Clean Energy Systems, Inc.
Power Without Pollution™

Clean Energy Systems, Inc.
Oxy-fuel Combustion Technology

Advanced Turbine Development for Pressurized Oxy-Combustion Commercial Scale-Up

25 October 2011

Leonard Devanna • Executive Vice-President • CES • 3035 Prospect Park Dr. Suite 150 • Rancho Cordova, CA 95670

Presentation Overview
Topics

POWER WITHOUT POLLUTION

- Company Background & Technology
- Advanced Oxy-Turbine Development
- Kimberlina Demonstration Project

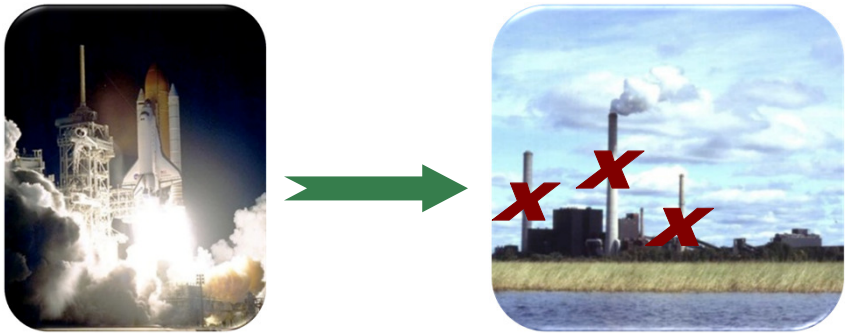
Clean Energy Systems, Inc.
Power Without Pollution™

Company Background
Vision

POWER WITHOUT POLLUTION

A new way to make power without pollution.

We use aerospace technology to change the way power is produced, and eliminate atmospheric emissions.

