# Coordinated State and Federal HFCV Policy Initiatives

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To the Hydrogen Technical Advisory Committee
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# The World Needs a Greenhouse Gas Policy

- America needs to adopt a policy to stabilize the environment considering current and future emissions that can be implemented worldwide
- *California state's and Presidential candidates' goal of 60 to 80% CO2 reductions by 2050 and support for a clean energy sector to spur the economy are such policies*.
- The policy needs to apply to both transportation and energy generation sectors to be effective
- As a society, the long-term cost effectiveness of achieving these goals is of paramount importance
- "Hydricity" is the only energy generation option that allows coal to be considered as an option with sequestration
- Need to be realistic - vehicle costs will be higher for advanced technology vehicles, requiring subsidies for a time period
- Fuel costs are likely to be lower ($/mile) for hydrogen or electricity

# We Need A Balanced Social Policy

- We can regulate and have the “polluters pay”, but the polluters are part of society and are not necessarily the manufacturers
- Mandates by themselves do not ensure that industry can sell their vehicles to the public at the significant costs of early new technology vehicles
- But in the case of hydrogen fuel cell vehicles (HFCVs) a state mandate can be a mechanism to coordinate infrastructure and HFCV requirements
- What is needed is both regulation (the stick) and government cost share (the carrot) working in concert, requiring state and federal cooperation

# Let the Marketplace Decide

- To achieve goals of 60 to 80% reductions of CO2 by 2050, *multiple* zero or very low carbon vehicle solutions are needed and can be synergistic
  - HFCVs, BEVs, and PHEVs with biofuels or H2
- All low carbon emission vehicle technologies have risks, different GHG reduction potential and the lowest cost option is unknown
- *Policy support is needed to bring all new vehicles to market, so that consumers can select and the cost to society can be minimized*
- *The ramifications to the electric generation sector needs to be better defined as a fuel and electricity provider*
- *The proper timing for a volume of production phase needs to be determined*

# There is a Dichotomy of Views in the Industry

- Press releases from Daimler and Honda indicate that HFCVs are the preferred option and could consider HFCV production by 2015
- Toyota is coming out with a 10 mile battery plug-in hybrid
- GM has indicated support for both the large battery plug-in hybrid (Volt) vehicles by 2010 and HFCVs by 2015
- Ford, Chrysler and Nissan are pursuing HFCV technology development programs with no firm commitment as to when to introduce pre-commercial HFCVs
- Only Shell and Chevron have maintained an active hydrogen program among the energy companies
- Generally the energy companies are reluctant to proceed without a better understanding of the future for HFCVs

# NAS Report Conclusions*

- **Lower-cost, durable fuel cell systems for light-duty vehicles are likely to be increasingly available over the next 5-10 years and, if supported by strong government policies, commercialization and growth of HFCVs could get underway by 2015, even though all DOE targets for HFCVs may not be fully realized.**

