

# Low Carbon Fuel Standard for Transit Agencies

Technology Symposium for Transit Buses  
February 8, 2016

**Sam Wade**

Chief, Transportation Fuels Branch

California Environmental Protection Agency

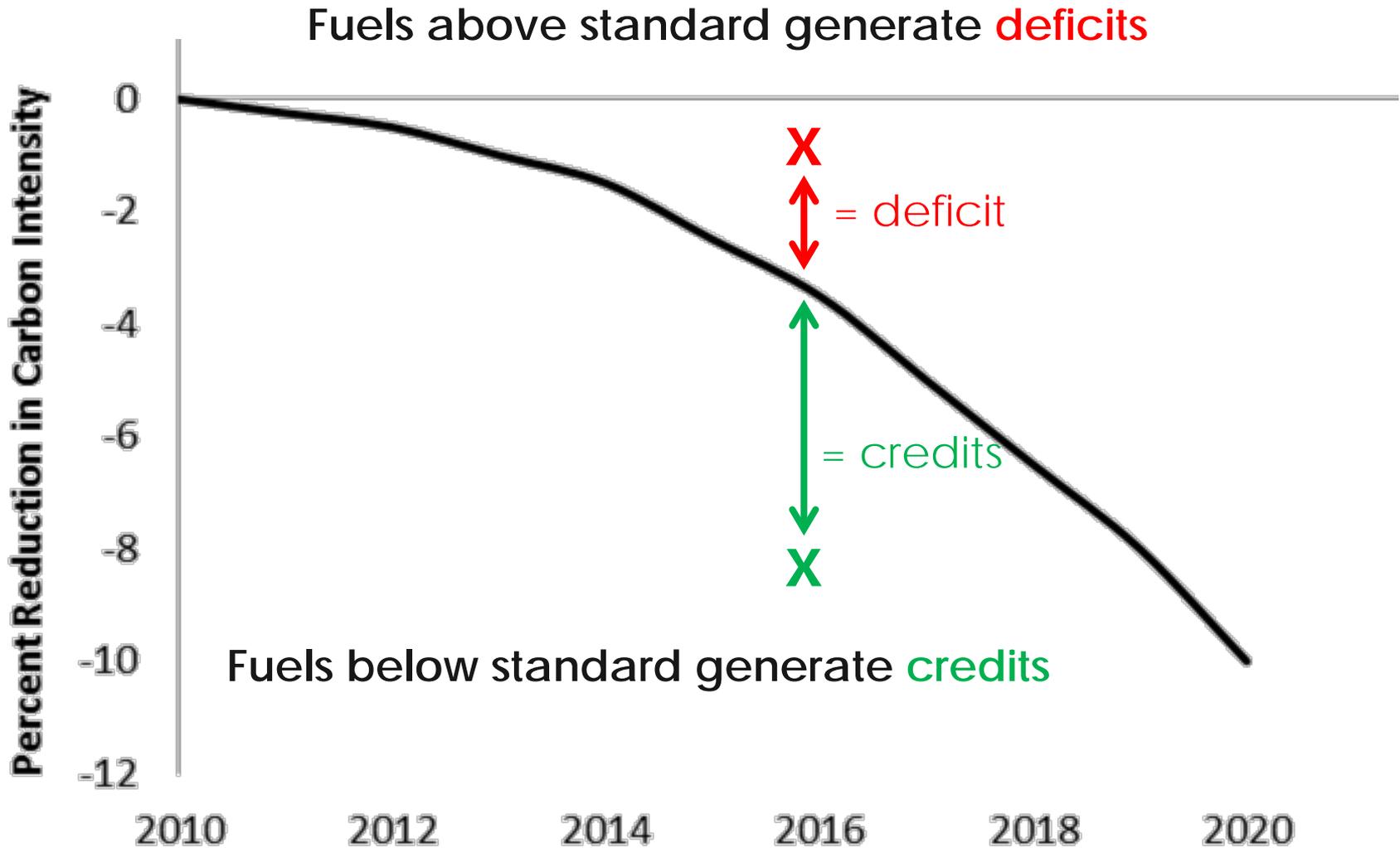
 **Air Resources Board**

# LCFS History

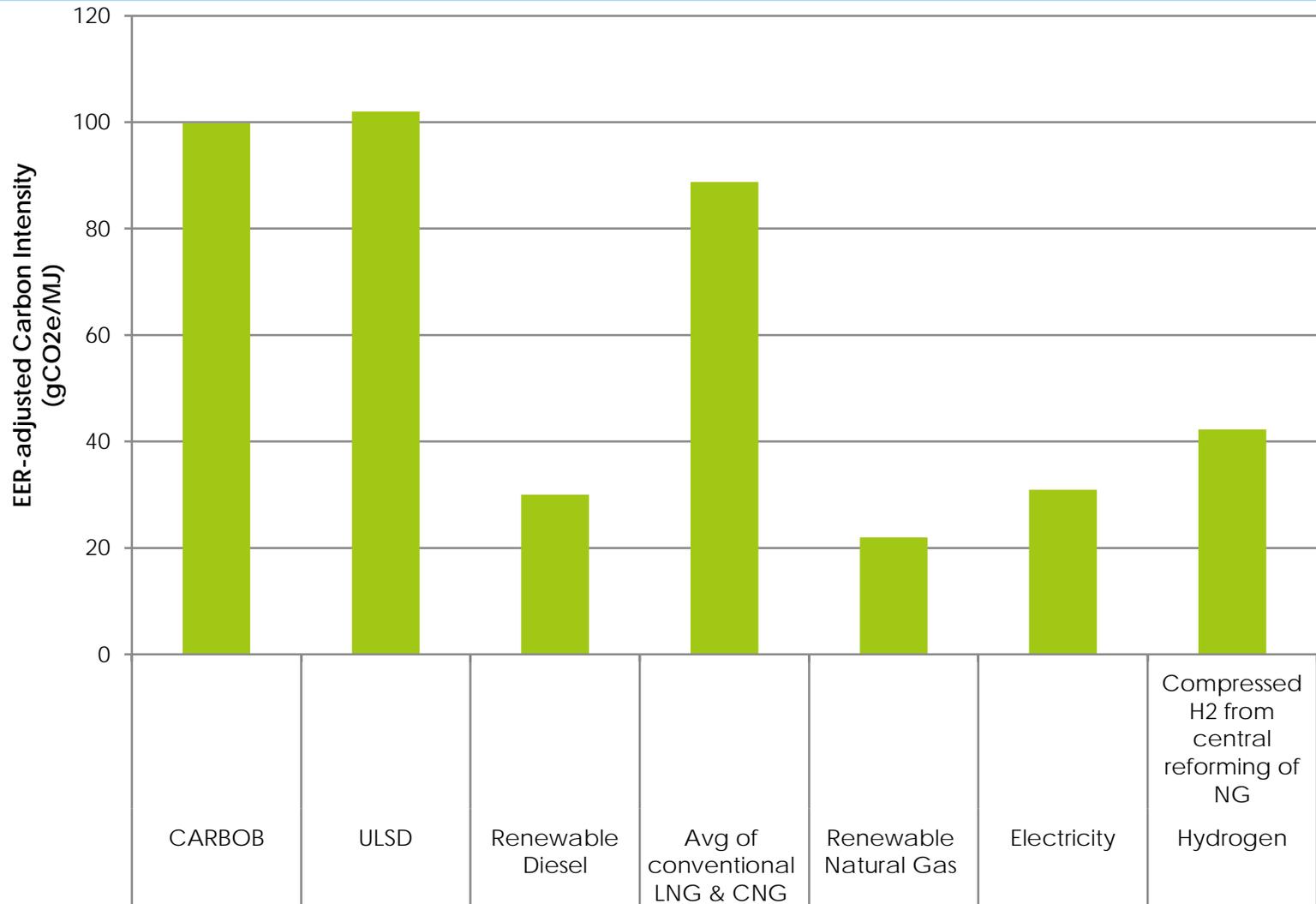
- Originally adopted in 2009, amended in 2011
- Approved for re-adoption in September 2015
- Goal: Reduce carbon intensity (CI) of transportation fuel pool by at least 10% by 2020
- Expected Benefits
  - Reduce greenhouse gases (GHG) emissions
  - Transform and diversify fuel pool
  - Reduce petroleum dependency



