



**NYSERDA**  
**Combined Heat and Power**  
**In New York State**

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# **Combined Heat and Power Economics & Financing**

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**New York, New York**

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# What Makes a Great CHP Project?

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## Economic Drivers

**#1 – “Natural”, Accessible and Abundant Thermal Load Dictates Technology, Operating Strategy & Savings**

- Hot Water and/or Steam

**#2 – Physical Logistics of Installation Dictate Cost**

- Easy to Install, Close Proximity to Mechanical & Electrical Interconnection Points, and Exhaust Location

**#3 – Reasonably High Electric Costs Dictates Savings**

- No \$0.05 Power Applications – Works best above \$0.10/kWh

**#4 – Utility Attitude Dictates Timing**


- No Ratched Demand Charges
- Reasonable Interconnection Requirements

**#5 – Scale Dictates Cost**

- Buildings Spending More Than \$500,000 Annually
  - Small Systems Are Hard to Make Cost Effective
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# Technology Selection for CHP

Technology	Pro	Con
 <b>Reciprocating Engines</b>	<ul style="list-style-type: none"> <li>◆ Versatile</li> <li>◆ Cost Effective</li> <li>◆ Efficient</li> <li>◆ Automotive Emissions Controls</li> </ul>	<ul style="list-style-type: none"> <li>◆ Not good for steam based thermal loads.</li> <li>◆ Big equipment - unwieldy for large systems.</li> <li>◆ Maintenance intensive</li> <li>◆ Noisy</li> </ul>
<b>Gas Turbines</b>	<ul style="list-style-type: none"> <li>◆ Best for large installations (3+MW).</li> <li>◆ Good to address steam based thermal loads</li> <li>◆ Reliable</li> </ul>	<ul style="list-style-type: none"> <li>◆ Small turbines are very inefficient</li> <li>◆ Require SCR to limit emissions</li> <li>◆ Noisy</li> </ul>
<b>Micro-Turbines</b>	<ul style="list-style-type: none"> <li>◆ Simple packages</li> <li>◆ Reliable</li> </ul>	<ul style="list-style-type: none"> <li>◆ Very Inefficient</li> <li>◆ Fairly Costly</li> <li>◆ Noisy</li> </ul>
<b>Solar Photovoltaics</b>	<ul style="list-style-type: none"> <li>◆ Reliable</li> <li>◆ Maintenance Free</li> <li>◆ No Fuel, No Emissions</li> <li>◆ Greatly Subsidized</li> <li>◆ Mandatory Interconnect in Many Regions</li> </ul>	<ul style="list-style-type: none"> <li>◆ Costly</li> <li>◆ Demand savings are not predictable</li> </ul>
<b>Fuel Cells</b>	<ul style="list-style-type: none"> <li>◆ Efficient</li> <li>◆ Quiet</li> <li>◆ No Emissions</li> </ul>	<ul style="list-style-type: none"> <li>◆ Costly</li> <li>◆ Extremely Heavy</li> </ul>
<b>Steam Turbines</b>	<ul style="list-style-type: none"> <li>◆ Great where steam is required at multiple pressures</li> </ul>	<ul style="list-style-type: none"> <li>◆ Limited Application</li> <li>◆ Usable Mainly in Industrials</li> <li>◆ Not a cost effective substitute for PRVs</li> </ul>
<b>Wind &amp; Hydro</b>	<ul style="list-style-type: none"> <li>◆ Limited Application</li> </ul>	<ul style="list-style-type: none"> <li>◆ Not relevant to Real Estate Industry</li> </ul>





