Encouraging Innovation in the Clean Transportation Tech Sector

Advanced Transportation Technologies
Clean Transportation Solutions™

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ETAAC, Sacramento
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Presentation Outline

• Overview of CA Clean Transportation Tech Industry
• Importance of “Co-Benefits”
• Pro-innovation and investment policies
• “Co-opetition” really works
• Importance of public investment
MISSION STATEMENT

CALSTART is dedicated to the growth of a clean transportation technology industry that will:

• Clean the air;
• Reduce greenhouse gas emissions;
• Secure the nation’s transportation energy future; and
• Create new high quality economic opportunities
CALSTART Has 130+ Members (partial list)
CALSTART’s Four-Part Role to Grow the Clean Transportation Technology Industry

**Industry Services**
Providing value-add services to companies: timely information, partnering, new business opportunities, conferences, technology evaluation

**Technology Commercialization**
Identifying opportunities, building teams, securing funding, and advancing technology, vehicles, fuels, and systems

**Clean Transportation Solutions Group**
Helping ports, property developers, transit districts, and fleets seeking to implement cost-effective customized solutions

**Policy**
Advancing key policies, advising policymakers, and helping companies plan for the future

**Unique Combination**

*Fuel & Technology Neutral = Honest Broker*
CA Clean Transportation Technology Industry 2009 Report

- January 2009 report identifies approximately 200 California companies and organizations in clean transportation technology industry

- California is well-positioned to be a leader in clean technology development and deployment due to “innovation infrastructure”

- Policy is a key market driver for this industry (and for cleantech in general). Need strong, consistent, and targeted regulations, incentives, and investments
California’s Clean Transportation Technology Industry

- About **200 organizations** and counting (up 57% from 2004 report)
  - Large # of advanced biofuels companies
  - Vehicle and component manufacturers
  - Supporting organizations also play important role
- Clean transportation technology “clusters” developing in SF Bay Area and LA region
California already has the essential building blocks of a robust cleantech cluster:

- Entrepreneurial culture and talent
- Public and private sector tech innovation, commercialization, and management expertise
- Access to capital across all stages of tech commercialization process
- Proximity to leading universities
- Significant local demand
- Proactive public policies
January 2009 report identifies over 200 California companies and organizations in clean transportation technology sector.

Industry could be leading source of future jobs – leverages talent from CA’s engineering schools and entrepreneurial spirit.

High # of leading nextgen biofuel firms based in state.

Venture capital firms showing higher level of interest than last CALSTART industry report in 2003.

State needs to be pro-active to foster growth (strong policies help).
Growing the Clean Transportation Tech Industry: Lessons Learned

**Policy matters**: standards and regulations can drive innovation

Patents filed for battery electric vehicle technologies

*Note dramatic jump when ZEV regulation was adopted*

Source: Public Policy Institute of California
EPA’s On-Road Heavy-Duty Vehicle Criteria Emission Program

EPA’s “Moore Law”: Cutting Emissions in Half Every 3-6 Years
A Coordinated Approach to Achieving Related Goals

- Balance all three competing needs
- Integrated Solutions Needed

- Air Quality
- Energy Security
- Climate Change

- Existing state programs are “single purpose”
- Need to look for synergies and co-benefits
- Focus on solutions that achieve multiple goals
Coordination and Co-benefits: Black Carbon and Transportation

• “Two for one” benefits: Targeting black carbon yields near-term climate and air quality benefits
  – It takes just weeks to reduce black carbon concentrations
• Black carbon (primarily soot from combustion processes) contributes to climate change AND air quality problems

• Reduction of black carbon should be a prime target for policy and public investment
• Transportation sector is the best target, as diesel emissions are by far the largest source of black carbon in the U.S.
• Prioritize black carbon reductions due to public health and climate change co-benefits.
• Focus on technologies that reduce black carbon AND other pollutants (e.g. hybrid and natural gas trucks, as opposed to diesel)
Need for Strong, Balanced, and Technology-Neutral Policies

• Policies should be **strong** enough to drive investment... but **realistic** enough to be met.
  – Need to push the envelope to accelerate RD&D
  – Unrealistic goals set us up for failure, require revision, and cause backlash
• **Technology-neutral** approach best
  – Government is not good at picking winners – remember Synfuels?
  – Tech-neutrality increases chances of unexpected solutions
• There is no **silver bullet**, and probably no bronze bullet either. Need to support a variety of technologies.
  – Need a **balanced portfolio approach**, in terms of risk/reward, near term/long term
Oil Demand in North America Began Declining Before Economic Downturn

Price Signal Drives Behavior – CA Saw Similar Response During Electricity Crisis in 2000-2001

OECD North America Oil Demand

- Peak in Oil Prices

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Vehicle Miles Traveled Down in US – What’s Needed to Hit GHG Targets

• Travel on all roads and streets changed by -3.1% (-7.0 billion vehicle miles) for January 2009 as compared with January 2008 – goal of SB 375
• All regions except for West
• Transit ridership stays high despite recession and cuts in service
Higher Oil Prices Also Resulted in Greater Private Sector Investment

Venture Investment in Clean Transportation Technology

1990’s – Low Oil Prices

2002 & Beyond – Period of Higher Oil Prices
Variable Gas Surcharge – Can Help Stabilize State Revenues

• Haas Business School Professor says variable gas surcharge can create a price floor that will encourage investment and change behavior

• Policy would help increase revenues during times when other state revenues likely to fall
Cap and Trade – Relevance for Transportation Sector?

