



WESTCARB Annual Business Meeting

CES Oxy-Combustion Technology Review

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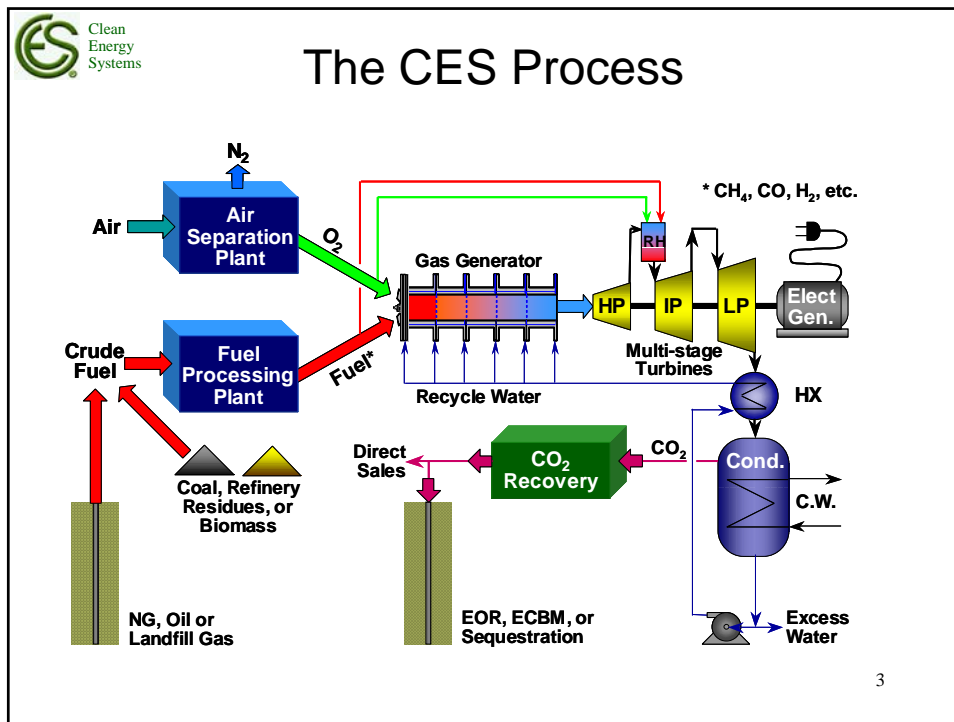
Anchorage, AK
October 2, 2008



Outline

- Introduction: CES Oxy-Combustion Technology & Power Cycle
- Kimberlina 20 & 200 MW_t Test Facility
- ZEPP-1 WESTCARB Project
- Summary


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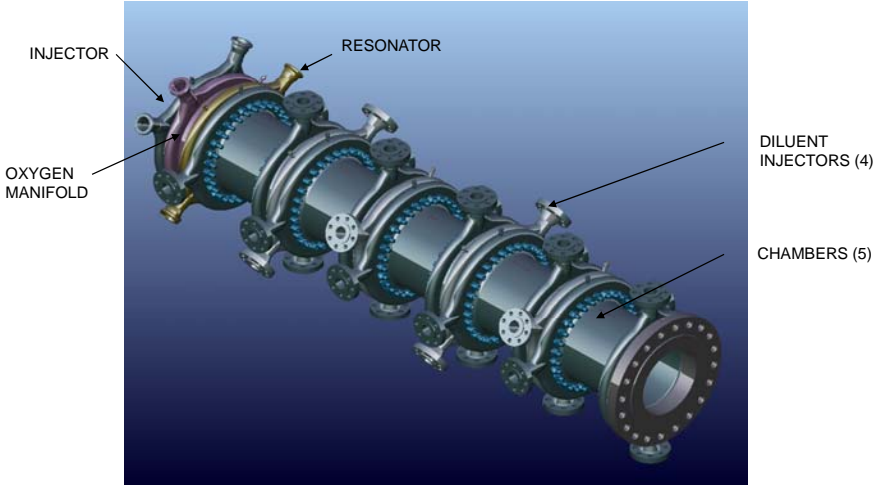


**Kimberlina Test Facility – 20 MW_t
CES Product Development Status**


- Online Feb 2005
- 2,000 hrs & 400 starts
- Nat Gas, simulated syngas & liquid fuels with sulfur
- Funding from California Energy Commission, US DOE, Air Liquide, Air Products & Investors