*** Joan Ogden paper presented to the California Hydrogen Business Council, September 12, 2008**

# Examine HFCV Targets

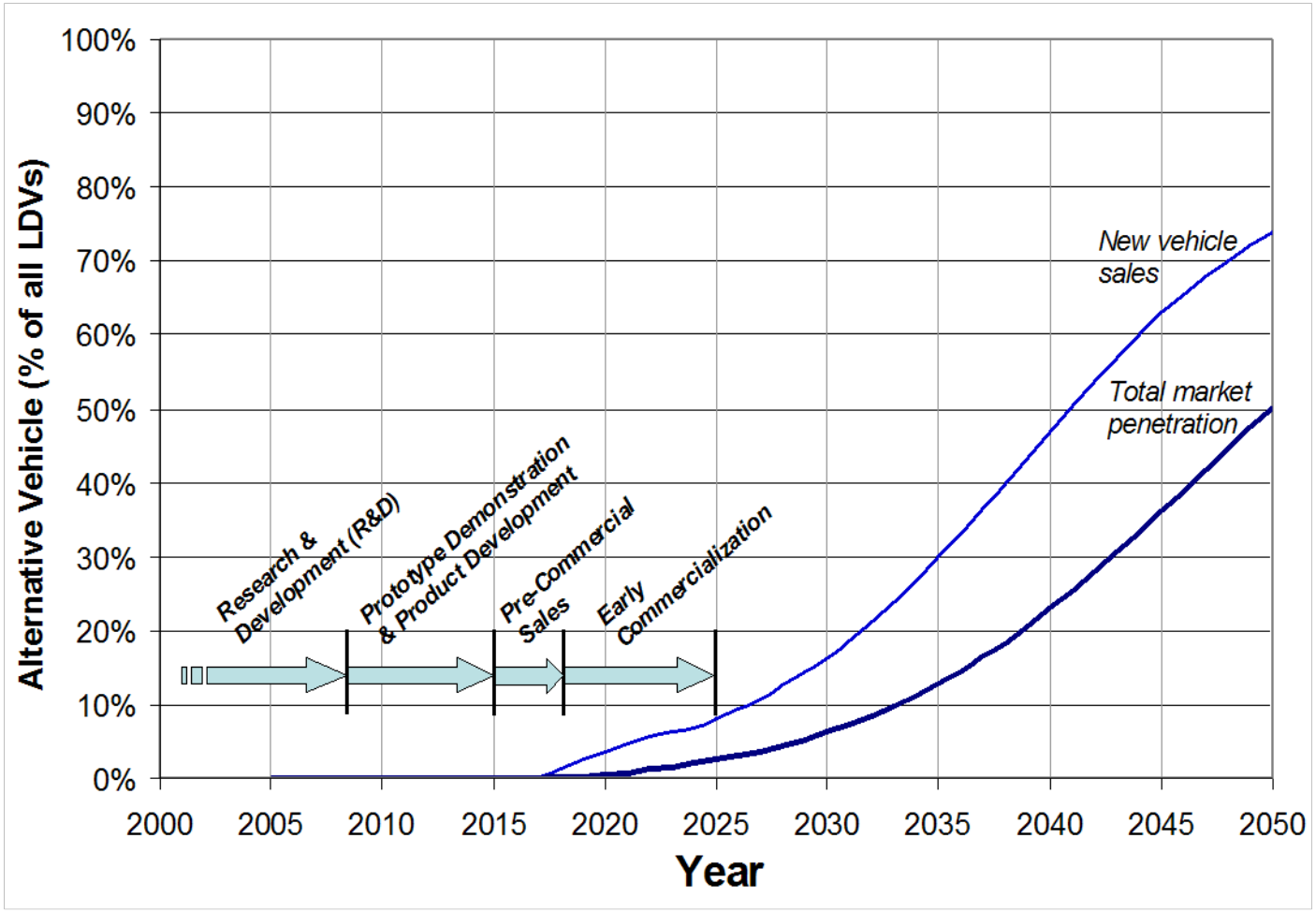
- To meet 2050 goals, HFCVs need to compete against plug-in hybrids with 30 to 40 mile electric mile range, BEVs or Biofuels
- Do we need to meet 2015 DOE targets to meet 2050 goals?
- HFCVs can be competitive with relaxed 2010 DOE targets (vs. 2015) when competing against PHEVs and BEVs
- To meet CO2 reduction targets plug-in hybrid vehicles and HFCVs would need a clean electric generation system including an acceptable coal option

- ** (MIT report, 2007 by Kromer and Heywood) (i.e, storage system costs of $15/kwh vs. $2/kwh and fuel cell costs of $50 to 75/kw vs $30/kw)*