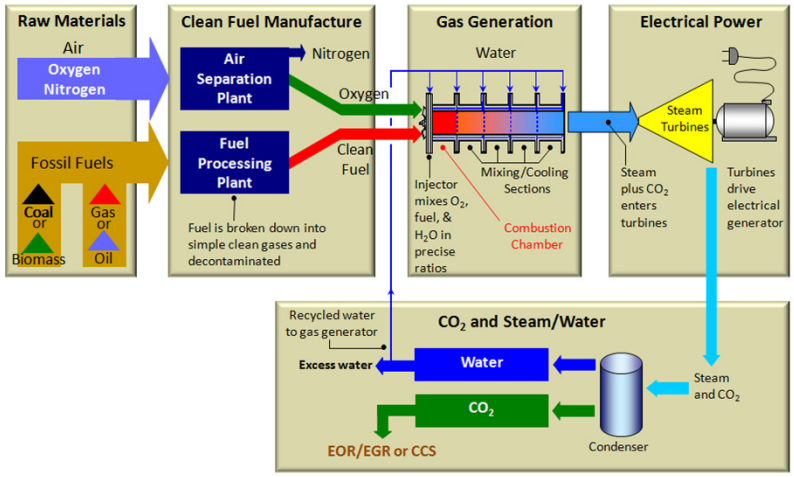


Clean Energy Systems, Inc.
Power Without Pollution™

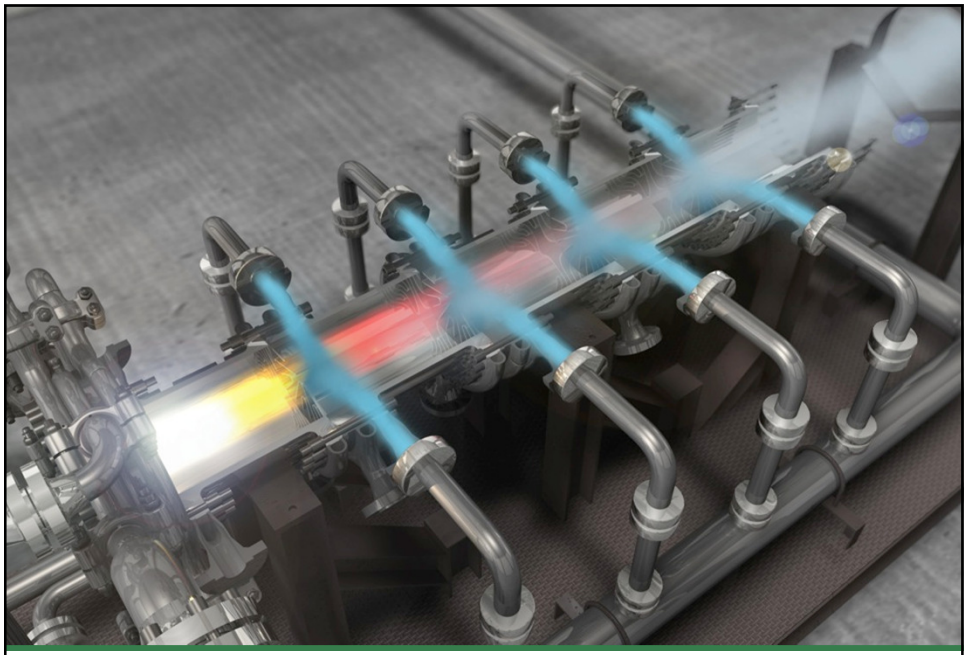
2

CES technology – process and plant

POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

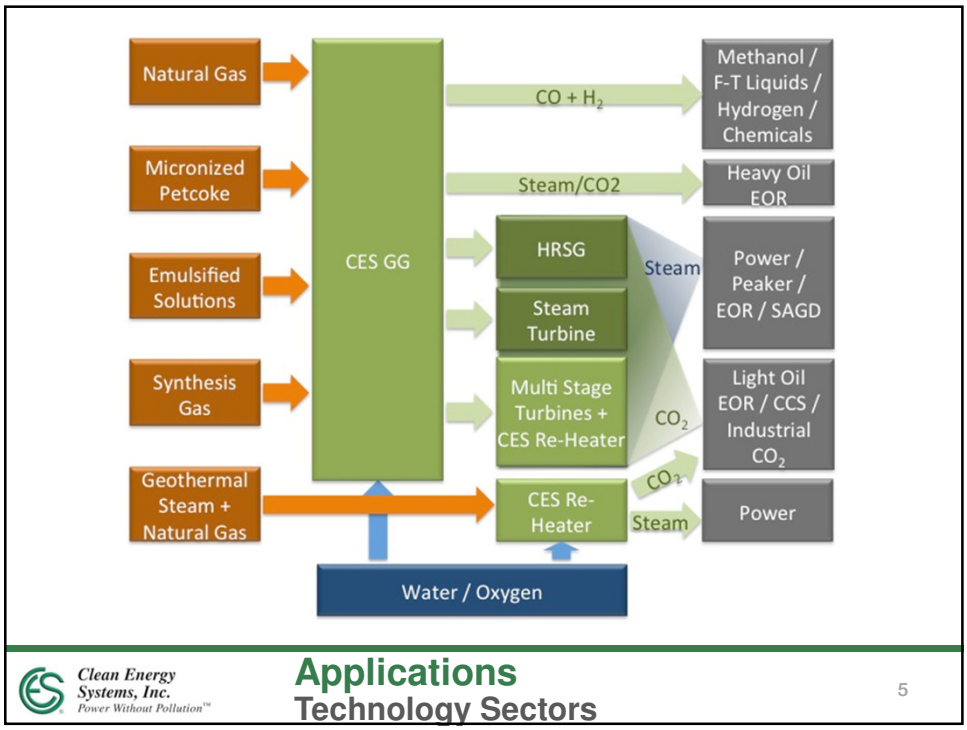


Clean Energy Systems, Inc.
Power Without Pollution™

CES Technology