# LCFS Mechanics

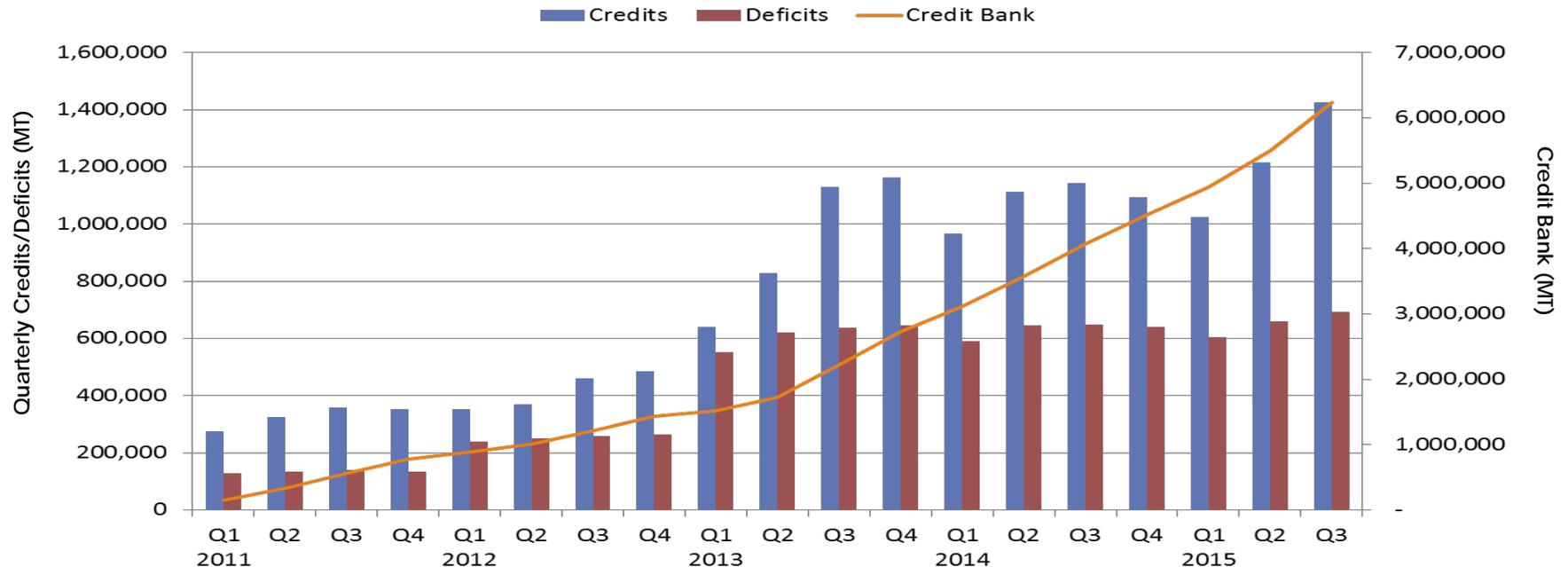


# Carbon Intensity for Gasoline, Diesel, Electricity, and Hydrogen



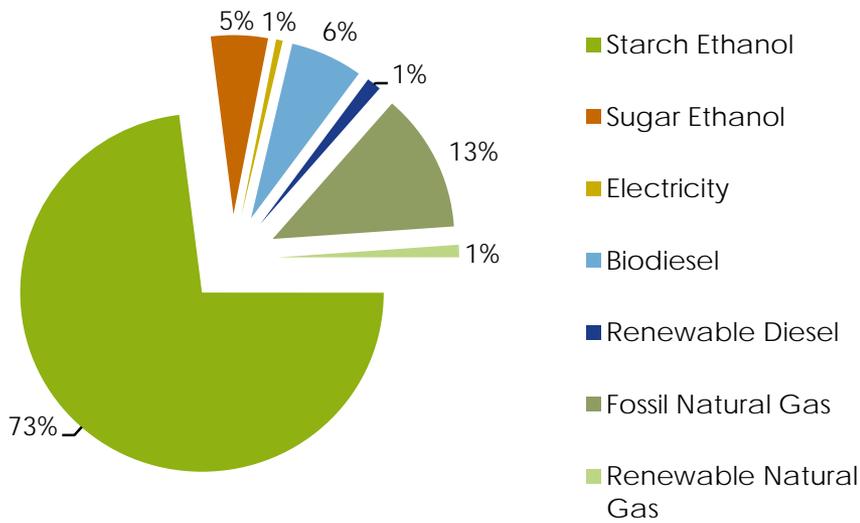
# LCFS Progress

- Low carbon fuel use is increasing
- Credits have exceeded deficits in all quarters and a significant credit bank has been built

