



The Hydrogen Energy California (HECA) Project: Update and Regulatory Experience

California CCS Review Panel
June 2, 2010

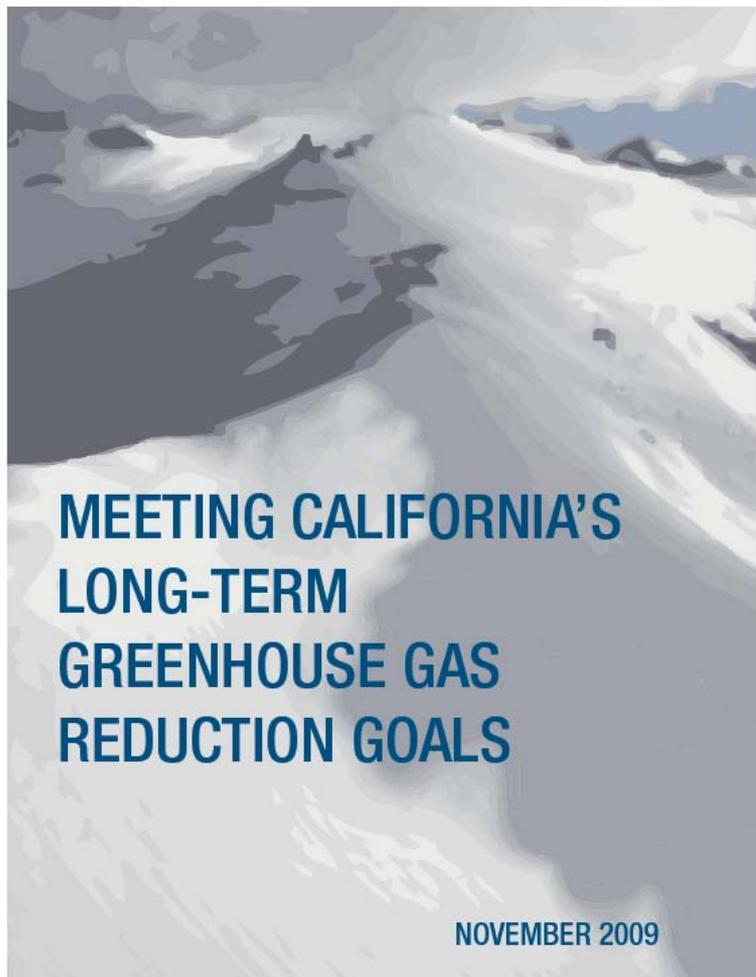
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Presentation Outline



- California GHG Goals and HECA Project Context
- HECA Project Summary
- Federal Regulatory Progress
- State Regulatory Progress
- Summary

California must dramatically decarbonize all sectors to meet its aggressive 2050 GHG reduction goals