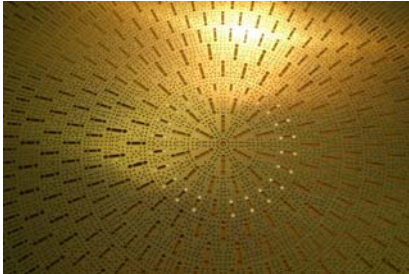

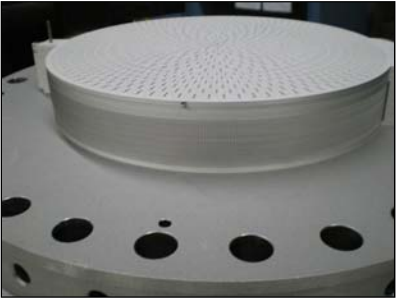
The complex block contains five photographs showing various components of the Kimberlina Test Facility, including piping, tanks, and industrial structures.

 **200 MW_t GAS GENERATOR**
Currently Undergoing Testing at Kimberlina



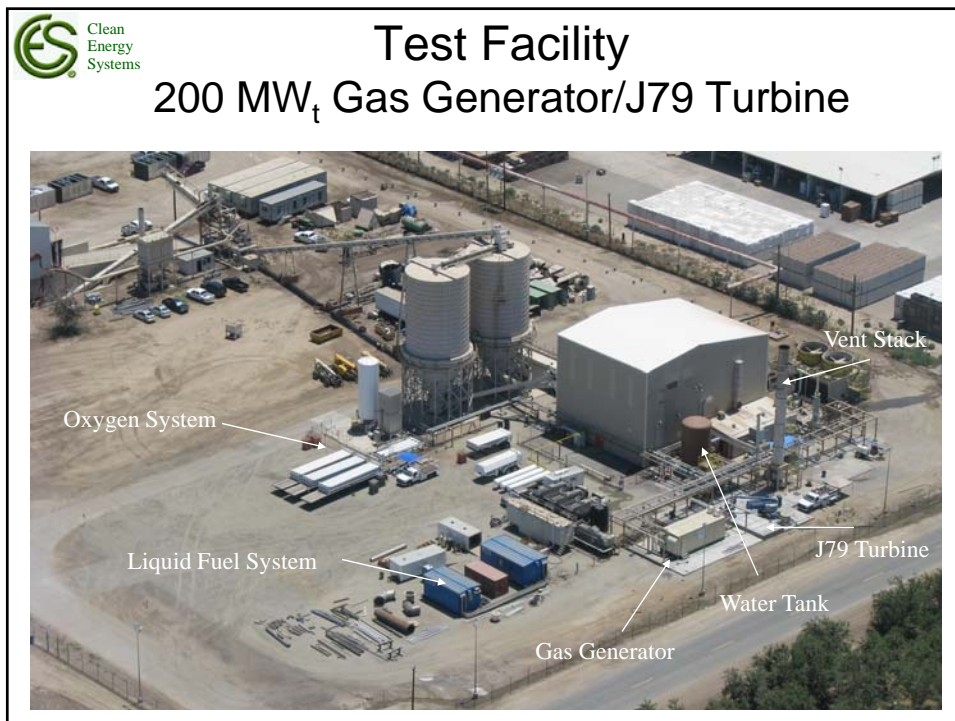
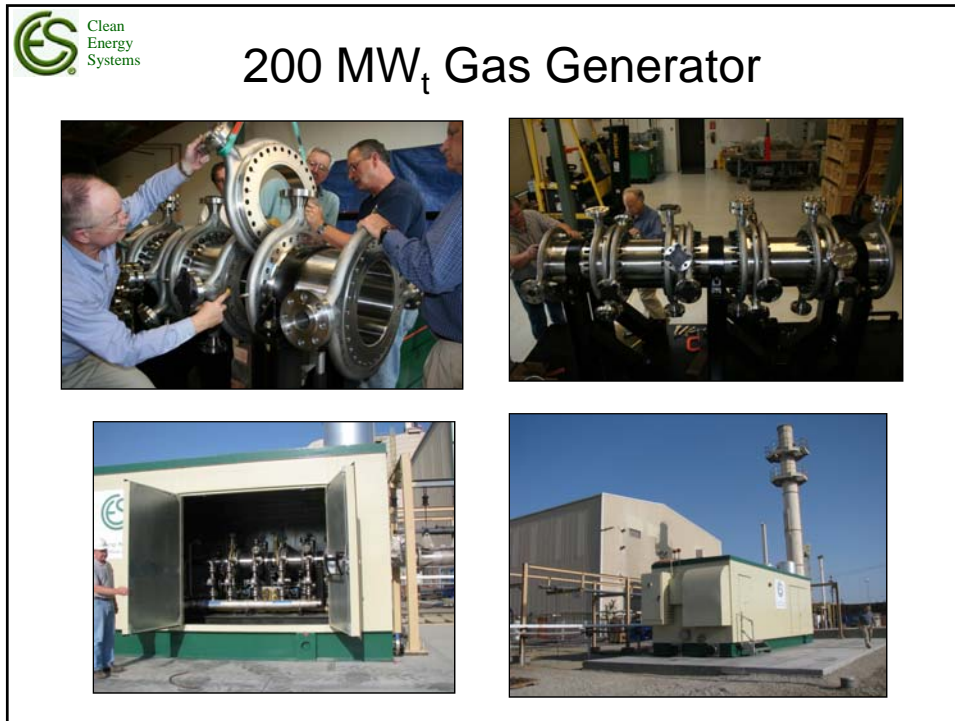
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 **200 MW_t Gas Generator**



