with The Southern California Gas Company (Gas Company) in order to utilize the existing Gas Company pipelines and comply with natural gas pipeline supply balancing requirements and gas quality specifications.

Staff has received numerous inquiries from various parties who are interested in providing RNG to Metro at the same rate it currently pays for natural gas. Metro has the opportunity to significantly reduce the carbon footprint of its operations without making any infrastructure or operational changes.

Staff will be developing a Request for Proposal (RFP) to implement this determination. The RFP will at a minimum include the following objectives:

- Supply Metro with RNG at the lowest cost feasible;
- Supply Metro with the maximum feasible volumes of RNG; and
- Assist Metro to manage and maximize the value of environmental attributes of RNG.

Staff will procure for a third party and execute delivery of biomethane at the conclusion of the procurement process.

DETERMINATION OF SAFETY IMPACT

This program will have no impact on safety.

FINANCIAL IMPACT

The initial funding for this project are included in the FY14 budget under Project Number 450004 – Carbon Emissions and Greenhouse, Cost Center 8420 Environmental Compliance and Services, Account 50316 Professional And Technical Services. Since this is a multi-year project, the cost center manager and Executive Director, Engineering & Construction will be responsible for budgeting in future fiscal years.

Impact to Budget

There will be no net impact to Bus and Rail Operating Budgets. The initial source of funds for this project is General Fund which can be used to fund Bus and Rail Operations. However, the initial proceeds of the LCFS transactions shall replenish the General Fund for actual costs incurred used to start the program. Thereafter, all ensuing proceeds from LCFS transactions shall be retained in a new and separate project on a life of project (LOP) basis. The program can be designated as self-funded utilizing the proceeds to fund project activities.

Proceeds generated from LCFS transactions can be allocated for the implementation, operations, and maintenance of sustainability related infrastructure projects through the establishment of this specific green fund. As sustainability related infrastructure projects are identified, the capital processes will be used to initiate and request utilization of this green fund for these purposes. A portion of operations and maintenance of existing sustainability related infrastructure installations such as green buildings, renewable energy, and energy efficiency projects can also be drawn from these funds to maintain the infrastructure in a state of good repair.

Staff research and current pro forma circulated by interested parties indicate that Metro can purchase biomethane or RNG at or below rates for traditional natural gas due to the value of environmental commodities associated with RNG transactions. Metro can also potentially earn additional revenues as a result of this transition to RNG which can include associated regulatory incentives and monetized credits. These additional proceeds shall also be allocated for the implementation, operations, and maintenance of sustainability related infrastructure projects through this specific green fund.

ALTERNATIVES CONSIDERED

If Metro chooses to not engage in LCFS transactions, the agency will effectively forfeit the value of these credits. The credits will not expire, but the regulatory program has yet to be renewed past 2020.

Not pursuing biomethane or RNG will result in the continued use of natural gas as fuel for our bus fleet. However, Metro would have lost the opportunity to significantly reduce its carbon footprint; as well as the positive attributes and potential revenue resulting from biomethane use.

NEXT STEPS

After Board approval of this action, staff will engage in LCFS transactions as outlined in the LCFS Market Analysis and Revenue Optimization Plan. A Biomethane Implementation Working Group, formed in June 2013, will develop and release an RFP to implement the biomenthane action.

ATTACHMENTS

A. LCFS Market Analysis and Revenue Optimization Plan
B. Biomethane Implementation Plan

Prepared by: Cris B. Liban, DEO, Environmental Compliance and Services, (213) 922-2471

Bryan Pennington
Executive Director, Engineering & Construction

Arthur T. Leahy
Chief Executive Officer

ATTACHMENT A

Final

LCFS Market Analysis & Revenue Optimization Plan

April 2014

Submitted to:
Los Angeles County Metropolitan Transportation Authority

Prepared by
ICF International
620 Folsom Street, Suite 200
San Francisco, CA 94107

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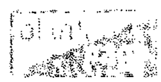


1. Summary of Low Carbon Fuel Standard and LACMTA

California's Low Carbon Fuel Standard (LCFS) requires a 10% reduction in the carbon intensity of gasoline and diesel used in on-road transportation applications by 2020. The carbon intensity of a fuel is the measure of its greenhouse gas (GHG) emissions on a lifecycle basis (reported as carbon dioxide equivalents, CO2e) per unit of energy in the fuel (reported in megajoules, MJ). The lifecycle of a fuel includes activities such as extraction and refining or production and processing, as well as the emissions from fuel use in the vehicle.

