NET Power

Truly Clean, Cheaper Energy

California Energy Commission CO_2 Capture Technology Workshop

April 16, 2015

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Introduction to NET Power

NET Power is an entirely new natural gas power cycle

1. Oxy-fuel combustion; inherent CO_2 capture and elimination of NOx concerns
2. Supercritical CO_2 working fluid; absence of steam and associated Rankine limitations
3. Highly recuperated Brayton cycle; high temperature re-heating
4. Simple design; employs single novel turbine and well proven-commercial equipment
5. Under construction; 50MWt demo plant operational in 2016
6. Near-term commercial readiness; in discussions for 500MWt commercial plants

NET Power offers major benefits in California

1. Near-zero air emissions; greater than 97% carbon capture
2. Highly efficient; 59% (LHV), including all parasitic loads and pipeline-pressure CO_2
3. Low capital cost; comparable to NGCC without capture: $800-1200/kW
4. Flexible water usage; can be a net consumer or producer of water
5. 100% electrical turndown; fast and flexible loading
6. Insulated from elevated ambient temperature and altitude; nameplate power rating is robust

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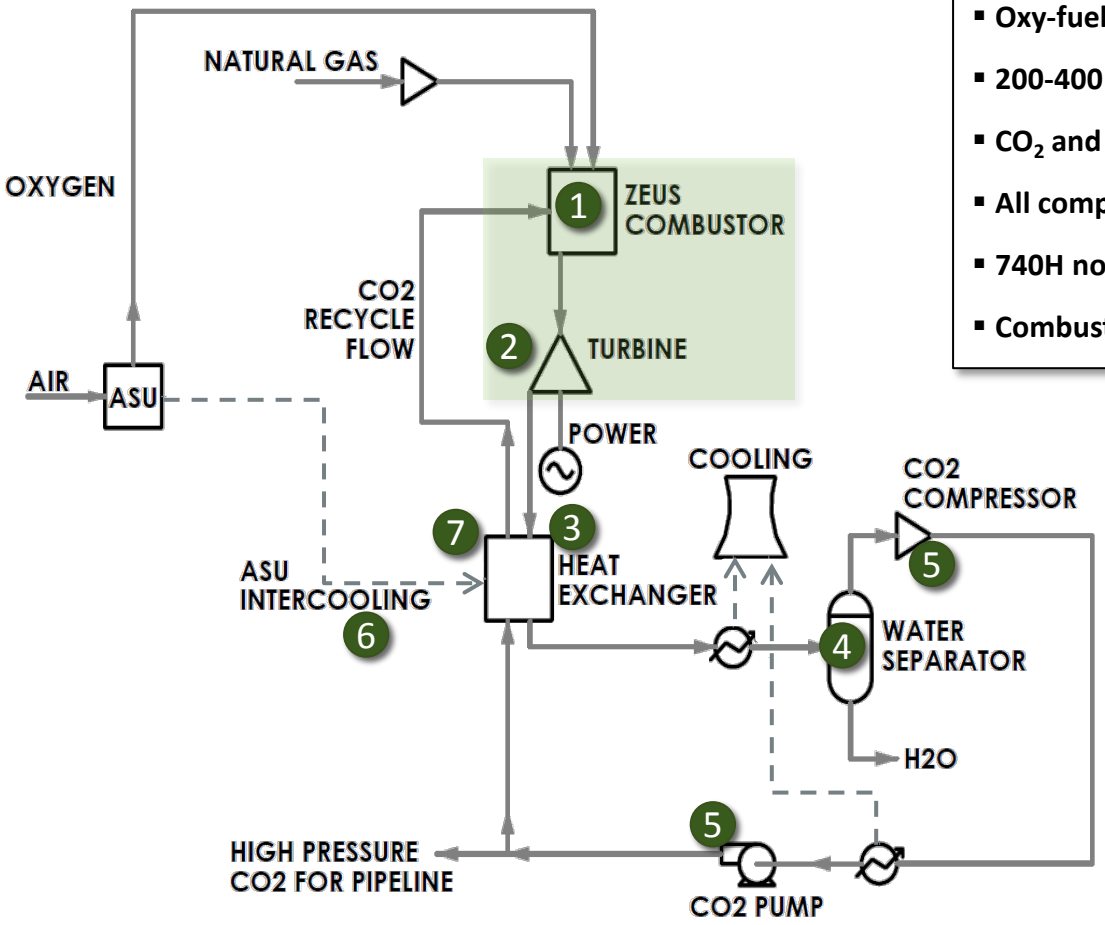
NET Power is based on the Allam Cycle