- AB 32 Scoping Plan calls for transportation fuels to be “phased into” into WCI cap and trade program in 2015
- Even if it was sooner would it result in a meaningful price on carbon?
- $25/ton of CO2 makes renewable electricity look better than coal but would only add about a quarter to a gallon of gasoline
“Co-opetition” – Can Be Critical for Early Stage Development

• Where competitors collaborate
• Co-opetition can be particularly helpful in supporting early stage growth of industry
• Communication between end-users and suppliers helps to improve end-product and build interest
• Higher degree of openness and willingness to share information among suppliers
• Coordinated message on policy, standards, and other needs
Hybrid Truck Users Forum (HTUF)

- Initial Goal: facilitate the development of commercially viable medium- and heavy-duty hybrid trucks in the U.S. by 2012
- New model of change: fleets become advocates for advanced technology
- User driven process involving more than 60 fleets with > 1 million trucks
- Joint CALSTART - U.S. Army program
0-6 in Six Years

Hybrid Truck on Hill Event (6-09)
Unified Hybrid Industry in D.C. (June 2009)

- CALSTART, HTUF and 9 major companies – including all truck makers – outline status, benefits and needs of hybrid trucks
- Joint call for federal assistance for:
  - Purchase incentives
  - Broader fleet demonstrations and
  - Long term R&D investment
Coalition in Western Sweden Developed Green-Gas Concept
Swedish Biomethane Vehicles
Even a Train Runs on Clean Burning Low Carbon Biomethane in Sweden!
### Adjusted Carbon Intensity Values for Diesel & Substitutes

Carbon intensity values are measured in grams CO2e/MJ  
10 pathways completed

<table>
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<tr>
<th>Fuel Pathway</th>
<th>Direct</th>
<th>ILUC</th>
<th>EER</th>
<th>Total</th>
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<tr>
<td>Diesel (1 pathway: average ULSD)</td>
<td>94.71</td>
<td>0</td>
<td>1</td>
<td><strong>94.71</strong></td>
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<tr>
<td>Compressed Natural Gas (CA and N. American, compressed in CA)</td>
<td>67.70 – 68.0</td>
<td>0</td>
<td>0.9</td>
<td><strong>75.22 – 75.56</strong></td>
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<tr>
<td>Compressed Biomethane (landfill gas)</td>
<td>11.26</td>
<td>0</td>
<td>0.9</td>
<td><strong>12.51</strong></td>
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<tr>
<td>Electricity (2 pathways – CA average and renewable mix)</td>
<td>104.70 - 124.10</td>
<td>0</td>
<td>2.7</td>
<td><strong>38.78 – 45.96</strong></td>
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<tr>
<td>Hydrogen (4 pathways – liquid &amp; compressed, various feedstocks)</td>
<td>76.10 – 142.20</td>
<td>0</td>
<td>1.9</td>
<td><strong>40.05 – 70.84</strong></td>
</tr>
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EER: Energy Efficiency Ratio
Renewable Methane: Building Upon the Success in Sweden

• CALSTART is working with industry and government officials to develop biomethane industry in CA
• Renewable form of methane would cut greenhouse gases and augment natural gas supply
• Variety of joint Sweden-CA projects in development

Undersecretary Desmond, Minister Sommestad, Commissioner Boyd Sign MOU between CA and Sweden (2006)
Along with strong regulations and complementary policies, **targeted public investment** is necessary to address **gaps and barriers** in technology commercialization process.

**Gaps and Barriers**

- High risks, long payback periods, spillover benefits restrict private sector investment
- Current public sector
- Shortage of financing for some types of technology demos, (e.g. biofuel production facilities)
- Long time horizons in cleantech restrict
- Higher risks and costs for first-of-a-kind projects
- Late stage cleantech investments too big for venture capital model
Amerigon – Named in Business Week’s “Hot Growth Top 50” -- 2008

• Amerigon is a manufacturer of thermo electric solid state devices that increase the efficiency of temperature control systems in vehicles

• A publicly traded company listed on the NASDAQ (ARGN), Amerigon’s product is available in 20 different cars with five different automakers

• Prior to mid-2008 downturn in global auto industry, Amerigon was enjoying double digit revenue growth, high gross margins, and positive net income

• CALSTART secured early stage government RD&D funding for Amerigon, one of the first companies to join CALSTART

In the summer of 2008 Amerigon shipped its 4 millionth climate control seat
DARPA provided $100 million in funding more than 100 M-HD hybrid electric projects from 1993-1998.

By early part of this decade, every major US bus manufacturer began offering one or more hybrid products.

Six different US M-HD hybrid drivetrain suppliers benefitted from program – from start-up to unit within GM (hybrid technology in GM cars today came from bus program).

Standard cost of developing new internal combustion engine $500 million to $1 billion.
Public Investment Programs: California and AB 118

- California’s AB 118 fills a number of important gaps in clean transportation tech RD&D, providing funding for:
  - Deployment of advanced vehicles
  - Rollout of infrastructure
  - Biofuel production facilities
  - Technology demonstrations
- Need for public funding is particularly acute given current economic climate
- Federal stimulus funds are significantly oversubscribed, underscoring need for public investment at state level
Summary: Proactive Policies to Drive Clean Technology Innovation

- Need a coordinated approach to deal with climate, air quality, and petroleum reduction
- Stable, long term price and regulatory signals essential
- Policies should be strong, balanced, and tech neutral
  - Support a balanced portfolio of technologies
  - Don’t let the perfect be the enemy of the good
- “Co-opetition” can help move early stage tech forward
  
- Need targeted public investment and intervention
  - Targeted public investments needed to fill financing gaps
  - Need proactive solutions for “chicken and egg” problems
  - State purchasing power can create demand pull
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