

Institute of Transportation Studies University of California, Davis



LCFS: Policy and Political Challenges

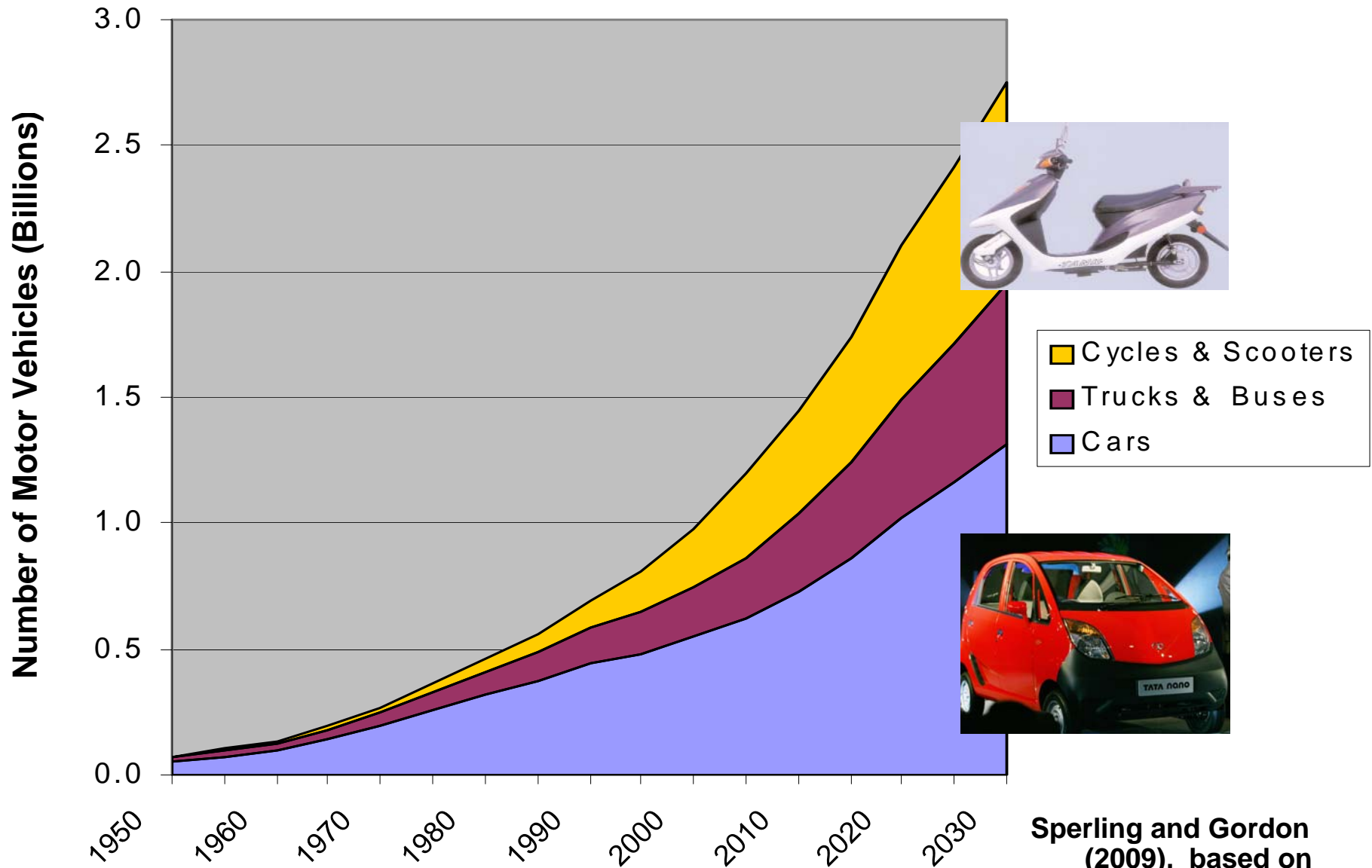
*Daniel Sperling
UC Davis (and CARB)*

*National Conference on Low Carbon Fuel
Standards for Canada*

