



Combined Heat & Power Conference

University of Illinois Chicago

July 9, 2002

Four Key Value Propositions

- V1: Power Availability
 - Can be off-grid or on-grid. Will tend to be continuous with generally high utilization rates (above 5,000 hours).
- V2: Power Reliability and Quality
 - Require very high reliability, 99.9999 uptime (5 or 6 “9’s”).
 - Experience frequent problems with utility.
- V3: Power Price Insurance and Hedging
 - Provide a hedge against very high peaking prices
 - Negotiate an interruptible power contract
- V4: Energy Optimization
 - The value proposition focuses on the sale of MP applications that optimize the client’s total energy needs and bill.
 - Most often a cogeneration application.

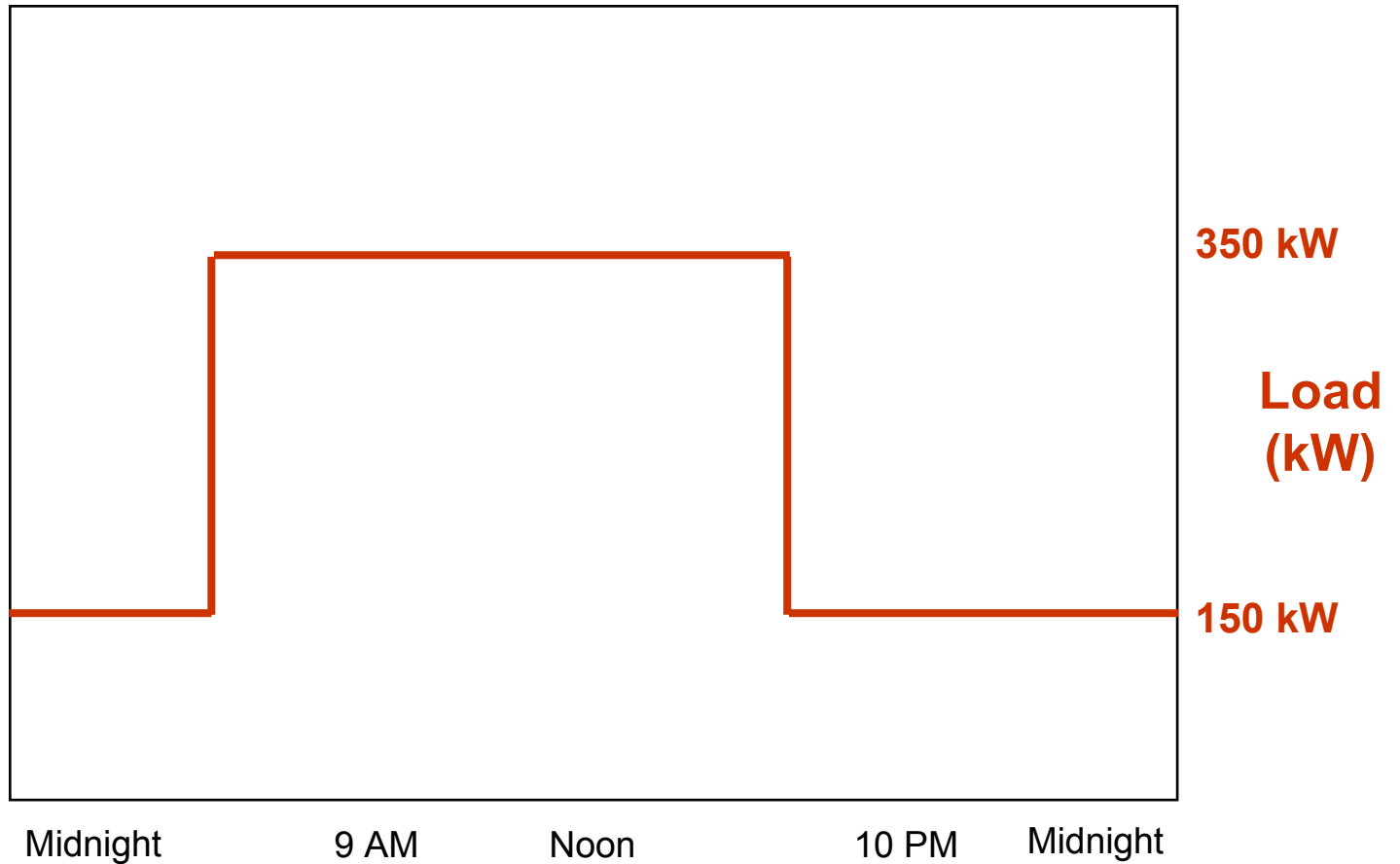
Distributed Generation Benefits

- Higher Reliability of total system
 - Prime power redundancy - gas & grid
- Much lower electric power cost
 - Reduced Operating Costs
- Reduced operating cost risk
 - Reduced utility price volatility
- Eliminate wasted capital tied up in “insurance”
 - Replace standby diesels with revenue generating gas units
- New gas customer classification
 - Lower per unit cost of natural gas
- Leverage in the electric commodities market
 - Play the *Marketeer* role with power providers from negotiating strength provided by full self-generating capability