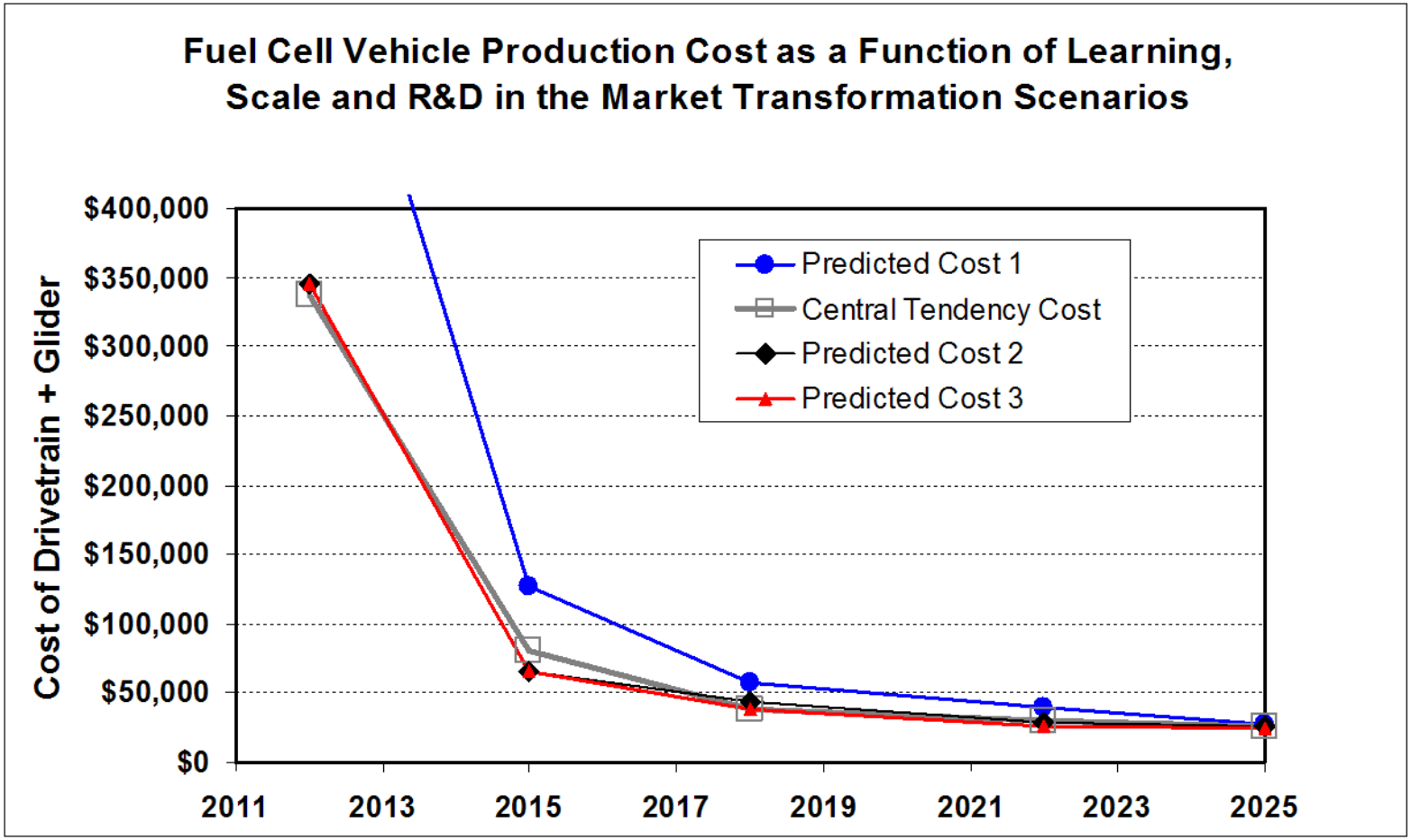
# Where Does the California ZEV Mandate Stand?

- Previous ZEV mandates have been reduced or delayed
- The current ZEV mandate calls for 7500 ZEVs during 2012 to 2014 and 25,000 ZEVs during 2015 to 2017
- One might expect 2500 to 3500 of those vehicles to be HFCVs during 2012 to 2014 at a 3 to 7 ratio for BEVs vs HFCVs
- That will require about 20 to 40 hydrogen fueling stations that are 200 to 400/kg/day
- The current ZEV mandate tacitly implies a volume of production phase by 2018 or later
- The ARB staff has been directed by the board to rip up the 2015 to 2017 ZEV targets and consider the need to meet the 2050 CO2 reduction goals to make a recommendation by 2009