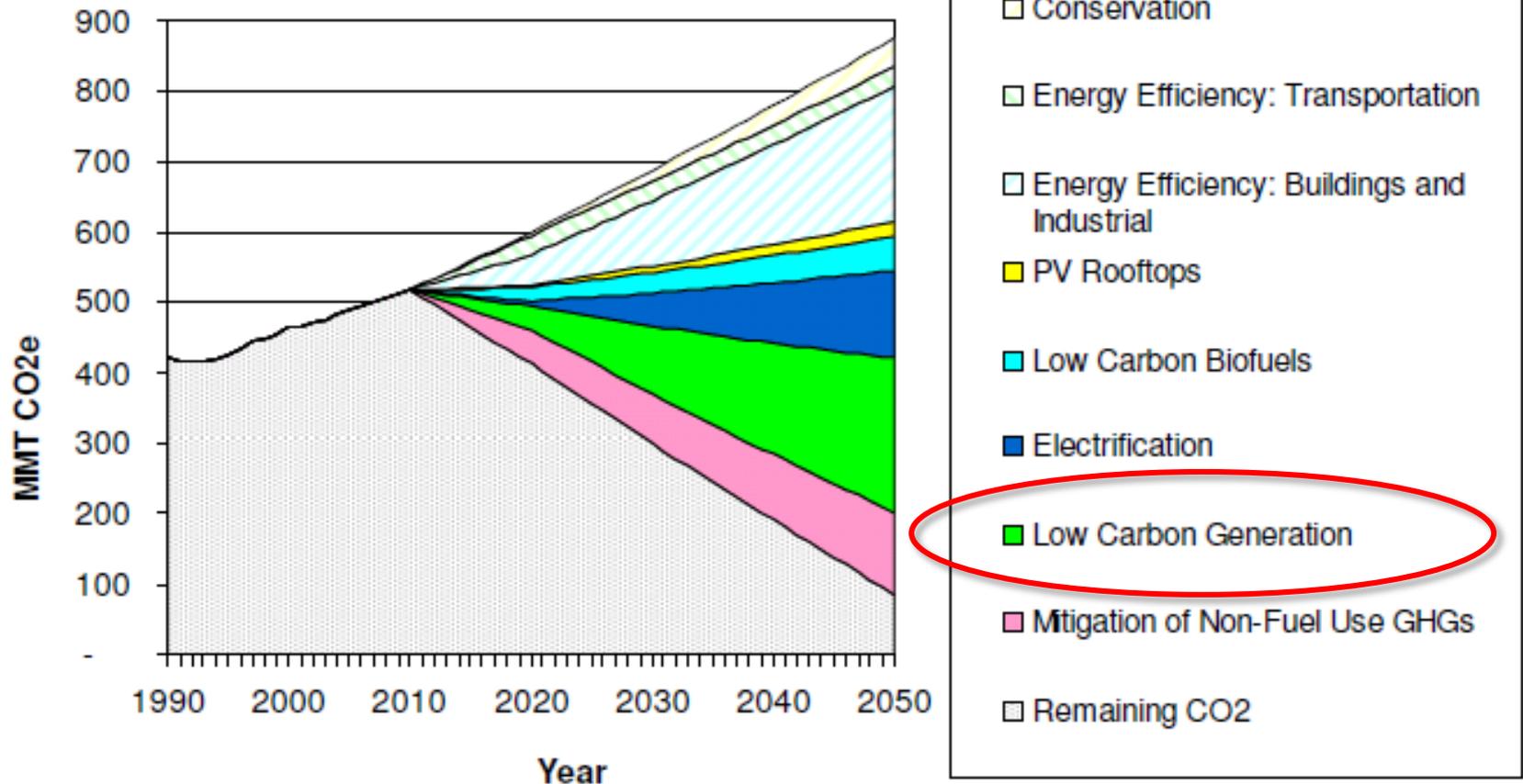


Study conducted by E3, Inc.

California must:

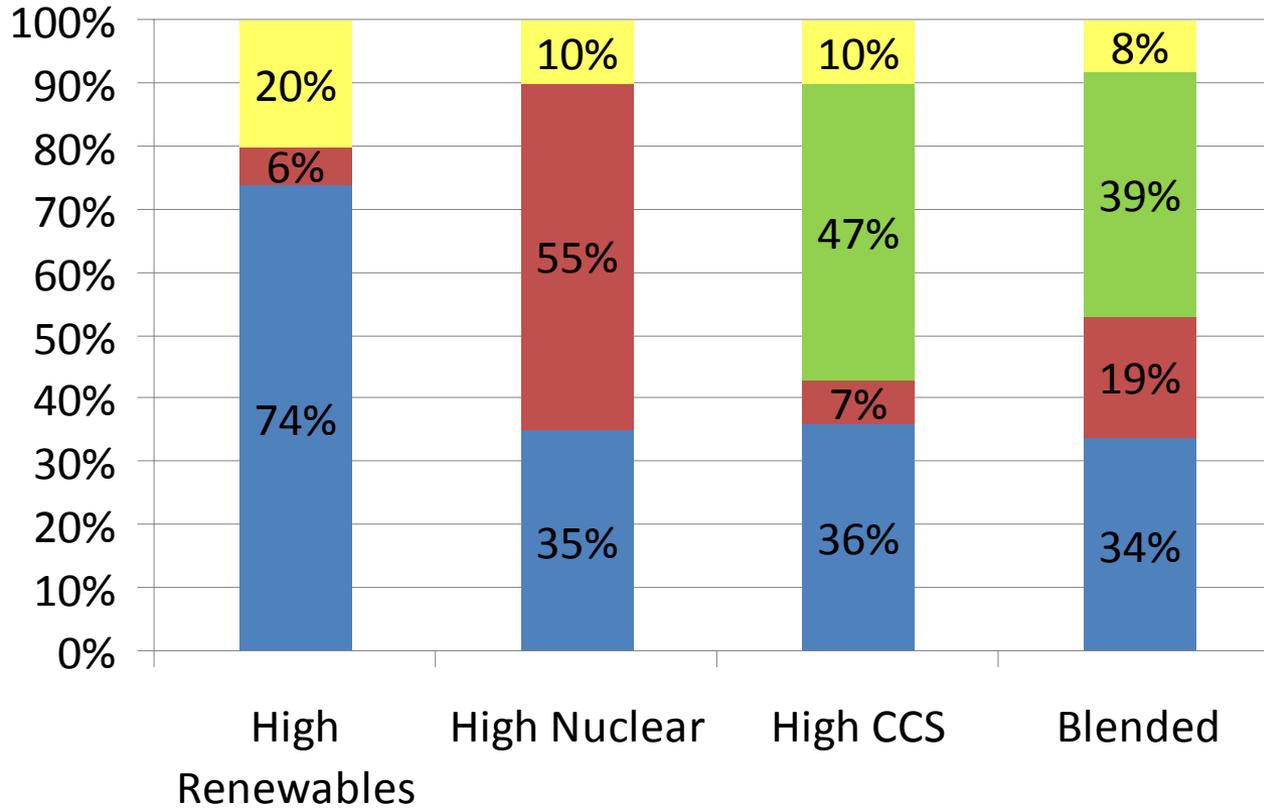
- Dramatically improve energy efficiency in all sectors
- Switch energy use to electricity everywhere possible, including transportation
- Decarbonize the electricity sector using three approaches in combination:
 - Renewable energy
 - Nuclear power
 - CCS
- Available from www.ethree.com

