Biofuels and the Low Carbon Fuel Standard In California

Global Bio-Energy Partnership
GHG reporting methodology meeting

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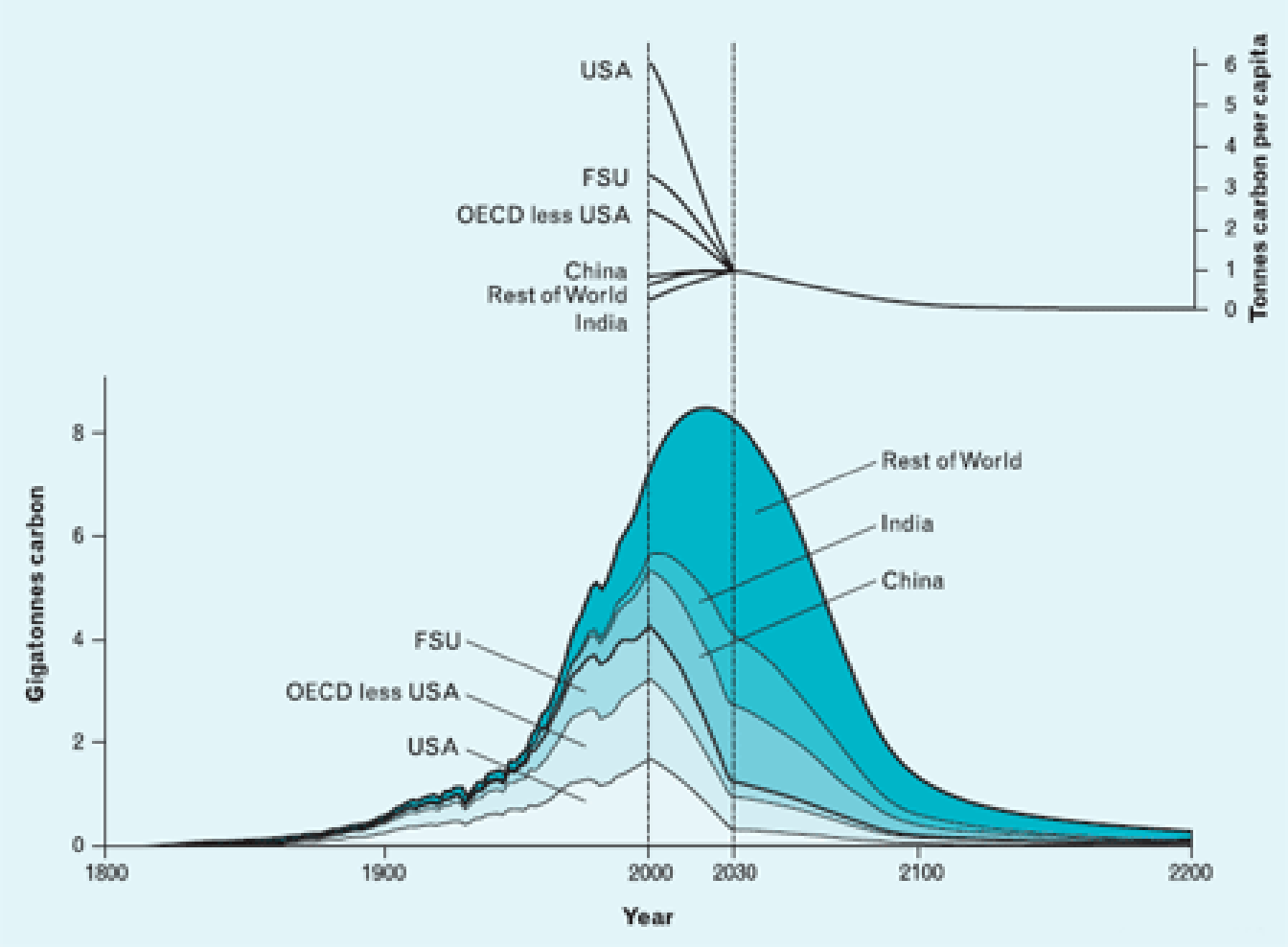
Climate stabilization requires efficiency, ambitious targets and technological innovation

