

Encouraging Innovation in the Clean Transportation Tech Sector



Advanced Transportation Technologies
*Clean Transportation Solutions*SM

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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

Clean Transportation Solutions Group

Helping ports, property developers, transit districts, and fleets seeking to implement cost-effective customized solutions

**Unique
Combination
!**

Technology Commercialization

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

**Fuel &
Technology
Neutral =
Honest Broker**

Policy

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

CA Clean Transportation Technology Industry 2009 Report

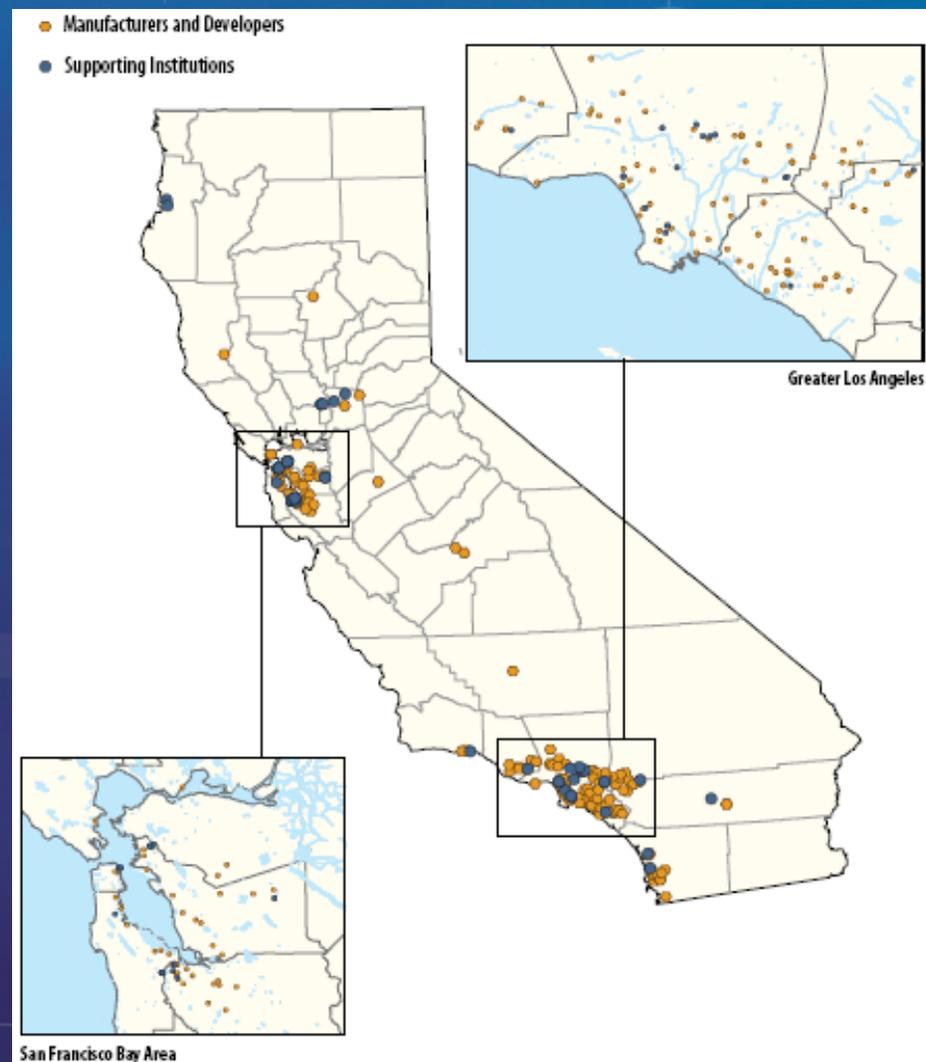


- January 2009 report identifies approximately **200 California companies** and organizations in clean transportation technology industry
- California is **well-positioned to be a leader** in clean technology development and deployment due to “innovation infrastructure”
- **Policy is a key market driver** 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