Platelet technology used for injector design – promotes intimate mixing and cooling

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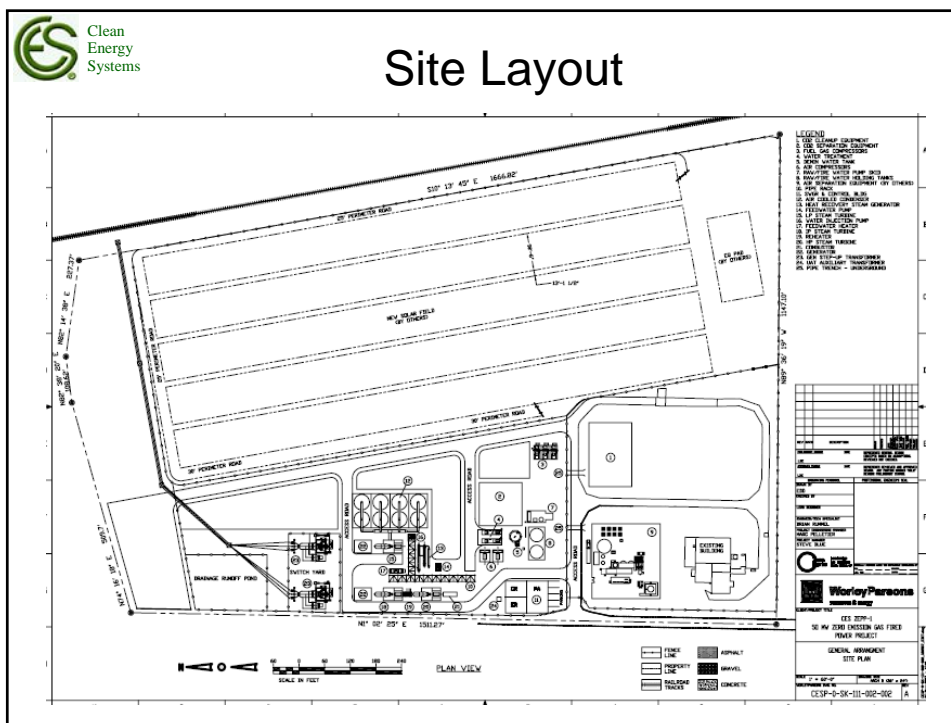