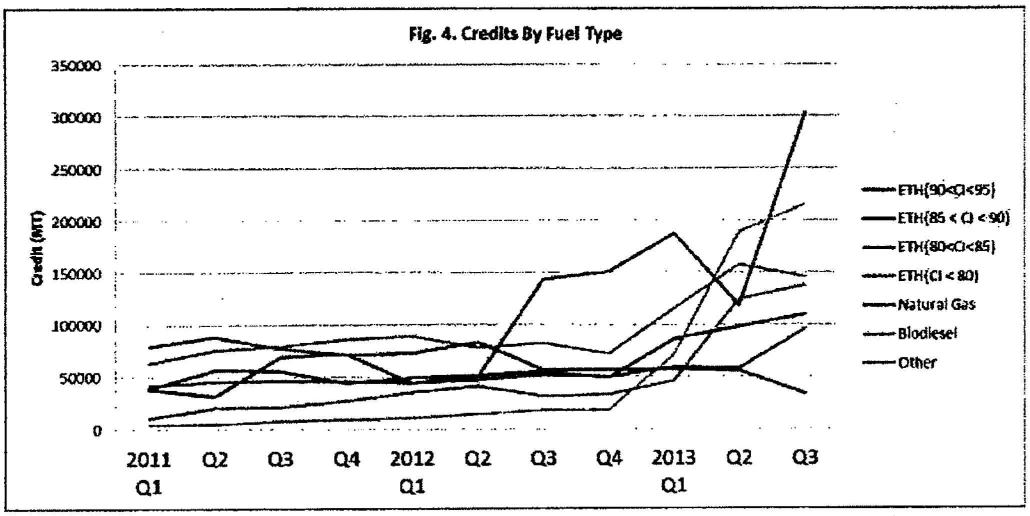
Refiners of petroleum that produce gasoline or diesel can comply with the LCFS via many strategies, including blending low carbon biofuels or by purchasing credits on the LCFS market that were generated via alternative fuel use. Metro is currently opted into the LCFS program as a regulated entity dispensing and consuming compressed natural gas (CNG) as a transportation fuel. Metro is therefore able to generate LCFS credits that can be sold to generate revenue. Metro had a balance of just over 267,000 credits at of the end of Q1 2014. As Metro continues to use CNG in its transit bus fleet at similar levels between 2014-2020, an additional 500,000 credits will be generated.

Metro is exploring a transition to renewable natural gas (RNG). While traditional natural gas (CNG) is generally extracted from deep underground rock formations or coal beds, RNG is derived from landfills, wastewater treatment plants, and dairy digesters and has a much lower carbon intensity than CNG. Due to this lower carbon intensity, the use of RNG as a transportation fuel generates up to three times more credits under LCFS. However, LCFS regulations dictate that the *producer* of RNG earns LCFS credits, not the owner of the fueling equipment, as is currently the case for Metro on the use of CNG. Though Metro would not necessarily be earning any credits if it used RNG; by partnering with an entity that provides RNG; part of the transaction resulting from such collaboration would include financial benefits derived from the monetization of LCFS credits resulting from the use of RNG. This can include a transfer, at minimum, of the equivalent LCFS credits that would have otherwise been earned by Metro through the dispensing of CNG. Therefore, Metro will not lose LCFS credits by transitioning to RNG.

2. LCFS Credit Market Assessment

The LCFS credit market is an emerging carbon market. Today, however, it is not fully iquid, immature, and often is difficult to understand the underlying fundamental market drivers. For instance, the majority of credits are being transferred to regulated parties (mainly refiners and importers of fuel), rather than purchased in the LCFS credit market. These credit transfers are currently happening at the point of blending biofuels like ethanol, biodiesel, or renewable diesel into gasoline or diesel. For instance, CARB reports 1.15 million credits have been traded via 271 credit transfers through February 2014. However, over that same period, nearly 6 million credits have been generated. Because much of the trading activity is happening as a result of credit transfers at the point of blending, this makes it difficult to understand what is driving the pricing for LCFS credits.

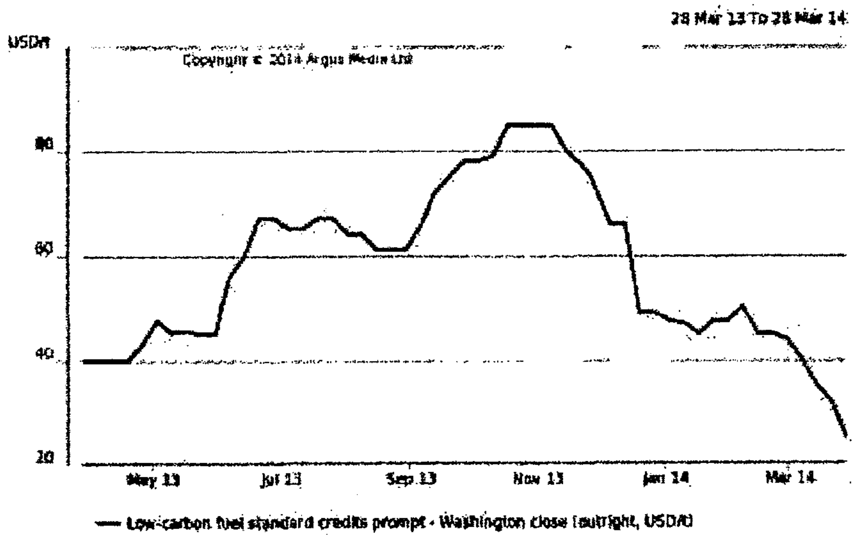
To date, most of the credits generated have come from shifting from higher carbon ethanol (e.g., conventionally produced corn ethanol) to lower carbon ethanol (e.g., sugarcane ethanol or improved corn ethanol techniques). This is illustrated in the graph below by looking at the purple line, which indicates the number of credits generated by ethanol with a carbon intensity less than 80 g/MJ. This is matched by a downward shift in ethanol with a carbon intensity between 90-95 g/MJ (see dark blue line).