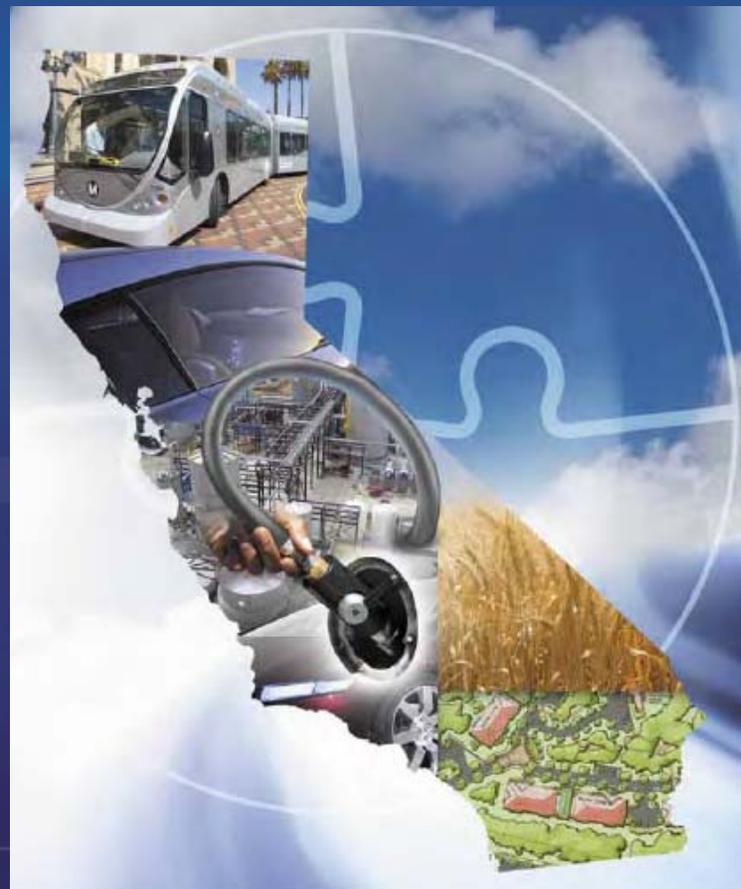




California Well-Suited to Become a Clean Technology Cluster

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





CA Clean Transportation Technology Industry 2009 Report



- 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)

