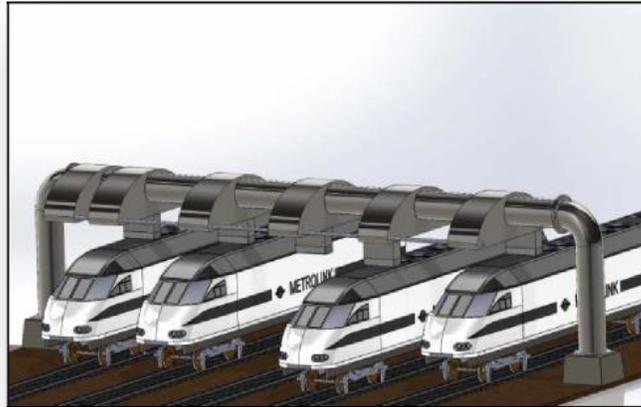


**Program:** California Sustainable Freight Action Plan Pilot Project Ideas

**Submission Date:** November 30, 2015



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**2. Project Title:** Metrolink Los Angeles Advanced Locomotive Emissions Capture System (ALECS) Pilot Project

**3. Project Location:**

Southern California Regional Railroad Authority - Metrolink Central Maintenance Facility (aka Taylor Yard) 1555 N. San Fernando Road, Los Angeles, CA 90065

#### **4. Executive Summary:**

Advanced Engineering Group, LLC (AEG) proposes to conduct a demonstration project of its patented Advanced Locomotive Emissions Capture System (ALECS) technology customized for Metrolink Los Angeles at their Central Maintenance Facility (CMF). AEG completed “proof of concept” testing of ALECS in 2006 at the Union Pacific J.R. Davis Rail Yard in Roseville, CA. Metrolink currently has 52 locomotives, 37 are Tier 0 (3000 hp, 58’ long) and 15 are Tier 2 (3600 hp, 68’ long). The exhaust stack for the main engine is located at the front of the locomotive and there is an additional Head & Power (HEP) diesel engine (approximately 600 hp) at the rear of the locomotive which is used to supply 480V power to the passenger cars. Therefore, two exhaust capture hoods are required for each locomotive, one in the front and one in the rear.

The ALECS will be constructed on an overhead rail system that will allow the ALECS in-line heat sensing Exhaust Capture System (ECS) to automatically position its emissions capture hoods over the locomotive engine exhaust stacks of three locomotives at the same time. The ECS will capture, treat and remove PM, NOX, SOX and VOC’s with a 95%-99% efficiency.

#### **5. Project Description:**

This project is being proposed because there is a significant need for a Locomotive Train Emissions Capture System that can be adapted to various freight and passenger rail yard configurations, different locomotive types, different engine sizes and stations. At this time there is no other existing technology in the world that can capture, remove and treat a locomotive engines diesel fuel exhaust emissions.

The Advanced Locomotive Emissions Capture Technology System (ALECS) is manufactured by Advanced Environmental Group, LLC at its Carson facility. It is the first of its type and has already completed “proof of concept testing.” The ALECS can be used for both freight and passenger locomotives.

This pilot project will further advance the development and applications of the ALECS technology. This next generation ALECS technology design version will connect to three locomotives and two engines on each locomotive at one time.

The pilot project will also meet the Los Angeles Metropolitan Transit Authority (MTA) Planning and Programming Committee intent of a motion approved on October 14, 2015 for the Southern California Regional Railroad Authority (Metrolink) to initiate a study on the “Feasibility of ALECS at the Central Maintenance Facility and Union Station,” in order to demonstrate the technological progress of ALECS to minimize the environmental and public health impacts of diesel pollution.

#### ***Locomotive Emissions Capture Technology Brief History.***

ALECS was first developed by Advanced Cleanup Technologies, Inc. (ACTI), the sister company of AEG. In 2003 ACTI management and engineering team pursued the technology concept and original design. In 2004 initial discussions began with the Placer County Air Pollution Control District (APCD) to ascertain if the Advanced Locomotive Emissions Capture Technology System (ALECS) technology could be applied to treat the emissions from stationary railroad locomotives in the Roseville, California Union Pacific Railyard. With positive interest, ACTI began completing the R&D.

In 2005 work began on the construction of the first ALECS and in August 2006 “proof of concept” testing began at Roseville which proved that the ALECS could effectively reduce air pollutants from locomotive diesel fuel engines exhaust. Independent 3<sup>rd</sup> party testing validated a 95% to 99% percent emissions reduction of PM, NOX and SOX.