High Reliability Integrated system -Keeping It Simple

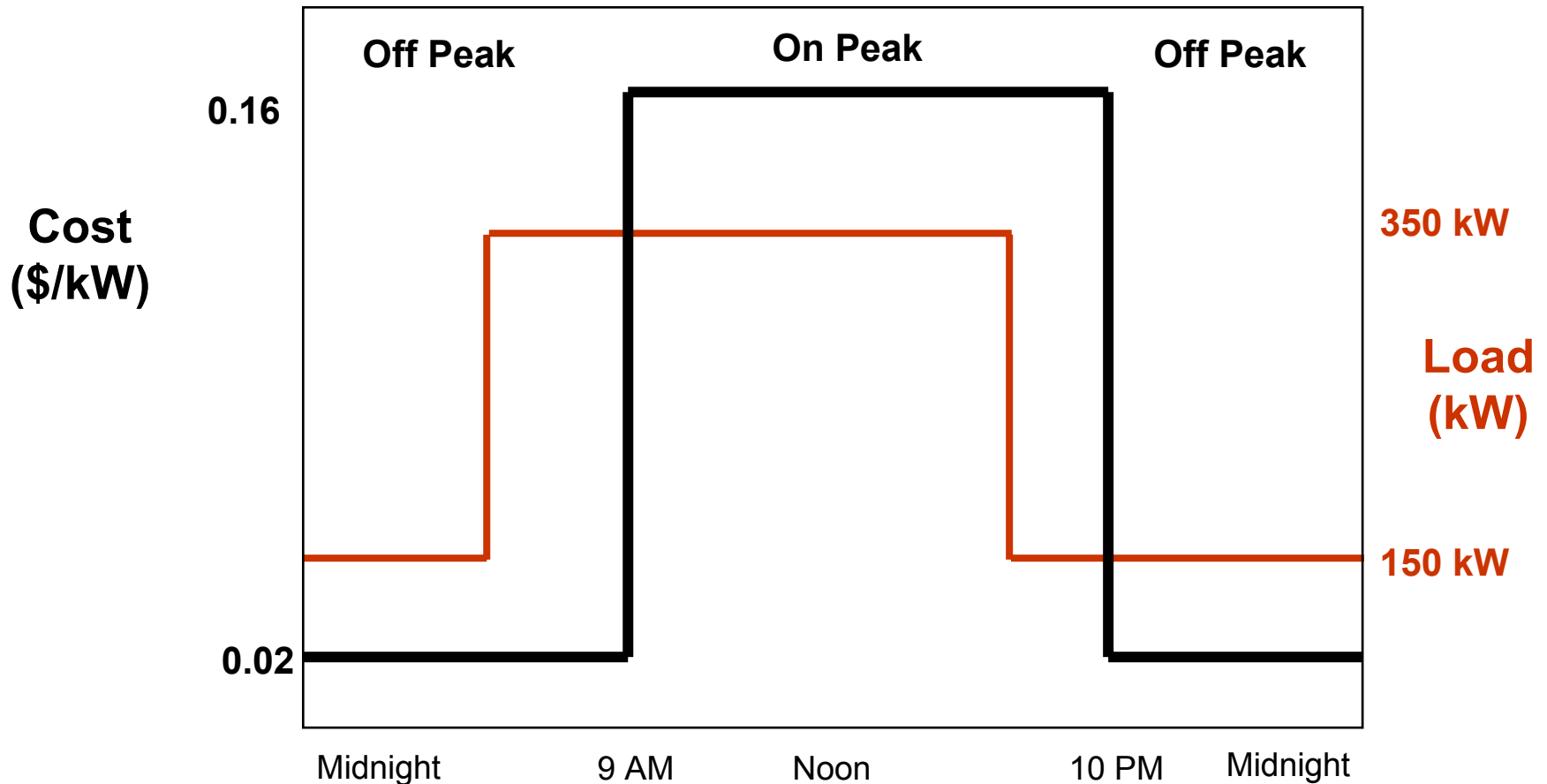


Load Profile

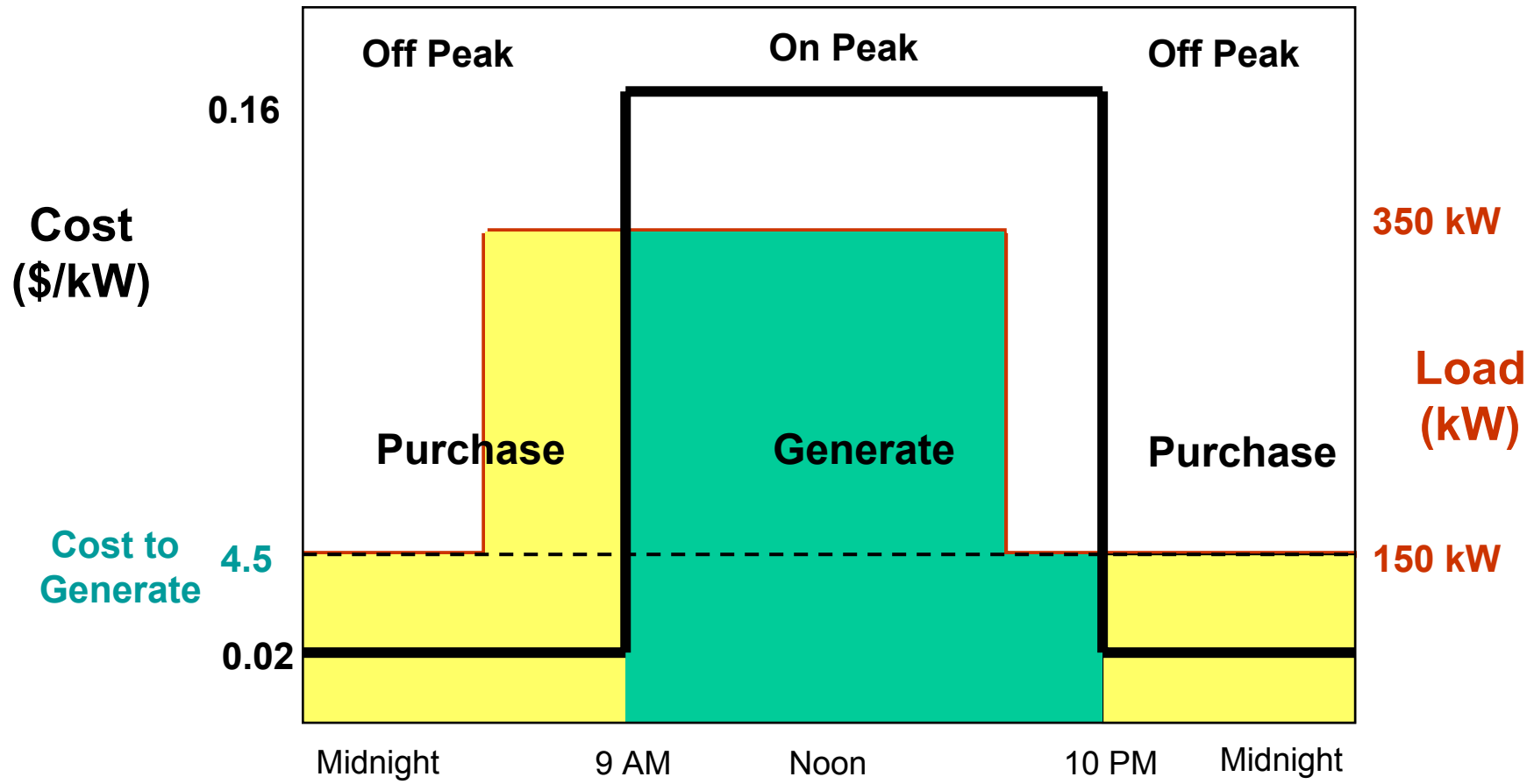




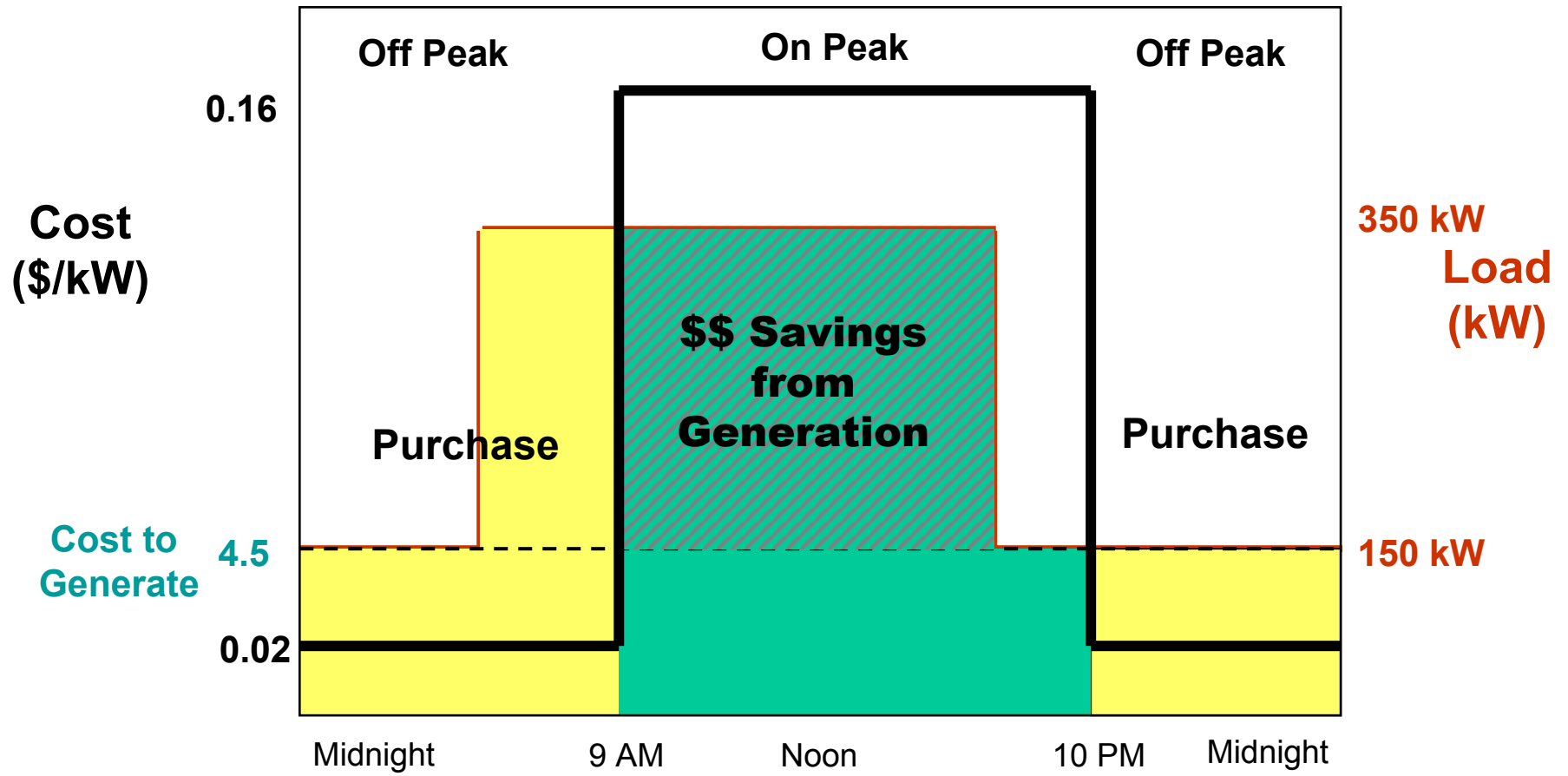
Load Profile & Utility Cost Curve