Oxy-Fuel Combustion Gas Generator

4



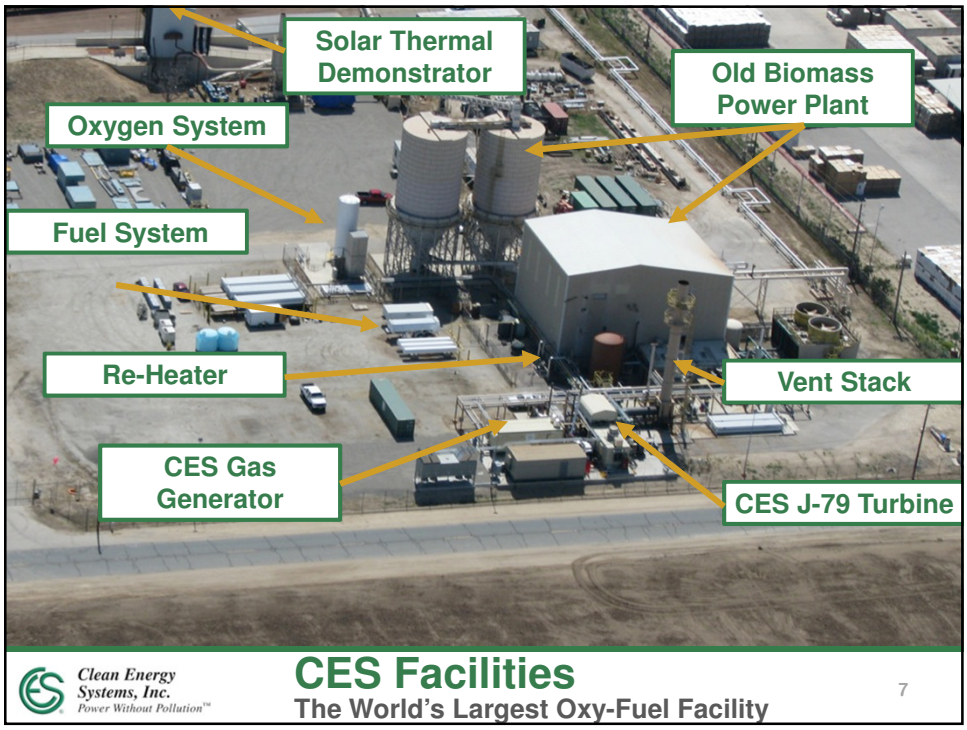
Clean Energy Systems, Inc.
Power Without Pollution™

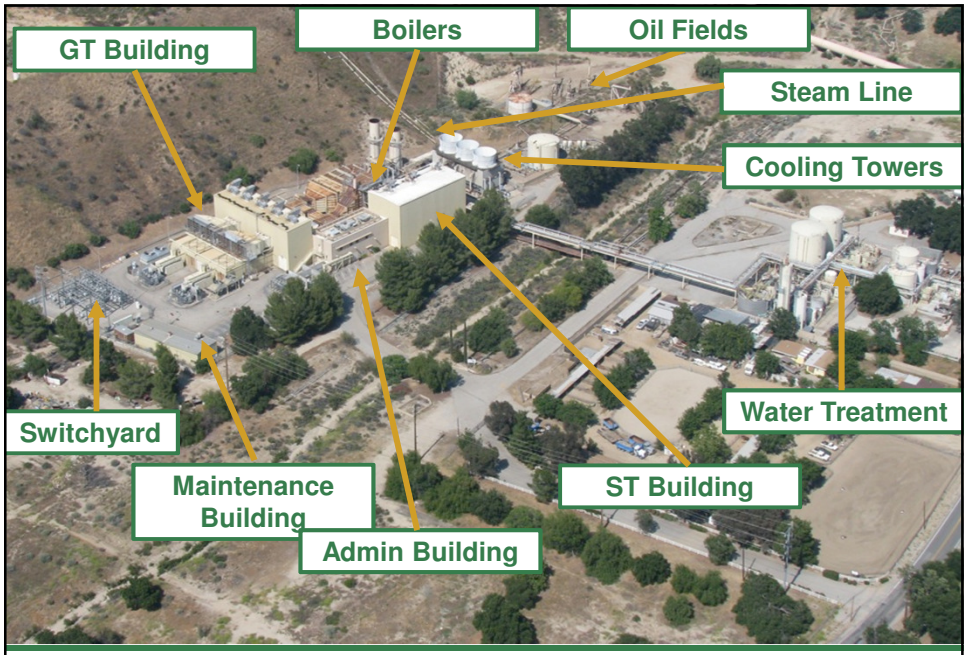
Applications

Technology Sectors

5


Clean Energy Systems, Inc.
Power Without Pollution™
CES Core Gas Generator
Compact Power – 200Wth – 100% Mobility
6