June 3, 2008



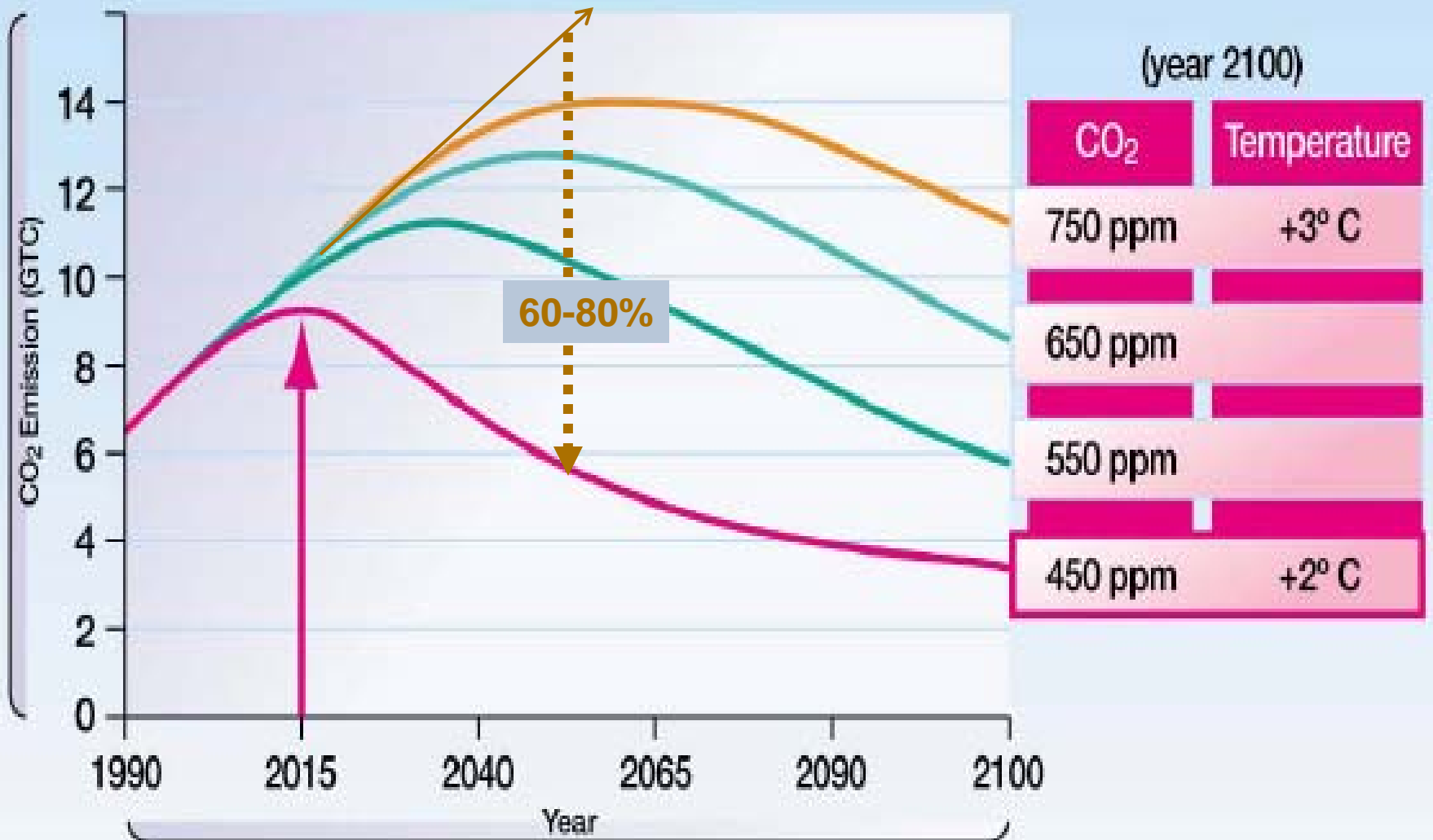
Global Vehicle Ownership (and oil use) Is Soaring



Sperling and Gordon
(2009), based on
DOE, JAMA, other

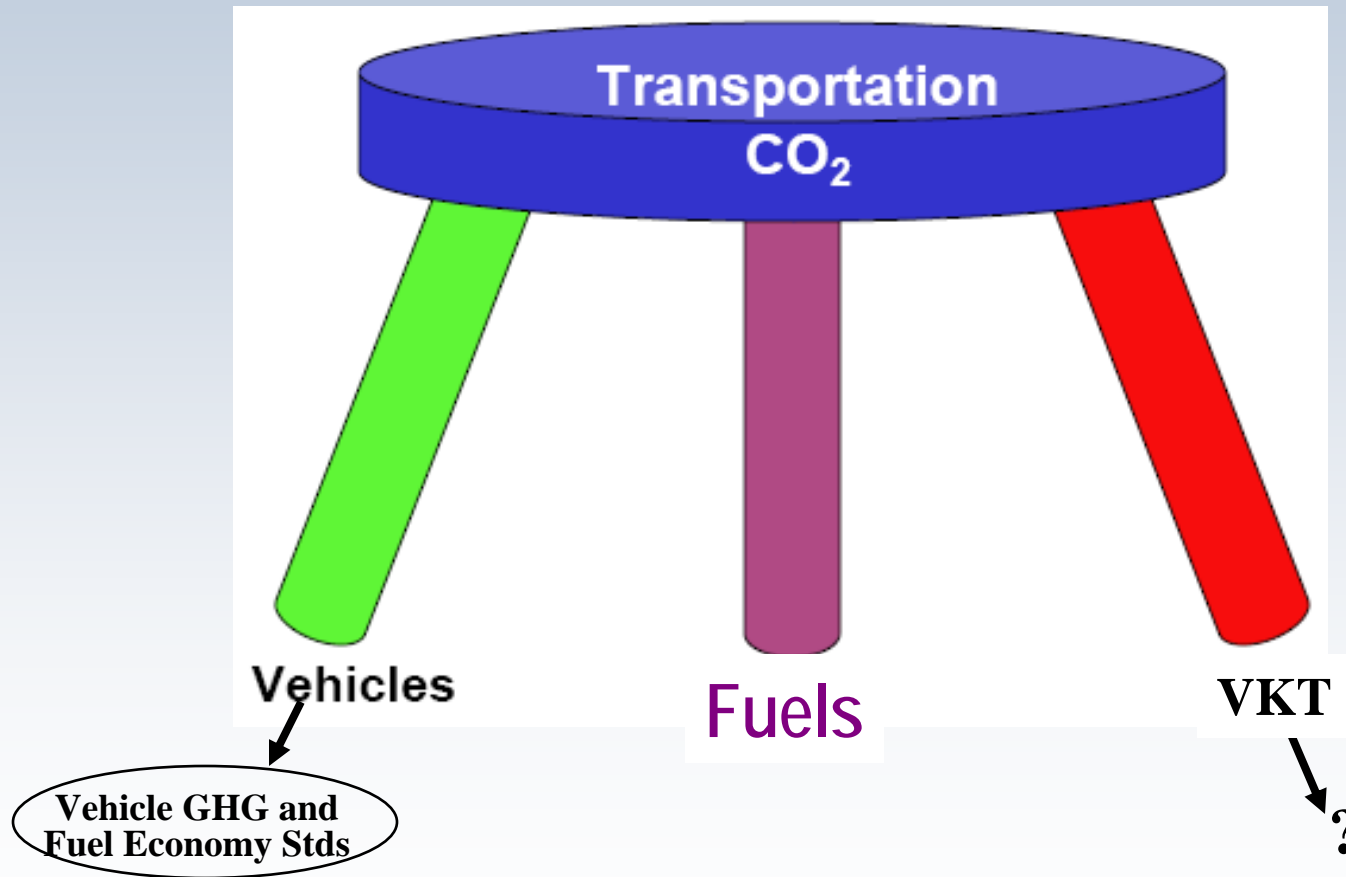
Large Reductions in CO₂ Needed Soon to Stabilize Climate

