



Packaged Onsite Cogeneration Systems

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Agenda

- Onsite cogeneration vs. central power
- Elements of onsite cogeneration
- An analogy - PC's and Mainframes
- Calculating the benefits
- "Packaged" system philosophy
- Case study - Fort Shafter

Utility Power vs. Onsite Cogeneration

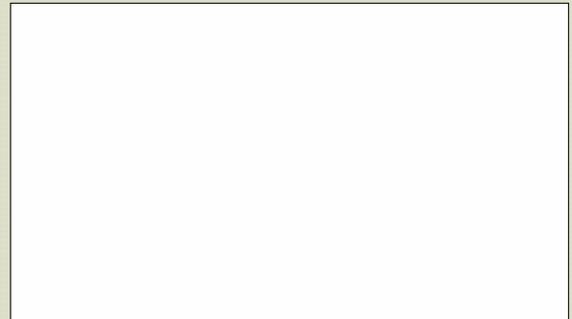
Onsite cogeneration offers significantly greater efficiency than traditional utilities.



Cost savings, additional reliability/security, and environmental benefits result!

Elements of Onsite Cogeneration

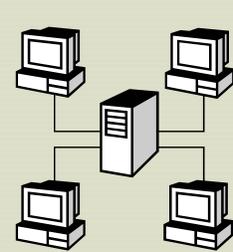
Cogen thermal output can be used to offset existing heating systems, electrical chilling loads, and produce additional electricity through a Rankine cycle-based generator.



An Analogy - PC's and Mainframes

PC's added substantial value to massive, centralized investments in mainframes, adding incremental computing power, tremendous flexibility, and substantially reducing costs.

Mainframe vs. PC



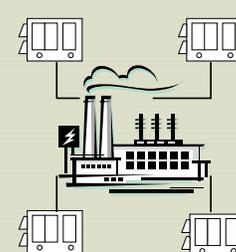
- Mainframe - 85% of IBM sales late 70's
- IBM fought the PC in the 70's
- Mainframes now 8% of IBM sales
- PC struggled with applications and standards. Standards drove explosion
- PC's allow businesses to put computing where and when needed quickly and cost effectively
- Both technologies work in tandem
- PC's required new way of doing business

Source: IBM annual reports.

Introduction to Cogeneration and Utilities - The Electric Utility

DG can add substantial systems benefits when broadly applied to the existing central power plant generation, transmission, and distribution paradigm.

Central Plant vs. DG



- Utilities fought DG - DG erodes sales
- DG interconnection standards vary widely
- DG pushes large capital investments back many, many years
- DG allows utilities to put power when and where needed quickly
- DG interconnection becoming standardized
- DG allows 100% of generating capacity to be used 100% of time
- **DG dramatically increases system security**
- DG requires new way of doing business

Calculating the Benefits

Substantial financial, reliability, security, and environmental benefits result from the proper application of onsite cogeneration.

Onsite Cogeneration Economics

| | | |
|-------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Blended Cost of Grid Electricity (\$/kWh) | \$0.13 | How much does it cost for a kWh of electricity from the grid? |
| \$/Therm of Gas Delivered to Customer | \$0.55 | How much does it cost for a therm of fuel (e.g., natural gas) delivered to the site? |
| Efficiency of Onsite Generation (BTU/kWh) | 10,500 | How many BTU's does it take to create a kWh of electricity with onsite generation? 100,000 BTU's = 1 Therm. |
| Cost of Onsite Electricity (\$/kWh) | \$0.06 | The cost to create a kWh of electricity through onsite generation, based on cost of fuel. |
| "Electric Spark Spread" (\$/kWh) | \$0.08 | The difference between the cost of grid electricity and the cost to produce it onsite is known as "spark spread". |
| Thermal Value of Waste Heat (BTU) | 5,500 | |
| Percentage of Waste Heat Used | 80% | With cogen, waste heat can be put to use. The thermal value is based on how much of the input fuel can be recovered in the form of hot water. Hess systems are 55% thermally efficient. |
| \$/Therm Value of Waste Heat per kWh | \$0.024 | |
| Maintenance Rate (\$/kWh) | \$0.017 | |
| Cogen Spread (\$/kWh) | \$0.08 | This recovered heat has a value based on what percentage of it the facility can use and what that facility would have paid for it (based on \$/Therm). |
| Installed \$/kW | \$1,590 | The cogen spread represents the value of producing electricity and heat onsite on a per kWh basis, after maintenance costs are considered. |
| Run Hours | 7,800 | Considering typical installed cost per kW, run hours, and cogen spread a payback on investment is calculated. |
| Time to Payback | 2.5 | |

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Calculating the Benefits

Onsite cogeneration has direct reliability and security benefits that include eliminated capital investment and avoidance of "mission critical" outages.

Typical High-Reliability Facility 24 Hour Load Profile and Cogen Application

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Packaged Systems Philosophy

The economics, scope, and scheduling of onsite projects vary significantly and are complex. Packaged system platforms work to address the complexities by providing a simple solution.

Typical Cogeneration System Economics - 1,000 kW

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Packaged System Philosophy

Risk is best managed with as few points of accountability as possible and by making the complex simple. "Packages" are less expensive, higher quality, and more quickly implemented.

Dell vs. Build-a-Box Approach

DG "Package" vs. Build-a-Box Approach

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Case Study - Fort Shafter - Honolulu, Hawaii

Fort Shafter is saving \$30,000 per year with total savings of nearly \$1 million over the contract term. No capital investment was required while \$150,000 in capital investment was avoided.

"The Hess system is providing substantial, zero-investment savings in addition to highly reliable, continuous power. We also lessen the burden placed on an already stressed utility grid."

- Michael Miyagi, Directorate of Contracting, US Army

Products/Services
Single continuous duty 200 kW package, 55 ton absorption chiller, 2,500 gallons of hot water storage, 20 ton electrical chiller

Key Business Challenges
Increasing operating expenses

Key Business Solutions
Hess Value Share program to generate immediate savings with no capital expense

Results
More than \$30,000 in annual savings, \$150,000 in capital savings

System Achieves 100% Uptime of Scheduled Run Hours

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Want to Learn More?

To learn more about packaged systems and for additional case studies, visit www.hessmicrogen.com.

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