# Installation Cost Considerations

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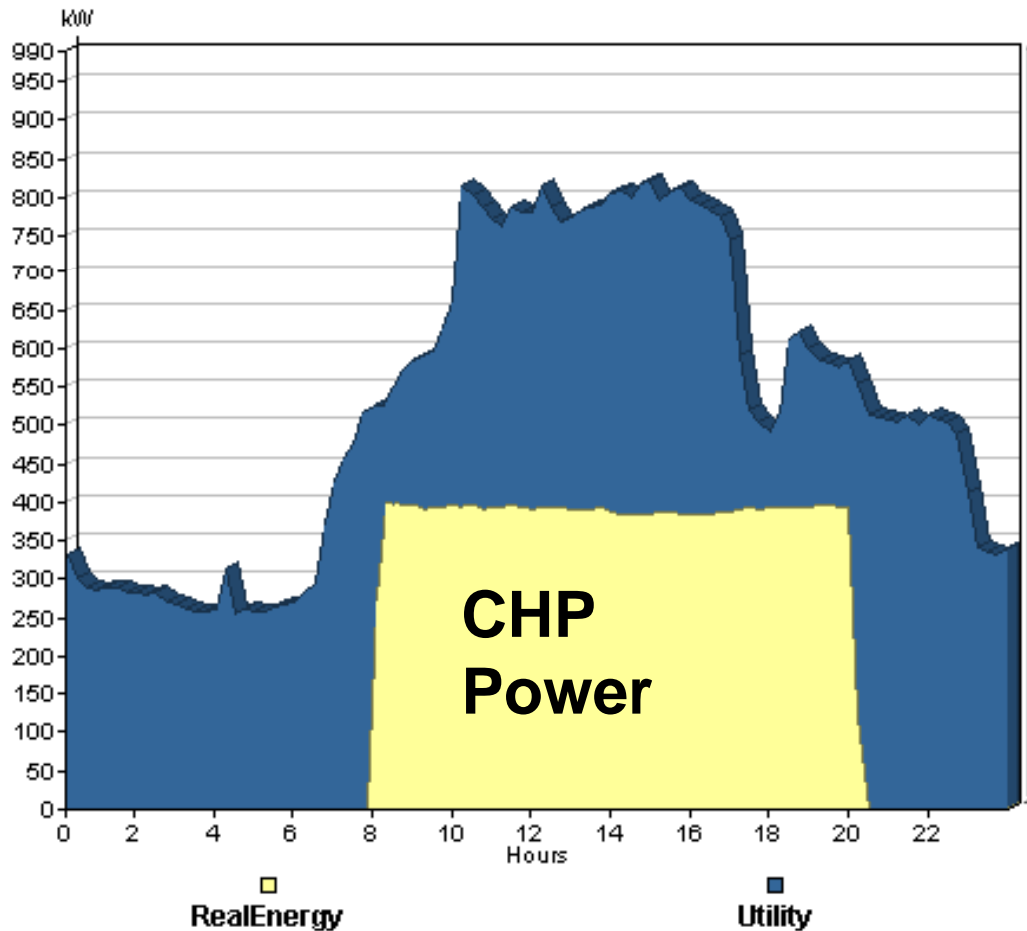
- System Size
    - Small Systems Are Much More Costly
    - Larger Systems Provide Many Options
  - Prime Mover
    - One Large Unit vs. Multiple Modular Units
  - Soft Costs – Importance of Experience
  - Physical Access to Thermal Load
  - Physical Access to Electrical Feeders
  - Physical Location (Ground, Roof, New Building - Rigging)
  - Physical Access to Exhaust Stack
  - Physical Access to Fuel (new gas line)
  - Flexibility of switching (switchgear to operate stand-alone vs. parallel)
  - Urban vs. Suburban vs. Industrial Locations
  - Sound Attenuation
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# Operating Strategy #1