These tests were funded jointly by ACTI, regulatory agencies California Air Resources Board (CARB), Placer County Air Pollution Control District PAPCD), South Coast Air Pollution Control District (SCAPCD), Sacramento Air Pollution Control District (SAPCD), and US Environmental Protection Agency (USEPA) and Union Pacific Railroad.

ALECS is also the sister technology to AMECS-Advanced Maritime Emissions Control Technology System which is used to capture ship emissions and was certified by CARB in October 2015. AMECS has been successfully tested on over 70 ships of all classes and sizes at the Port of Long Beach, California.



ALECS Demonstration-Union Pacific J.R. Davis Rail Yard - Roseville, CA

### ***ALECS Technology Sustainability & Energy Efficiency.***

ALECS is a Sustainable Freight Transportation Support Solution because it is an effective locomotive emissions capture system with renewable energy solar panel power built into the over-head rail system. Solar panel energy is also stored in rechargeable Lithium-Ion batteries for use in low sun light, cloudy days, evenings and rainy days. The ALECS is also connected to the main power grid to assure continuous power.

### ***ALECS Environmental Benefits.***

ALECS Technology Environmental Benefits Include:

- All electric technology
- Renewable energy power supply
- No fossil fuel requirement
- No hazardous waste
- 70%-79% Noise Reduction in Locomotive Noise
- Vibrationless

## ***ALECS Emissions Capture Efficiency***

ALECS Captures, Removes & Treats:

- PM 94.5% Efficiency
- NOX 99+% Efficiency
- SO2 98.5% Efficiency
- VOCs 99.5% Efficiency

## ***ALECS Public Safety Benefits.***

ALECS Public Safety Benefits Include.

- Does not use flammable or explosive fuels
- Does not produce any toxic hazardous materials

## ***ALECS Logistics Technology Options.***

ALECS Logistics Benefits Include:

- One ALECS can treat one line-haul locomotive at full power or 6 at idle
- Ability to combine ALECS units for increased locomotive capacity
- ALECS can be constructed and operated outdoors or indoors
- Can accommodate any rail yard or track configuration
- Can be easily custom designed to meet rail customer requirements
- Requires a small land footprint
- In-Line heat sensing can automatically position its emission capture hoods over locomotive engines exhaust ports
- Can operate automatically without disrupting locomotive operations
- Can be built, installed and operational in less than one year
- Can easily be relocated
- Is 100% self contained unit
- Minimum manpower and operation requirements
- Minimum and low cost maintenance requirements

## ***ALECS Technology Nuts & Bolts.***

ALECS uses proven off-the-shelf emission control and treatment technology and applies it to locomotive industrial environment. ALECS consists of the following two patented technology systems. The Exhaust Capture System (ECS) and the Emissions Treatment System (ETS).

The ECS consists of multiple emission capture hoods connected to an overhead rail system which uses an in-line heat sensing unit which can automatically position emission capture hoods over locomotive engines exhaust stacks. The ECS has a built-in vacuum system which draws the exhaust emissions into it.

There are two ECS design configuration options available, the "In-Line" and "Continuous." The In-Line ECS has the ability to position an emission capture hood anywhere along a 15 foot length over the locomotive to accommodate various stopping locations and different styles and types of locomotives. The Continuous ECS can be designed to be any length, even hundreds of feet and contains multiple hoods which can be placed over multiple exhaust

stacks. This is ideal when you have two or more locomotives in a row and can be located anywhere under the length of the ECS and hoods.

The patented ETS process receives the exhaust gas captured by the ECS. The ETS is composed of a Particulate Matter (PM) scrubber/filter and a Selective Catalytic Reducer (SCR) where Nitrogen Oxide (NOX) is removed.

The ALECS utilizes a SCR to remove NOX from the exhaust gas. The SCR operates under temperatures ranging from 500-700 degrees Fahrenheit, so gas is heated using a gas or electric-fired heater. A heat exchanger (HX) receives about 85 Percent of the waste heat from the gas stream exiting the SCR and uses it to preheat the gas stream entering the SCR. The heater then only needs to add the 15% shortfall. Liquid urea is used as the NOX reactant. Urea is converted to ammonia when it mixes with the hot gas within the system ducting downstream of the heater and prior to entering the SCR, where the reaction takes place. NOX is reduced to nitrogen gas and water vapor. Ammonia slip is controlled to less than 3ppm.