- 58.9% (LHV) net efficiency, with capture of >97% of carbon
- Oxy-fuel, closed-loop, CO_2 working fluid
- 200-400 bar; 6-12 pressure ratio
- CO_2 and water are the only byproducts
- All components, other than combustor/turbine, available
- 740H now in commercial use at two facilities
- Combustor and turbine under development by Toshiba

1. Fuel Combustion
2. CO_2 Turbine
3. Heat Rejection
4. Water Separation
5. Compression and Pumping
6. Additional Heat Input
7. Heat Recuperation

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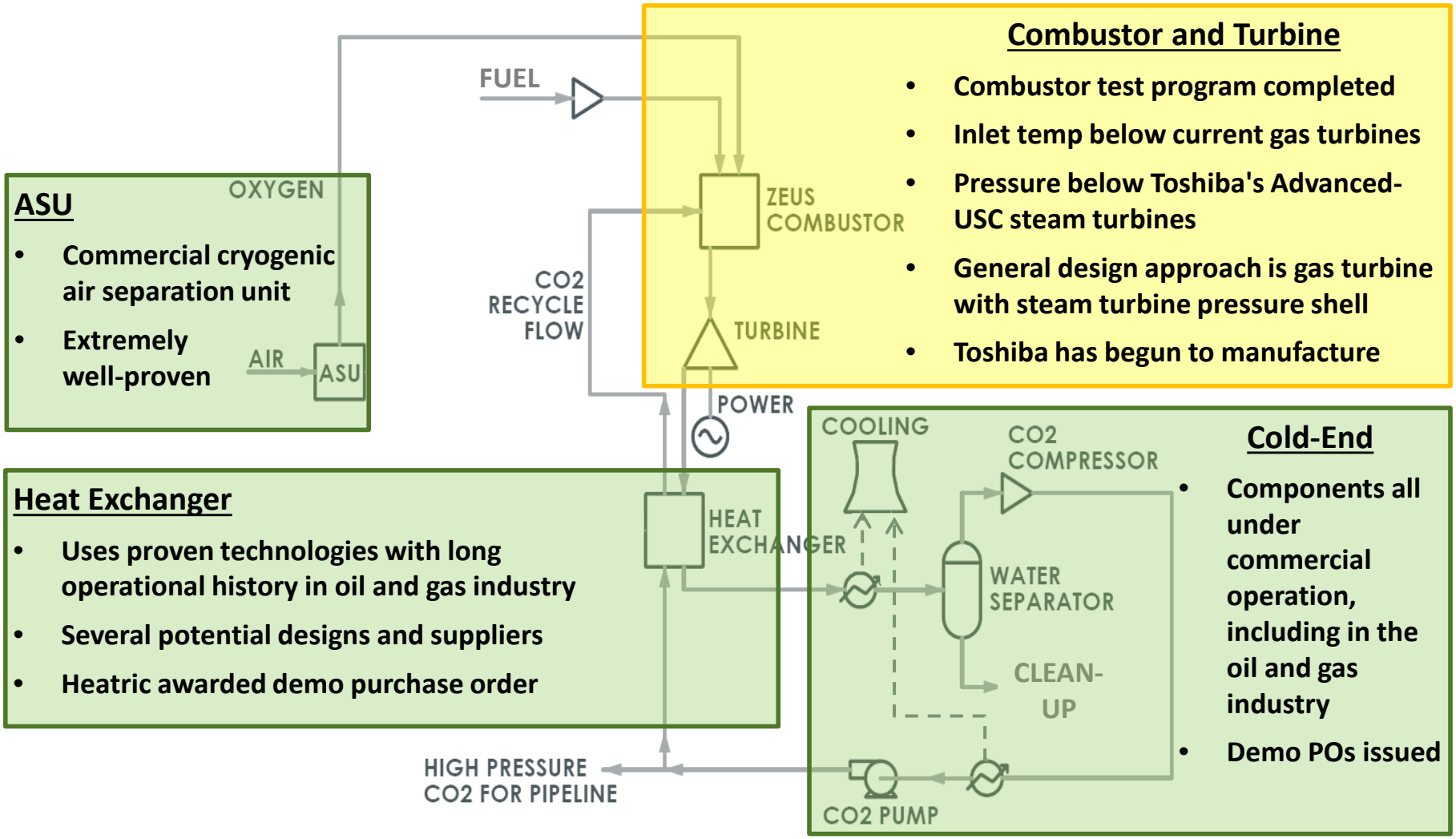
NET Power utilizes proven components, materials, technology



ASU

- Commercial cryogenic air separation unit
- Extremely well-proven

Combustor and Turbine

- Combustor test program completed
- Inlet temp below current gas turbines
- Pressure below Toshiba's Advanced-USC steam turbines
- General design approach is gas turbine with steam turbine pressure shell
- Toshiba has begun to manufacture