Stopping at 450 ppm requires ~60% reduction from BAU by 2050

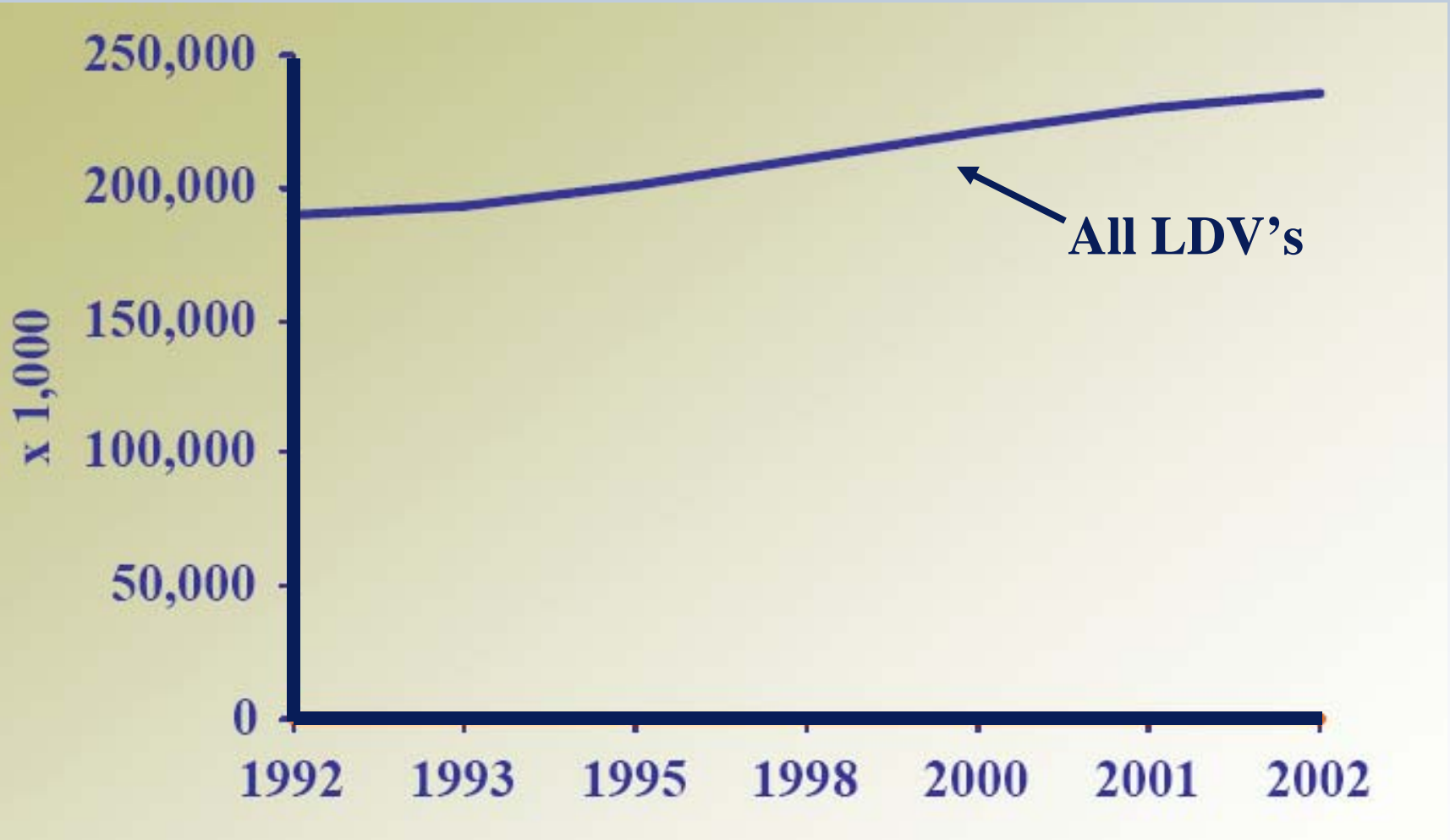


Source: IPCC, 2007

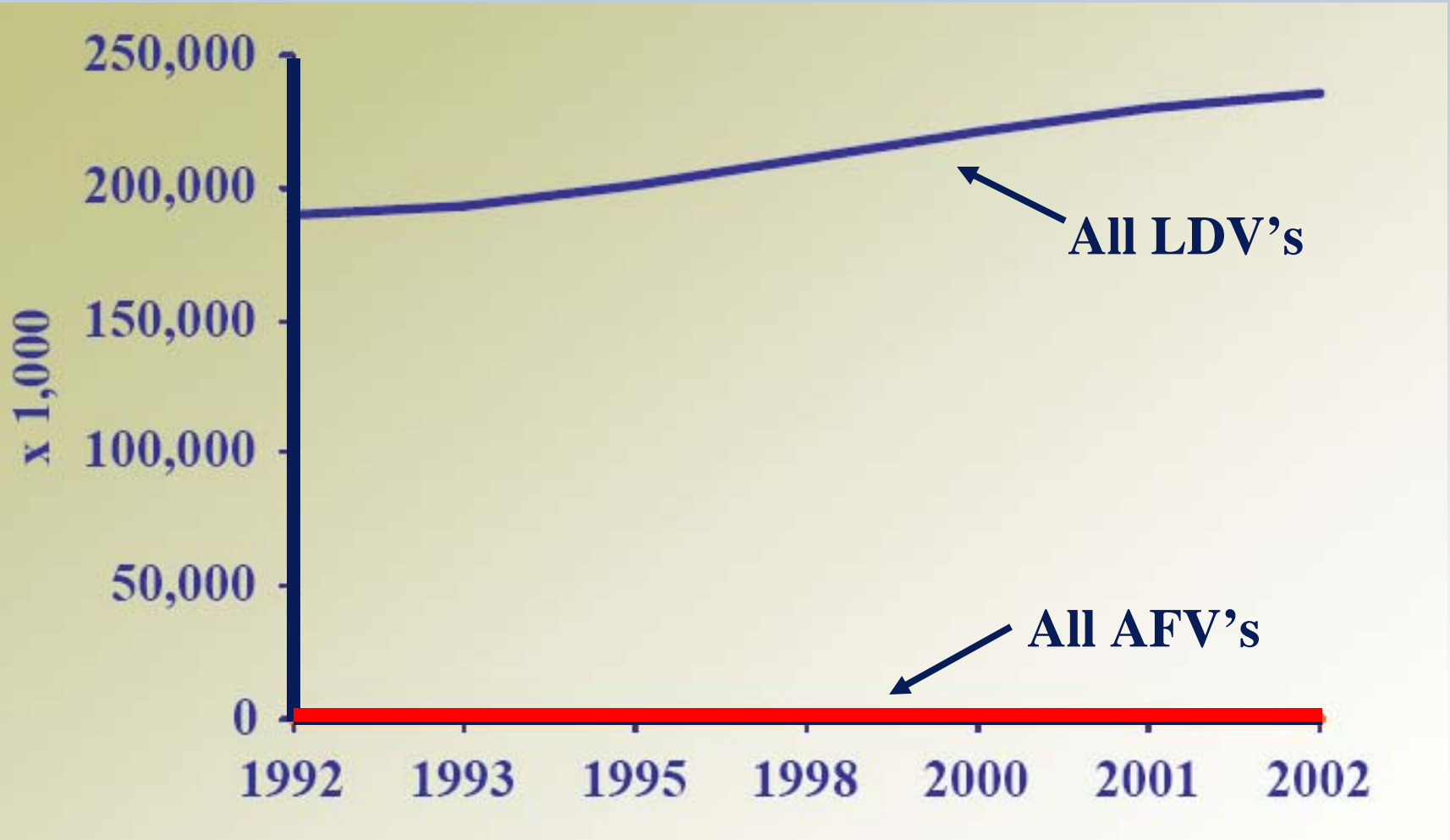
3 Strategies to Reduce GHG Emissions from Transport Sector



History of alternative fuel vehicles (US)



History of alternative fuel vehicles (US)