Particulate Matter removal is accomplished using a Diesel Particulate Filter (DPF). The DPF is a proven technology that has been applied to a wide variety of diesel engines. DPF units rely on the physical characteristics of solid particles for removal. PM is captured via filtration and then processed through a high heat regeneration process. The resulting non-hazardous ash is periodically cleaned from the system and safely disposed of in a landfill. There is also a potential for the residual ash to be recycled and used in cement as a binder material. The DPF is designed to remove 90 to 95 percent of diesel PM from exhaust systems. The DPF designed for ALECS installs the filter in-line prior to the exhaust entering the SCR unit. This ensures that PM has been removed prior to the SCR and avoids any potential fouling of the catalyst.

Metrolink currently has 52 locomotives, 37 are Tier 0 (3000 hp, 58' long) and 15 are Tier 2 (3600 hp, 68' long). The exhaust stack for the main engine is located at the front of the locomotive and there is an additional Head & Power (HEP) diesel engine (approximately 600 hp) at the rear of the locomotive which is used to supply 480V power to the cars. Therefore, two exhaust capture hoods are required for each locomotive, one in the front and one in the rear.

### ***ALECS Project Economic Benefits.***

#### Pilot Project Short Term Economic Benefits

- 1<sup>st</sup> Locomotive Emissions Capture Technology To Support Freight Transportation in California & US
- Significantly reduces emissions that have serious long term environmental and health consequences for the immediate surrounding communities.
- Major EJ Community Health Care Cost Savings Benefit Project in California
- Will generate new local and state revenues from business licenses, permits and taxes
- Creation of local Los Angeles area temporary construction labor jobs
- Creation of local permanent Los Angeles area labor jobs
- Local buyer of parts & materials revenues
- Opportunity for local universities, community colleges, trade schools to learn new technologies & develop curriculum and classes

#### Pilot Project Future Deployment Economic Benefits

- Significantly reduces emissions and that impacts the environment and health
- Major EJ Community public health care cost savings benefit project in California
- Will generate new local and state revenues from business licenses, permits and taxes
- Local increase in construction labor jobs
- Long-term permanent employment-operations & maintenance
- Local buyer of parts & materials revenues
- Opportunity for local universities, community colleges, trade schools to learn new technologies & develop curriculum and classes
- Lower long-term energy grid infrastructure expansion & replacement costs

### ***ALECS Pilot Project Demonstration Site Location.***

The pilot project demonstration will take place at the Metrolink Central Maintenance Facility 1555 N. San Fernando Road, Los Angeles, CA 90065.

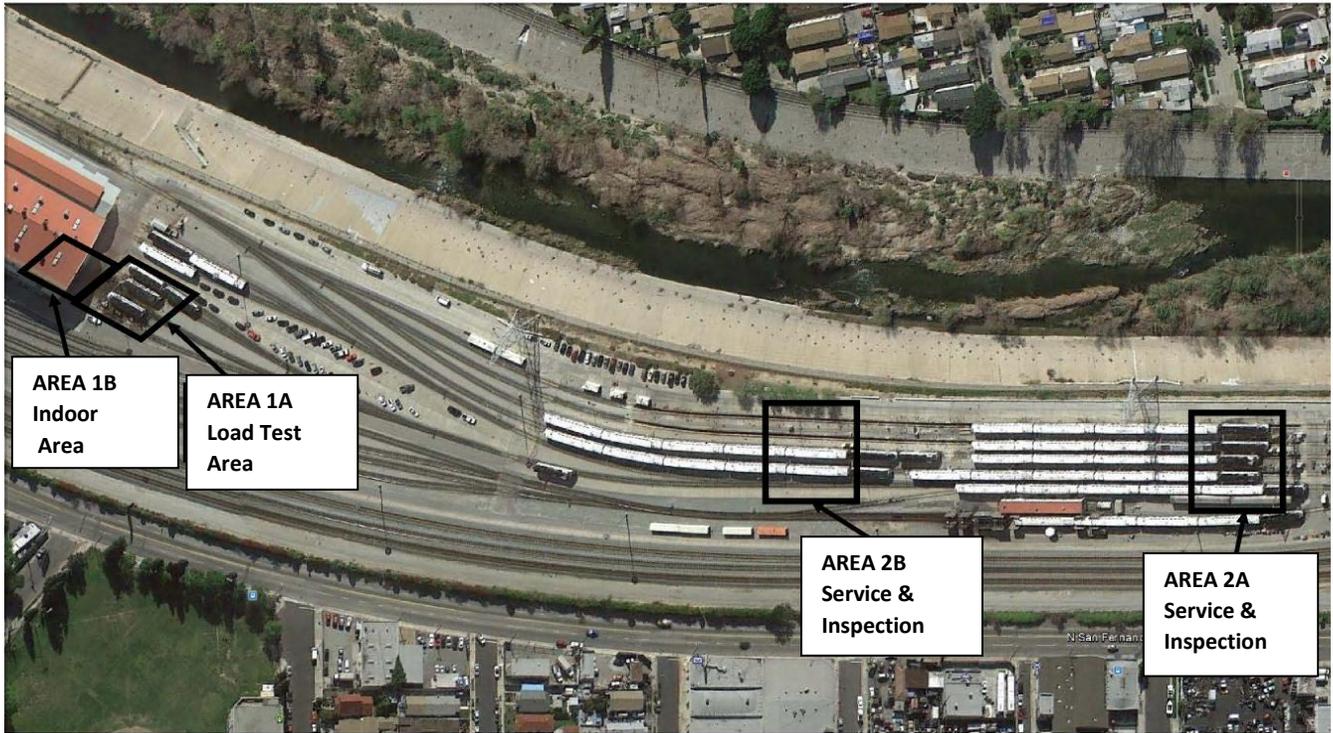
### ***ALECS Project Future Deployment***