## On-Peak

4/24/02 Site Energy Use



### Saving Strategy:

On Peak Energy Savings  
– Just the most expensive power

### Application:

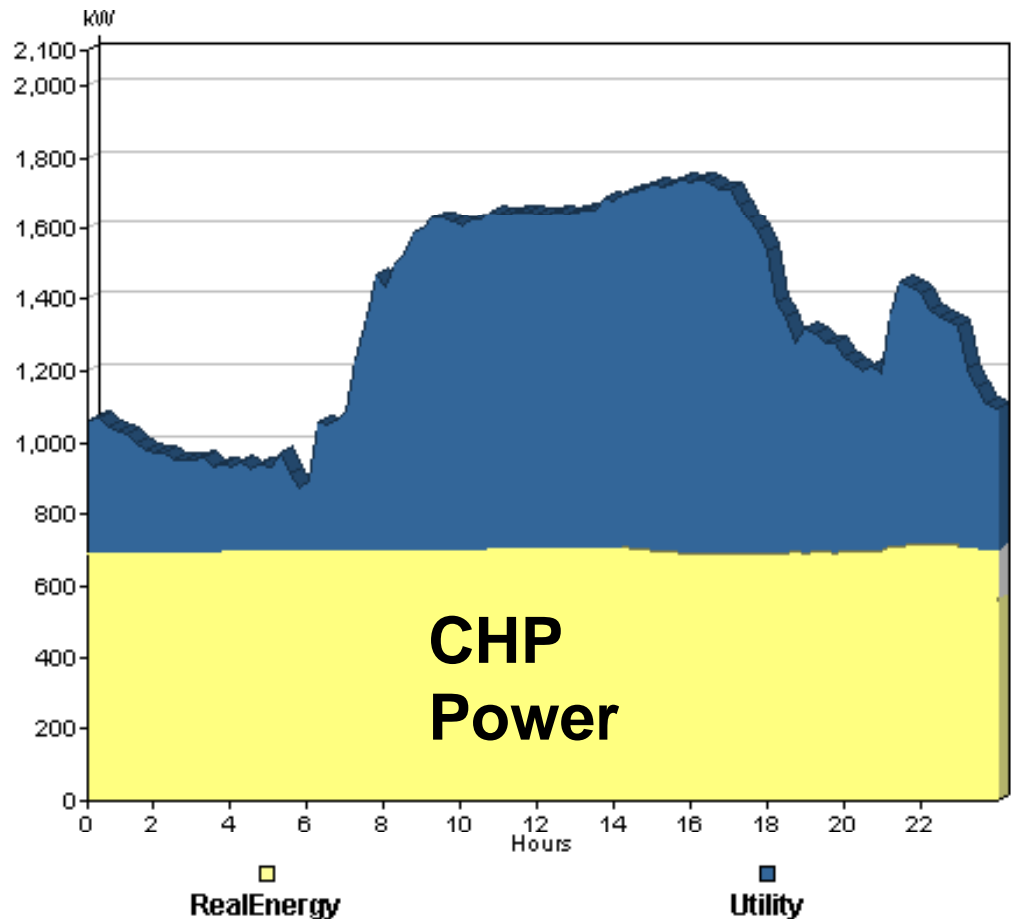
When there is little thermal Energy required off peak – Commercial Office Buildings



# Operating Strategy #2

## Base Load

4/24/02 Site Energy Use



### Saving Strategy:

Energy and Demand Savings During All Periods – Whenever “Spark Spread” allows

### Application:

When Thermal Energy can be used 24-hours per day – Industrials, Hotels, Hospitals & Certain Types of Office Buildings



# Economic Projections

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## Components of Savings

### (1) Cost Reductions

- On Peak Energy
- Off Peak Energy
- Demand Charges
- Thermal Energy
  - Chilled Water
  - Hot Water
  - Steam
  - Valued against appropriate fuel
- Operations & Maintenance
- ESCO Energy Purchases of “Residual” Power Requirements

### (2) Expenses

- Fuel
- Operations & Maintenance
- Backup Power
- Insurance, Taxes, Misc

### (3) Other Sources of Revenue

- ICAP
- Wholesale Energy Sales
  - EDRP & Day Ahead Sales

### (4) Projections

- Escalators
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# Proforma Savings

- Current Year Savings Projections (Vastly Simplified)



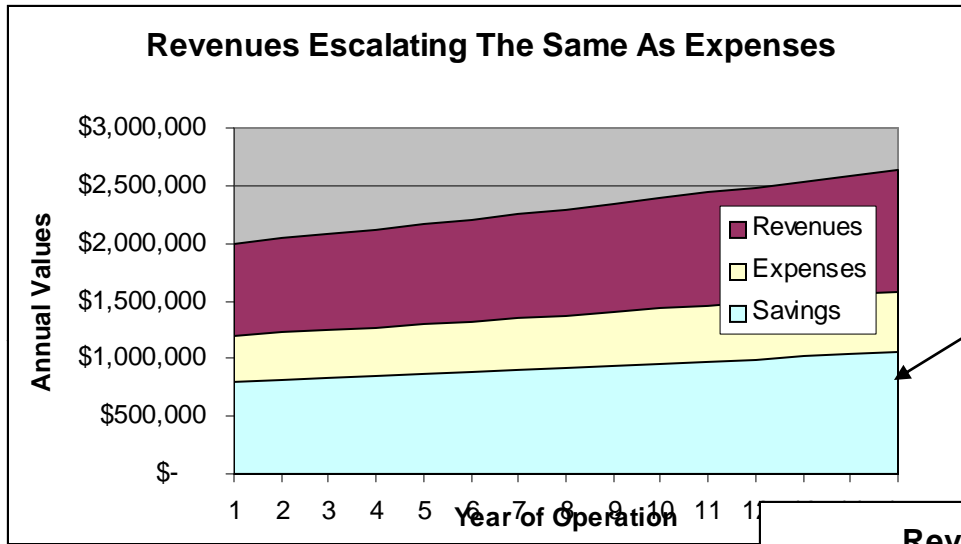
**Proforma Cashflow Summary**  
**12 Operating Months**  
**June 14, 2002**