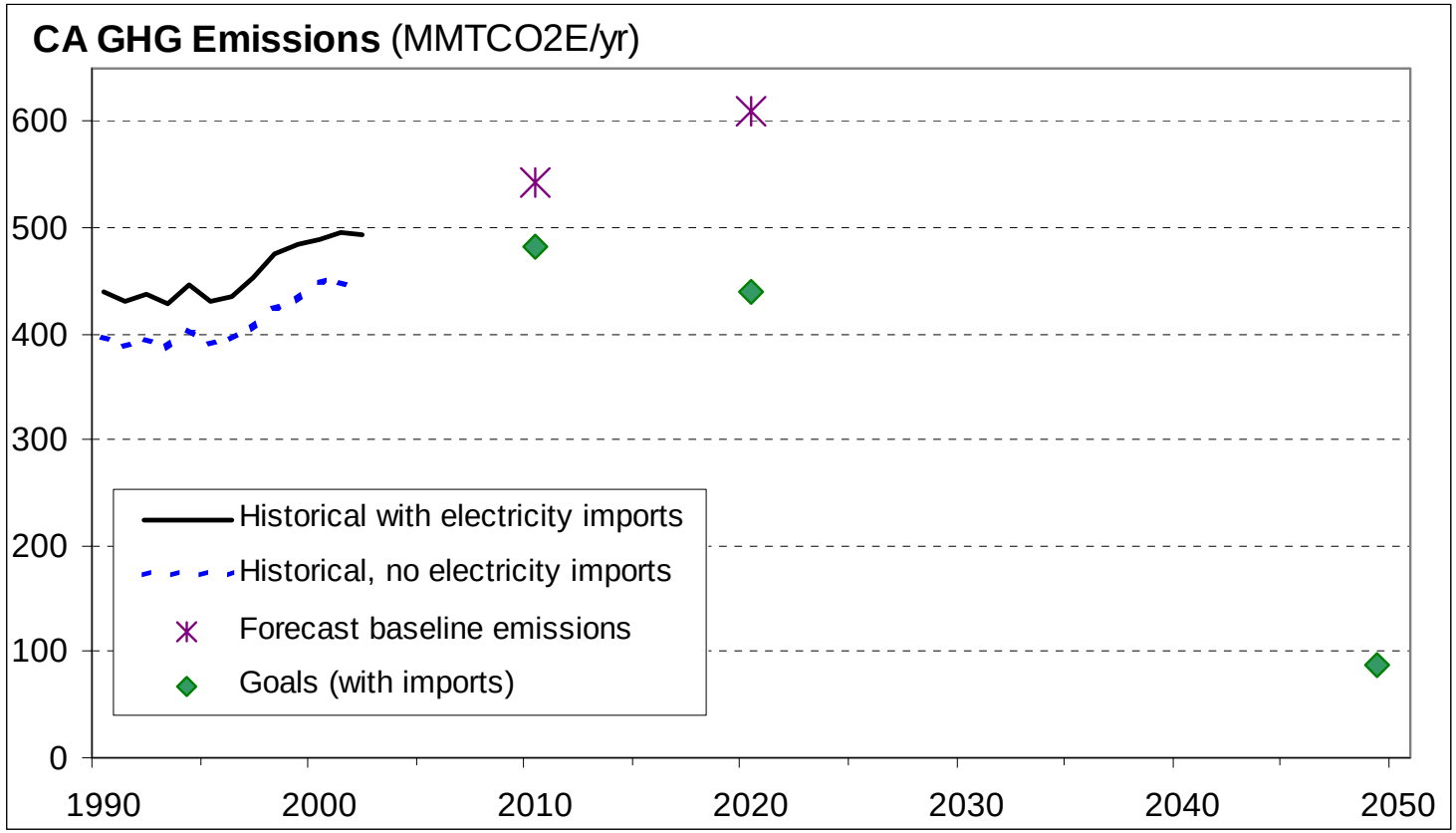


The LCFS is only a start – it will require a 10% *intensity* reduction by 2020

450 ppm example of "contraction and convergence" per the Global Commons Initiative

Source: www.cru.uea.ac.uk/tiempo/newswatch/comment060704.htm

Therefore, California has set ambitious targets and has designed policies to foster innovation



- Executive Order S-3-05 GHG emission reduction targets
  - –2010: maintain 2000 levels (~10% reduction from baseline)
  - –2020: return to 1990 levels (~25% reduction from baseline) → **AB32**
  - –2050: attain 80% below 1990 levels → **Climate Stabilization**

Climate change strategy has three overarching goals

1. **Deploy near-term technologies to cut emissions by ~25% by 2020**

2. **Stimulate innovation & investment in new technologies needed to meet 2050 stabilization targets**

3. **Contribute to related objectives**
   - Economic growth
   - Air quality
   - Affordable energy prices
   - Diversity of energy sources
   - etc.