Source: California Air Resources Board, Q3 2013 Quarterly Update
http://www.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm

LCFS credit trading has decreased significantly over the last several months after peaking around $85/ton in November 2013 (see figure below). The run up in credit prices last year was driven in part by concern regarding compliance at the end of the year and in part due to the higher costs of Brazilian sugarcane ethanol. Due to some delays in reporting for the Q3/2013, regulated parties took stock of their credit balance in the middle of Q4/2013, a bit later than they otherwise would have. As a result there was a run up in prices and then the market settled as credit/deficit balances became clearer, leading to a dramatic decrease in demand for credits.

This decrease has continued in recent months because of a significant drop in demand for credits. The LCFS market continues to run at a credit surplus – an estimated 2.5 million surplus credits at the end of 2013. ICF has advised Metro that this situation is unlikely to change in the near-term until the surplus of credits is reduced. Some of the near-term market realities impacting this are outlined below.



Source: Argus Media

Today, there is downward pressure on LCFS credit prices, as shown in the figure above. This is expected to continue for a variety of reasons:

- Due to the outcome of legal challenges and internal processes, ARB is freezing the carbon intensity reduction requirement in 2014 and 2015 at 2013 levels (1% reduction). This means that gasoline and diesel providers need to offset fewer deficits with credits.
- ARB is considering multiple amendments to the LCFS program, many of which include opportunities to generate additional credits. For instance, under ARB proposed amendments for adoption later this year, ARB is focusing on the following changes to the regulation:
  - Electricity used in forklifts (an off-road application) and in fixed guideway applications (e.g., Metro's rail system) will generate credits.
  - Modifications to the so-called indirect land use change (ILUC) emissions to conventional biofuels (e.g., ethanol from corn and sugarcane or biodiesel from soy oil) are likely to be reduced significantly. This means that these fuels will generate more credits for the same volume.
  - ARB is considering the implementation of a cost containment mechanism which may put a cap and a floor on LCFS credits prices.
- Finally, ARB is also considering some new concepts, including:
  - ARB is considering a concept in which refiners can earn credits for GHG reductions at refineries.

  - ARB is also considering changing the way fuel pathways are approved. As part of this, they are considering bins for fuels with similar pathways. Depending on the size of these bins, this might have an impact on how credits are generated.

Although the near-term outlook for the LCFS credit market indicates that credits will likely continue to trade in the $25-$85/ton range, the post-2015 outlook for the LCFS program indicates that credits will likely increase in value. For instance, most analysts suggest that the pathway towards compliance in the 2017-2020 timeframe will require significant use of banked credits from previous years due to the forecasted limited availability of alternative fuels to achieve the program's ultimate goal of a 10% carbon intensity reduction.

In summary, there are two main drivers for LCFS credits in our current outlook:

- There is forecasted downward pressure on credits as a result of ARB modifying the program to create more opportunities to earn credits; and
- The compliance stringency in the 2017-2020 timeframe will act as a drive for higher credit prices in the future.

3. Revenue Optimization Plan

3.1. Metro and Environmental Commodities

Metro has the capacity to manage the selling of LCFS credits on its own. There is precedence for Metro selling environmental commodities in the past. For instance, up until 2013, Metro sold credits in the Regional Clean Air Incentives Market (RECLAIM) managed by South Coast Air Quality Management District (SCAQMD). Metro was able to successfully redeem value from RECLAIM Trading Credits (RTCs) earned from using cleaner fuels.

There are several brokers engaged in the LCFS credit market; however, there are restrictions in credit trading that limit the role of brokers and other third parties. Through research and outreach in partnership with consultants like ICF, Metro could get a higher price for credits at the point of sale by using a broker; however, it is unclear at this point if the higher price is warranted given broker fees. There is inherent value in continuing to keep management in house namely:

- **Metro has a stable volume of credits.** Buyers in the market know that Metro has a stable supply of credits generated by using CNG in its transit buses.
- **Metro has a large volume of credits.** Metro's balance of 246,000 credits at the end of 2013 puts it in a strong position. On its own, Metro represents about 4 percent of all credits generated in the program through 2013.

3.2. Proposed Optimization Plan

Metro has already been contacted by no fewer than ten interested parties over the last 12 months regarding the sale of LCFS credits. Given Metro's history of managing environmental commodities in markets and its advantageous position in the LCFS credit market, Metro should move forward with small volume trades via Request for Quotes (RFQ) process. This recommended process will enable Metro to:

- Test the market demand for Metro's supply of credits
- Develop an understanding of the internal processes that are required to sell LCFS credits
- Maintain control over the terms and conditions of the sale

After conducting these test sales over the span of 6-12 months Metro will conduct a review of credit sales. The objective of this review will be to determine whether or not Metro could have earned more revenue from the sale of LCFS credits, for instance, by contracting with a broker or through another avenue. Furthermore, Metro will use the review as an opportunity to assess the internal processes that have been developed regarding the sale of LCFS credits. The assessment will include a review of staff and consultant time and the corresponding process efficiencies that have been developed.

3.3. Annual Reporting to Metro's Board

Metro staff will provide annual updates to Metro's Board on LCFS related activities. These updates will include credits earned and monetized, as well as a brief on LCFS market trends and projections.

Los Angeles County
Metropolitan Transportation Authority

ATTACHMENT B

Biomethane Implementation Plan

APRIL 2013

Metro

Table of Contents

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).