Government Intervention Is Needed for Alt Fuels

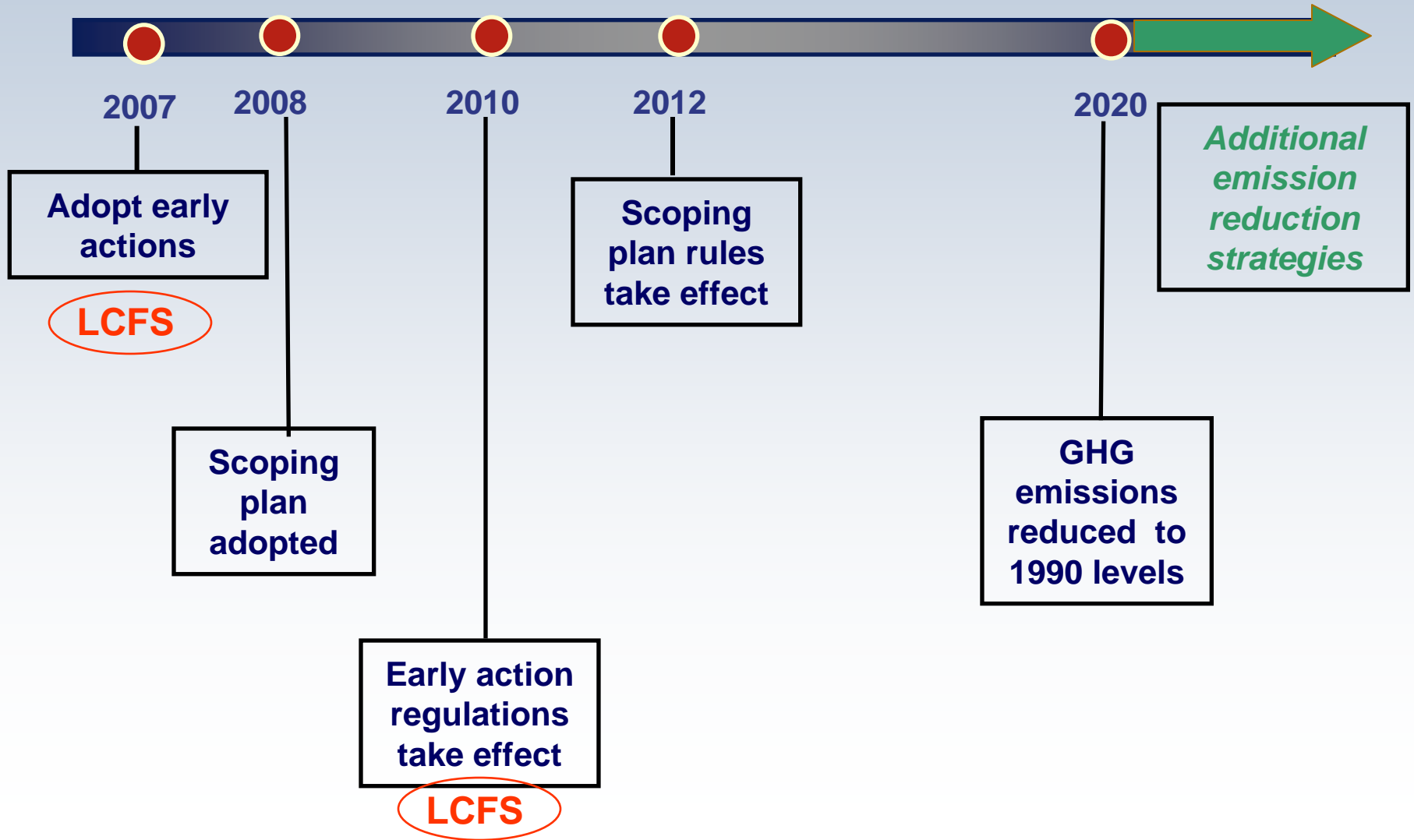
Many market imperfections

- Inadequate R&D (spillover)
- Inability of government to make credible long-term commitments
- Market power (petroleum)
- Coordination (network effects)
- Externalities (air pollution, energy security, etc.)
- Uncertainties (climate thresholds)
- Distributional effects (equity)

Transport market resistant to new fuels

California's Approach

LCFS is Part of Global Warming Solutions Act (AB 32)



Alex and Dan at Governor Schwarzenegger's unveiling of LCFS executive order, January 2007



What is a LCFS ... California's Definition

- Includes all possible road-based transport fuels
 - Excludes aviation and maritime fuel (because Calif lacks authority)
 - US Northeast states are including home heating oil
- Measured on lifecycle basis
 - Includes CO₂ and other GHGs
 - Measured in gCO₂e/MJ
 - Adjusted for drivetrain efficiency (Initial proposal was for Gasoline = 1.0 by definition, Diesel = 0.78, Electricity = 0.20, H₂ = 0.47)
- 10% reduction in GHGs by 2020 (with further reductions to follow)
- Point of regulation is oil refineries (and oil importers)
- Allows trading and banking of LCFS credits (but only amongst fuel providers)
- Could be combined with carbon tax or cap

How to Comply?

1. Improve energy efficiency or lower upstream CO₂ emissions (eg, eliminate flaring)
2. Blend in fuels with lower carbon intensity (eg, biofuels)
3. Sell fuels with low carbon intensity (e.g. electricity)
4. Buy credits from other fuel providers

Key Clean Alternative Fuel Options for Vehicles



Why LCFS Seems Like the Best Policy Approach for Introducing Alt Fuels and Reducing GHGs

- Mandates and Subsidies (eg, EU biofuels mandate, US ethanol subsidies)
 - But gov't not good at picking winners
- Renewable Fuel “Standards”
 - US RFS mandates 36 billion gallons/yr by 2022 (with 4 categories)
 - Simpler than LCFS but awkward treatment of GHGs, ignores non-biofuel options (including oil sands, EVs. etc), and weak effect on innovation
- Carbon Tax, and Cap and Trade
 - Not very effective for transport fuels in near term (assuming politically plausible taxes and uniformity across sectors)

Why Carbon Taxes and Cap & Trade Aren't Enough (for transport sector)

\$25/ton CO₂ price would have following impact on prices

- Nuclear + renewable electricity \$0.00 per kWh
- IGCC+CCS \$0.002 per kWh
- Natural gas combined cycle \$0.01 per kWh
- Pulverized coal \$0.02 per kWh

- Gasoline \$0.22 per gallon

- *Electricity companies would be responsive to carbon caps and taxes because they have many choices (wind, nuclear, natural gas, biomass, solar)*
- *Oil companies would not be responsive because they have few choices*
- *Drivers would not be responsive*

TRANSPORT FUELS: carbon taxes and caps would have little effect in the near term

Carbon taxes and cap & trade not effective at introducing new fuels

- In a pure cap and trade system, fuel producers may just buy allowances and pass the costs along to customers