To ensure innovation across the economy, a sectoral approach is needed

- **Multiple market imperfections create the need for complements to economy-wide policies**
  - Inadequate R&D; High private discount rates; Market power; Network effects; Infrastructure requirements; Differences in fuel-on-fuel competition, Poor applicability of carbon capture and sequestration
- **Can be added to economy-wide cap and trade**
- **Example: Implications of a $25/ton CO_2 price**

– Nuclear + renewable electricity	$0.01/MWh
– Integrated gasification combined cycle with carbon capture and storage (IGCC+CCS)	$02.50/MWh
– Natural gas combined cycle (NGCC)	$12.50/MWh
– Pulverized coal (PC)	$20.00/MWh
– Gasoline	$0.22/gallon
– Corn ethanol	$0.11 to $0.23/gallon

California has developed a comprehensive, sectoral strategy to cut GHG emissions

- **Overall goals**
  - Executive Order S-3-05 (2005)
  - Global Warming Solutions Act 2006 (AB 32)
  - Energy Action Plan (CEC and CPUC)
  - Bioenergy Action Plan (CARB, CEC, CPUC, etc.)
- **Energy research portfolio**
- **Buildings and appliances**
  - Energy efficiency standards (CEC)
- **Electricity other large sources**
  - Carbon Adder (CPUC)
  - Renewable portfolio standard for electricity (SB 107)
  - GHG performance standard (CPUC and SB1368)
  - GHG emissions cap (CPUC)
  - Energy efficiency targets for utility companies (AB 2021)
- **Transportation**
  - Vehicle GHG performance standard (AB 1493, CARB)
  - Low Carbon Fuel Standard (LCFS Executive Order S-1-07, CARB, CEC, and others)
  - Reduce vehicle usage
- **Other policies**

Main provisions of AB32

- **GOAL Reduce CA GHG levels to 1990 levels by 2020**
- **CARB lead agency / CPUC involvement**
- **2012 cap on stationary sources**
  - Covers all GHGs and most emitting stationary sources
  - Market-based mechanisms recommended (preferred?)
- **Numerous regulatory programs under development**
  - Energy efficiency standards, port and truckstop electrification, afforestation, manure management etc.
- **Early action plans**
  - Low Carbon Fuel Standard (LCFS), etc.
- **Environmental justice considerations**
- **Governor can delay the deadline**

AB32 Timeline (selected)

- **Jan 07** - Form advisory committees and lay out schedule actions
- **Jan-May 2007** – Agencies conduct initial workshops and analyses
- **June 2007** – University of California Berkeley/Davis study of LCFS
  www.its.berkeley.edu/sustainabilitycenter
- **July 2007** – CARB starts regulatory proceedings on early actions, public workshops and notice and comment process
- **July 2008** – CARB adopts mandatory reporting regulations
- **Jan 2009** – CARB adopts plan for achieving 2020 targets and completes regulatory proceedings for early actions (including LCFS)
- **Jan 2010** – Early action regulations take effect (including LCFS)
- **Jan 1, 2012** – All GHG regulations are legally enforceable

LCFS basics

- **Carbon intensity must be measured on a lifecycle basis**
  - Average Fuel Carbon Intensity (AFCI) measured in gCO2e/MJ
  - AFCI must decline by at least 10% by 2020
- **Stimulate technological innovation**
  - Use performance standard, with tightening over time
  - Measures desired outcome (GHGs), not a proxy (renewable)
  - Different fuels (electricity, biofuels, fossil, etc.) compete with one another, so government does not pick winners (or losers!)
- **Compliance by manufacturers or importers of fuels (mostly oil refiners)**
- **Additional to vehicle performance standards**
- **Overcompliance creates credits that can be traded in a market or banked for later use**
- **Default and opt-in approach** (Thanks to the U.K.)