Heat Exchanger

- Uses proven technologies with long operational history in oil and gas industry
- Several potential designs and suppliers
- Heatric awarded demo purchase order

Cold-End

- Components all under commercial operation, including in the oil and gas industry
- Demo POs issued

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NET Power plants are highly efficient

NET Power and Combined Cycle: General ISO Efficiency Comparison (LHV)			
Energy Components	**F-Class US NGCC Plant (0% CC)***	**US NGCC Plant (~90% CC)***	**NET Power NG Plant (~97% CC)**
Gross Turbine Output	58.7% (Compressors mechanically coupled)		82.7%
CO_2 Compressor Power			-11.6%
Parasitic Auxiliary Power	-1.2%		-12.2%
Net Efficiency	**57.5%**	**47.4%**	**58.9%**

*Performance data from NETL Cost and Performance Baseline Report, 2013.

Parasitic Load Provides Opportunity for Efficiency Improvement	
ASU	91.8%
NG Compressor	8.2%

NET Power Estimated Performance Range			
Location	**Efficiency (LHV)**	**Cooling Approach**	**Water Consumption**
Vacaville, CA	55.3 – 59.2	Hybrid	<171 gal/MWh
Bakersfield, CA	55.3 – 59.1	Hybrid	<171 gal/MWh
Carlsbad, CA	51.8 – 56.7	Dry	0*

*Net H_2O production of ~ 0.5 MGD

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NET Power offers other performance and siting advantages

Water usage can be tailored to the extent to which dry cooling is desired/required.

- Complete dry cooling enables net water production given capture of combustion derivatives (no make-up water required)
- Reduction in dry cooling complexity compared to NGCC given lower Cp value of CO_2 vs. H_2O
- Cooling temperature doesn't impact turbine performance
- Hybrid cooling offers best balance between minimal water consumption and maximum efficiency

Flexibility is in-line with NGCC, with much greater turndown capability.

- 2-3 hour projected start-up from cold start; ramp rate expected to be 2-5% per minute
- Capable of 100% turndown (no electricity to grid; CO_2 being exported); only parasitic loads operated
- Negligible impact of turndown on emissions and thermal cycling

Semi-closed loop nature of the cycle permits constant gross turbine output with net output variation in differing site ambient conditions.

- Main air compressor on ASU must be speed-controlled and sized to meet changes in air density
- Efficiency varies with changes to cooling temperatures given impact on inter-cooling schemes from more extreme ambient conditions.

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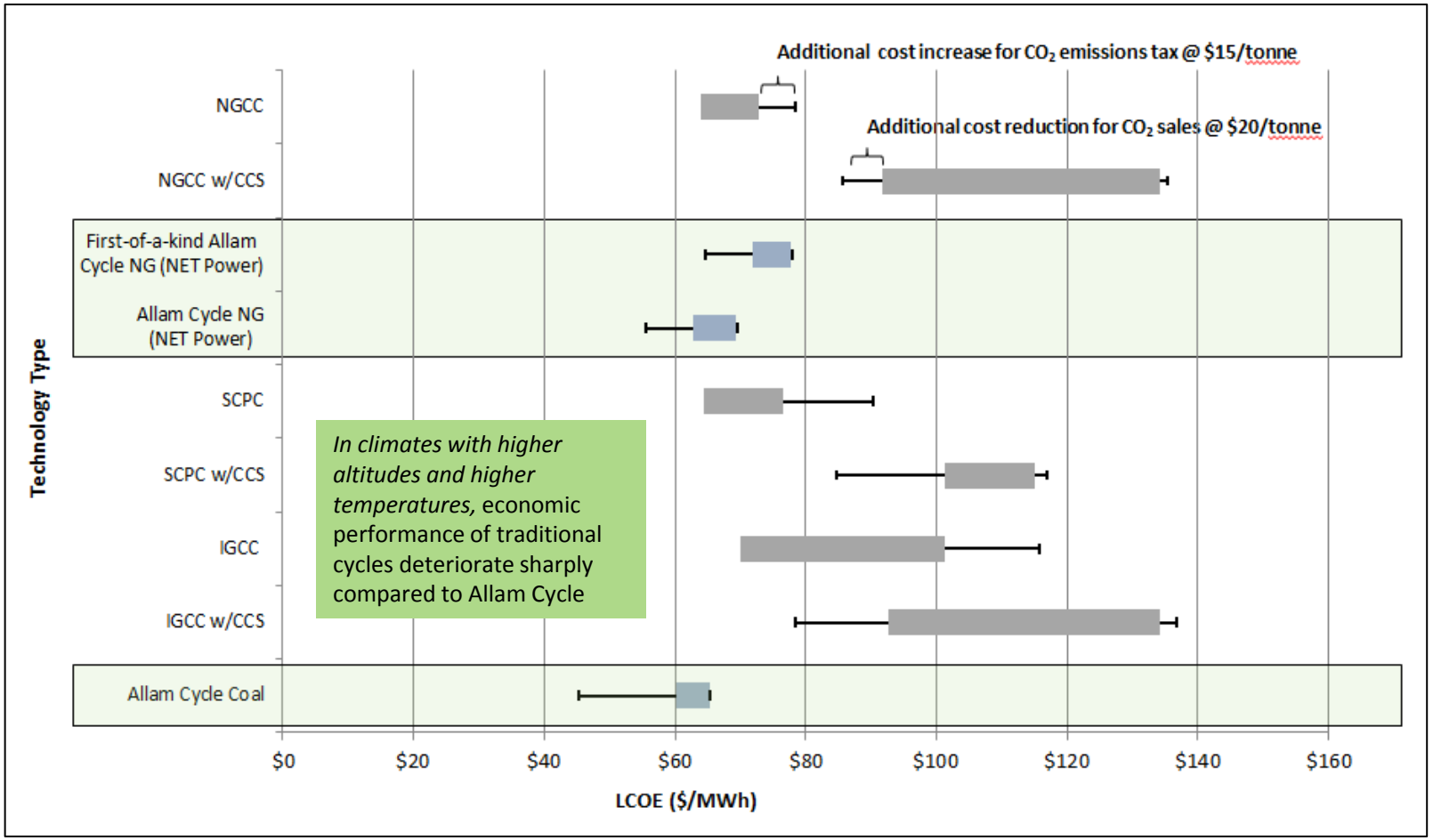
NET Power produces lower cost electricity than existing systems