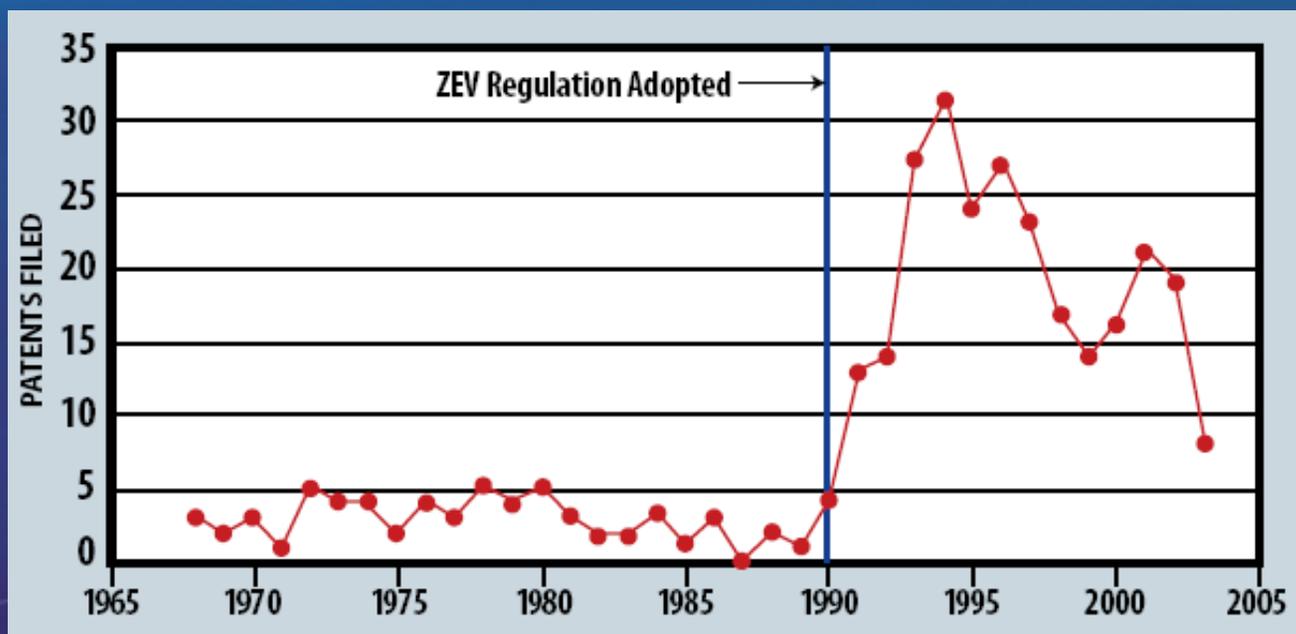


Growing the Clean Transportation Tech Industry: Lessons Learned

Policy matters: standards and regulations can drive innovation

Patents filed for battery electric vehicle technologies

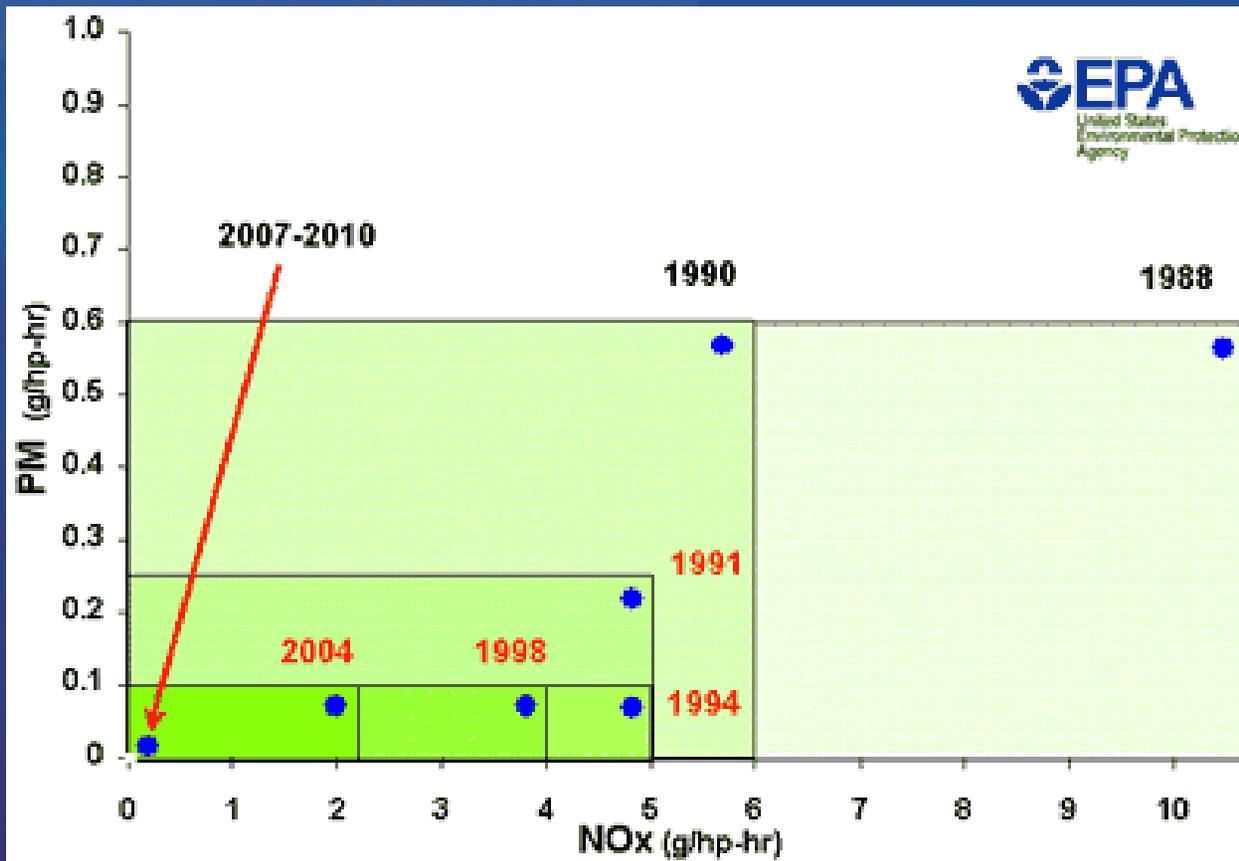
Note dramatic jump when ZEV regulation was adopted



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



- 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)