Compliance through default and opt-in approach

- **Compliance is possible with many competing technologies:**
  - Lowering the carbon intensity of current fuels – e.g. refinery efficiency
  - Using new, low-carbon fuels – biofuels, electricity, hydrogen, etc.
  - Buying credits (or offets)
- **Default: all fuel inputs are assigned a carbon intensity**
  - Fuel inputs must be categorized
  - Highest value in common use is the default value
  - Encourages opt-in and focuses management attention
- **Opt-in: certified data allow lower carbon intensity values**
  - Requires protocol development and data collection
  - Certifiers are needed
  - Tends to encourage innovation
- **Default example:**
  - Gasoline: conventional oil, heavy oil, tar sands, coal
  - Diesel: conventional oil, heavy oil, tar sands, coal
  - Ethanol: U.S. corn, Brazilian sugar, U.S. switchgrass

A Low-Carbon Fuel Standard for California

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www.its.berkeley.edu/sustainabilitycenter/lowcarbonfuelstandards.html

Several LCFS compliance scenarios are feasible for California with moderate biofuel use

Scenario name	**Volume in 2020 (million GGE/yr)***	
Business as Usual (BAU)	Gasoline: 15,300 (of which ~900 are ethanol) Diesel: 850	
Existing Vehicles and Advanced Biofuels	Low-GHG ethanol: 957 Low-GHG diesel: 709	*Today's pilot plants*
Biofuel Intensive	Mid-GHG ethanol: 3,293 Mid-GHG diesel: 423	*Today's average practices*
Multiple Vehicles and Fuels	Low-GHG ethanol: 1,262 Low-GHG diesel: 171 CNG: 289 Electricity: 69 Hydrogen: 59	*Today's best practices*

* GGE = gallons of gasoline equivalent

Regulatory implementation requires a new approach to Life Cycle Analysis

- **Plant-specific analysis is required**
  - May be proprietary and thus must be protected by government
  - Mechanisms for certifying data are needed
  - Results must be self-documenting
- **Key assumptions** (e.g. forecast information) **must be agreed-upon by all users**, else the model produces any answer you want
- **Uncertainties** must be calculated and evaluated.
- **Factors that cannot be represented in a LCA need to be added** – market responses such as land use change
- Must be **usable** by regulated entities, **resistant** to fraud, and easy to **verify**.

Key implementation issues and questions

- **Basis of competition**

Electricity	**Oil**	**Biofuels**
Rate-of-return regulation	Competitive	Subsidized/Protected
All emissions capped	Intensity target	Ignored unless LCFS
Local/Regional	Global	Global
“Ratepayer subsidies”	“Capital at risk”	“Mandated volumes”

- **Including “upstream” emissions for oil production**
- **Rationalization (aka “leakage”)**
- **LCA methods and compliance tools**
- **Compliance schedule and time for innovation/investment**
- **Complementary regulations and government actions**
- **Availability of offsets, interactions with cap and trade**
- **Land use change**

What does the LCFS mean to biofuel producers?

- **Accept default or obtain certified information** that allows for a lower, more accurate opt-in value.
- Value for product will be reflected in **prices** that the regulated entities (e.g. refiners) have will pay
- **Incentives to lower GHG emissions** (efficiency, fuel switching, process changes, etc.)
- **Incentives to use waste and residue feedstocks** that require little or no inputs because these have low GHG emissions and so obtain a high price.
- **Feedstock production on newly-cleared land is likely to have a low price** (due to high GHG emissions, direct and indirect)

The LCFS may become a complement to (or replacement for) biofuel mandates

- **United Kingdom:** Renewable Transportation Fuel Obligation (like a RFS) requires GHG monitoring in 2008
- **California:** LCFS regulations to be in effect 2010
- **Consideration by other states and provinces:** AZ, BC, CT, DE, MD, MA, MN, NH, NJ, NY, ON, OR, NM, RI, VT, WA…
- **Federal regulations:** Proposed CAFE + LCFS rule in Nov 2007
- **Federal bills:** Sanders-Boxer, Feinstein, Inslee, Boucher
- **European Union:** monitoring in 2009, reductions in 2011
- **Global Bio-Energy Partnership:** Oct 9-10 meeting on GHG emission monitoring

Thank you

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