



# Hydrogen Energy California a low carbon power project

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HECA LLC

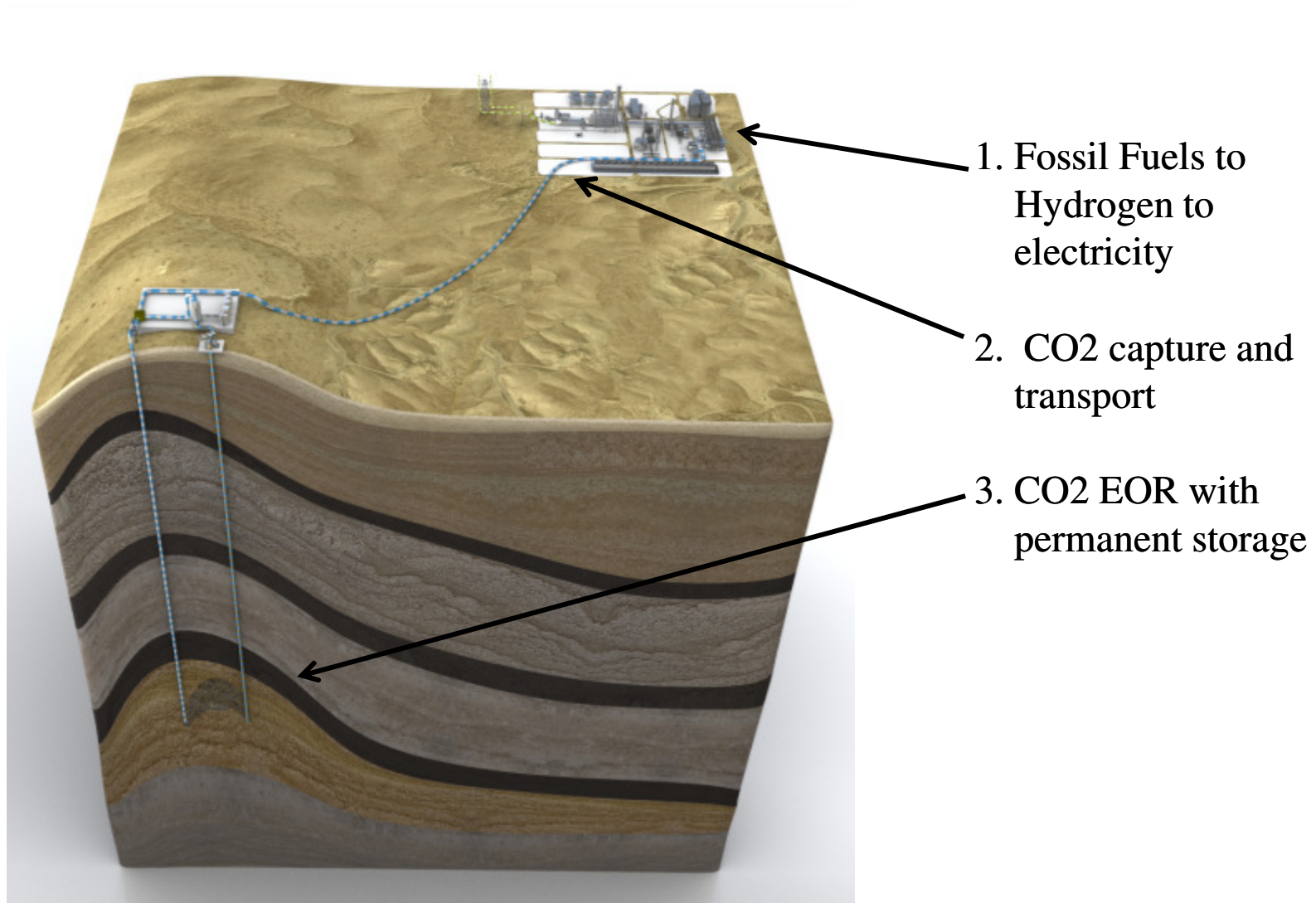
Summer 2010

# *Hydrogen Energy California LLC*



- Working to permit and to build a clean energy power plant that supplies low carbon electricity to 150,000 homes
- Enabling California to meet its regulatory target to reduce Green House Gasses from the power sector and to build new in-state power
- Facility transforms fossil fuel feedstocks into Hydrogen that is used to produce baseload clean electricity
- Additionally by capturing and injecting underground 90% of the plants CO2 HECA will be enabling Enhanced Oil Recovery in the Elk Hills