Solar Thermal Demonstrator
Old Biomass Power Plant
Oxygen System
Fuel System
Re-Heater
Vent Stack
CES Gas Generator
CES J-79 Turbine
Clean Energy Systems, Inc.
Power Without Pollution™
CES Facilities
The World's Largest Oxy-Fuel Facility
7



Clean Energy Systems, Inc. Power Without Pollution™

CES Facilities

Placerita Power Plant, Santa Clarita, CA

8

Major Global Investors/Partners

POWER WITHOUT POLLUTION

- **AES Corporation**
  - ⇨ One of the largest global power companies, with 40 GW in 30 countries (4 GW in CA)
- **Southern California Gas Co.**
  - ⇨ An energy services company with $8 billion in revenues.
- **Paxton (Subsidiary of Paramount Resources Ltd.**
  - ⇨ A Canadian oil exploration, development and production company
- **Siemens Power Generation**
  - ⇨ Not an investor, but shares a strong synergic relationship with CES in the mutual development of oxy-fueled turbines, combustors and balance-of-plant systems
- **Maersk Oil and Gas**
  - ⇨ A subsidiary of the world's largest shipping company operating in 130 countries and producing .5-1% of total global oil production
- **California Energy Commission Pier Grant**
- **Investors/Partners Support Ongoing CCUS ($$$$) Projects in Europe, Canada, Middle East and US**

Clean Energy Systems, Inc. Power Without Pollution™

9

POWER WITHOUT POLLUTION

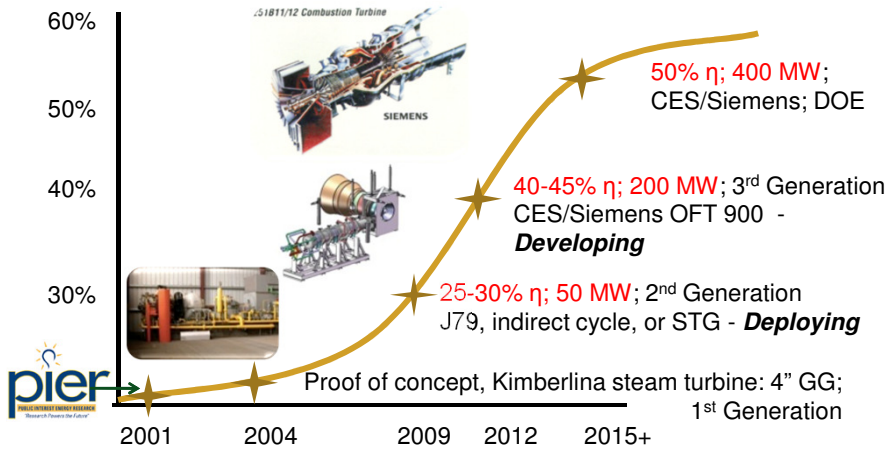
Advanced Oxy-Turbine Development

10

CES Technology

CES Power Turbines

POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

11

CES Oxy-Fuel Technology

2nd Generation Turbine: CES J79

POWER WITHOUT POLLUTION

- Originally a GE J79 turbine
- Used for **12 MW** industrial applications (LM 1500) and F4 Phantom
- Converted to a **40 MW** oxy-turbine (below)

- "No-load" testing commenced in 2010. Part-Load testing completed.
- Can be used in peaking or base load plants