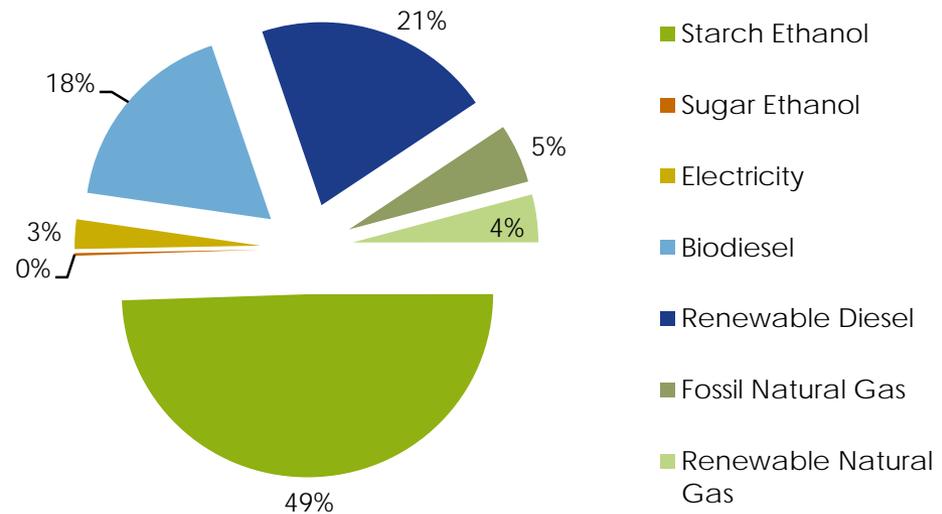


# Alt Fuel Diversity is Increasing: 2011 vs. 2014

LCFS Credits 2011 - 1.3 MMT CO<sub>2</sub>e



LCFS Credits 2014 - 4.1 MMT CO<sub>2</sub>e



# LCFS Credit Generation Eligibility

Fuel	Vehicle	1 <sup>st</sup> in line	2 <sup>nd</sup> in line
Biodiesel	Bus	Fuel Provider	
Renewable Diesel	Bus	Fuel Provider	
Fossil NG	Bus	<b>Station Owner</b>	
Renewable NG	Bus	Fuel Provider	
Hydrogen	Bus	Fuel Provider	
Electricity	Bus	<b>EV Fleet Operator</b>	Utility
Electricity	Fixed Guideway	<b>System Operator</b>	Utility

- The entity eligible to generate credits varies by fuel type
- In some cases a secondary credit generator is eligible if the primary credit generator has not opted-in or has chosen to not generate credits
- The option to generate credits can also be contractually passed to other parties

# How Do I Opt-in?

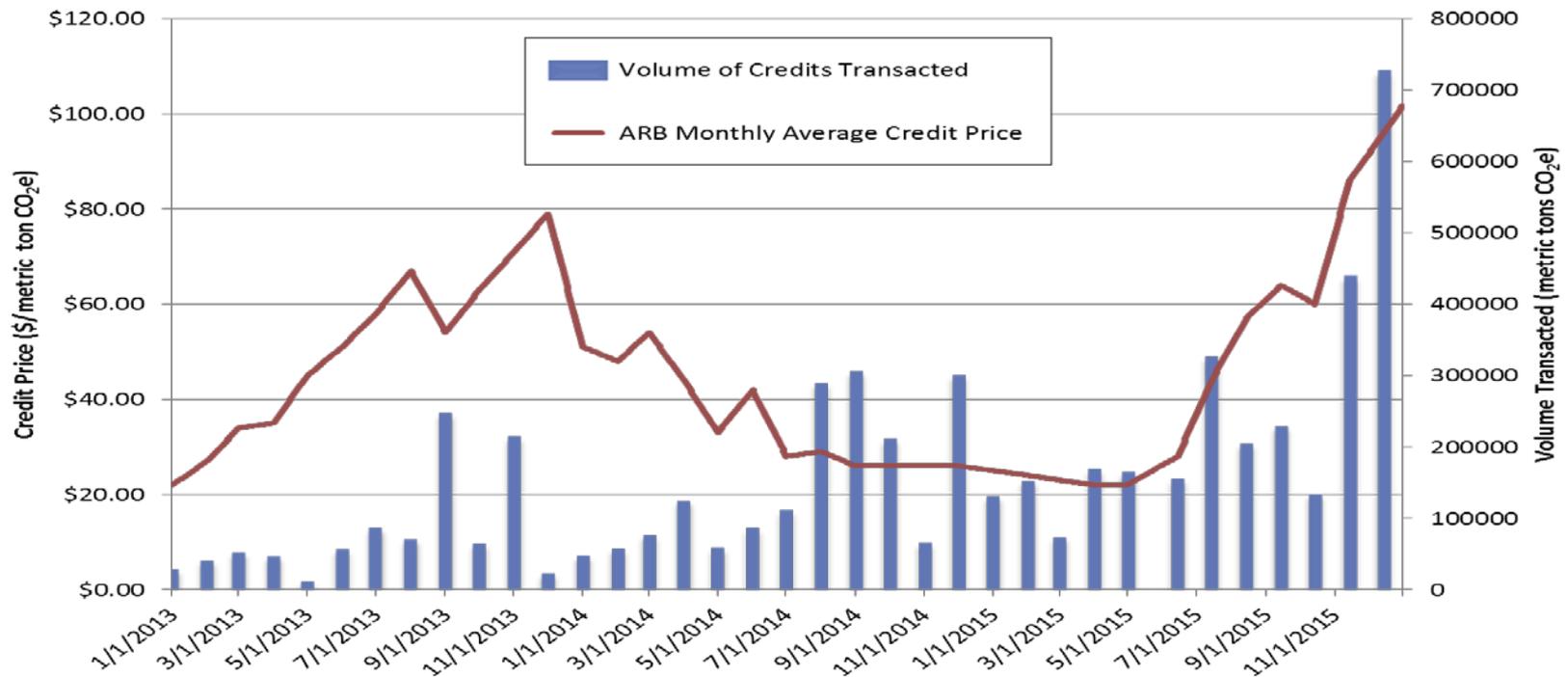
- Register as an opt-in party in the LCFS Reporting Tool and Credit Bank & Transfer System (LRT-CBTS)
- Go to [www.arb.ca.gov/lcfsrt](http://www.arb.ca.gov/lcfsrt)
- Provide:
  - organization name
  - organization address
  - organization federal employer identification number
  - primary contact person's name
  - telephone number
  - email address