# Low Carbon power and Enhanced Oil Recovery



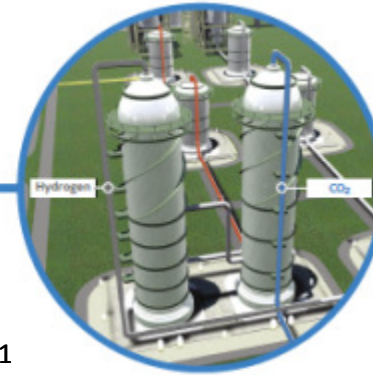
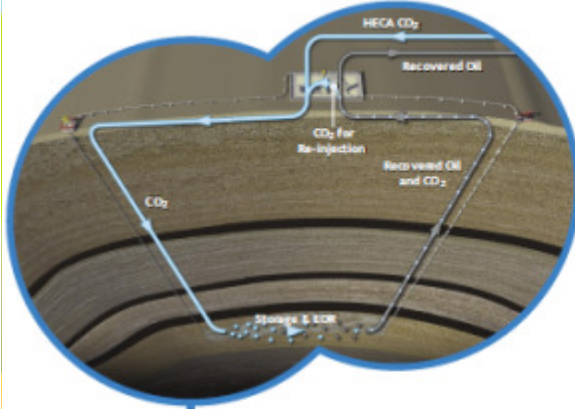
1. Fossil Fuels to Hydrogen to electricity

2. CO2 capture and transport

3. CO2 EOR with permanent storage

## Step 2

The closed-loop process enables the re-introduction of carbon back underground: CO<sub>2</sub> is captured at the HECA plant and delivered into a depleted oil reservoir where it is used for Enhanced Oil Recovery (EOR) and ultimately trapped and stored

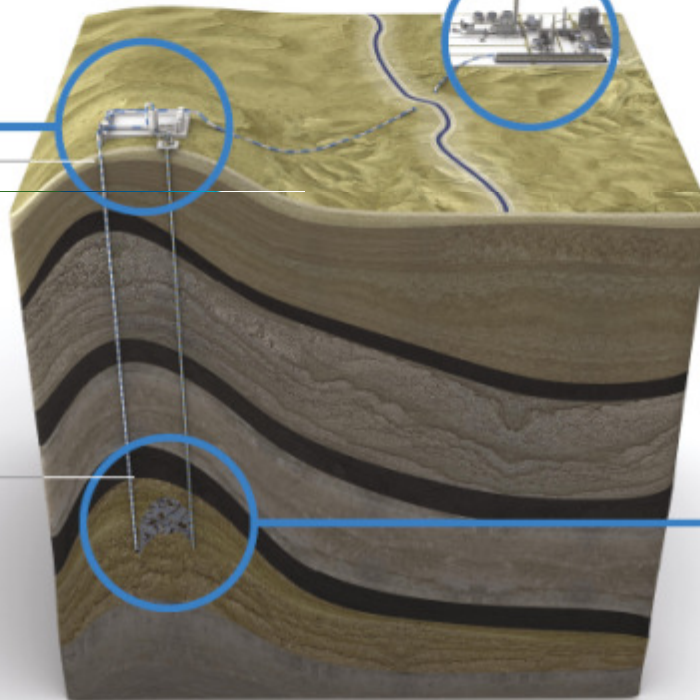


Step 1

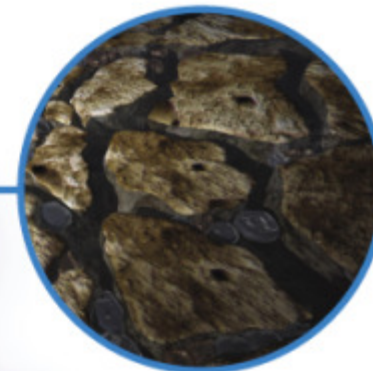
**Low-carbon and low emission power:** petcoke and coal are gasified then separated into hydrogen and CO<sub>2</sub>. The hydrogen is directly used to generate electricity in a gas turbine and the CO<sub>2</sub> is transported to a depleted oil field for use in enhanced oil recovery operations

Step 3

The CO<sub>2</sub> is injected to a depth of 6,000 ft which is the equivalent depth of four empire state buildings stacked on top of each other.