Thus, something more effective than cap and trade and carbon taxes is needed now to motivate change and innovation with transport fuels

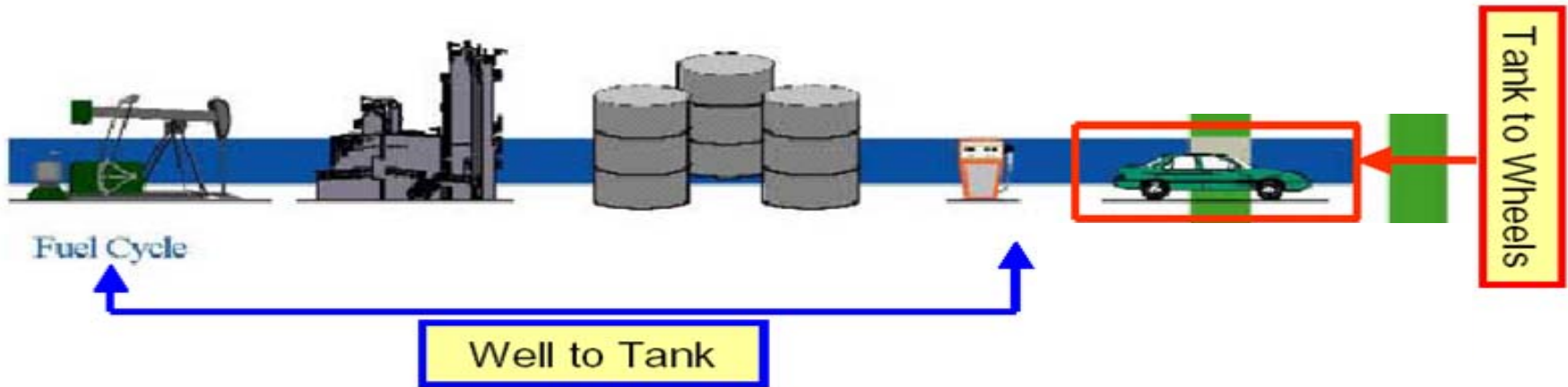
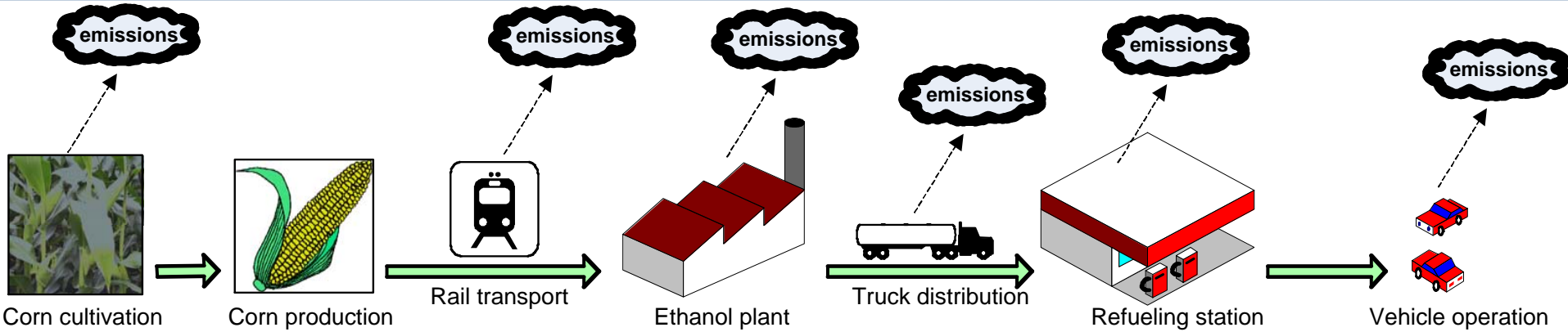
LCFS Gaining Increasing Attention

- **California:** LCFS regulations take effect Jan 2010
- **Consideration by other US states and Canadian provinces**
 - **British Columbia, Western Governor's Assoc, Northeast states**
- **US**
 - **Energy Independence and Security Act (EISA 2007)**
 - 36 billion gallons/yr by 2022 (4 categories)
 - 15B corn-ethanol must have lifecycle GHGs 20% below gasoline
 - Other 21B must be 50-60% below gasoline
 - Indirect land use must be included in GHG calculations
- **United Kingdom:** Renewable Transportation Fuel Obligation (like a RFS), requires GHG monitoring
- **Germany:** Sustainability requirements for biofuels in 2009
- **European Union:** monitoring in 2009, reductions in 2011 (proposed)