A Balanced Approach to CO₂ Mitigation is Necessary



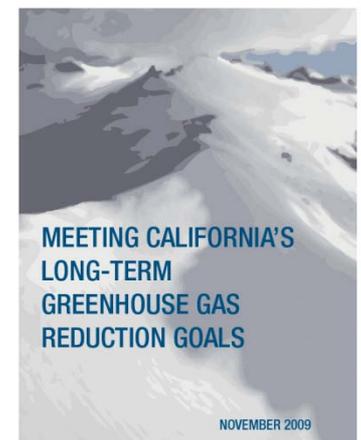
Meeting California's Long-Term Greenhouse Gas Reduction Goals, E3

Four low-carbon electricity generation scenarios were studied to meet the 2050 goals

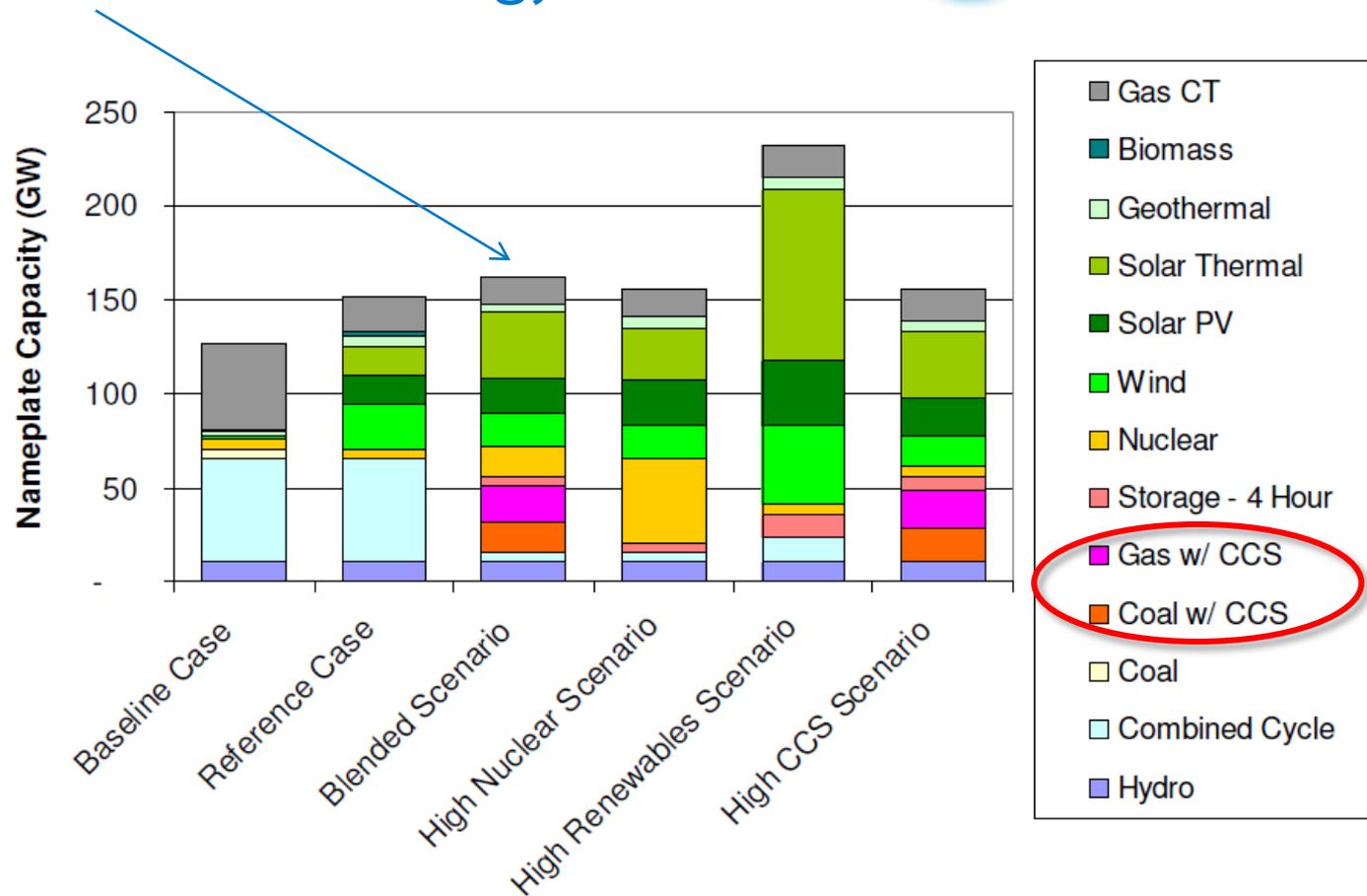
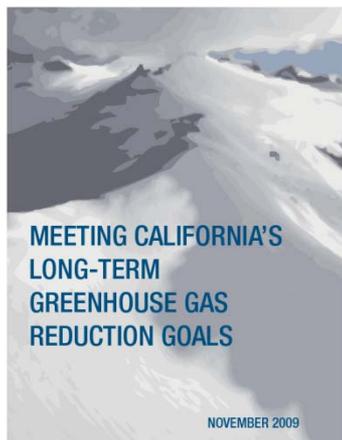