Upon completion of the pilot demonstration project and successful demonstration of the locomotive emissions capture system technology, further deployment can be introduced in phases. The first phase would be at the Metrolink Central Maintenance Facility and secondly installed at the Los Angeles Union Station and thirdly other stations throughout the region. Priority would be maintenance facilities and passenger stations which have the most impact on Environmental Justice Communities and passengers who are most impacted by air pollution, noise, vibration and health problems.

### ***Near Term Introduction***

ALECS installation and demonstration can be divided into four locations in order of priority:

- 1A) The Load Test Area
- 1B) The Indoor Maintenance Area
- 2A) The Front Service & Inspection Area (North)
- 2B) The Rear Service & Inspection Area (South).



## Load Test Location

The Load Test location will typically have at 3 to 4 tests per day which may run the locomotive through the various notch power levels and takes 3 to 4 hours. Operations can be modified such that the locomotives can all be located directly next to each other across the four tracks. This would enable use of the “In-line” ECS style.

## Indoor Maintenance Area

Directly south of the Load Test area is an Indoor Maintenance Building, where major maintenance work is performed. It would be desirable to extend the ALECS system into two of the tracks that enter this building so that these locomotives can be operated inside without the accompanying ambient fumes. This would be a cost-effective extension of the ALECS which would supply two hoods per track therefore accommodating one locomotive at a time per track within the building.

## Service & Inspection (S&I) Location (Front/North)

The Service & Inspection (S&I) location has four tracks with two sets per track for a total of eight locomotives at this location. It takes about 40 minutes to 1 hour per set to perform service. Fourteen (14) sets per day are bypassed and only get fuel, cleaning, and inspection. Fueling takes place in the front (northern) section and all the locomotives line up at the same place to connect to the fueling apparatus. The longer Tier 2 locomotives stick out ten (10) feet further north than the Tier Zero locomotives. The HEP stacks are practically in-line at this location. Therefore, a “In-line” ECS is possible at this location.

## Service & Inspection (S&I) Location (Rear/South)

Two sets line up, one behind the other, on each track in the S&I location. Typically sets consist of 4 to 6 cars. Currently, the second set is positioned directly behind the first set. However, it is possible to always position the second set at a location that would always allow for up to 6 cars in the first set, thus assuring that the second set of locomotives would always line up across from each other at the same location across the four tracks. This would allow use of the "In-line" version of the ECS at this location.

### ***Long Term Deployment***

There would be unlimited regional and statewide opportunities for future ALECS technology deployment. Initial deployment could take place at California's major international trade ports, than port supported near dock rail yards, regional rail yards, agricultural area supported rail yards, rock/cement quarries and private major commercial warehouse locations.