Load Profile & Utility Cost Curve



Load Profile & Utility Cost Curve



Existing Products 60 Hz

QSK19G	330 kW	1800 rpm
QSV81G	1100 kW	1200 rpm
QSV91G	1250 kW	1200 rpm
QSV91G-GB	1750 kW	1500 rpm



QSV 81 & 91 High Efficiency Lean Burn Genset
12:1, 500 mg/Nm³ Nox, 203 deg F. HT outlet

<u>GENSET</u>	<u>CONTIOUS RATING</u>	<u>ELECTRICAL EFFICIENCY</u>	<u>HEAT RATE</u>
QSV81G	1100 kW	38.2 %	8,937
QSV91G	1250 kW	38.5 %	8,868
QSV91GB	1750 kW	38.1 %	8,955

New Products

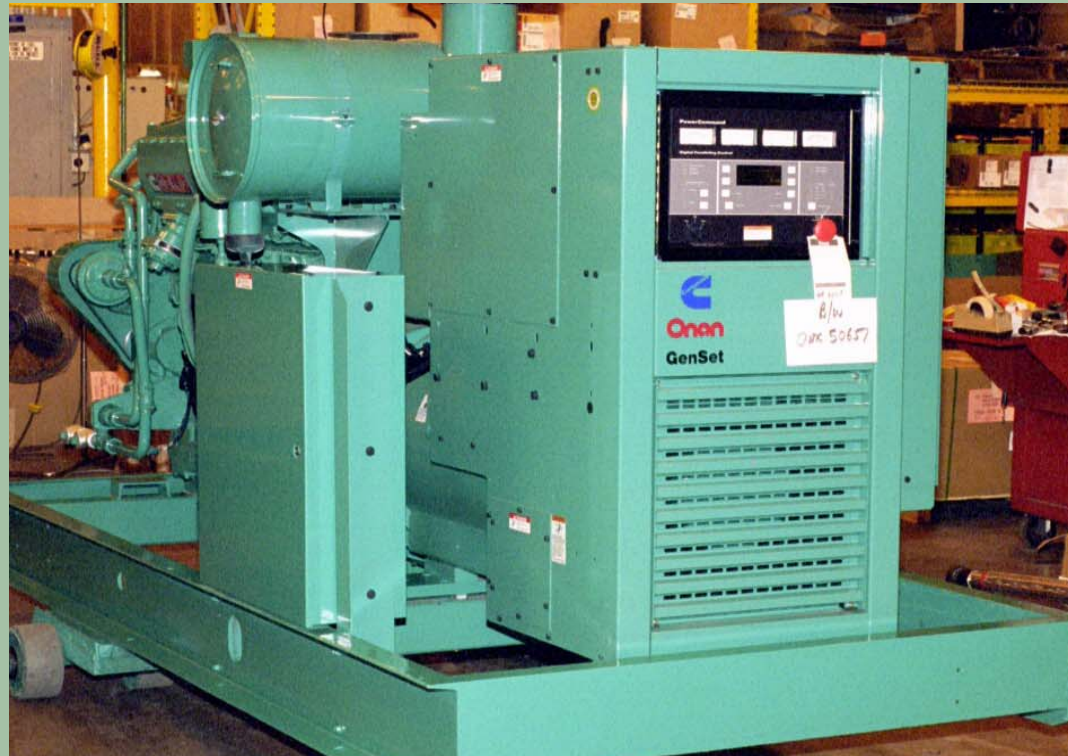
Product	1200rpm 39% electrical efficiency	1800rpm 38% electrical efficiency
QSK45G	700 kW	1050 kW
QSK60G	950 kW	1400 kW