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual Total</u>
<b>(A) Cogeneration Plant Sales</b>													
Electricity Sales	\$116,622	\$103,794	\$124,729	\$117,312	\$113,086	\$126,675	\$129,836	\$122,801	\$135,451	\$111,992	\$112,462	\$113,289	\$1,428,050
Thermal Sales	\$28,796	\$26,778	\$31,802	\$32,513	\$23,922	\$24,513	\$32,403	\$38,015	\$33,389	\$39,683	\$36,086	\$30,855	\$378,756
NYISO ICAP Sales	\$16,200	\$12,960	\$16,200	\$12,960	\$16,200	\$12,960	\$16,200	\$12,960	\$16,200	\$12,960	\$16,200	\$12,960	\$174,960
Total Cogeneration Plant Sales	\$161,617	\$143,532	\$172,731	\$162,785	\$153,208	\$164,149	\$178,439	\$173,776	\$185,040	\$164,635	\$164,748	\$157,105	\$1,981,766
<b>(B) Cogen Plant Expenses</b>													
Gas	\$79,915	\$66,186	\$73,243	\$75,690	\$76,849	\$75,088	\$92,065	\$95,101	\$93,235	\$94,899	\$89,591	\$78,772	\$990,635
O&M	\$14,798	\$13,366	\$14,798	\$14,321	\$14,798	\$14,321	\$14,798	\$14,798	\$14,321	\$14,798	\$14,321	\$14,798	\$174,236
Other (Standby, Insurance, etc.)	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$60,000
Total Expenses:	\$99,714	\$84,552	\$93,041	\$95,011	\$96,647	\$94,409	\$111,863	\$114,900	\$112,556	\$114,697	\$108,912	\$98,570	\$1,224,872
<b>(C) Cogen Plant Net Income:</b>	\$61,904	\$58,981	\$79,690	\$67,774	\$56,561	\$69,740	\$66,576	\$58,876	\$72,484	\$49,938	\$55,836	\$58,535	\$756,894

- Forward Savings Projections
  - Escalators for each line item
  - Sensitivities



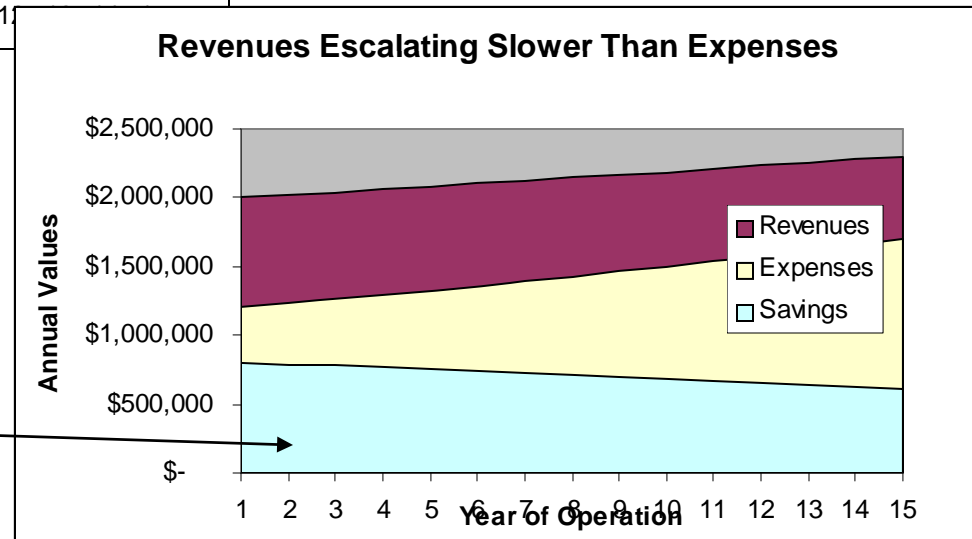
# The Importance of Escalators



Savings Increase over Time

Or....