# How Do I Generate Credits?

- If desired, register for an individual carbon intensity pathway
  - Defaults available for electricity, hydrogen and some renewable natural gas
  - Fossil natural gas must request an individual CI by the end of 2016
- Submit quarterly reports indicating the amount of fuel dispensed
  - Must be “uploaded” to LRT by 45 days after the end of each quarter
  - Must be “submitted” by the end of the quarter following the data quarter
    - Q1 report by June 30<sup>th</sup>
    - Q2 report by September 30<sup>th</sup>
    - Q3 report by December 31<sup>st</sup>
    - Q4 report by March 31<sup>st</sup> of the following year
- Credits are saleable after these quarterly deadlines
- An annual report is due by April 30<sup>th</sup> of each year

# How Do I Sell Credits?

- The major refiners are the primary buyers in the LCFS
- Brokers are available to facilitate transactions



# Approximate Credit Revenue for Transit Buses

Bus Fuel Type	Fuel Efficiency		Credit Revenue Per Mile (LCFS credit value \$100)	Annual Credit Value (based on an annual mileage of 40,000)
Diesel	3.8	mile/dge	\$0.00	\$0
Renewable Diesel/Biodiesel	3.8	mile/dge	\$0.24	\$9,549*
Fossil LNG & CNG	3.4	mile/dge	\$0.07	\$2,858
Renewable Natural Gas	3.4	mile/dge	\$0.29	\$11,415*
Electricity**	0.5	mile/kWh	\$0.23	\$9,064
Hydrogen	6.5	mile/kg	\$0.20	\$8,102*

\* Generally fuel providers claim the credits, and savings are reflected in fuel price.

\*\* LCFS credit revenue for electricity is based on the current California grid electricity mix. The credit revenue will be higher as renewable electricity in the grid increases.

# Fixed Guideway Systems

- Definition:

A system of public transit electric vehicles that can operate only on its own guideway (directly operated, or DO) constructed specifically for that purpose (such as light rail, heavy rail, cable car, street car, and trolley bus).
- Credit scheme:
  - Systems operating on or before 2010 (Existing Systems)

Are NOT awarded credits for fuel displacement
  - Systems expansion beyond 2010, including extension to existing track (New Systems)

Are awarded credits for fuel displacement

# Estimated Credit Revenue for Fixed Guideways

Fixed Guideway System Type	Benefit per KWh (@ LCFS credit value \$100)
Existing Heavy Rail	¢2.78
Existing Light Rail	¢2.45
Existing Trolley Bus, Cable Car, Street Car	¢2.38
New Heavy Rail	¢12.77
New Light Rail	¢8.09
New Trolley Bus, Cable Car, Street Car	¢7.37

# Contacts:

- Sam Wade, Chief of Transportation Fuels Branch  
[samuel.wade@arb.ca.gov](mailto:samuel.wade@arb.ca.gov) (916) 322-8263
- Manisha Singh, Ph.D., Manager of Fuels Section  
[manisha.singh@arb.ca.gov](mailto:manisha.singh@arb.ca.gov) (916) 327-1501
- Jing Yuan, Ph.D., Lead Staff  
[jing.yuan@arb.ca.gov](mailto:jing.yuan@arb.ca.gov) (916) 322-8875