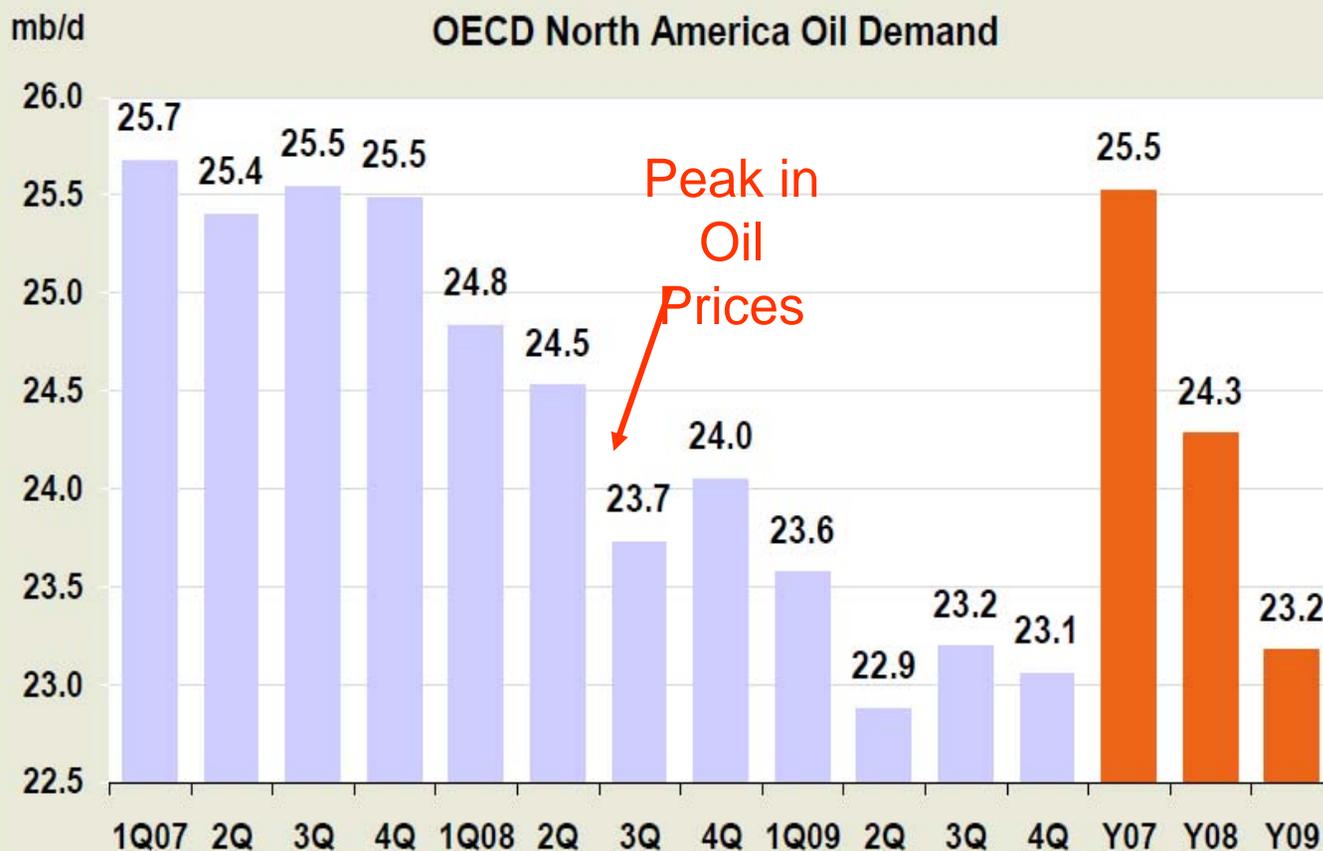
Need for Strong, Balanced, and Technology-Neutral Policies