# Stages of Commercialization

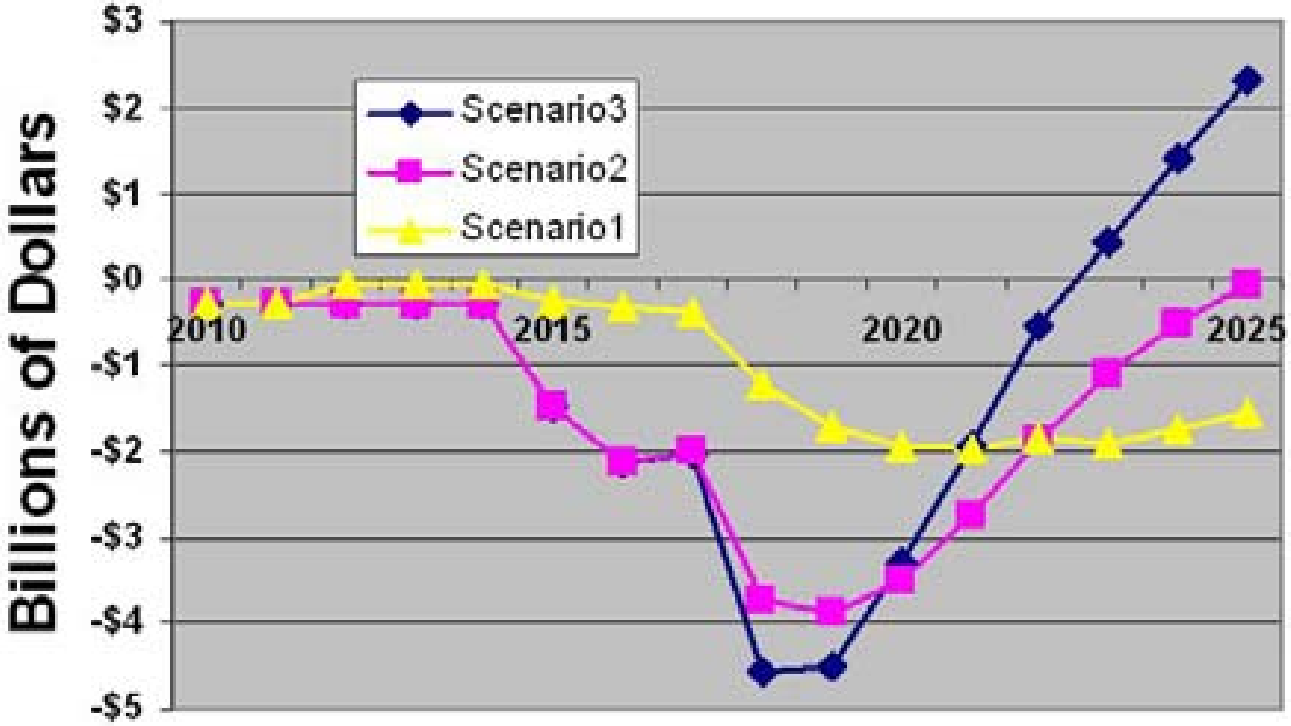


# HFCV Production Costs as a Function of Learning

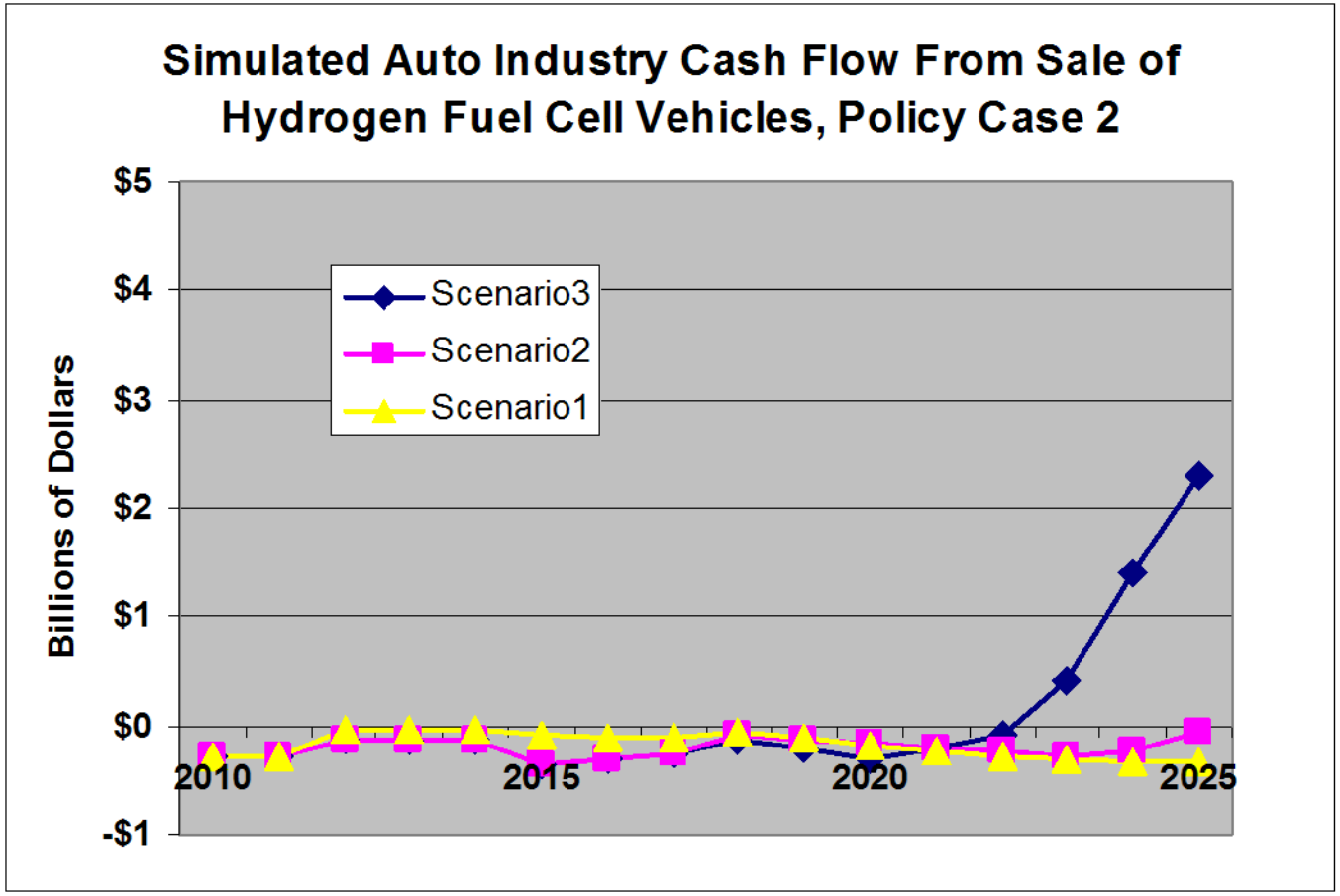