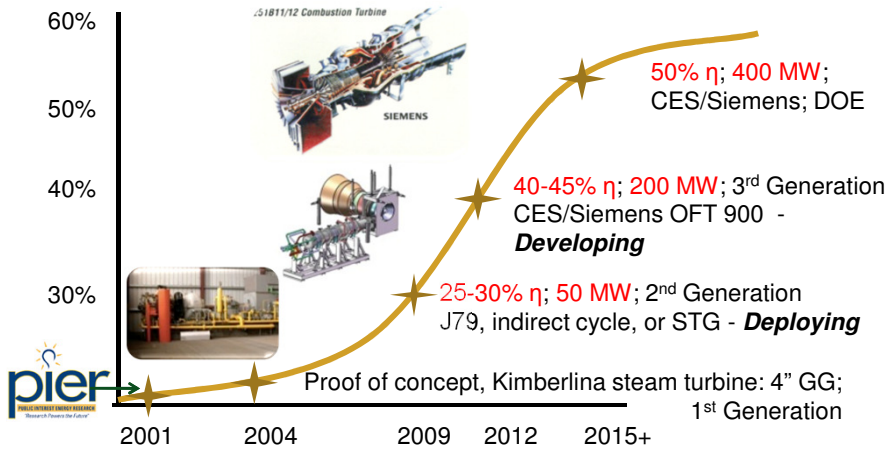
Clean Energy Systems, Inc.
Power Without Pollution™

12

CES Technology

CES Power Turbines

POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

13

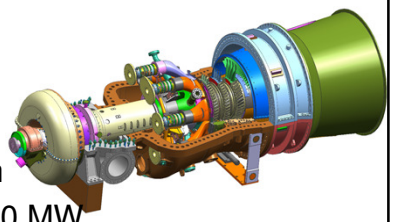
The Next Generation Turbine

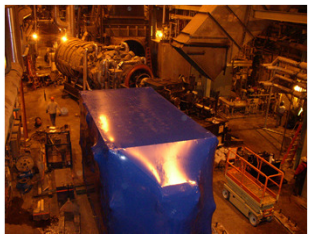
3rd Generation Turbine: OFT-900

POWER WITHOUT POLLUTION

Main Tasks:

- Finalization of OFT-900 Design
- Develop Oxy-Fuel Reheater System
- Purchase, Disassemble SGT-900: 50 MW
- Manufacture New Components
- Design OFT Test Site
- Upgrade Test Site
- Test OFT-900: 150 MW
- $43MM Program - $30MM of DOE





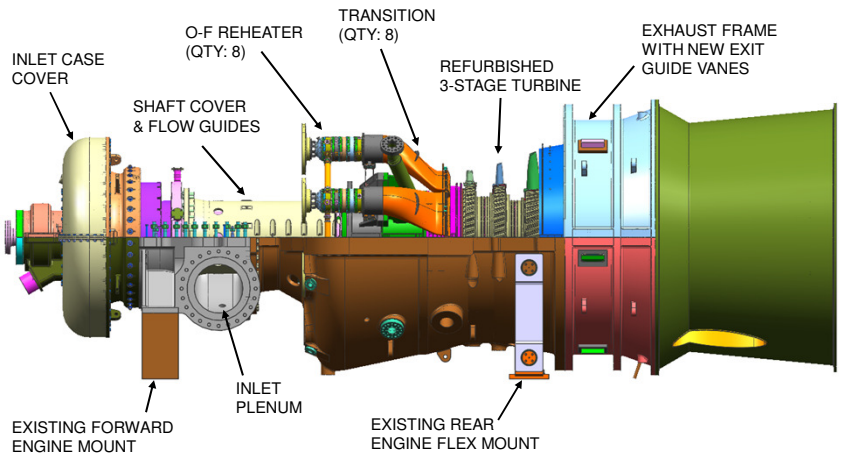
Clean Energy Systems, Inc.
Power Without Pollution™