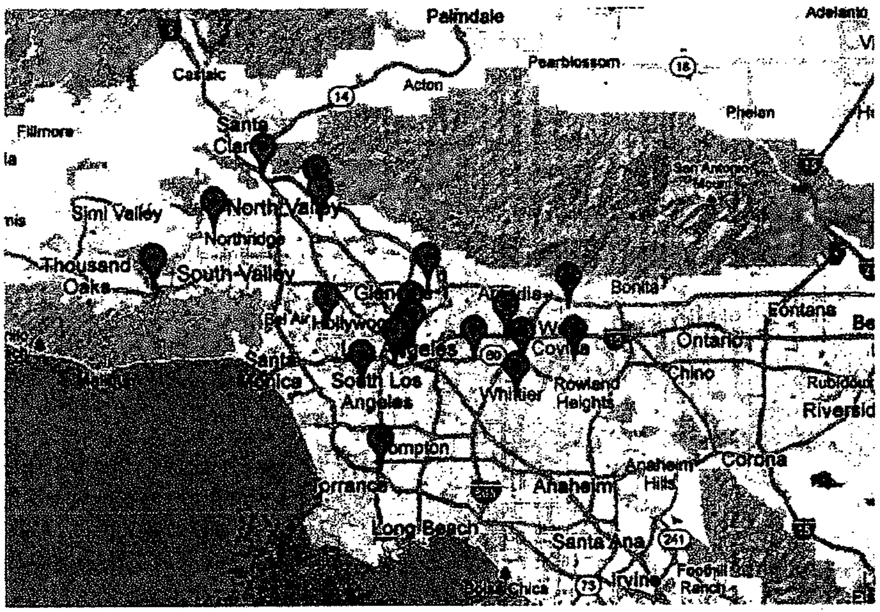


Figure 1. Metro Divisions (blue markers) and Nearby Landfills (red markers)

[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

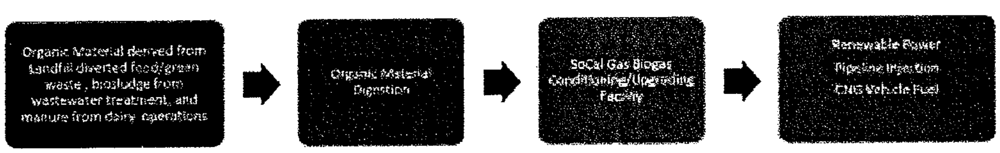
As noted previously, it is likely that Metro – in coordination with its biogas supplier – will have to install a storage facility because of the constant production of biogas from landfills. Conditioned biomethane can be stored in tanks designed for pressurized gas at an additional cost. For example, 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

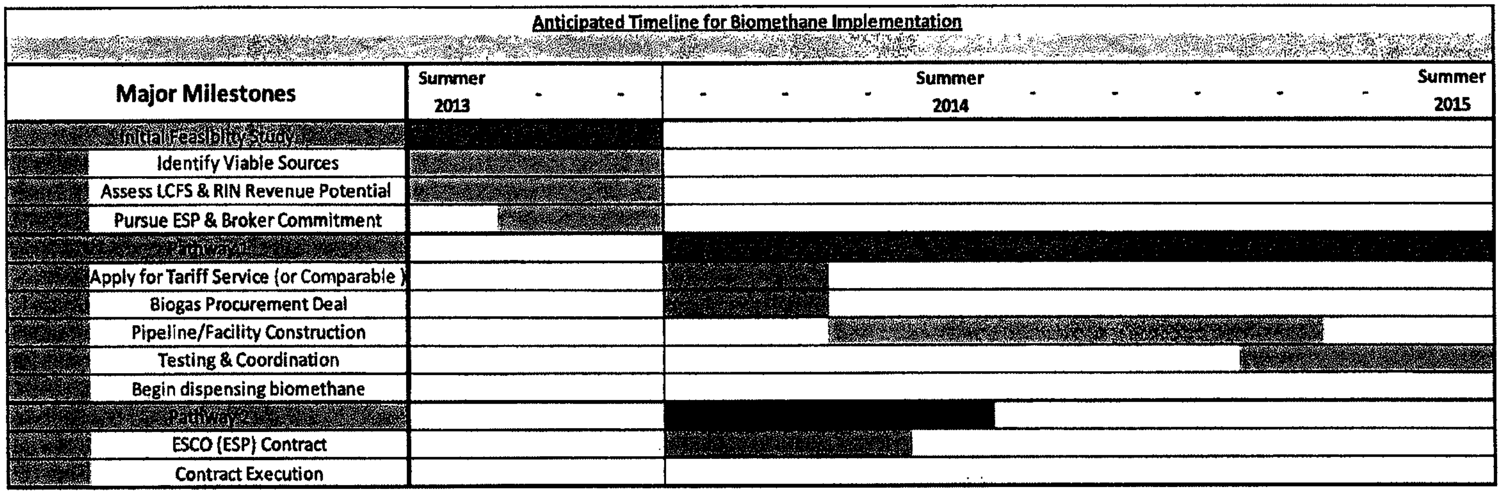
Metro staff have identified two potential sources of grant funding to help offset the additional costs of delivering and conditioning biogas that we would incur if we pursued Pathway 1:

- 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
Major Milestones
Summer 2013
Summer 2014
Summer 2015
Initial Feasibility Study
Identify Viable Sources
Assess LCFS & RIN Revenue Potential
Pursue ESP & Broker Commitment
Pathway 1
Apply for Tariff Service (or Comparable)
Biogas Procurement Deal
Pipeline/Facility Construction
Testing & Coordination
Begin dispensing biomethane
Pathway 2
ESCO (ESP) Contract
Contract Execution

Attachment D. LCFS Update (Spring 2015)

Final Report

LCFS Update (Spring 2015)

March 2015

Submitted to:
Los Angeles County Metropolitan Transportation Authority

Prepared by
ICF International
620 Folsom Street, Suite 200
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1. Introduction and Background

ICF has supported the Los Angeles County Metropolitan Transportation Authority (Metro) on issues related to California's Low Carbon Fuel Standard (LCFS) since early 2011. That support has included the following through March 2015:

- Estimated revenue generation potential (including a report issued in June 2011)
- LCFS administrative support, including reporting and training
- LCFS market research and updates
- Identifying opportunities to supply biomethane or biogas as a transportation fuel to Metro's fleet of natural gas transit buses (including a report issued in 2013)

1.1. Review of the Low Carbon Fuel Standard

The LCFS was established by Executive Order S-01-07 and requires at least a 10 percent reduction in the carbon intensity of transportation fuels by 2020. The ARB identified the LCFS as an early action item as part of the Global Warming Solutions Act of 2006 (AB 32), thereby creating a schedule to adopt and implement a regulation by 2010.

The LCFS is a flexible market-based standard implemented using a system of credits and deficits: transportation fuels that have a higher carbon intensity than the compliance schedule yield deficits, and fuels that have a lower carbon intensity generate credits. Regulated parties are required to have a net zero balance of credits and deficits annually. Credits can be banked and traded without limitations, and credits do not lose value. Transportation fuels that have a lower carbon intensity than the compliance schedule include ethanol, biodiesel, natural gas, electricity, and hydrogen. CARB quantifies and publishes carbon intensity values for all fuel pathways.

The Nuts and Bolts of LCFS

Carbon intensity (CI) is measured on a lifecycle or well-to-wheels basis in units of grams of carbon dioxide equivalent per unit energy of fuel (gCO2e/MJ).

The LCFS is implemented using a system of **credits and deficits**, with each credit representing one metric ton of reduction. Credits are generated by transportation fuels that have a carbon intensity lower than the compliance schedule (ranging from about 98 gCO2e/MJ in 2013 to 89 gCO2e/MJ in 2020) and deficits are generated by gasoline and diesel.

At the end of each year, compliance is achieved by offsetting deficits with credits. Credits can be banked and traded, and they do not lose value over time.

The regulation reports carbon intensity lookup values, distinguished as a) gasoline and fuels that substitute for gasoline and b) diesel[1] and fuels that substitute for diesel. Metro earns LCFS credits as the owner/operator of compressed natural gas (CNG) fueling stations that dispense CNG as a transportation fuel.

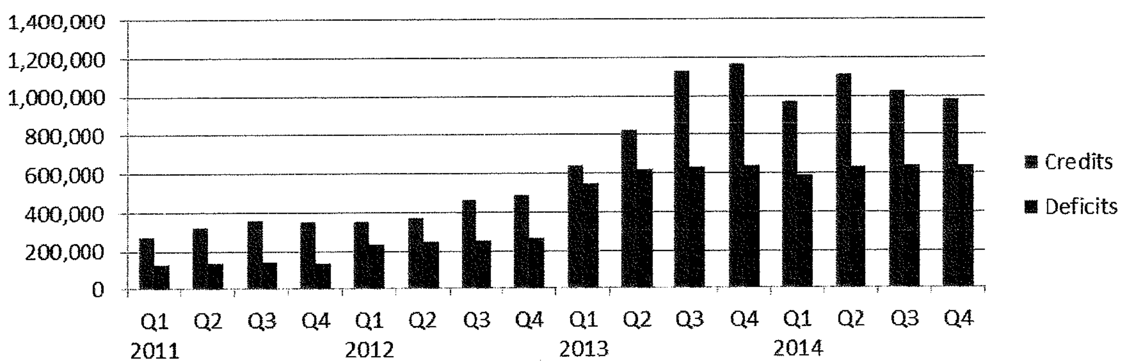
[1] Diesel in California is sold as Ultra Low Sulfur Diesel (ULSD), a cleaner burning diesel fuel which contains a maximum of 15 parts-per-million (ppm) sulfur.

2. LCFS Status Update

2.1. Program Update

Legal challenges to the LCFS have left the required CI reduction frozen at 2013 levels for both 2014 and 2015. As a result of this, the market is significantly over-supplied with credits–as of the end of Q3 2014, the market had a surplus of 4.33 million credits (see figure below).[2]

Figure 1. Total Credits and Deficits for All Fuels Reported, Q1 2011 – Q4 2014[3]



The LCFS program is currently going through a significant re-adoption (discussed in more detail below in Section 3 LCFS Outlook). The uncertainty in the program has impacted the price of credits significantly, as discussed in more detail below.

