



Energy+Environmental Economics

# + CHP Economics & Business Models

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Columbus, Ohio



# Energy and Environmental Economics, Inc.

- + 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



# Background

## + 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





# Two Key Issues

## + 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?

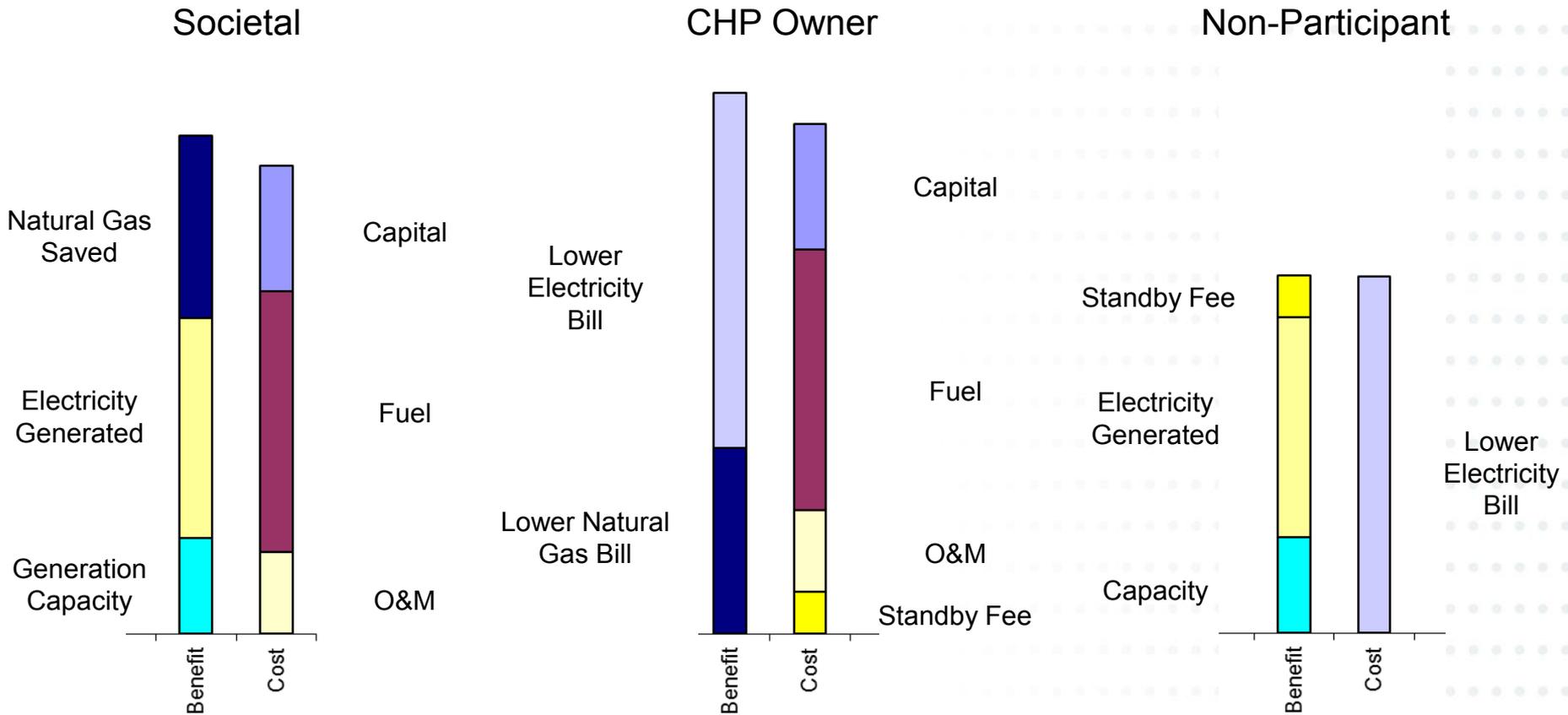
## + Key Drivers

- 
- 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





# 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



# Utility-owned business model

## + 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 3<sup>rd</sup> parties for CHP design, construction, and maintenance services