Step 4

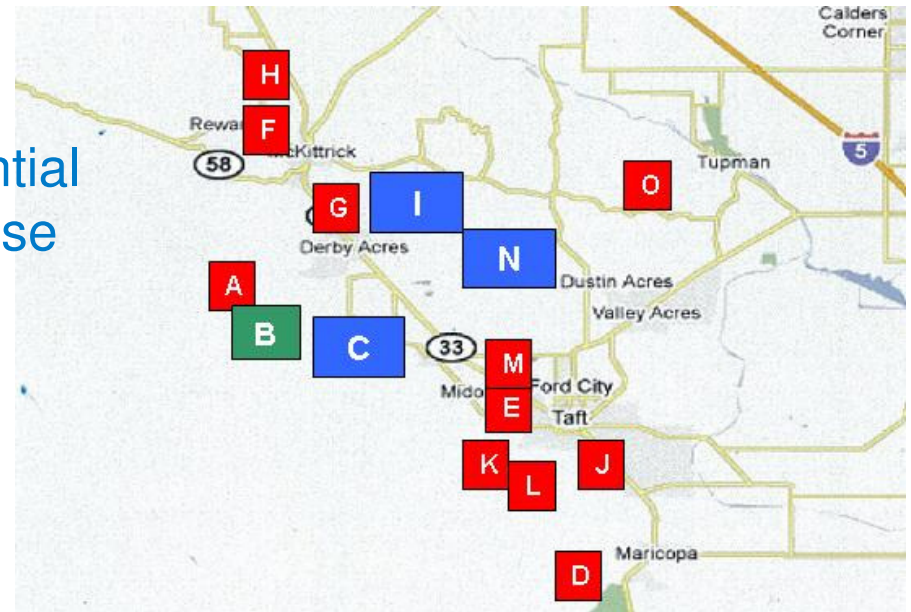


**Permanent CO<sub>2</sub> storage:** the CO<sub>2</sub> becomes locked in the pore spaces where oil had been trapped for millions of years.

# Large Potential for CCS in California



- HECA enables a CCS sink with potential 3 GW of natural gas generation in close proximity
- HECA infrastructure is a platform for CCS technology development and deployment
  - Utilizing other feedstocks (gas, biomass)
  - Usage of large scale hydrogen fuel cells



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

## *Local Economic Benefits*



- First in world near zero carbon plan with EOR in Kern County
- New jobs: 1,500 during construction & 100 during operation
- New tax revenues for KC
- CO2 Storage Extends life of Elk Hills Oil economy
- Preserves fresh water for agriculture by using 100% brackish water
- Limits land use: 470 acres process area surrounded by 500 acre farmland buffer
- Community benefits package: projects to improve quality of life

# *Environmental Benefits*



- CCS removes 2million T of GHGs from power generation
  - Equivalent to taking >400,000 cars off the road
- Comply with SJV Air Board
  - Meet or exceed Best Available Control Technology AQ standards
  - Purchased Emission Reduction Credits
  - Investing >\$700K into Valley air improvement projects
- Eliminates traditional emissions related to fossil fuel use
- Discharges zero waste water and storm water
- Enables Buena Vista Water Storage District Brackish water remediation plan

# *Community Benefits*



- Discussions underway for a large scale Community Benefits package that would accompany project development:
- Continued annual community donations to local programs
  - Eg: Local infrastructure investments, environmental offset projects

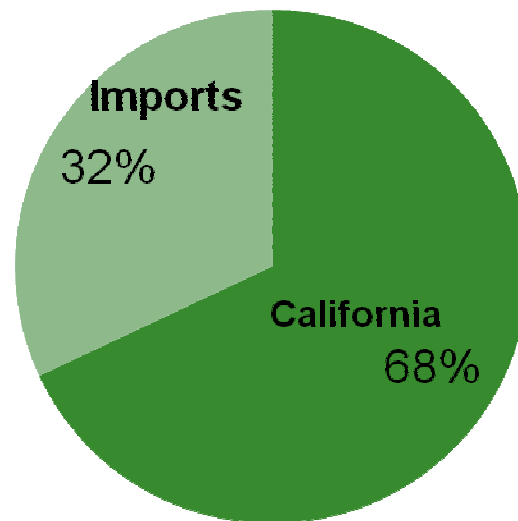
# State wide benefits



1. California imports 32% of its electricity: more than any other state

- **HECA project could bring jobs, investment and power reliability back to California**