There are many ways in which credits are transferred to regulated parties; we generally focus on the following three credit transactions:

- **Transfer of credit at the point of liquid biofuel blending**. The majority of credits are currently being transferred at the point of blending. For instance, when ethanol is blended with gasoline to produce reformulated gasoline, the credits generated by the ethanol are likely transferred to the blender/refiner. In this case, the credit price may not be fully disclosed, rather it may be embedded in the overall price paid for the ethanol. There are similar issues related to biodiesel and renewable diesel blending.
- **Transfer of credits internally at an integrated energy company**. Several integrated energy companies have investments in alternative transportation fuels such as ethanol and renewable natural gas. For instance, Valero owns ethanol production facilities with more than 1 billion gallons of production capacity, whereas Shell and BP both have investments in renewable natural gas.
- **Purchase of credits in the LCFS market**. When LCFS credits are generated by fuels other than liquid biofuels, and are not generated by an integrated energy company with

[2] CARB, 2014 LCFS Reporting Tool (LRT) Quarterly Data Summary – Report No. 4, Available online: http://www.arb.ca.gov/fuels/lcfs/20150316_q4datasummary.pdf

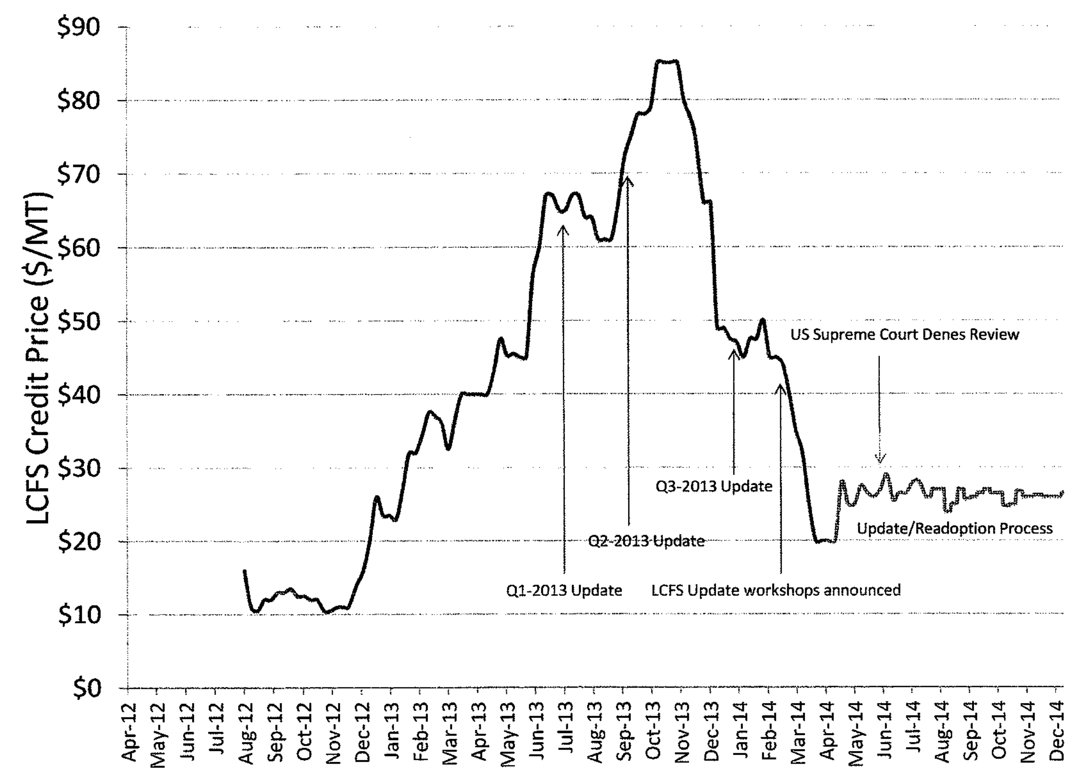
[3] Ibid.

investments in both refining and alternative fuels, then these credits are available on the credit market. In this case, a regulated party that is seeking credits to offset deficits (e.g., a refiner) will seek out credits from other regulated parties, such as utilities (regulated primarily for electricity, but also natural gas in some cases), fleets (using natural gas or electricity), and others. These credit transactions are the most transparent of the three described here.

By and large, the LCFS credit market lacks liquidity and transparency in part because entities can obfuscate the LCFS credit price paid at the point of blending or simply transfer credits internally (several companies active in the LCFS market have various investments in both refining and low carbon fuels). CARB reports, for instance, that one-in-five LCFS credit transactions have $0 credits being transacted.[4]

The graph below shows the LCFS credit price since August 2012 (note that there were only trivial volumes of credits transacted prior to this date).

Figure 2. LCFS Credit Values, August 2012 – December 2014



Source: Argus Media

As shown in the figure above, the LCFS credit market peaked in November 2013 at about $85 per metric ton ($/ton). It is unclear what the specific factors enabled the run up in credit prices

4 CARB, October 27, 2014 LCFS Workshop on Proposed Compliance Curves and Cost Compliance Provision.

in late 2013, however, ICF believes that it was a function of two things: 1) imports of Brazilian sugarcane ethanol and 2) the perception that the credit market was thinning out sooner than anticipated.