## 6. Budget:

Approximately \$7.2 million

### **ALECS TREATMENT SYSTEM BUDGET**

Component	Identifier	Quantity	Unit Price	Total
Ammonia Injection	AIS	1	\$ 175,000	\$ 175,000
Constant Emission Monitoring System	CEM	2	\$ 175,000	\$ 350,000
DPFs	DPF	10	\$ 35,000	\$ 350,000
SCR	SCR	1	\$ 350,000	\$ 350,000
SO2	SO2	1	\$ 168,000	\$ 168,000
ALECS FRAME SYSTEM (steel, motors, piping)	FRM	1	\$ 1,050,000	\$ 1,050,000
Cost of Mounting and Assembly		1	\$ 420,000	\$ 420,000
ALECS Capture System Subassemblies (Bonnetts)	LCS	6	\$ 140,000	\$ 840,000
Solar Power System Subassembly	SPS	1	\$ 280,000	\$ 280,000
Power Supply Interconnect and Transformer	PWR	1	\$ 70,000	\$ 70,000
Integration of Subsystems	INT	1	\$ 700,000	\$ 700,000
Design & Engineering Work	ENG	1	\$ 350,000	\$ 350,000
Corporate Overhead Costs	OVH	1	\$ 910,000	\$ 910,000
Testing (3rd party testing firm)	TST	1	\$ 300,000	\$ 300,000
Contingency	CNT	1	\$ 885,000	\$ 885,000
Sub Total				\$ 7,198,000
LicFee		0		
Total				\$ 7,198,000

Note 1. AEG/ACTI has invested \$ 2.5 Million to complete the Proof-of-Concept Study in 2006

Note 2. AEG/ACTI has invested \$15 Million to date on the ALECS/AMECS R&D, Construction and Testing

### ***Potential Pilot Project Funding Sources***

1. Greenhouse Gas Fund - AB32 Global Warming Solutions Act of 2006 - 100% Funding
2. Proposition 1B - The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 – Trade Corridors Improvement Fund - 100% Funding
3. California Energy Commission
  - Alternative and Renewable Fuel and Vehicle Technology Program - 2016-2017 Investment Plan Update
  - EPIC 2015-2017 Investment Plan
  - Regional Energy Innovation Clusters GFO-15-306
  - Sustainable Energy Entrepreneur Development Initiative RFP-15-305

- Emerging Energy Technologies & Strategies To Market Needs & Opportunities RFP-15-304
- 4. Measure R 3%
- 5. USDOT
  - Research & Development Grants
- 6. Harbor Community Benefit Foundation ([www.hcbf.org](http://www.hcbf.org))

**Potential Future Long Term Project Expansion Funding**

1. Greenhouse Gas Fund - AB32 Global Warming Solutions Act of 2006 - 100% Funding
2. Proposition 1B - The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 – Trade Corridors Improvement Fund - 100% Funding
3. USDOT
  - Transportation Infrastructure Finance & Innovation Act (TIFA)
  - Build America Bonds-American Recovery & Reinvestment Act
  - Private Debt Financing Bonds (PABS)
  - Section 129 Loans
5. Maritime Goods Movement Act for the 21<sup>st</sup> Century
6. The National Freight Network Trust Fund Act of 2014 (HR 935, HR5101)
7. Multimodal Freight Funding Formula Program & National Freight Infrastructure Competitive Grant Program (HR 1308)

**7. Timeline:**

Estimated Timeline for the engineering, design, construction and testing of ALECS is 12 months from design to implementation estimated as follows:

1. Preliminary Design, Engineering and Procurement:	2 months
2. Site Preparation (can be done simultaneous with Step 1):	1 – 3 months
3. Construction of Frame and Emission Capture System:	4 months
4. Construction of Emission Treatment System:	4 months
5. <u>Integration of all subassemblies and system testing:</u>	<u>1 months</u>
	12 months
 3 <sup>rd</sup> Party Testing and Certification of Completed System:	 1 month

**8. Progress Analytics:**

ALECS Technology:

- Demonstration shall prove that ALECS can successfully work at various rail yard site locations
- Demonstration shall prove that ALECS can successfully work on various locomotive types.
- Demonstration shall prove that ALECS can successfully work outdoors and indoors

- Demonstration shall prove that the In-Line Exhaust Capture System (ECS) will successfully function per manufacturer specifications.
- Demonstration shall prove that the Emissions Treatment System (ETS) will successfully function per manufacturer specifications.
- Demonstration shall prove that 3 Locomotives can be connected to ALECS at the same time and successfully function per manufacturer specifications.
- Demonstration shall prove that the In-Line ECS has the ability to position an emission capture hood anywhere along a 15 foot length over a locomotive.
- Demonstration shall prove that the In-Line ECS has the ability to position itself at various stopping locations and different styles and types of locomotives.
- Demonstration shall prove that the In-Line ECS emission hood design can effectively capture emissions per manufacturer specifications.
- Demonstration shall prove that the ALECS does not generate hazardous materials
- Demonstration shall prove that PM ash can safely and efficiently be removed from the Diesel Particulate Filter (DPF) and properly disposed.
- Demonstration shall prove that ammonia slip can be controlled to less than 3ppm.
- Demonstration shall prove that ALECS can be powered by renewable solar energy power.