## California Electricity Generation



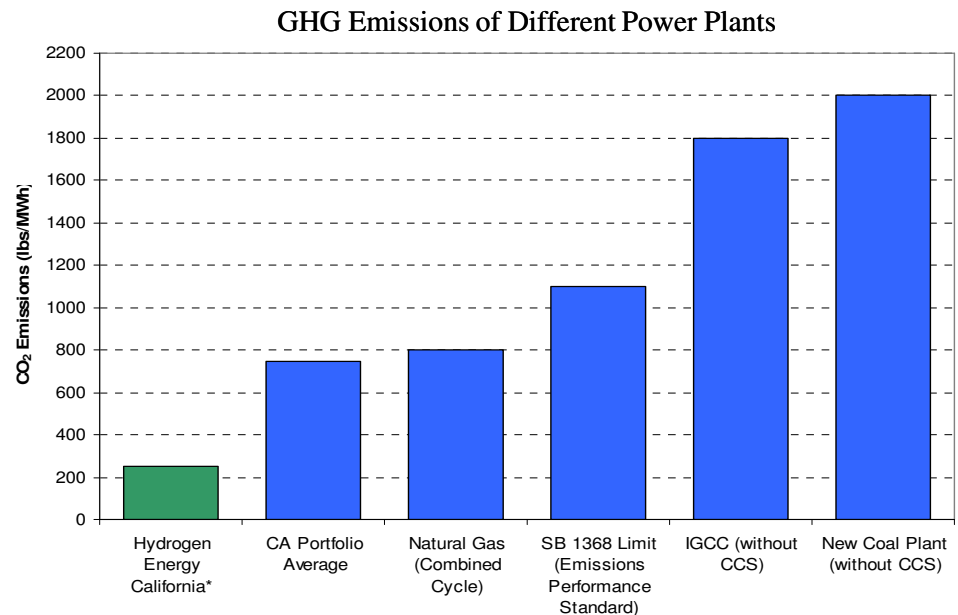
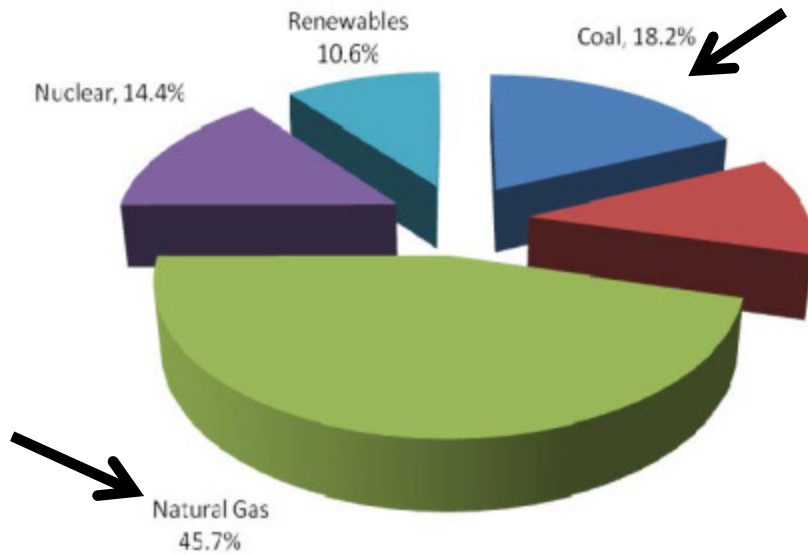
Source: CEC 2009

# State wide benefits



2. CA power mix contains 18.2% traditional Coal (mostly imported) and relies largely on natural gas

- **HECA reduces need for traditional coal and cuts GHG & most criteria emissions by more than 5x**
- **HECA provides fuel diversity from reliance on Natural Gas**