14

Refining & Finalizing OFT Design

Conversion of 50 MW turbine to 150 MW OFT-900

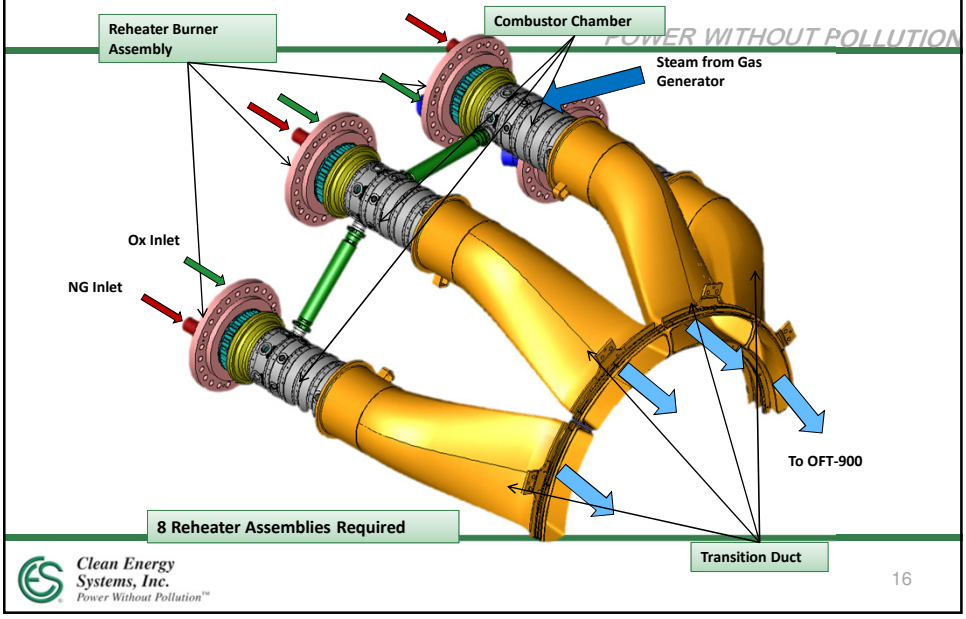
POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