- Other
- Generation w/ CCS
- Nuclear Energy
- Renewable Energy

Energy storage, MW	12,000	4,000	8,000	6,000



A blended, diversified approach reduces the risks of any particular technology



We're eventually going to see need to employ CCS on a large scale in California... if we are going to be able to meet the 2050 goals of AB32." -President Michael Peevey, California PUC, Feb 20, 2009

HECA: Project Overview



- Demonstrates commercial operation of 250 MW IGCC with 90% CO₂ capture, eliminating ~2 million tons of GHG emissions annually
- Reduces the pressure and need for natural gas with in-state, low-carbon baseload power
- Increases energy security by boosting production from California's own oilfields
- Received CCS support in stimulus bill (CCPI-3 award from US DOE)
- HECA would provide a stimulus to Kern County, creating over 1500 construction jobs and over 100 permanent jobs

“(We) became increasingly convinced of the value of the HECA Project, and its environmental benefits to California ... it really is a win-win-win-win-win.”
– President Michael Peevey, California PUC, Feb 20 2009

HECA Project Progress



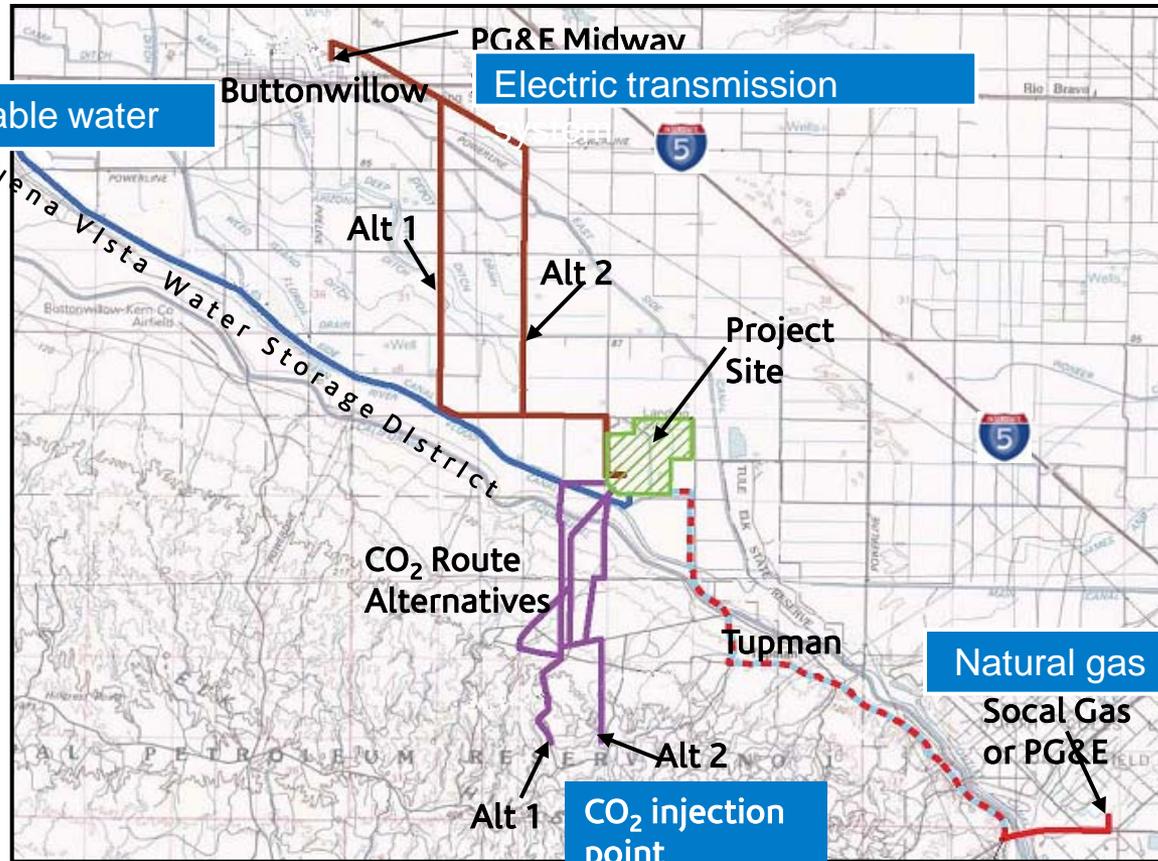
- Federal funding: \$308M DOE CCPI- Round 3
 - Selected for negotiations July 2009, based on Jan 2009 application
 - Cooperative Agreement signed with DOE Sept 2009
 - \$14 million in cost share to date
- State Funding: PUC Decision on SCE's \$30M funding request
 - 5-0 commissioners vote in February 2009
 - SCE Rate Recovery approved December 2009
 - Other utilities encouraged to participate
- Engineering:
 - Signed GE License Agreement, completed Process Design Package
 - FEED scheduled to commence in 3Q2010

HECA: Permit Progress



- Application for Certification (AFC) with CEC
 - May 2009: submitted “Application For Certification”
 - Aug 2009: “data adequacy” achieved
 - Sept 2009: Information hearing and HECA site visit completed
 - Dec 2009: HECA and Oxy site visit with CA regulators, U.S. EPA and U.S. Senate staff
 - Over 150 data requests addressed
 - April 2010: Data request workshop #1
 - May 2010: Data request workshop #2
 - Preliminary Staff Assessment (Part 1) expected in 2Q2010
 - CEC agreed to bifurcate PSA for HECA and Oxy CO₂ Projects as requested by HECA

HECA: Siting for Success



Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TPOI. ©2006 National Community and State of California (proposed and approved projects).