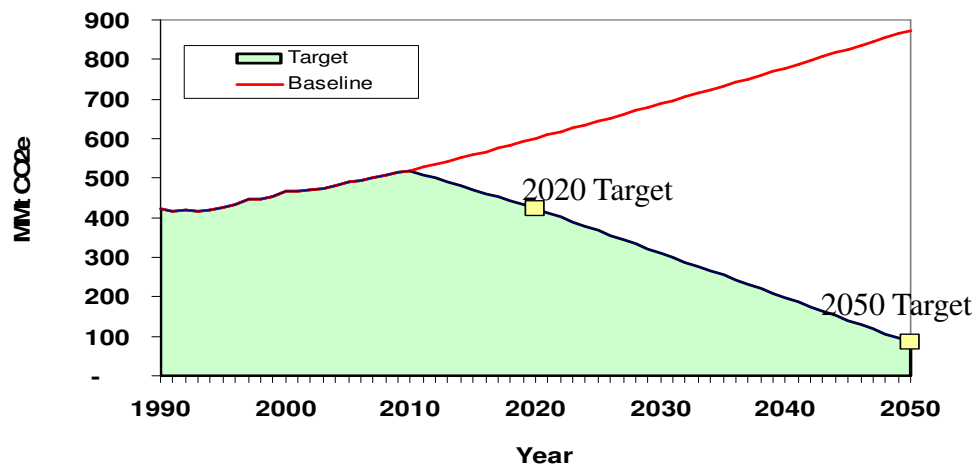
# State wide benefits



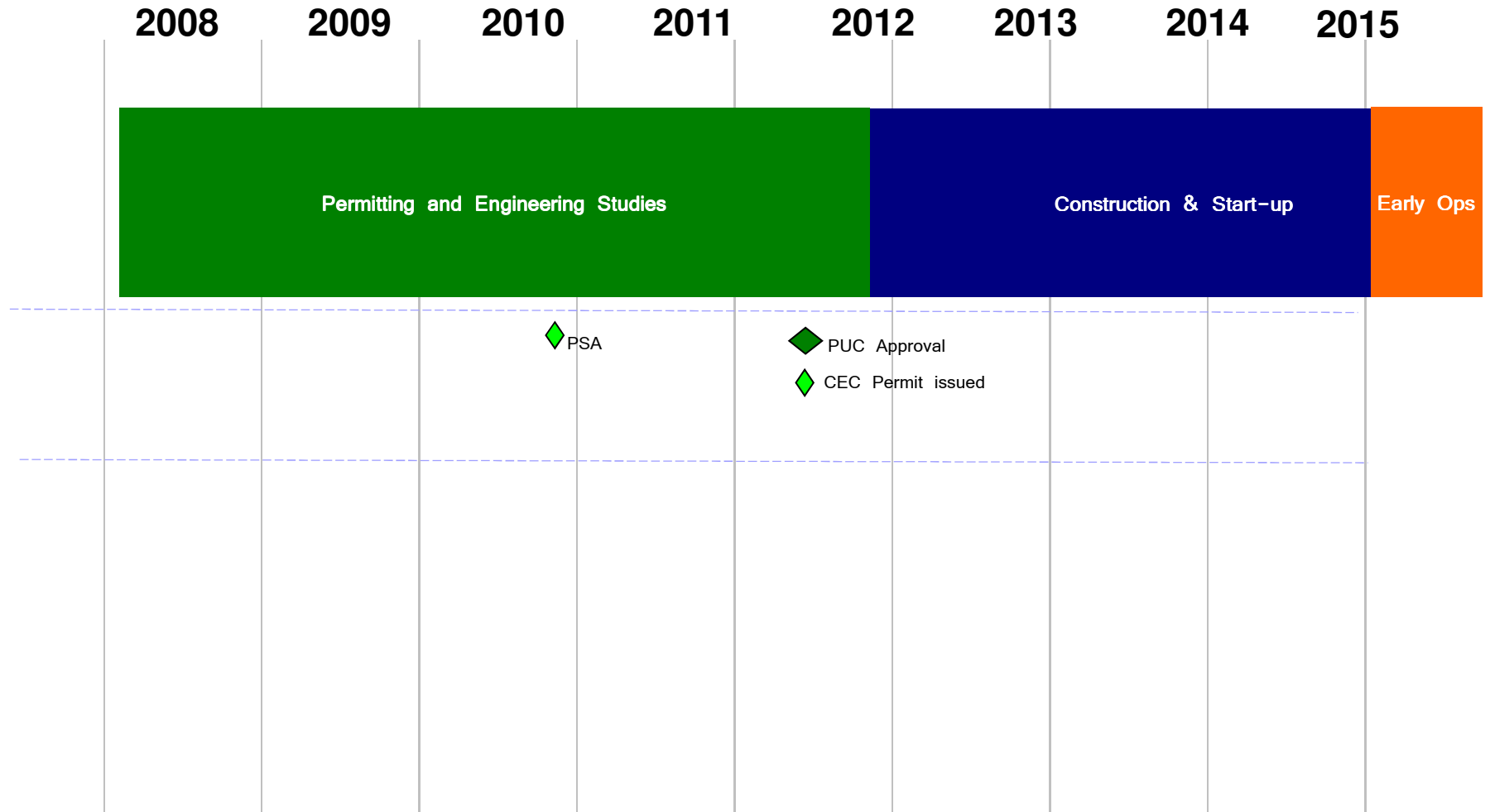
3. CA set target to reduce GHG to 1990 levels by 2020

- **HECA project would help state reach this goal and enable Kern County to be pioneers in technology needed to build power plants and meet regulations**

California Regulatory Target for GHG reductions



# Project Schedule



# *Conclusion*



- World Class technology & investment in Kern County
- Extensive Economic & Environmental Benefits
  - Locally: New jobs, taxes, oil sector growth, water and air impacts minimized
  - State: Reduce imports, increase investment, improve energy mix, meet GHG regulatory targets

Thank you.