15

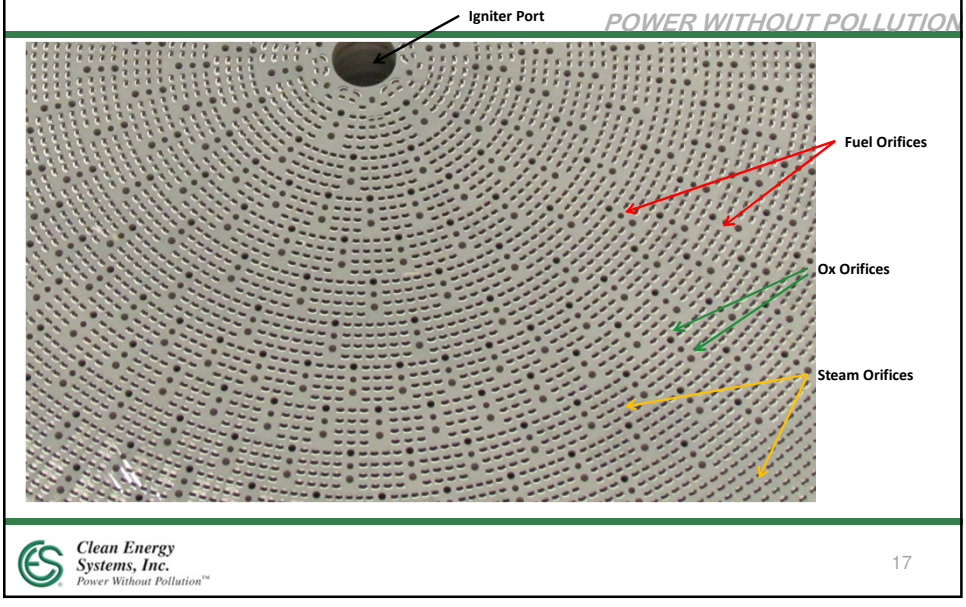
Reheater Assembly for the OFT-900



Clean Energy Systems, Inc.
Power Without Pollution™

16

Reheater Injector Face



Clean Energy Systems, Inc.
Power Without Pollution™

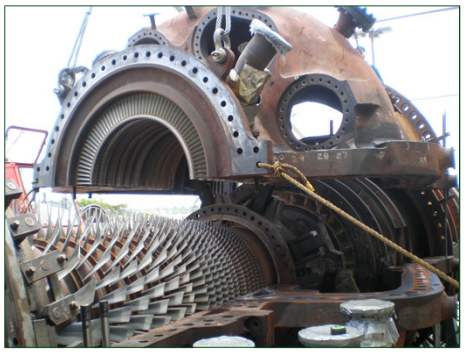
17

Purchase & Inspect SGT-900

Disassemble & Inspect

POWER WITHOUT POLLUTION

- May 27:Disassembly & Inspection activity kicked off
  - ⇨ Work area setup, activities commenced (platform, tent, etc.)
- June 21: SGT-900 top half cover removed



Clean Energy Systems, Inc.
Power Without Pollution™

18

Schedule

Conversion from SGT-900 to OFT-900

POWER WITHOUT POLLUTION

Schedule (estimated completion):

• Dismantle SGT-900	28-Jul-11
• Inspect Components	23-Aug-11
• Inspection Reports	28-Sep-11
• Refurbish Components	24-Nov-11
• New Component Mfg	6-Jan-12
• Reassemble OFT	12-Apr-12
• Ship to CES KPP	21-Apr-12

Clean Energy Systems, Inc.
Power Without Pollution™

19

POWER WITHOUT POLLUTION

Kimberlina Demonstration Project

20

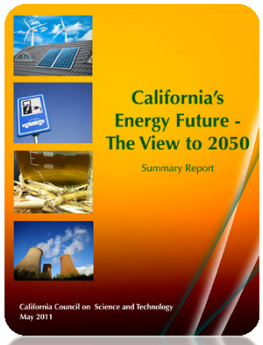
California's Energy Future: 2050

POWER WITHOUT POLLUTION

- The CCST report provides guidance to state regulators on meeting GHG emission requirements
- AB-32 requires
  - ⇨ Reduction of GHG emissions to 25% of 1990 levels by 2020.
- Executive Order S-3-05 requires
  - ⇨ Reduction in GHG emission to 80% below 1990 levels by 2050 (while the population increases from 37 mil to 55 mil).
- The report concludes that:

a. reduction of 80% will require the development of certain critical technologies including ZELB for non base load generation.

b. CCS is a critical technology for decarbonizing natural gas and other fuels to produce hydrogen.



Clean Energy Systems, Inc.
Power Without Pollution™

Project Objectives

POWER WITHOUT POLLUTION

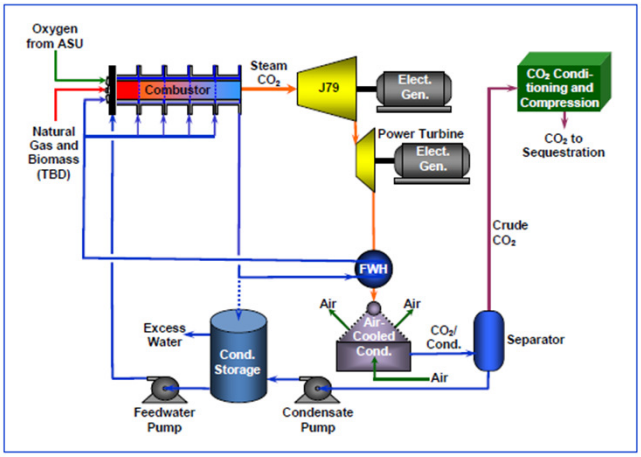
1. **Demonstrate ZELB power generation with varying power output (i.e. non-base load).**
2. **Demonstrate 100% CCS effectiveness (vs. 90%) with CO_2 sequestration into a saline formation.**
3. **Demonstrate the successful sequestration of CCS into a saline formation.**
4. Demonstrate biofuel production of electricity with CCS.
5. Demonstrate the permitting and monitoring, reporting, verification (MRV) requirements necessary for CCS.
6. Demonstrate the CCS decarbonization of natural gas to produce hydrogen.