- California imported about 130 million gallons of Brazilian sugarcane ethanol between July 2012 and March 2013 (covering that initial steep increase in credit prices). Based on ICF's analysis of the price of sugarcane ethanol – including the transportation costs and associated taxes – the premium that would need to be covered to get the fuel to California would have been about $50-100/ton (depending on the CI pathway). ICF believes that there is a lag between credit market prices reported and imports reported, which also led to the continuous uptick in credit prices post March 2013.
- The other factor that likely played a significant role in credit prices increasing during 2013 was the *perception* that the surplus of credits generated (i.e., the number of credits generated compared to the deficits generated) was plateauing. CARB reports on the LCFS program on a quarterly basis; by-and-large, this is the only macro-level insight into the overall balance of credits and deficits that regulated parties receive. At the end of 2012, CARB reported a net balance of 1.35 million excess credits. CARB's first quarterly report in 2013, issued in July for Q1, indicated that the net surplus was still around 1.35 million excess credits. As one can see from Figure 1, the credits and deficits reported in Q1-2013 were very close to being equal.[5] To some extent, this "spooked" the market a bit, and may have led to more aggressive purchasing by regulated parties needing to offset deficits. As the year progressed, however, and additional information was made available regarding the net balance of credits (noting that Q3 and Q4 of 2013 had significantly higher credit balances), ICF believes that the market started to settle and credit prices decreased accordingly.

Although ICF believes that credit prices will increase again significantly in the future (discussed in more detail in the following section), the peak in 2013 was equal parts harbinger of things to come and over-reaction from regulated parties in response to imperfect information.

2.2. Metro's Role in the LCFS Program

Metro is a regulated party that dispenses CNG as a transportation fuel; through the end of 2014, Metro generated more than 330,000 credits. Over the last several years, ICF has supported Metro in the following key activities:

- **LCFS Reporting**. ICF has completed quarterly and annual reporting on Metro's behalf from 2011 to 2014. ICF developed a streamlined reporting protocol for Metro staff, including a tracking spreadsheet, documentation storage consistent with the regulation's requirements, and timely submission of reporting materials. ICF has provided training to Metro staff and provided training documentation to ensure a smooth transition so that Metro staff can internalize reporting and other administrative issues at the conclusion of ICF's contract.

[5] Note that in the initial quarterly release, the reported number of credits was even lower. CARB notes in every report that "figures are subject to change as regulated parties edit their quarterly data."

- **Transition to biomethane or renewable natural gas (RNG).** With a much lower CI than fossil-based natural gas, RNG provides an opportunity for Metro to reduce its carbon footprint significantly. Changes to the federal Renewable Fuel Standard and the availability of LCFS credits in California have led to a drastic increase in the availability of RNG to end users in California. ICF helped research likely sources, potential costs, and benefits to Metro.
- **Monetizing credits**: Metro now has the mechanisms in place to monetize LCFS credits quickly and efficiently (via a vetted RFP process). Metro did not have an efficient or transparent process to monetize credits previously–and as a public agency, ICF urged caution as it relates to engaging in the LCFS credit market with an emphasis on transparency. Even as Metro developed the mechanisms to monetize LCFS credits moving forward, ICF urged Metro to wait until at least the LCFS program is re-adopted (scheduled for mid-2015) to sell more significant volumes of credits, in large part because a) the market prices have been flat and b) there is little trading activity because of the uncertainty surrounding the LCFS program. These issues will both be resolved as part of the re-adoption process (expected to be completed in July or August 2015), and ICF maintains that credits will likely increase significantly as the program garners more certainty, the market develops more credibility, and most importantly, the CI targets become more stringent.
- **Market research and analysis.** ICF has provided regulatory updates, legislative updates, market research, and analysis for Metro staff over the last four years, ensuring that Metro staff have the most updated and robust information possible to make the best decisions as it relates to their LCFS account. ICF regularly interacts with stakeholders, including CARB, brokers, other regulated parties, investors, and other analysts providing complementary services (e.g., legal firms). When needed, ICF has sought to distill and digest LCFS market information in a manner that provides the most valuable information to Metro.

3. LCFS Outlook

3.1. Regulatory Changes

As part of the re-adoption process, there are several factors that must be considered, namely changes to the so-called indirect land use change values that affect the CI of liquid biofuels, additional credit generating opportunities included by CARB, and a cost containment mechanism. CARB released the proposed regulation in January 2015, and is likely to release the revised LCFS package in May or June 2015, with re-adoption by the Board expected in July 2015.

Indirect land use change

As a result of updated modeling (performed by CARB) on the impacts of so called indirect land use change (ILUC) – the concept that increased demand for biofuels produced from crop-based feedstocks like corn, sugarcane, soy beans, and canola will lead to knock-on effects in how land is used to meet the global demand for food/feed crops – the CI of key biofuels is change significantly. For instance, biodiesel from soy oil and ethanol from sugarcane used to have ILUC adders of 60 g/MJ and 46 g/MJ, respectively. The current proposed regulation has ILUC values of 29.1 g/MJ and 11.8 g/MJ for these fuels, respectively. These changes drastically favor sugarcane ethanol and soy-based biodiesel (which was previously a strictly niche market participant in California at 80+ g/MJ).