- 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

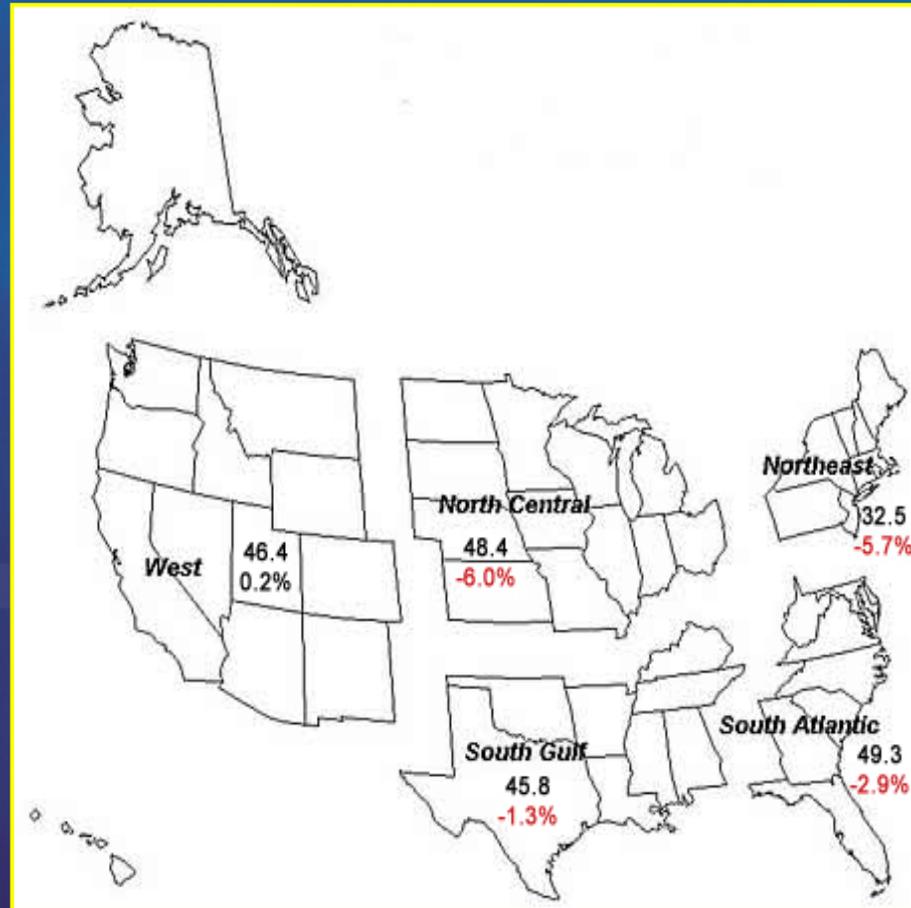
Price Signal Drives Behavior – CA Saw Similar Response During Electricity Crisis in 2000-2001





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?



Waxman-Markey legislation calls for national carbon cap and trade program

- 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)