LEGEND	
	Project Site
	Carbon Dioxide
	Potable Water/NG
	Process Water
	Natural Gas (NG)
	Transmission
	Potable Water

Siting CCS Projects more complicated than traditional power projects

- less than 5 miles away from Elk Hills reservoir
- transmission, natural gas, water lines under 10 miles

“This project ... is an unusual occurrence when the various components of technology and siting come together to provide a world first opportunity...” – Commissioner Bohn, CPUC, Feb 20, 2009

HECA- Stakeholder Outreach



- **Information Center**
 - Located in Buttonwillow, CA
 - Staffed by locally hired HECA personnel
 - Includes displays and educational materials
- **Project newsletter**
 - Quarterly newsletter is sent by postal mail/ email
 - stakeholders, local community and interested parties
- **Education on Project and Technology**
 - CCS workshops, media interviews, conference presentations
- **Comprehensive Coverage**
 - Local, state and federal outreach
 - Dedicated staff and external consultants

HECA – Stakeholder Outreach



- Governor’s Office
- CA Public Utilities Commission*
- California Energy Commission*
- CA Dept Of Conservation/DOGGR*
- EPA Region IX*
- US Fish & Wildlife*
- Cal EPA & Air Resources Board
- SJV Air Pollution Control District*
- Regional Water Quality Control Board*
- Fish and Game*
- State Legislative Representatives
- CA Congressional Delegation
- National Environmental Organizations
- Kern County Board Of Supervisors
- Local Labor, Trade Organizations
- Local Community Leaders
- Local Environmental Organizations
- Area Business Associations
- Area Homeowners’ Associations