# The Valley of Death for HFCVs

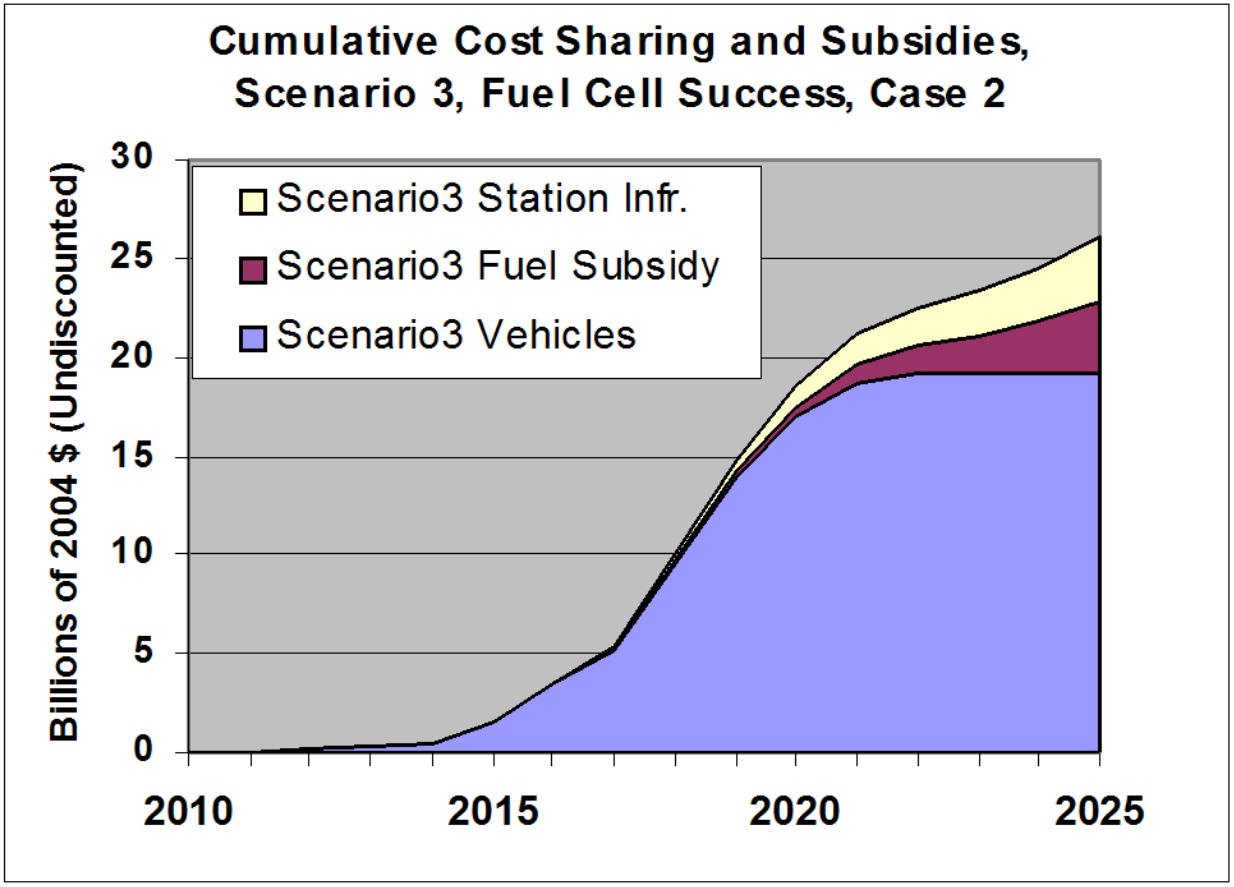
- Simulated cash flow by industry associated with 3 scenarios to achieve 2, 5 and 10 million HFCVs sold by 2025