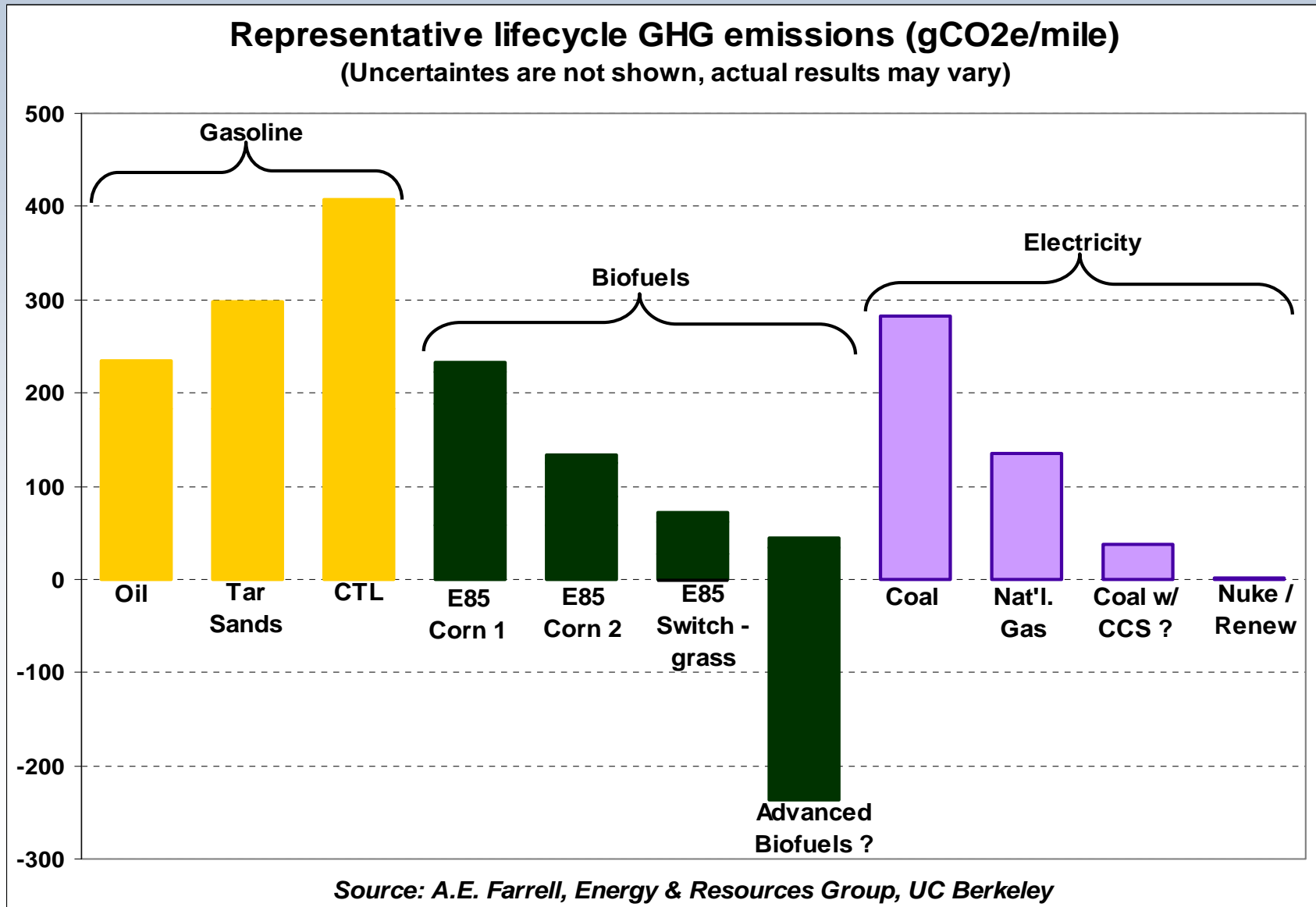
Principles Underlying LCFS

- Create durable framework for orchestrating near and long term transition to low-carbon alternative fuels
 - Send consistent signals to industry and consumers to reduce GHGs
- Stimulate technological innovation
 - Need to create low-carbon alt fuel options
- Do not pick winners (or losers)
 - Use performance standard, with tightening over time
 - Provides industry with flexibility
- Use lifecycle approach
- Assure compatibility between Canada, US, EU, Brazil, others