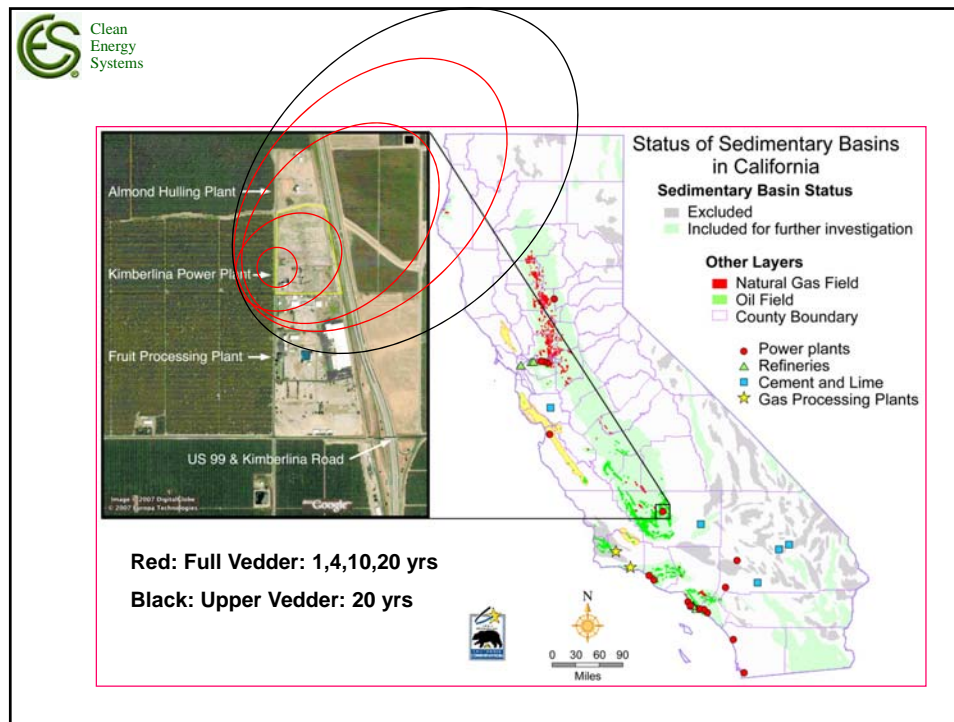


Proposed ZEPP Kimberlina

- ~50 MW ZEPP using direct cycle natural gas and/or MSAR™ (Low cost bitumen fuel)
- SoCal Gas, oil/gas producers, and electric utility are engaged
- Will supply 1 million tons CO₂ to WESTCARB and then CO₂ for EOR (~800 tpd on NG)
- Project development underway
- Low cost fuels (MSAR™) and renewable energy opportunities may further improve project economics
- A future upgrade of plant with a higher-temperature turbine (SGT-900) may be possible
- Power sale agreement negotiations underway

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Permits

- Land Use (Power Plant)
 - ✓ CEC if 50 MW or >, or driven by Funding Participation
 - CEC Determination Process for < or > 50 MW
 - AFC, 19 Months, Rigorous, Front Loaded
 - Power Plant and Sequestration – Combined
 - OR
 - ✓ Kern County CEQA if < 50 MW
 - EIR, 12 Months, Higher Political Sensitivity?
 - County Accept “Programmatic” Sequestration (Full Sequestration Review Later)
- ✓ Either Permit Path
 - Biology Survey: Done, No T&E Species on Site
 - Air Permits: Achievable with ZERO Emissions
 - Water: Dry Cooling, No Evaporative Use

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Permits

- CO₂ Injection (WESTCARB)
 - ✓ EPA UIC for Injection
 - Class V Now
 - Draft Class VI Released
 - ✓ Kern County CEQA for Land Use
 - Negative Declaration (ND) if Minor Impact
 - EIR if Deemed Significant Impact
 - Test/Final Wells Permitted Same Time
 - ✓ DOE NEPA for Funding
 - Have Received Advice from DOE

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Other Requirements

- Natural Gas: SoCal Line, 3 Miles, Public ROW
- Electric Transmission Connection: PG&E/ISO System 3 Miles
 - ✓ Private ROWS Required
 - ✓ ISO Temporary Suspension of New Applications
- Public / Political Outreach
 - ✓ Favorable Local Press Coverage
 - ✓ Receptive County Reaction
 - ✓ Synergy from Proposed BP/Oxy project?

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Summary

1. Oxy-Turbine technology has been demonstrated at a 20 MW_t scale on multiple fuels since 2004
2. Testing is underway on a 200 MW_t Gas Generator and modified gas turbine operating on steam/CO₂
3. First commercial projects are under development in California and Europe
4. Cal ZEPP-1 will provide CO₂ for WESTCARB – target online date of 2011
5. Deployment strategy is focused on scaling up over time to utility scale applications

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For more information:

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