#### Environmental:

- Demonstration shall prove no greenhouse gas emissions are generated by ALECS.
- Demonstration shall prove that ALECS generates minimum noise.
- Demonstration shall prove that ALECS will capture locomotive emissions per manufacturer specifications.
- Demonstration shall prove that ALECS hood technology significantly reduces locomotive noise.

#### Energy:

- Demonstration shall prove that renewable solar energy can be used with the ALECS Technology.
- Demonstration shall prove that the solar energy efficiency be determined.

### **9. Interagency Partner Roles:**

#### Governor's Office of Business & Economic Development (BED)

BED can participate in the technology, business and labor economic cost assessments and benefits.

#### California EPA/Air Resources Board (ARB):

ARB can verify that ALECS Technology is a zero emissions technology and releases no greenhouse gases. ARB can verify near noiseless operation and near vibrationless operation. ARB can quantify potential public health care and cost benefits.

#### California Energy Commission (CEC):

CEC can validate the amount of renewable energy being generated, energy being used, compare energy efficiency to a traditional locomotive train.

California Department Transportation (Caltrans) Office of Freight Planning:

Caltrans can verify test operations, logistics data, assess potential integration into existing transportation infrastructure and land-use-right-a-ways.

Department of Toxic Substances Control (DTSC):

DTSC can verify the minimum generated residual PM waste and waste disposal of ALECS. DTSC can verify ALECS Technology use and proper disposal of non-toxic Chemicals and hazardous materials

## **Attachment - A**

### **METROLINK Los Angeles Advanced Locomotive Emissions Capture System (ALECS) Pilot Project**

#### **Project Team Summary**

**Advanced Environmental Group, LLC (AEG)** ([www.advancedemissionscontrol.com](http://www.advancedemissionscontrol.com)) .....

##### **Ruben Garcia – President and Founder**

Mr. Garcia is the President and Founding Member of Advanced Environmental Group, LLC (AEG). He is also the President and Founding Member of Advanced Cleanup Technologies, Inc. (ACTI). Mr. Garcia has invested over \$20 million developing the AMECS/ ALECS technology over the last ten years. During this period, Mr. Garcia has been successful in establishing numerous patents and building a critical base of support for the wide spread use of the AMECS technology with maritime business and government leaders.

Prior to developing AMECS, Mr. Garcia built ACTI into a nationally recognized environmental services business that generated \$50 million in annual revenue. Mr. Garcia has over 30 years of experience in the environmental services arena and petrochemical space specializing in hazardous waste management, emergency response and industrial services catered to corporate clientele.

##### **Randal Pasek, Ph.D. – VP Environmental Regulation and Industrial Relations**

Mr. Pasek brings to AEG/ ALECS years of experience working with industry and government to clean the air. Mr. Pasek most recently held the position of Manager, Off-Road Section, South Coast AQMD. While at the SCAQMD, Mr. Pasek spearheaded many important initiatives dealing with air pollution from all forms of off road transportation, which included marine, air and rail transportation. Among the many important responsibilities Mr. Pasek performed while at the SCAQMD was serving as Technical Advisory Committee Member for the Source Air Pollution Reduction Review Committee (MSRC). In this role Mr. Pasek reviewed promising technology for cleaning the air and recommending it for funding. Prior to joining the SCAQMD, Mr. Pasek was with the California Air Resource Board (CARB) for 18 years where he held various positions within the agency, starting with the stationary source division and eventually heading the emissions inventory group for the entire state. Mr. Pasek earned a B.S. in Chemical Engineering and a Ph.D. in Mechanical Engineering from UC Davis and an MBA from the Ecole National des Ponts et Chaussées International School of Business in Paris, France.

##### **Captain John Holmes, USCG (Ret.) – VP Operations**

Capt. Holmes has over 40 years of experience in positions that include a Chief Operating Officer, Fortune 500 executive, Senior Coast Guard officer and maritime operations specialist.

He most recently served as Director of Operations for the Port of Los Angeles. Prior to his position at the Port he was the Chief Operating Officer of the Marsec Group, a consulting firm specializing in port and maritime operations. Immediately following his Coast Guard service, Capt. Holmes was a Vice President at Science Applications International Corporation (SAIC). Capt. Holmes retired from the United States Coast Guard in 2003 following 27 years of service in posts that included Captain of the Port for the Los Angeles-Long Beach port complex. Captain Holmes was at the helm on September 11, 2001, and has been credited with the creation of number of national port initiatives. During his Coast Guard Service, Captain Holmes also served as Deputy Chief of the Office of Congressional Affairs, and as Committee Chairman at the International Maritime Organization in London.