## + Customer Perspective

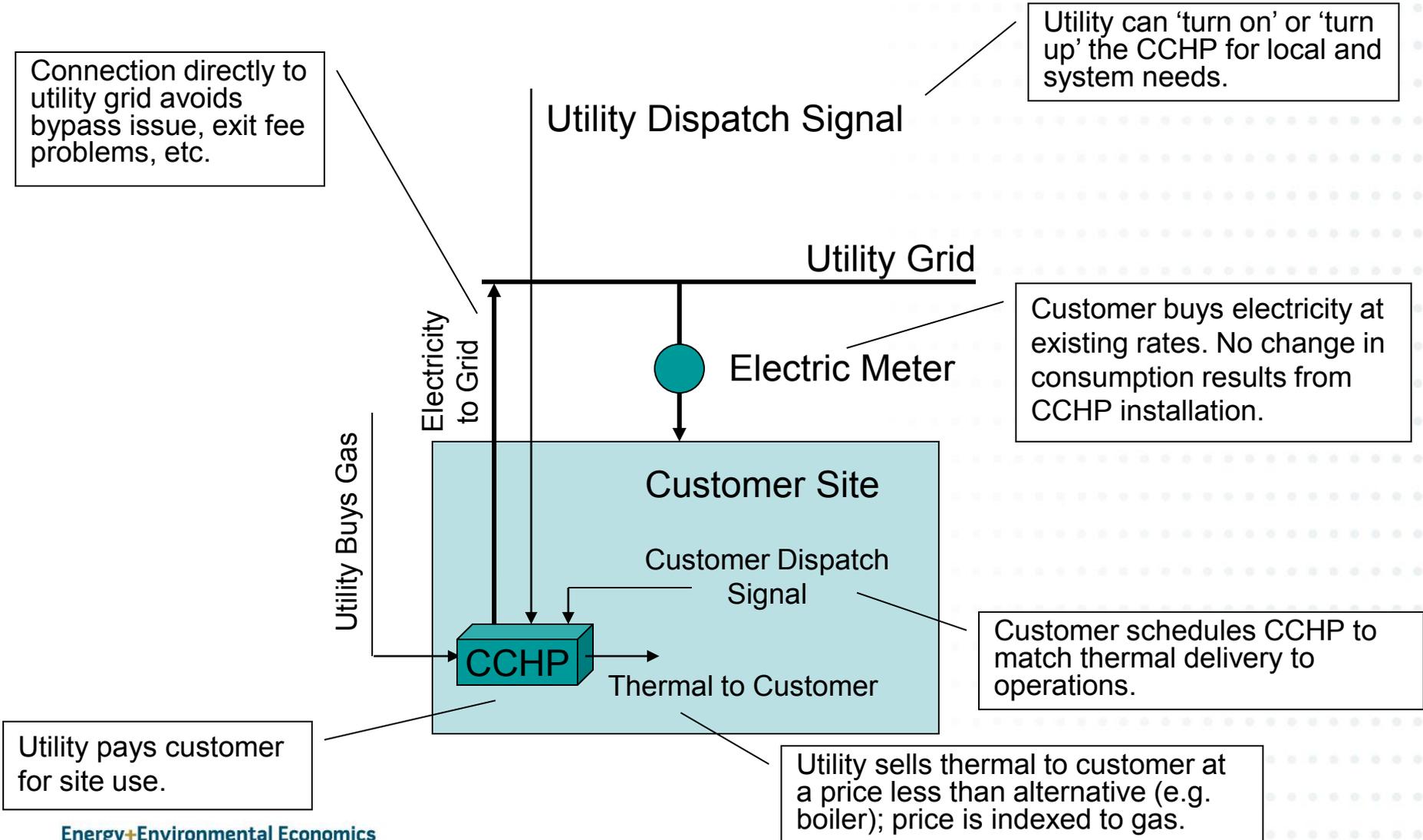
- Pros: No operating risk, balance sheet impact, doesn't preclude customer-owned and operated systems
- Cons: Possibly less financial opportunity

## + 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



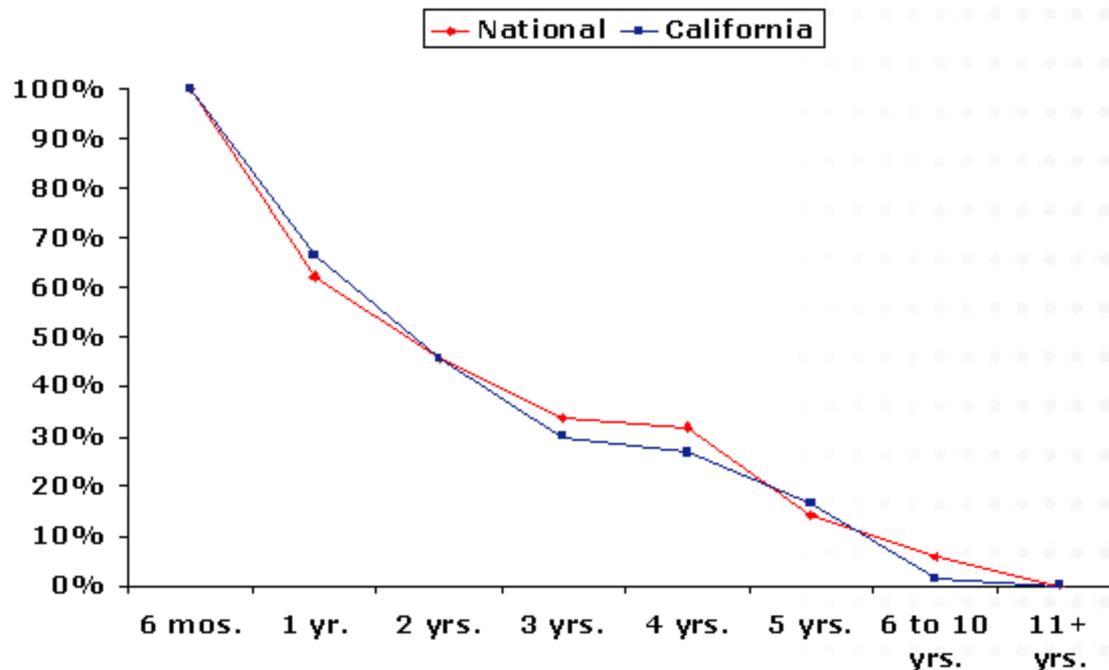


# Appendix: Additional thoughts on utility-owned CHP



# Payback Acceptance

**“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 / 3<sup>rd</sup> party access for servicing**



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