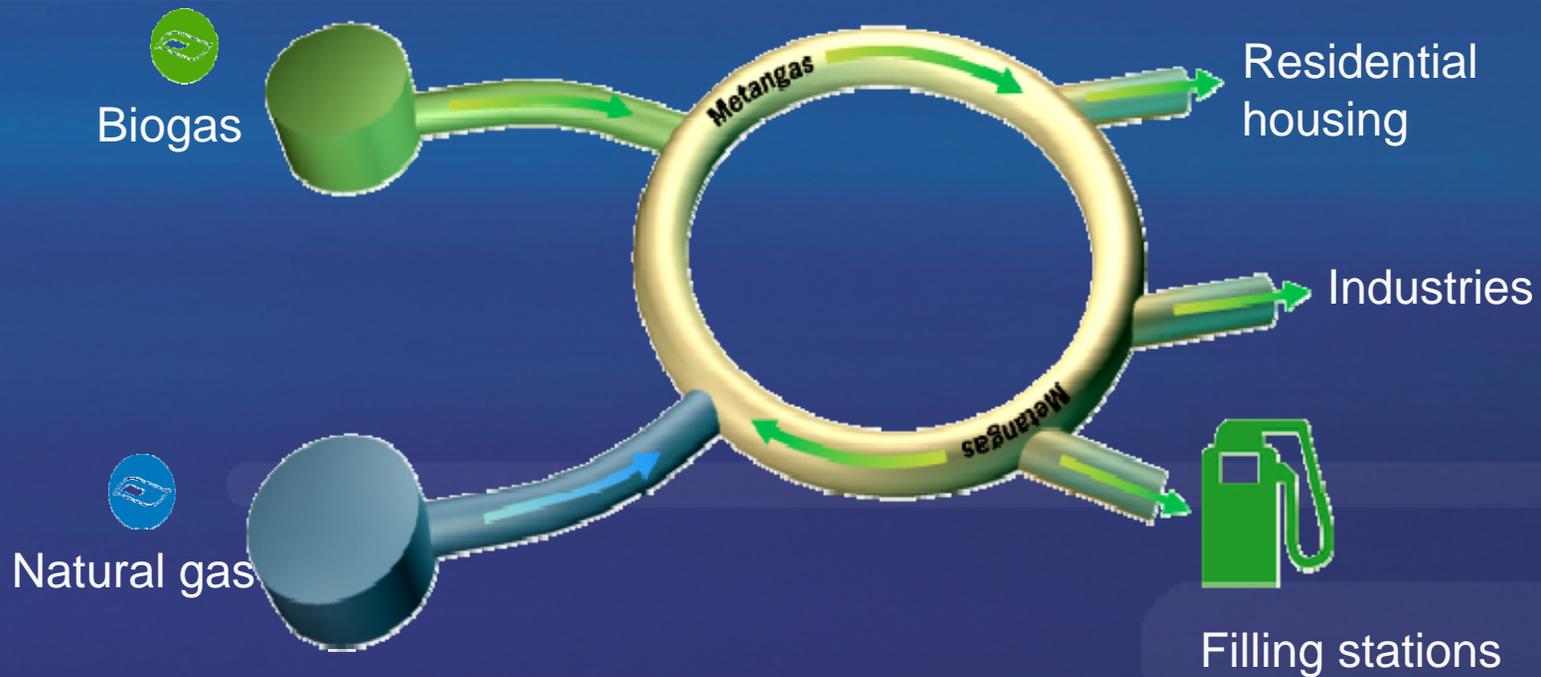
Unified Hybrid Industry in D.C. (June 2009)



- 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





www.fordonsgas.se



Even a Train Runs on Clean Burning Low Carbon Biomethane in Sweden!





Adjusted Carbon Intensity Values for Diesel & Substitutes

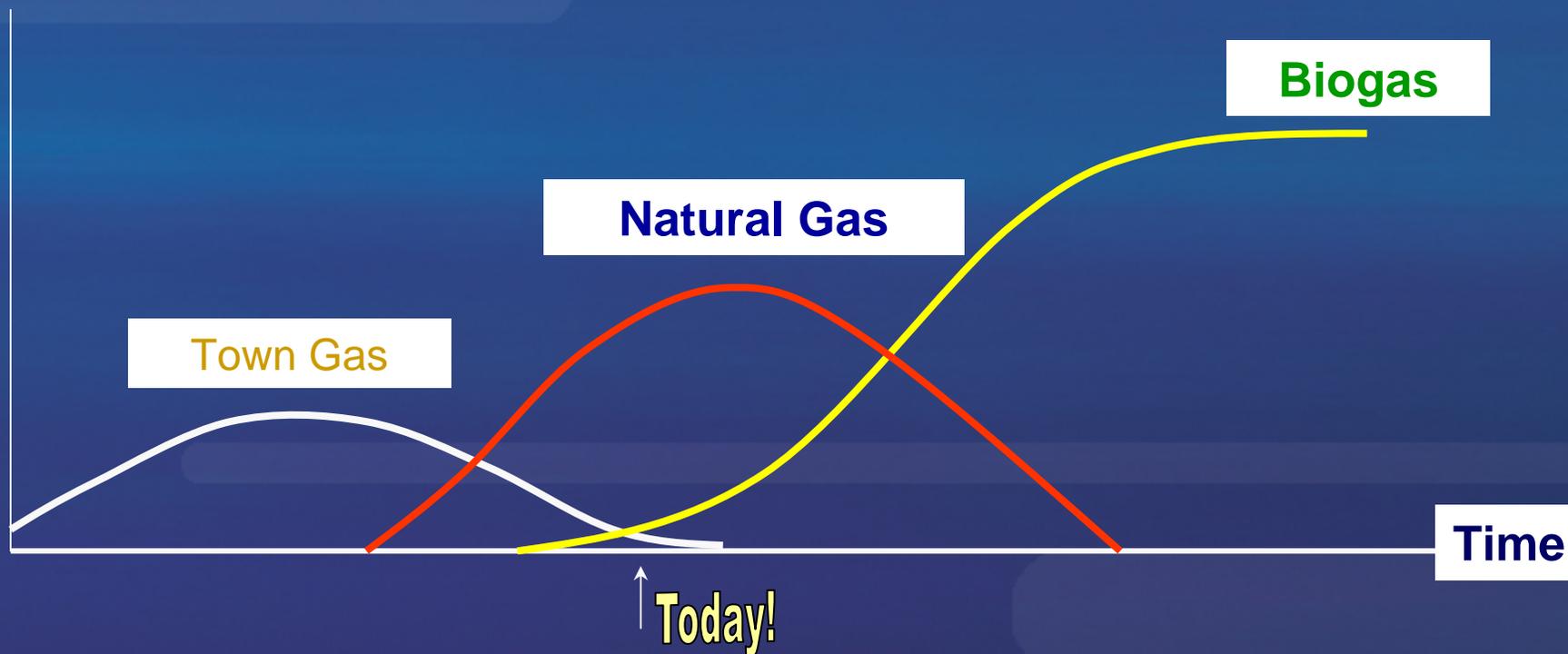
Carbon intensity values are measured in grams CO₂e/MJ
10 pathways completed

