Outline

- Introduction: CES Oxy-Combustion Technology & Power Cycle
- Kimberlina 20 & 200 MW\textsubscript{t} Test Facility
- ZEPP-1 WESTCARB Project
- Summary
The CES Process

Kimberlina Test Facility – 20 MWt
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
Clean Energy Systems

200 MWt GAS GENERATOR
Currently Undergoing Testing at Kimberlina

Platelet technology used for injector design – promotes intimate mixing and cooling
200 MW\textsubscript{t} Gas Generator

Test Facility
200 MW\textsubscript{t} Gas Generator/J79 Turbine
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
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
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

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?
Summary

1. Oxy-Turbine technology has been demonstrated at a 20 MWt scale on multiple fuels since 2004
2. Testing is underway on a 200 MWt 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

For more information:

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