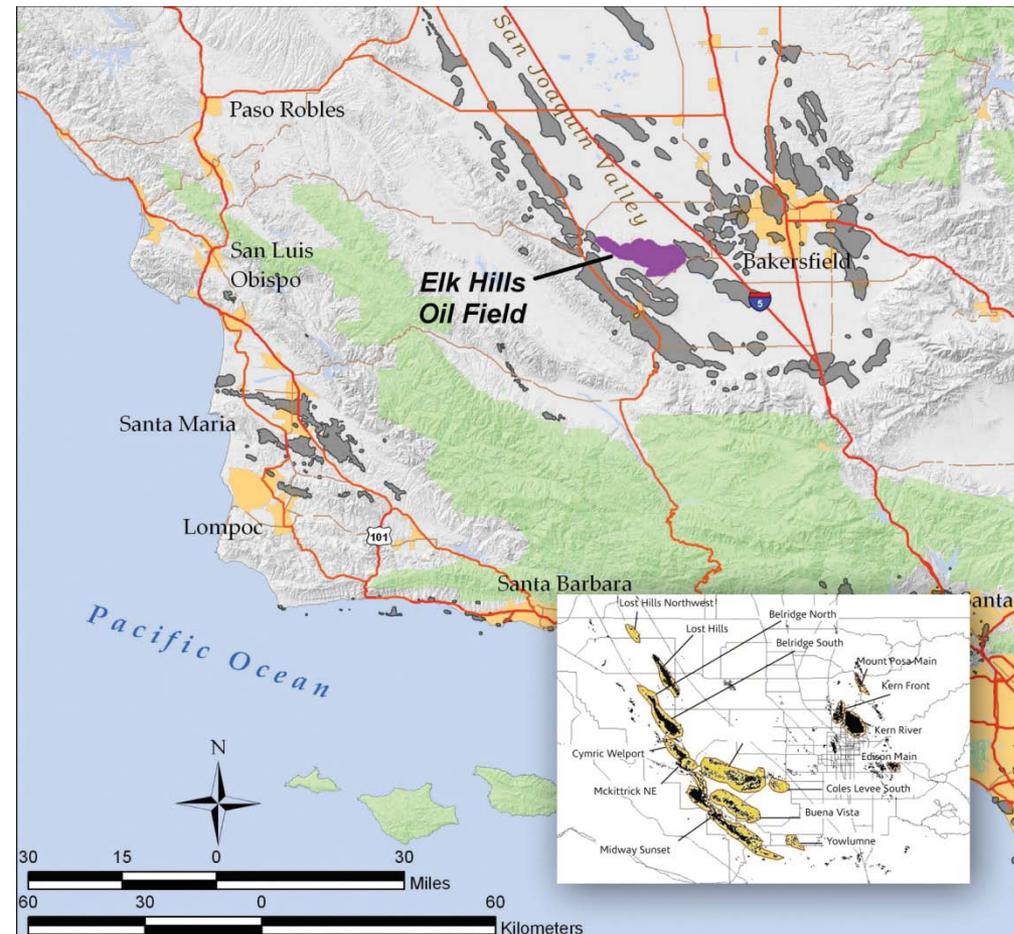
*agencies with HECA permitting input

... permitting a new plant site, CO₂ pipeline and CO₂ sequestration site

HECA CO₂ Sink: Elk Hills Field



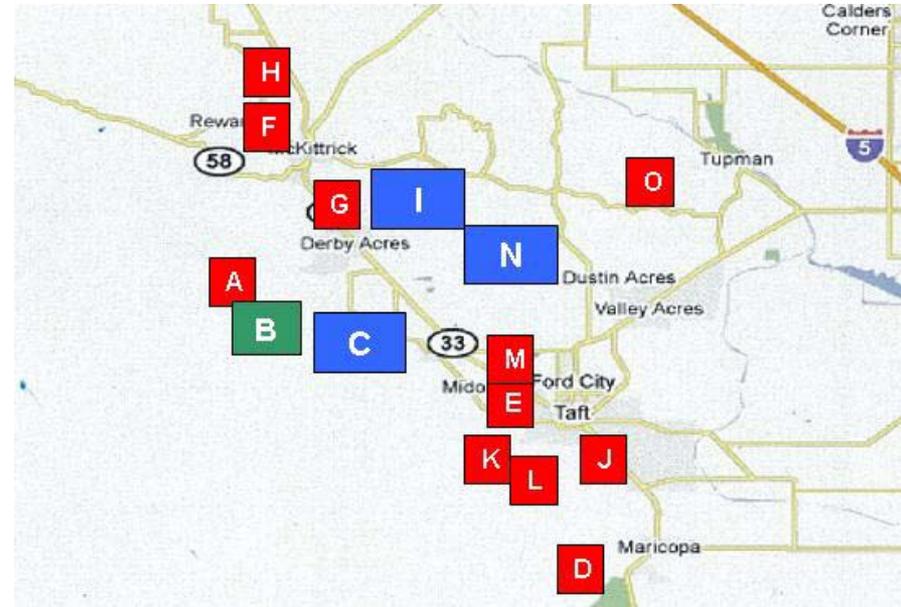
- Proximity to sink was important siting consideration
- Elk Hills Field is well characterized
 - Part of Strategic Petroleum Reserve 1912-1998; owned/ operated since by Occidental of Elk Hills Inc. (Oxy)
 - 7 potential storage horizons, each with shale seals
 - Stevens formation alone has 300+MT CO₂ storage capacity
- EOR and Sequestration is very well understood
 - 40 years of industry experience with CO₂ EOR
 - Oxy is acknowledged leader in EOR operations
 - CO₂ EOR pilot tests successful



HECA is a catalyst for Low Carbon Power Hub network in Central California



- HECA enables a CCS sink with ~3 GW of natural gas generation in close proximity
 - Development of a network to enable dispatchable CCS power as technology comes down cost curve
- HECA infrastructure is a platform for CCS technology development and deployment
 - Utilizing other feedstocks (gas, biomass)
 - Usage of large scale hydrogen fuel cells to power