Fuel Pathway	Direct	ILUC	EER	Total
Diesel (1 pathway: average ULSD)	94.71	0	1	94.71
Compressed Natural Gas (CA and N. American, compressed in CA)	67.70 – 68.0	0	0.9	75.22 – 75.56
Compressed Biomethane (landfill gas)	11.26	0	0.9	12.51
Electricity (2 pathways – CA average and renewable mix)	104.70 - 124.10	0	2.7	38.78 – 45.96
Hydrogen (4 pathways – liquid & compressed, various feedstocks)	76.10 – 142.20	0	1.9	40.05 – 70.84



Gotheborg Energi' Vision for Biogas

Capacity





Renewable Methane: Building Upon the Success in Sweden



Undersecretary Desmond, Minister Sommestad, Commissioner Boyd Sign MOU between CA and Sweden (2006)

- 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



Public Investment Needed to Speed Commercialization

Along with strong regulations and complementary policies, **targeted public investment** is necessary to address **gaps and barriers** in technology commercialization process

Basic Research
and Technology
Development

Further
Development and
Pilot Scale
Demonstration

Commercial
Demonstration
and Deployment

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)

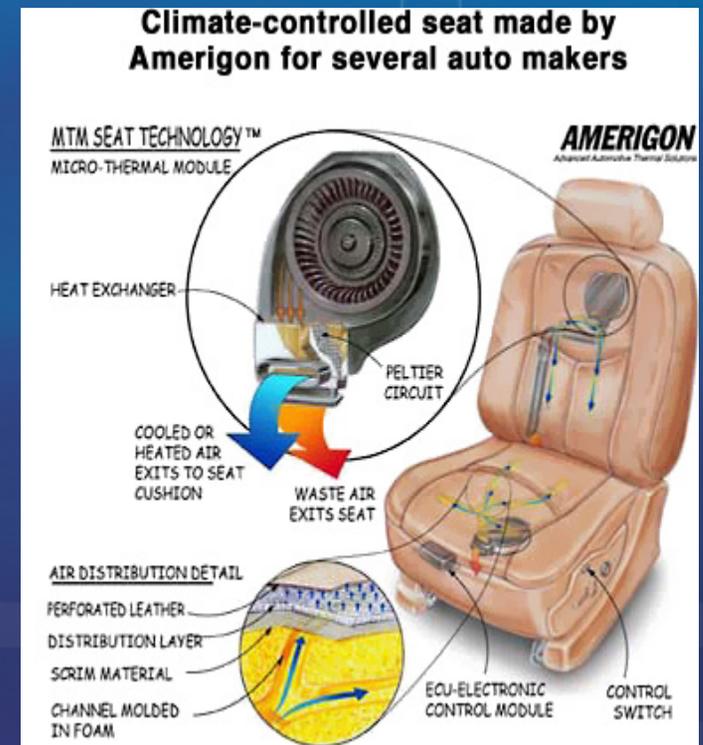
- Long time horizons in cleantech restrict

- 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 Consortium Program Spurred American HD Hybrid Industry

- 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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