Capt. Holmes is a current member of the Transportation Research Board, Marine Board and the Los Angeles Area Board of Directors of the American Red Cross. He holds bachelor's degrees in English and Education from Boston College, and a Master's Degree in business administration from Washington University in St. Louis. He is currently pursuing his Doctorate in Public Policy at the University of Southern California.

### **Robert Sharp – VP Engineering**

Mr. Sharp is Vice President of Technology at Advanced Cleanup Technologies, Inc. Mr. Sharp has two degrees in Mechanical Engineering and Engineering Science / Electronic Engineering from California Polytechnic State University, San Luis Obispo. Previously, Mr. Sharp was president of an environmental simulation equipment company for several years where he was responsible for producing a wide variety of custom automated process, space simulation and test equipment for companies such as Raytheon, Northrop-Grumman, Toyota, and NASA's Jet Propulsion Laboratory.

Mr. Sharp's first job was reliability laboratory manager for a cruise missile project at a major aerospace company. Mr. Sharp also served ten years as Project Engineer at a custom test equipment company which manufactured a wide range of equipment including large drive-in environmental wind tunnels. It was at this company that Mr. Sharp developed skills in project management, electrical power distribution, electronics, programmable controllers, process controls, instrumentation, industrial software, HVAC, and mechanical design. Additionally during the past 25 years, Mr. Sharp has been the founder of several businesses, including an electronic circuit design company and a co-owner of a personal fitness company.

### **Ron Moore – VP Finance and Administration**

Mr. Moore brings to AEG over twenty years of investment banking and corporate banking experience. Over the course of his banking career he has arranged over \$5 billion of non-recourse debt and equity financing for more than 50 independent projects covering a broad range of technologies and industries and more than \$10 billion in corporate banking transactions. He has been active in all phases of project financing from financial modeling to corporate advisory assignments for Fortune 500 companies, on large domestic and international projects. During his banking career he managed investment banking teams on advisory and M&A assignments as well a large staff of corporate banking officers at the V.P. level.

Prior to joining AEG, Mr. Moore was an independent business consultant and Co-Founder and Managing Member of DMP Energy, LLC, a successful and reputable energy consulting company. Prior to forming DMP Energy, Mr. Moore was a Director at Mizuho Securities USA, (Top 10 Global Bank) in Los Angeles and responsible for business development in the Western U.S. ; Manager of National Corporate Banking at Union Bank of California in Los Angeles ; Director at Credit Agricole Corporate and Investment Bank (Top 10 Global Bank) in New York, NY ; Vice President, Energy - Structured Finance at GE Capital in Stamford, CT ;

and Vice President, Investment Banking, Utilities and Power at Deutsche Bank Securities (Top 10 Global Bank) in New York, NY. He received his Bachelor of Science degree with a triple major in Accounting, Finance and Marketing and a minor in Economics and completed the required course work for a Masters in Economics from California State University, Fullerton. He holds an MBA from Chapman University in Orange, CA. He is a Level III candidate in the Chartered Financial Analyst (CFA) Program. Mr. Moore also formerly held a FINRA Series 7 and Series 63 securities license.

### **Matt Wells – VP Finance and Corporate Development**

Mr. Wells joined AEG after serving as Director of Finance for VOPAK Terminals in Long Beach, CA. While at VOPAK Mr. Wells was responsible for leading the acquisition for various strategic terminal assets in North America. Prior to joining VOPAK, Mr. Wells was with KPMG in the corporate finance practice consulting group where he worked on the valuation of numerous M&A assignments for KPMG clients in a wide variety of industries. Mr. Wells recently completed an Executive MBA at the Anderson School of Business at UCLA (July 2015).

### **Bob Foster – Advisory Board**

Mr. Foster served eight years (2006 – 2014) as Mayor of Long Beach, CA, the 36<sup>th</sup> largest city in the United States and home to the second busiest container port in the United States which is responsible for approximately \$100 billion in trade and provides over 316,000 jobs in Southern California.

Prior to serving eight years as Mayor of Long Beach, CA, Mr. Foster served as President of Southern California Edison, one of the largest utilities in the U.S. serving more than 14 million customers. Mr. Foster spent more than 20 years with the Company before his retirement in 2006. As an Edison executive Mr. Foster led California's largest electric utility through the energy crisis of the late 90's and early 2000 decade. During Mr. Foster's tenure, Edison developed the largest renewable clean energy program in the United States.