# The Valley of Death with Government Demonstration & Tax Incentive Programs



# Cumulative Costs



# What are the Critical Issues?

- How do we come down the learning curve with a sensible government policy?
- When does the program transition from a technology development program to a “volume of production” phase?
- Are relaxed 2010 DOE targets (i.e., $50/kw fuel cell system costs and $15/kwh storage system costs when mass produced) viable for future market considerations?
- Can a reasonable prospectus be known from data that exists in industry laboratories in 2009 to 2010 considering a 6 to 7 year new vehicle development cycle to plan for a “volume of production” phase for 2015+?
- Does the entire industry have to agree?
- How can a signal be sent to fuel providers that there is a potential market for them to make the necessary investments?

# Summary

- If the commercialization of HFCVs depend on meeting 2015 DOE targets then it is relegated to be a technology development ad infinitum
- LA & NY are the prime demographic areas for the initial HFCV deployment- California H2 station mandate might be useful
- There needs to be a coordinated federal and California state policy as to when it is realistic to consider a “volume of production” phase (either program is insufficient to accomplish the mission)
- If a 2009 industry/government review of HFCV’s progress against revised 2010 targets is positive and the ARB establishes a new 2015-17 mandate, then a “volume of production” of HFCVs can be considered by 2015
- A policy that includes government support and regulation for both technology development and an economy of scale of HFCVs, and an infrastructure strategy is necessary for commercialization
- Up to 150,000 to 200,000 HFCVs may be needed during the “volume of production” phase (ORNL report, 2007 by Greene, et al) if 3 to 4 OEMs participate (full industry participation is not necessary)

# EPACT 2005 Provides the Authorization for a Second Phase Learning Demonstration Program

- **Section 808, Demonstrations**
- After 2010, add another research and development phase, ------, including the vehicle and infrastructure partnerships developed under the learning demonstrations program concept of the Department;
- Identification of New Program Requirements – In carrying out the demonstrations under subsection ( a ), the Secretary, ------, shall –
- ( 1 ) -------, and after 2010 for vehicles, identify new requirements that refine technological concepts, planning and applications; and
- ( 2 ) during the second phase of the learning demonstrations -------, redesign subsequent program work to incorporate those requirements.
- AUTHORIZATION OF APPROPRIATIONS, -

  ( 5) $375,000,000 for fiscal year 2010; and

  (6 ) such sums as are necessary for each of fiscal years 2011 through 2020

# Recommendations

- Recommend that there be an industry/government meeting to revise targets that are necessary to consider mass producing HFCVs (2009-2010) to meet the President's and California state's 2050 GHG CO2 reduction goals of 60 to 80%
- Recommend to the Secretary of Energy and Presidential Transition Team that a "Second Learning Demonstration Program" be submitted as part of DOE's 2010 budget submittal that extends to 2017 with HFCV numbers that are consistent with ZEV mandate requirements during 2012-2014, and a "volume of production phase" during 2015-2017 if warranted by technological progress and industry commitment.