Clean Energy Systems, Inc.
Power Without Pollution™

22

Project to Demonstrate ZELB, 100%CCS and Sequestration: 42MW; 300,000 TPY

POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

23

Kimberlina's In-Place Equipment Provides Access to Proven Operating Systems and Reduces Project Costs

POWER WITHOUT POLLUTION

- CES' 12" "zero-emission" gas generator can be used to demonstrate 100% CCS.
- CES' 40 MW_e oxy-fuel turbine can be used to demonstrate ZELB.

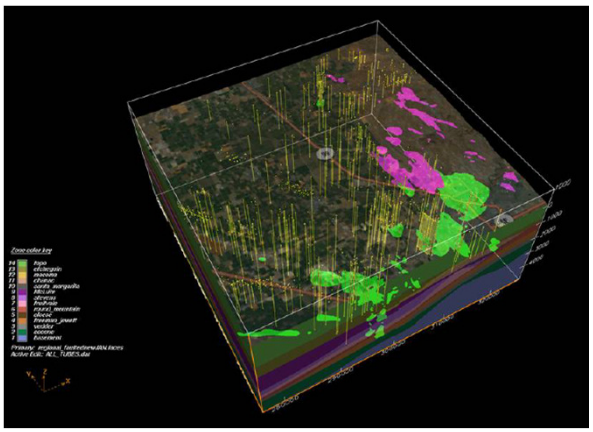
- CES' 20 MW_t "zero-emission" generator can be used for the decarbonization of natural gas.
- CES' extensive infrastructure will be used throughout the testing program.

Clean Energy Systems, Inc.
Power Without Pollution™

24

Work by WESTCARB has Characterized the Kimberlina Geological Formations for CCS

POWER WITHOUT POLLUTION



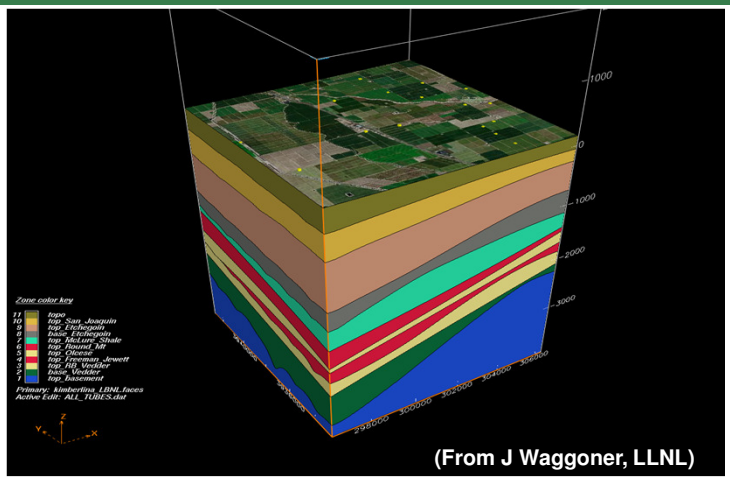
Existing boreholes around Kimberlina plant that provided stratigraphic data

Clean Energy Systems, Inc.
Power Without Pollution™

25

Initial Geological Model Based on Available Well Data

POWER WITHOUT POLLUTION



Clean Energy Systems, Inc.
Power Without Pollution™

26

Project Cost Structure

POWER WITHOUT POLLUTION

- Locate at Kimberlina an 8 or 20 MW ZELB power plant with100% CCS
- Operations by 2013 possible
- Plant output a function of capex vs. energy price trade-off

- Sets the stage for deployment of 200 MW ZEPPs currently under development
- Levelized Cost of Electricity for 200 MW estimated at $0.10-0.15/kWh, dependent on CO2 revenues and gas pricing.
- Commercial plants can be online by 2015-2016

Clean Energy Systems, Inc.
Power Without Pollution™

27