Based on "Source-to-Wheel" (Lifecycle) Emissions

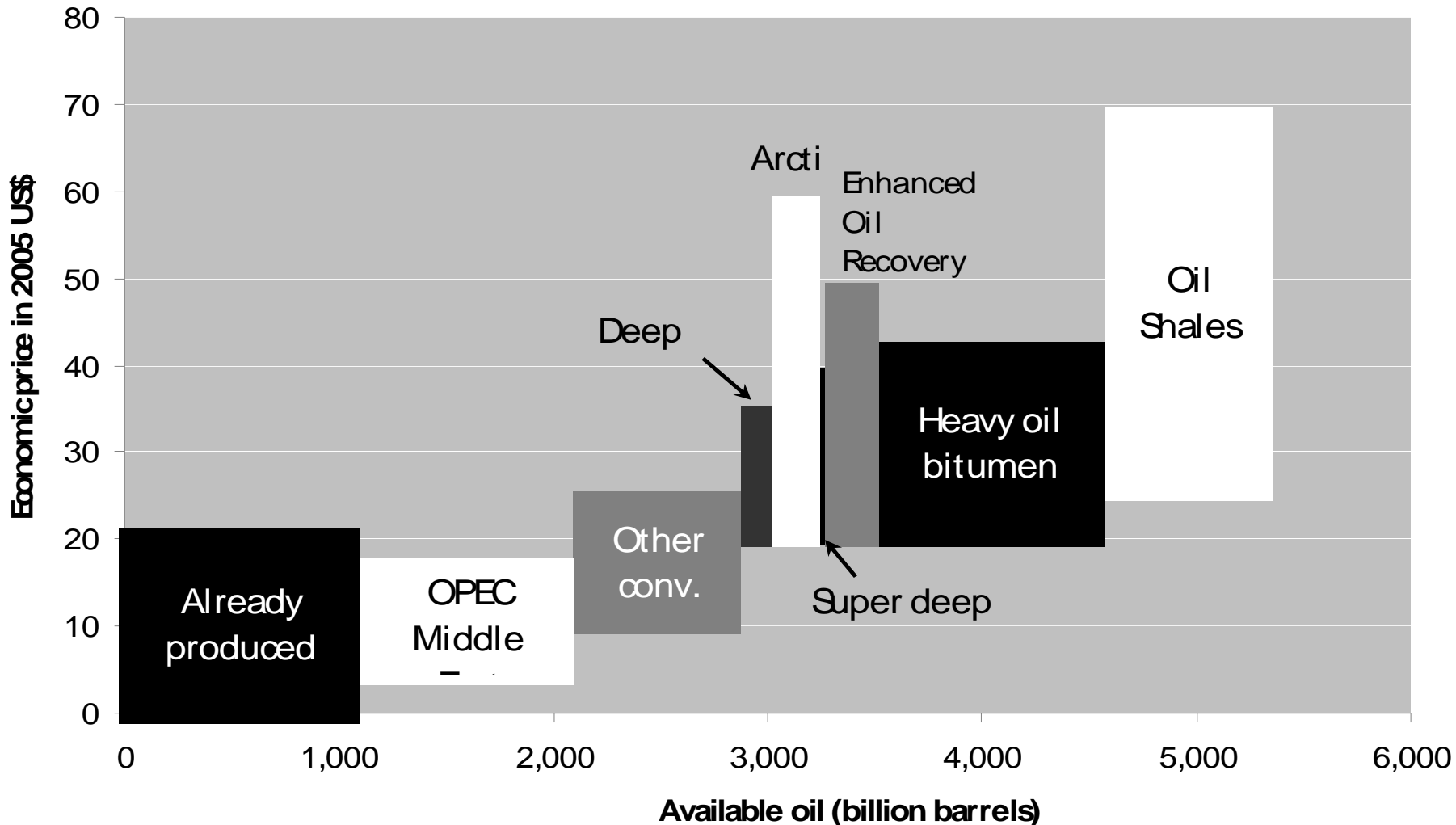


LCA Needed Because GHG Emissions Depend on How Fuel is Made



Unconventional Oil Is One of Few Instances Where Energy Security and Climate Strategies Conflict.

Can LCFS help (by providing an overall framework)?



Other Major Issue: “Sustainability”

1. Conservation of biodiversity and ecosystem integrity
2. Do not convert natural ecosystems, parks, or national forests
3. Sustainable use of water resources (no over-use and no pollution)
4. Use good agricultural practice (e.g. maintain soil fertility and avoid runoff)
5. Avoid invasive species and GMOs
6. Promote economic development in developing countries and rural areas
7. Protection of workers rights and safety, and of informal land ownership
8. Avoid competition with food and fodder cultivation.



Political Challenges

- How to address sustainability concerns (without making LCFS rules too onerous and still maintain support from NGOs)
- How to maintain oil company support or at least acquiescence
 - They “bought” into LCFS initially because it seemed more responsive to market forces and was more performance based than other approaches
 - Now concerned about triple regulation (RFS, cap and trade, LCFS), esp at US national level
 - Oil companies likely to continue supporting LCFS in California, but uncertain elsewhere
- Politicians (and environmental community) generally prefer mandates (eg MA biodiesel story)

Political Attractiveness: LCFS is Hybrid of Market and Regulatory Policy (something for everyone!)

- Stimulates technological innovation and investment
 - Current technologies were not developed to reduce carbon intensity
- Many technologies will compete to lower costs
- Credit trading minimizes costs.

Policy and Regulatory Challenges

- Need to reconcile LCFS with other states, provinces, and nations, and with RFS, cap and trade, other actions
- How to handle land use changes and other sustainability issues?
 - When land use GHG effects included, does LCFS serve as proxy for “ecological” concerns?
 - How to handle social sustainability concerns, if at all?
- Other “technical” issues:
 - Default values; trading rules; measuring electricity use; offsetting electricity utility caps; dealing with “shuffling”; vehicle efficiency adjustment factors; gasoline vs diesel pool; dealing with diesel cars.

Compliance Through Default and Opt-in Approach

Default: Each step in each fuel pathway is assigned a carbon intensity

- Highest value in common use is the default value (“conservative” values used)
- A company may use defaults for some steps in a fuel production path but may “opt-in” with specified values for other steps when the company can better the default value
- Encourages opt-in and focuses management attention

Opt-in: certified data allow lower carbon intensity values

- Tends to encourage innovation
- Requires protocol development and data collection
- Certifiers (3rd party?) needed

My Overarching Messages

- I'm a believer (based on 30 years of research and observation) ... LCFS provides a durable regulatory and policy framework to guide the transition to low carbon fuel alternatives. I can imagine no better approach.
- LCFS is just the foundation. It will be most effective with liquid alternatives (biofuels) and less effective with non-liquid alternatives
 - Other policies are needed to complement the LCFS, esp for electricity and H₂.
- LCFS can easily co-exist with “carbon cap and trade” programs
- Important to have consistency in LCFS rules across provinces, states and nations (though need not have identical targets)

LCFS is Hugely Important

Yes, there is uncertainty.

Yes, there is some complexity.

Yes, more research is needed.

But... this is the most important policy initiative in transportation fuels, perhaps ever!

We need to make this work.

Thank You