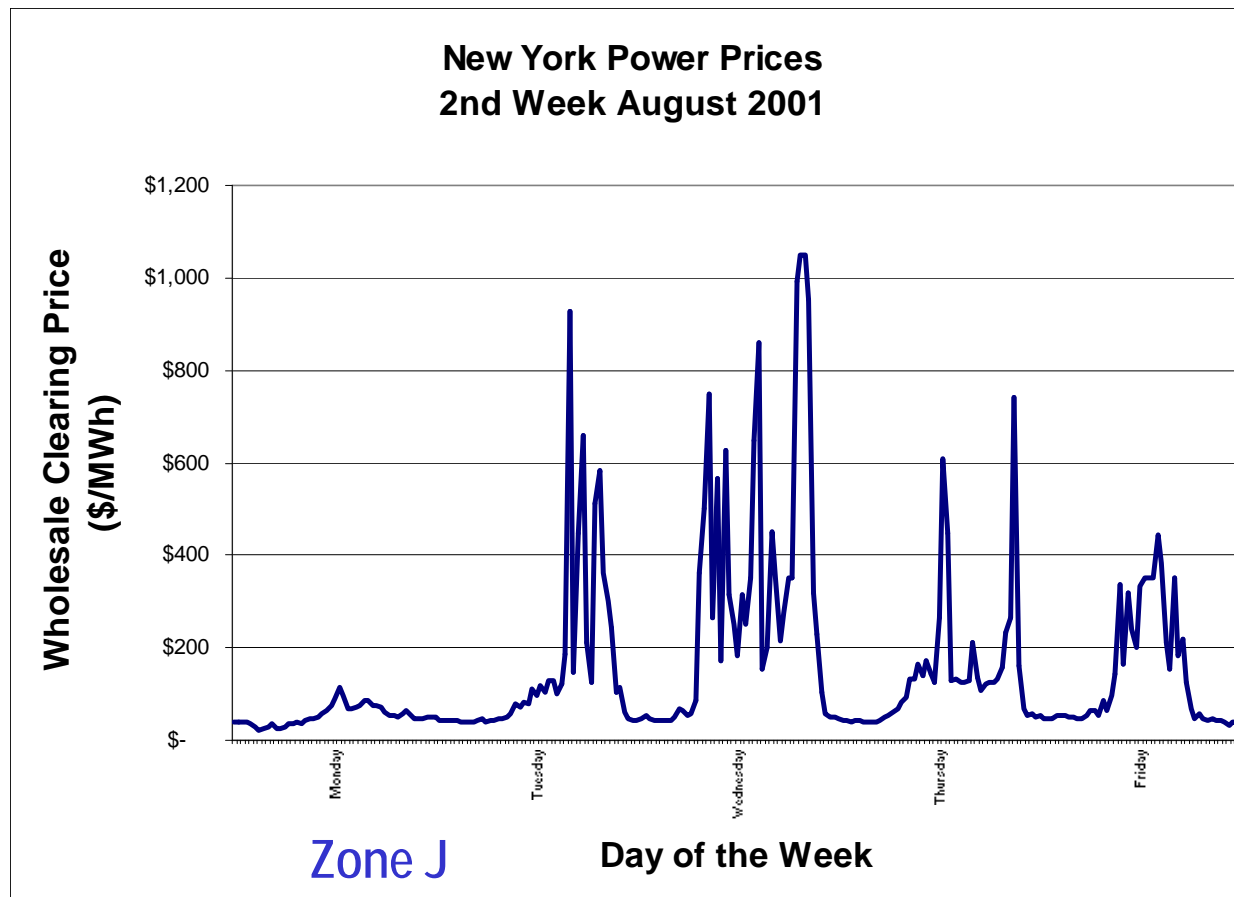
Savings Decrease over Time





# Enhancing CHP Economics

## Selling Wholesale via EDRP Program

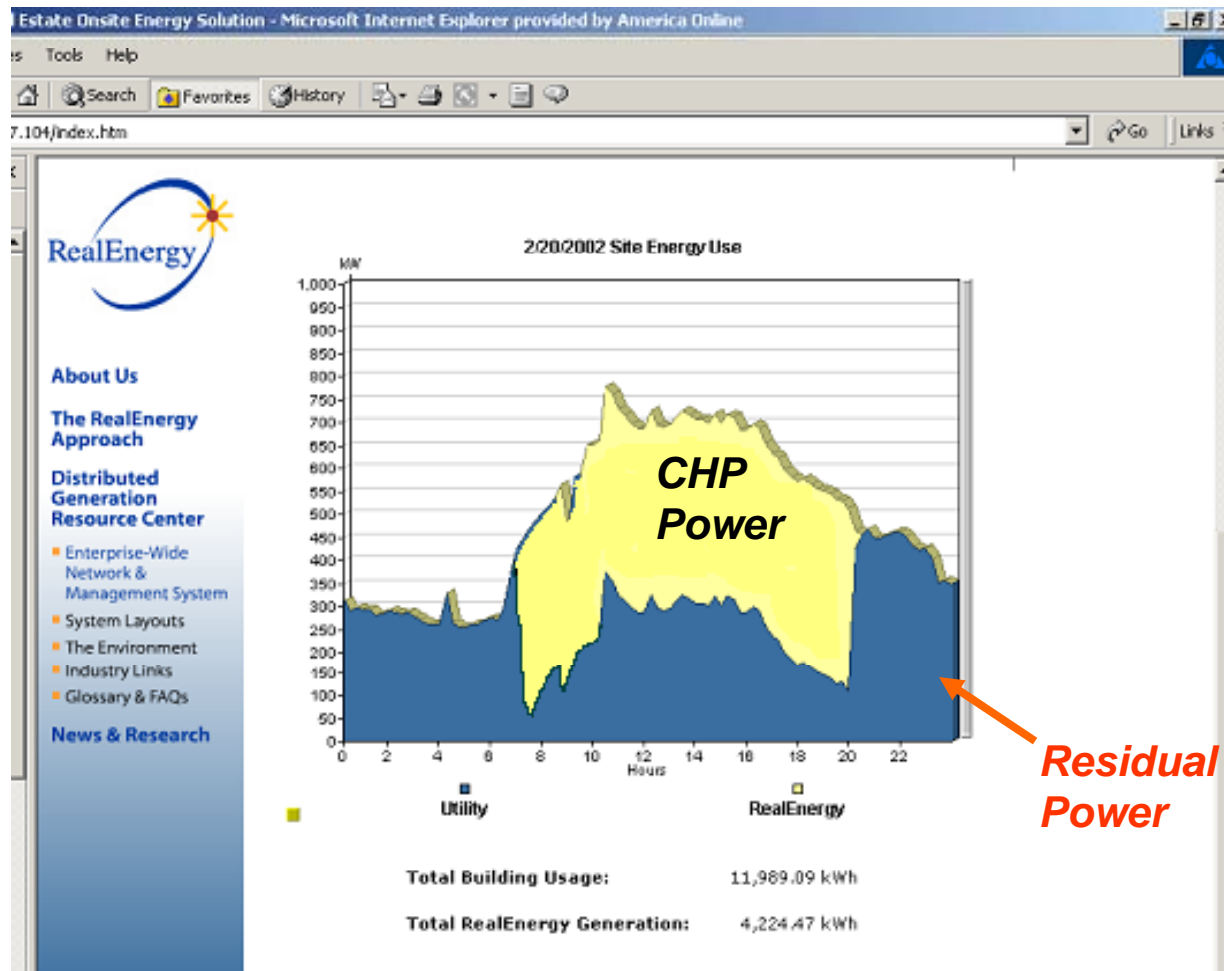


Opportunity:  
Selling Power  
at Wholesale  
rates during  
ISO declared  
emergencies



# Enhancing CHP Economics

## Purchasing “Residual” Power



Energy Purchased From Traditional Suppliers *Before* CHP:

•65% On Peak

•35% Off Peak

Energy Purchased From Traditional Suppliers *After* CHP:

•35% On Peak

•65% Off Peak

CHP Radically Changes Your Purchased Power Load Factor



# Enhancing CHP Economics

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## Defraying Installation Costs

### Subsidies That Help Reduce Upfront Cost

- NYSERDA – Both Hard & Soft Costs
  - NY Utilities are soliciting responses to RFPs to reduce “congestion” via DG. Funding levels vary.
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# Forward Projections, Hedging & Financing

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- Escalators
    - Fuel Cost
    - Electric Value
    - Thermal Value
    - O&M
  
  - Hedging Risk
    - Fuel Contracts
    - O&M Contracts
    - Electric Value?
    - Thermal Value?
    - Indexing
  
  - Financing
    - Due Diligence
    - Assurity of Operating Margin
    - Hedging To Greatest Extent Possible
    - Expect:
      - High Debt Coverage Ratios
      - Partial Leveraging
      - Sensitivities
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# Overcoming the Hurdles

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## The RealEnergy Offer

Recognizing the Difficulties Developing “One-Off” projects, RealEnergy crafted an offer that gives owners many of the benefits of owning CHP without many of the associated risks.

- ***RealEnergy Sells Power, Chilled Water, and Hot Water at Prices that are at a discount to the best price owners can obtain from the market.***
  - ***The offer costs owners nothing.***
  - ***The offer creates a new revenue stream for property owners.***
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