He was appointed as the Environmental Committee chair for the U.S. Conference of Mayors in 2008 and elected to be a member of the Advisory Board in 2009 and the Board of Trustees for the U.S. Conference of Mayors. Governor Arnold Schwarzenegger appointed him to the Board of Directors for the California Independent Systems Operators (CAISO) in 2010. Mr. Foster is a graduate of California State University, San Jose in Public Administration.

### **David Wright – Advisory Board**

Mr. Wright has provided advice and guidance to Mr. Garcia over the years as the AMECS technology has evolved from concept to the fully operational unit it is today. He has his own consulting company – DEWright, Inc which provides consulting and advisory services to the petroleum and other related industries and organizations. Except for a two year commitment to the US Army, Mr. Wright spent his 46-year career involved in various aspects of the petroleum transportation industry with focus on both products and crude oil transportation. He has extensive experience with cross country pipelines and the petroleum storage and terminal petroleum production, refining and marketing areas. Mr. Wright has worked in various executive management areas with Conoco, Crystal Energy, Baja Resources, GATX Terminals, Tosco, Pacific Energy Partners, L.P.(now merged with Plains All American Pipeline L.P. and was most recently a Vice President with Plains, a Houston Texas based Midstream Master Limited Partnership firm which owns and operates petroleum pipelines and terminals in the United States and Canada.

Over the past 10 years Mr. Wright has focused on petroleum distribution industry project development, mergers and acquisition and various governmental and community outreach programs. Mr. Wright continues to be an active member of a number of local business organizations including the Los Angeles County Economic Development Corporation, Los Angeles Area Chamber of Commerce, Central City Association, Harbor Association of Industry and Commerce, Valley Industry and Commerce Association, Western States Petroleum Association, Future Ports and several Port area Chambers of Commerce. Mr. Wright attended the University of Wyoming where he earned a BS degree in Electrical Engineering and a Masters Degree in Business Administration.

### **Sidney Kanazawa – Advisory Board**

Mr. Kanazawa is a Partner in the law firm of McGuire Woods, LLP. Mr. Kanazawa has been practicing corporate law for over 35 years and has extensive experience in environmental law. Mr. Kanazawa has worked closely with Mr. Garcia over the years and has been involved in the development of the AMECS technology since its inception. Mr. Kanazawa has successfully represented corporate defendants in numerous high profile environmental and product liability cases. His areas of expertise and specialized practice, includes environmental law, environmental litigation, product liability and product liability mass tort.

Mr. Kanazawa's experience over the years in trial, crisis and negotiation settings gives him unique skills in bringing people together versus dividing them. Through his counsel he provides a unique contribution to the Company.

Mr. Kanazawa holds a Juris Doctorate from University of Southern California Gould School of Law and a Bachelors Degree from the University of Hawaii.

### **EJ Organization Partners**

**Coalition For A Safe Environment (CFASE)** is an Environmental Justice Organization with its office located in the Port of Los Angeles community of Wilmington, California. CFASE founded in 2001 has been a leading community science based organization researching alternative, innovative and emerging 21<sup>st</sup> century technologies that can modernize port operations and mitigate the negative environmental, socio-economic and public health impacts of major international trade ports, freight transportation, energy and petroleum industries. CFASE believes that we must plan and invest in a future sustainable environment and balance the need for economic growth and the public's best interests. CFASE will provide project Community Relations, Public Presentations, Information Distribution, Participate In Media Events, Community Events, and Industry Conferences, Trade Shows and Seminars. CFASE will additionally provide professional photography and HD Videography of the project. CFASE will also participate in the project testing witnessing, technology assessment and final evaluation report.

**East Yard Communities for Environmental Justice (EYCEJ).** EYCEJ was established in 2001 by residents of the Commerce/East Los Angeles area who were concerned with the increasing environmental health impacts of industrial pollution in their community, as well as several pending expansion projects adjacent to homes, schools and parks. After running into each other at several public meetings and realizing the huge wall they came up against as individuals, these concerned residents made the decision to work in unity and formed a community group that would fight for the lives of their families and neighbors. In 2002, EYCEJ was formally funded as a non-profit organization under the fiscal sponsorship of Social and

Environmental Entrepreneurs (SEE). Since its inception, EYCEJ has achieved many important successes, including bring issues of environmental justice and air quality to the forefront for other community, environmental, and governmental entities at both regional and statewide level. EYCEJ will provide project Community Relations, Public Presentations, Information Distribution, Participate In Media Events, Community Events, and Industry Conferences, Trade Shows and Seminars. EYCEJ will additionally provide professional photography and HD Videography of the project. EYCEJ will also participate in the project testing witnessing, technology assessment and final evaluation report.