+ Founded in 1989

+ Offices in San Francisco, CA and Vancouver, B.C.

+ 25 professional staff in economics, engineering & public policy of the electricity industry

+ Specialized in using analysis to guide policy decisions and guiding stakeholder processes
Agenda

+ **Background**
  - Why CHP is interesting today?
  - Business models in consideration

+ **CHP as an energy efficiency resource**
  - Social, non-participating ratepayer, and CHP owner perspectives
  - Key drivers

+ **Utility-owned CHP**
  - Considerations of a new, innovative business model
Why revisit CHP now?

- Natural gas prices are low, and with shale gas are projected to remain low in the future.
- Some coal plant retirements have been announced in response to low gas prices and new clean air standards. CHP can help replace generation capacity.

Can we define CHP and the business model?

- CHP as Energy Efficiency; High efficiency CHP behind the meter, with the possibility of some electricity export.
- Utility-owned CHP; Utility sells electricity and heat to host.
Key Issues for consideration in policy development

1. How to identify and encourage highly efficient systems?
   - Drives the societal benefits and industrial competitiveness

2. How to encourage adoptions without creating an undue burden on non-participating customers?
   - Affects any incentives for CHP as well as retail rate design
   - Utility-owned business model is also a solution
Regulatory Economics of CHP

Three main perspectives and questions

- Societal
  - Can CHP lower energy costs to the state and provide environmental benefits?

- CHP owner
  - Can CHP lower my energy bills and costs of industrial output?

- Non-participating ratepayer
  - Will CHP have a cost impact on non-participating ratepayers?

Key Drivers

- System efficiency
- Fuel prices
- System costs
  - Capital, financing, operating
- Incentives
- Retail rate design
  - Exit fees / standby charges, Demand charges, Rate design
- Payment for exports
Balancing the Economics

Levelized Economics – CHP as Energy Efficiency

Societal

- Natural Gas Saved
- Electricity Generated
- Generation Capacity

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<th>Benefit</th>
<th>Cost</th>
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<tr>
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<tr>
<td>Lower Natural Gas Bill</td>
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CHP Owner

- Lower Electricity Bill
- Lower Natural Gas Bill
- O&M

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Non-Participant

- Standby Fee
- Capacity

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Energy + Environmental Economics
How to increase CHP penetration?

+ **Improve economics (reduces payback period)**
  - Waive / reduce standby fees
  - Move more of the rate into kWh charges
  - Move more of the rate into coincident or subscribed demand, less on non-varying demand charges (kW)
  - Others?

+ **Reduce risks (increases payback acceptance)**
  - Pooled natural gas purchasing
  - “Lock in” electric utility rates, or rate structures
  - Others?
Why consider utility-owned CHP?

- Combined heat and power installations can be cost-effective for customers today.
- However, success is very sensitive to natural gas prices, retail rates, exit fees, and the thermal value stream provided to the customer.
- Therefore, there are significant risks from a customer perspective: natural gas price volatility, electric utility rates, project development and operations, etc.
- Customer-owned CHP also requires companies to invest their own capital outside their core business and core competencies.
- The existing market ‘prices in’ these factors, resulting in only projects with very short payback periods (often under 2 years).
Could there be a utility role?

+ Yes, sites are already utility customers and utility is already providing energy and energy services
  - Knowledge of customers and their energy usage

+ Utility can add value by coordinating customer-sited CHP operations with the electric grid
  - dispatch during local and system peak periods
  - targeting of congested areas

+ Utility is in a position to address CHP risks
  - Good procurement processes
    - Mechanisms for vendor selection
    - Potential scale economies through purchasing many CCHP units
    - Potential scope economies through managing multiple installations
  - Natural gas price management
  - Access to capital
How would utility-owned CHP work?

- CHP system supplies electricity to the utility side of the meter, customer pays regular electricity rate, has purchase agreement for waste heat and operating agreement
- Utilities would competitively contract with 3rd parties for CHP design, construction, and maintenance services

Customer Perspective

- Pros: No operating risk, balance sheet impact, doesn’t preclude customer-owned and operated systems
- Cons: Possibly less financial opportunity

Considerations

- CHP industry acceptance; preserve the developer role
- Would only a ‘win win win’ project could qualify
- Longer payback systems are possible
One Utility-Owned CHP Approach

Connection directly to utility grid avoids bypass issue, exit fee problems, etc.

Utility Dispatch Signal

Utility can ‘turn on’ or ‘turn up’ the CCHP for local and system needs.

Utility Grid

Customer buys electricity at existing rates. No change in consumption results from CCHP installation.

Electric Meter

Utility pays customer for site use.

Customer Dispatch Signal

Customer schedules CCHP to match thermal delivery to operations.

CCHP

Utility buys Gas

Utility sells thermal to customer at a price less than alternative (e.g. boiler); price is indexed to gas.

Customer Site

Thermal to Customer

Electricity to Grid
Appendix:
Additional thoughts on utility-owned CHP
“The payback threshold that California energy users apply is very demanding – less than half of all energy users would be willing to accept a payback of even two years for a CHP project (Figure ES-2). Most would require a payback of one year or less.”
Would customers like the utility-owned model?

+ **We don’t know; some probably would**

+ **We do know that some customers want to install and manage their own energy systems**
  
  - Utility-owned CHP would not limit this customer choice, but would provide another customer option

+ **We suspect other customers may want a utility-managed energy system**
  
  - Reduces project risk, removes the need for customer capital, will not distract from core business
  
  - For these advantages, some customers are willing to accept a smaller share of benefits
How would the project work?

**Interconnection**
- CHP is connected at a customer site, on the utility-side of the meter (either actually, or ‘virtually’ through submetering)

**Ownership and financing**
- CHP is utility-owned and financed. Projects could be ratepayer investments, included in ratebase, or shareholder funded. Projects result in returns for shareholders. Utility also earns the CO2 reduction value and any other CHP-related credits

**Customer-contract**
- Customer agrees to purchase thermal output at a price less than its existing cost or alternative, e.g. priced as a 100% efficient boiler
- Customer is paid for site usage (fixed or linked to CHP output)

**Operating Agreement**
- CHP operates when electricity plus thermal value is more than the natural gas cost and variable costs, simple dispatch model
  - May result in electric-only mode during peak
- Scheduling necessary to make sure thermal loads are met
Do all CHP projects qualify?

+ No, only ‘good’ projects with the right economics and overall efficiency make sense

+ ‘Good’ projects should be cost-effective to multiple stakeholders (win-win-win)

+ Reasonable assumptions on cost and operations should result in the following:

  - from a utility resource perspective, provide a lower-cost alternative than market purchases of electricity
  - from a participating customer perspective, reduce energy costs while avoiding capital investment and minimizing risks
  - from a non-participant perspective, not increase rates
  - from a societal perspective, source-Btu efficiency provides environmental and economic benefits for the State, and reduces State’s overall energy bill
What are the potential problems?

- CHP industry acceptance for utility-owned equipment
- Utility interest in taking on additional, unfamiliar and complicated functions of managing CHP projects
- Ensuring a fair and level playing field for nonutility CHP providers
- Ensuring that other ratepayers remain whole, or receive benefits commensurate with any added costs they pay
- Developing a mutually agreeable operating agreements that coordinate both customer thermal needs, and utility system needs
- Insurance, liability for utility equipment on customer premises, and utility / 3rd party access for servicing
Snuller Price, Partner
Energy and Environmental Economics, Inc.
101 Montgomery Street, Suite 1600
San Francisco, CA 94110

(415)391-5100
snuller@ethree.com