Additional credit generating opportunities

CARB staff have proposed several new ways for LCFS credits to be generated including: electricity used in forklifts and fixed guideway systems (e.g., the rail in Metro's system); refinery investments that reduce GHG emissions (e.g., efficiency improvements); and innovative crude production technologies (e.g., solar steam for enhanced oil recovery or on-site solar photovoltaic electricity generation). Although these opportunities vary in their credit-generating potential, ICF anticipates that these will yield significant downward pressure on prices in the near-term future.

Cost containment mechanism

CARB staff have proposed that the revised regulation include a cost containment mechanism to increase market certainty. Staff proposed what they consider a "credit clearance" market. Under this approach, regulated parties that have a shortfall of credits (to offset deficits) would be allowed to carry over deficits to the next compliance period in the event that they purchase their pro-rata share of credits made available for sale during a credit clearance period. These credit clearance periods would occur at the end of compliance years, during which time any excess credits that are held can be voluntarily pledged to sell. In the event that a regulated party carries over any deficits during one year, then that deficit would need to be repaid with interest within 5 years (the interest rate is proposed at 5 percent).

CARB has proposed a price cap of $200/ton starting in 2016, with that number indexed to the consumer price index (CPI) in subsequent years.

3.2. LCFS Compliance Outlook

Liquid biofuel blending

Generally, ICF assumes that blending lower carbon biofuels will continue to drive credit pricing in the future. ICF believes that liquid biofuel providers will be the most price-sensitive to LCFS credits in the future. We believe that these producers will need to monetize the credits more rapidly than other providers given the return on investment sought on significant capital outlays (e.g., a cellulosic ethanol production facility is generally assumed to be a $200 million investment; a $1/gallon premium on that cellulosic biofuel will generally cover the interest costs on debt alone).

- Brazilian sugarcane ethanol will continue to drive the average credit pricing for the near-term up to $100/ton. This will continue through the 2016-2017 timeframe. Although this represents the average credit price, it is important to note that there will be transactions at the margin of higher value.

- In the 2017-2018 timeframe, biodiesel and renewable diesel will start to drive credit pricing, particularly biodiesel from waste grease and corn oil. Based on ICF outreach and interview with stakeholders, the biodiesel market in California is demonstrating many signs of an immature market e.g., higher-than-expected margins and some lack of clarity regarding pricing. ICF assumes that it will take another year or two for the biodiesel market to settle and stabilize prices and volumes.
- In the final stage of the program (out to 2020), ICF assumes that cellulosic ethanol pricing will drive credit prices. Although the long-term production cost of cellulosic ethanol has the potential to be cost competitive with ethanol from corn or sugarcane, the demand for the fuel – as a result of the LCFS and RFS2, for instance – will command around a dollar per gallon premium compared to conventional corn ethanol. This gallon premium is equivalent to an implied price of carbon around $180-200 per ton, pushing up against the price of the cost containment mechanism proposed by CARB staff.

Changes in transportation fuel mix

The diesel sector is most susceptible to disruption in the near-term given the very low volume of alternative fuels consumed to date in California. The gasoline sector is largely limited to ethanol feedstock switching because fuel switching entirely (e.g., to electricity to hydrogen) is costly and the supply of these fuels/vehicles is severely constrained. As the ZEV Program comes into play more significantly in the post-2018 timeframe, however, electricity (and to a lesser extent hydrogen) as a transportation fuel will likely play an increasingly significant role in LCFS compliance on year-over-year basis, with the program expected to yield about 1.5 million ZEVs on the road by 2025.

Post-2020 CI reductions

In CARB's most recent Updated Scoping Plan – staff make note of a 15-20% CI reduction by 2030 for the LCFS. Furthermore, Governor Brown mentioned a goal of "up to 50% reduction" in petroleum consumption from on-road vehicles during his State of the State address in January 2015; ICF assumes that the LCFS will be one of the primary policy tools by which the state will seek to achieve these targets.

3.3. Metro and the LCFS

Moving forward, there are a handful of issues that Metro will have to consider, including:

- **Transition to RNG**. As Metro transitions to RNG, it will need to consider the reporting obligations associated with it. The regulated party for biogas or RNG is technically the producer or importer of the fuel, rather than the entity that has dispensed the fuel into a vehicle. Metro will need to ensure via its contracting process that it retains at least the LCFS credits that it would have otherwise generated for dispensing fossil CNG.
- **Changes to the CI of fossil CNG**. Revisions to the California GREET model (CA-GREET), which CARB uses to assess the CI of transportation fuels, have yielded a higher CI for fossil CNG. Preliminary estimates indicate that the CI could increase from about 68 g/MJ to upwards of

78 g/MJ. There is also going to be an increase in the carbon intensity of diesel (which is the benchmark against which CNG is measured to determine the LCFS credits generated), but that increase is not as significant. As a result, CNG will achieve about a 16% reduction compared to diesel. As the regulation becomes more stringent, and as it moves beyond 2020 even, the credits generated by fossil CNG consumption will decrease significantly.

- **Additional reporting obligations.** Metro will need to consider its expanding opportunities in the LCFS program, including via provision of electric vehicle charging infrastructure, charging of electric buses, and for electricity used in its rail network.

Each of these issues presents an opportunity for Metro, rather than a barrier for continued, meaningful participation in the LCFS program. ICF has provided Metro with an array of background information related to the potential for RNG, which should help that transition go smoothly. Further, the reporting protocols that ICF has helped develop should make for an easy transition with regard to the additional reporting obligations.