Levelized Cost of Electricity Note:

- LCOE calculated using EPRI methodology
- Assumes $6.50/MMBtu natural gas and $2.00/MMBtu coal
- Cost ranges represent data from several sources: EIA (2013); Parsons Brinkerhoff (2013); NETL (2012); Black & Veatch (2012)

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NET Power's low-cost CO_2 changes the dynamic of CO_2 utilization and storage

Enhanced oil recovery economics are enhanced.

- EOR remains highly viable even in a low-cost-of-oil environment

Economics of saline storage greatly enhanced, especially where other carbon monetization mechanisms exist (cap-and-trade).

- Major potential to exploit fresh water generation from aquifer-pressured CO_2

Industries that are constrained by affordable, available CO_2 can be jumpstarted.

- Algae feedstock
- Chemical process feedstock
- Building materials/concrete
- Natural resource development

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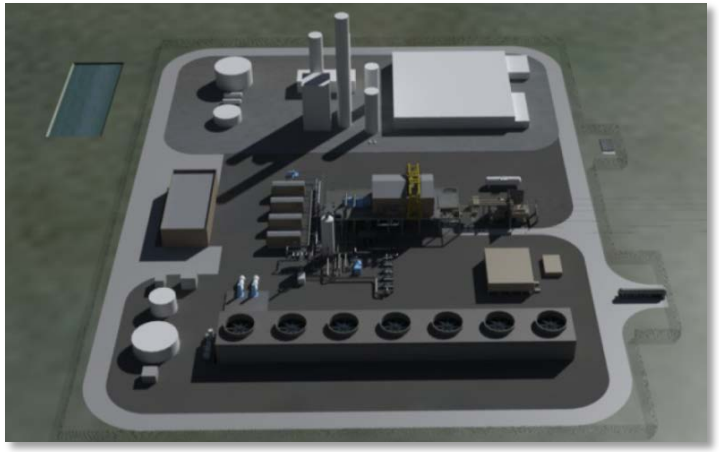
NET Power's deployment program is on schedule

50MWth natural gas demonstration plant is underway

- Program is fully funded: $140 million for construction, testing and operation from Exelon and CB&I; in-kind contributions from Toshiba and 8 Rivers.
- Turbine, EPC, O&M, and Technology agreements complete.
- Major purchase orders issued.
- Turbine manufacturing underway.
- Site has been selected (remains confidential).
- Commissioning to begin in late 2016.

295MWe commercial plant to be deployed in 2018-19

- Pre-FEED study completed on full commercial plant.
- Ready to begin FEED and early development work.
- Customers engaged and evaluating NET Power in resource planning and development activities for 2018-2022.
- Securing commitments contingent on price, performance.



NET Power Commercial Natural Gas Plant	
Electric Output	295MW
CO_2 Output	804,000 ton/year at 120 bar pressure
ASU Output Demand	3,500 ton/day
Site Area	13 acres
Turndown Capability	100%*

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The Allam Cycle natural gas power system