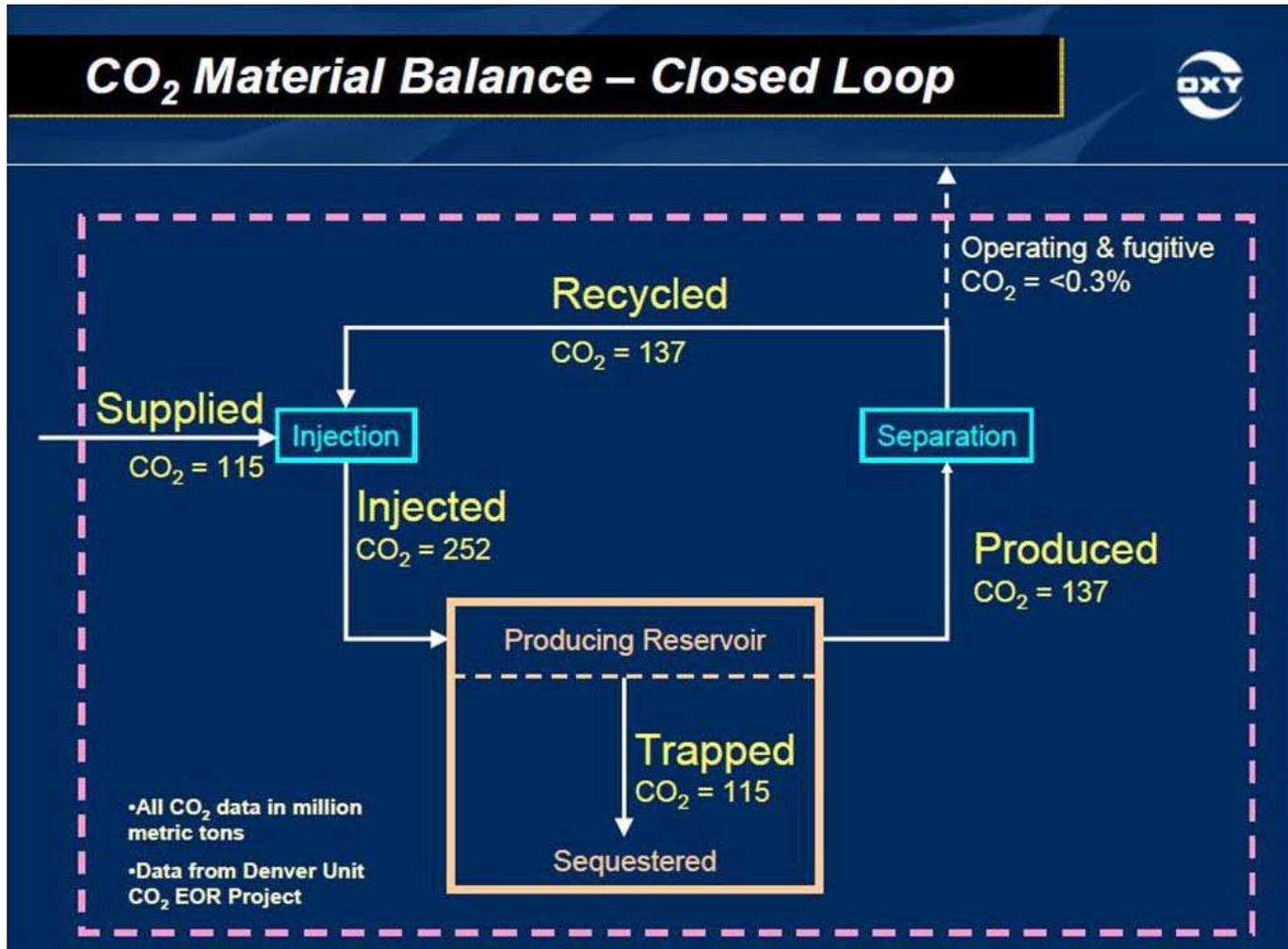
ID	PLANT NAME	MW
A	MIDSUN COGEN	26
B	MIDWAY-SUNSET COGEN	234
C	SUNRISE	572
D	CHALK CLIFF COGEN	47
E	TEXACO N MIDWAY COGEN	11
F	CHEVRON CYMRIC COGEN	26
G	MCKITTRICK COGEN	47
H	S BELRIDGE COGEN	60
I	LA PALOMA	1,200
J	CHEVRON - TAFT COGEN	13
K	MONARCH - BERRY COGEN	18
L	BERRY COGEN	37
M	MIDSET COGEN	39
N	ELK HILLS	567
O	NAVY 35R, OCCIDENTAL COGEN	47

CO₂ Sequestration in Oil and Gas Formations



- Supports Project Schedule
 - Draws upon extensive existing characterization information
 - Well-functioning, existing regulatory framework
- Oil and Gas formations are proven structural traps
 - Geology has shown ability to store oil and gas for millions of years
 - Provide 4-way closure
 - No lateral migration
- Pore-space ownership, trespass, etc., are typically NOT issues

CO₂ EOR with Sequestration is a Closed Loop System



- 30-50% of the CO₂ injected is sequestered in any one “pass”
- Virtually all the CO₂ is eventually sequestered in the formation
- Unaccounted CO₂ does not leave the system
- CO₂ recycling and accounting is an economic imperative!

Courtesy: OXY

Federal Regulatory Activity



- **EPA Proposed Class VI Rule**
 - Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells
 - Recognition of importance of CCS as technology to mitigate climate change
 - Attempted to adopt framework that would encourage deployment of CCS in a manner protective of underground sources of drinking water (USDWs)
- **EPA Proposed GHG Reporting Rule for CO₂**
 - Subpart RR: Mandatory Reporting of GHGs for Injection and GS of CO₂
 - Application: all facilities that inject CO₂ for purpose of GS or for EOR/EGR
- **Long-term Stewardship / Liability**
 - Bingaman bill
 - Casey-Enzi bill
 - CURC recommendation
 - Kerry-Lieberman discussion draft

EPA Regulatory Activity: Multi-Stakeholder Group



- Organizations representing a broad array of interests
- Organizations discussing interests and issues in an effort to reach consensus or at least narrow differences
- Organizations making joint recommendations
- MSD Participants:
 - Industry associations (American Petroleum Institute (API), Edison Electric Institute (EEl), Carbon Sequestration Council, Texas CCS Association)
 - eNGOs (Clean Air Task Force, Environmental Defense Fund, Natural Resources Defense Council)
 - Ground Water Protection Council, Interstate Oil and Gas Compact Commission, U.S. State UIC program and oil and gas agency officials

EPA Regulatory Activity: Multi-Stakeholder Group Consensus



- Joint written recommendations submitted to EPA in December 2009 on Class VI rulemaking
 - Key agreement reached regarding regulation of enhanced recovery of oil or natural gas (EOR/EGR) and geologic sequestration (GS) of CO₂ for purposes of the Safe Drinking Water Act
 - Recommended further clarification in rules regarding the applicability of Class II requirements where GS of CO₂ occurs in connection with EOR/EGR activities
- “bright line” or “business as usual” definition:

“For enhanced recovery of oil or natural gas where geologic sequestration is occurring during or in connection with enhanced recovery of oil or natural gas *provided* (i) there is reasonable expectation of more than insignificant future production volumes or rates as a result of carbon dioxide injection and (ii) operating pressures are no higher than reasonably necessary to produce such volumes or rates”

Multi-Stakeholder Group: Seeking Regulatory Clarity for Early Movers



- **Why was this important?**
 - Provides more clarity and certainty for early mover projects
 - Assures reasonable requirements for GS in oil and gas reservoirs, which are better known and understood than saline reservoirs
 - Sets up UIC framework so that GS in oil and gas reservoirs would proceed under Class II and GS in saline reservoirs would proceed under Class VI
- **What remained unanswered by MSD recommendations?**
 - No consensus regarding what was required to demonstrate storage
 - What is appropriate Monitoring, Verification and Reporting for GS in oil and gas reservoirs?

EPA Regulatory Activity



- **EPA Proposed GHG Reporting Rule for CO₂**
- Subpart RR: Mandatory Reporting of GHGs for Injection and GS of CO₂ (April 12, 2010, 75 FR 18576-18606)
- Application: all facilities that inject CO₂ for purpose of GS or for EOR/EGR
- Requirements:
 - Develop and implement EPA-approved site-specific monitoring, reporting and verification (MRV) plan
 - Report amount of CO₂ geologically sequestered using mass balance approach
 - EOR/EGR operators could choose to “opt-in” and satisfy additional requirements for GS
 - First reports due by March 31, 2012 for injection in 2011

State Regulatory Activity: HECA Permitting Basis



Pursuant to the Warren-Alquist Act provisions in the California Public Resources Code (section 25000, et seq.), the HECA project can be fully authorized through the facility siting application process (Siting Process) currently pending before the CEC

- CEC staff conducts an independent analysis of the AFC
- Prepares an independent assessment of a project's potential environmental impacts, feasible mitigation measures, and alternatives
- CEC staff consults with interested local, regional, state, and federal agencies, and Native American tribes.
- Through the Siting Process, CEC must consider all potentially significant environmental impacts of the HECA project and associated facilities.

NEPA review for DOE cost-share being coordinated with CEQA review

- CEC is cooperating agency for NEPA process

HECA Permitting: Legal Basis



- Because CO₂ sequestration is a necessary component of the HECA project, CEC's review must include consideration of potential impacts from the associated Oxy CO₂ EOR project.
 - For the OXY CO₂ EOR Project, CEC staff will consult with all state and local agencies that are responsible agencies or trustee agencies under CEQA.
 - CEC can specify as conditions for certification of the HECA project additional project design features and mitigation measures that should be implemented by other agencies responsible for the permitting of the Oxy CO₂ EOR project.
- As a responsible agency under the Siting Process, DOGGR is fully authorized to include in any Class II UIC permits issued to Oxy in relation to the HECA project all appropriate mitigation measures identified by the CEC, including the MRV and closure requirements.
 - Such actions are consistent with DOGGR's statutory mandate to increase oil and gas resources in the state.

HECA Permitting- Legal Basis



- CEQA empowers DOGGR to impose additional mitigation measures and/or project design elements to measure and verify the sequestration of CO₂ injected for EOR and to mitigate potential impacts through DOGGR's discretionary permitting authority.
- Public Resources Code establishes a dual mandate for DOGGR:
 - (1) to increase the recovery of oil and gas resources within the state; See Cal. Pub. Res. Code § 3106(b) (authorizing DOGGR "to permit the owners or operators of the wells to utilize all methods and practices known to the oil industry for the purpose of increasing the ultimate recovery of underground hydrocarbons.... including, but not limited to, the injection of air, gas, water, or other fluids into the productive strata..."); and
 - (2) to do so in a manner that is consistent with its environmental protection mandate "so as to prevent, as far as possible, damage to life, health, property, and natural resources...." Cal. Pub. Res. Code § 3106(a)

HECA Legal Basis: Summary



- UIC Class II permitting by DOGGR, *as supplemented by additional CEQA mitigation measures*, represents the most sensible regulatory framework
- Existing regulatory requirements for Class II UIC wells adequately assure the integrity and permanence of CO₂ injected into target formations
- Decades of experience using Class II to permit projects injecting CO₂ for purposes of EOR, which is widely recognized as the best platform for the early demonstration of commercial-scale sequestration
- US EPA guidance further supports DOGGR's authority for regulation of these activities
 - CO₂ EOR historically been permitted under Class II
 - EPA has clearly stated that CO₂ injection for EOR will continue to be permitted under Class II in preamble to Class VI rulemaking

Summary



- California's GHG targets clearly establish the need for CCS as part of a balanced portfolio of technologies
- Regulatory certainty for early mover CCS projects are essential to timely technology deployment and enabling private / public investment
- CO₂ EOR and sequestration applications are essential to early commercial demonstration of CCS technologies, since they do not face the technical, regulatory or legal challenges associated with saline formations
- The most effective pathway for permitting CO₂ EOR and sequestration is the existing UIC Class II program, suitably augmented by appropriate mitigation measures



www.hydrogenenergycalifornia.com