QSK19G

330KWe 60Hz

315KWe 50Hz

- Lean Burn
- Open Chamber combustion
- 6 Cylinder, in-line
- 14 Bar bmep 50Hz
- 12.4 Bar bmep 60Hz
- 1500rpm 50Hz
- 1800rpm 60Hz
- 34.3% electrical efficiency

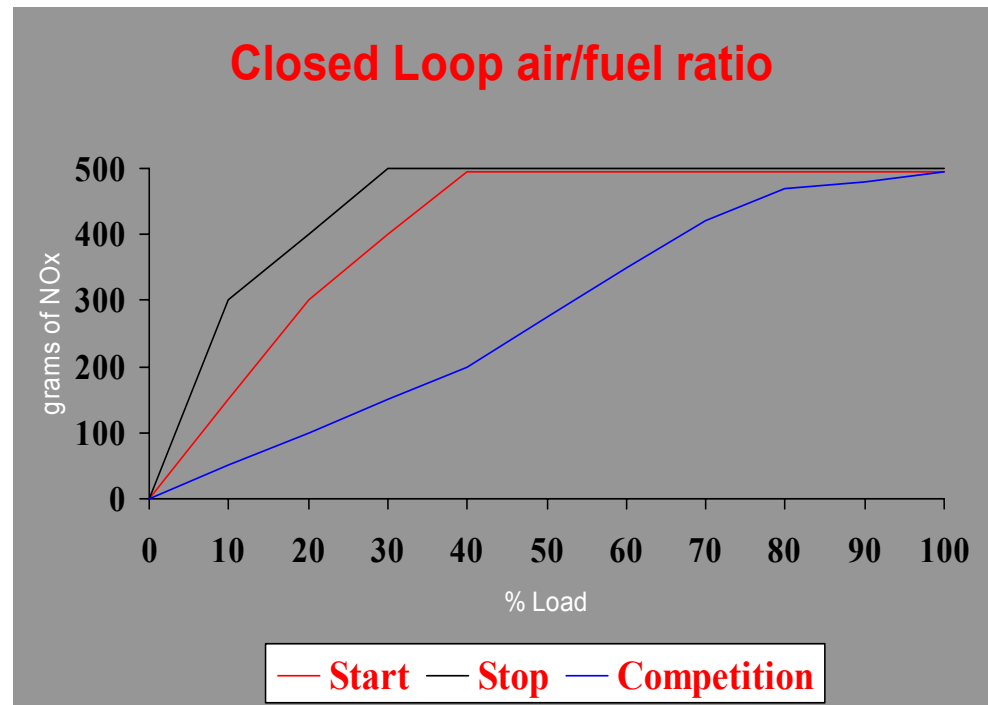


EMISSIONS CONTROL

Competitors use open loop control as standard which only allows emissions control at one load setting

Cummins STANDARD closed loop air/fuel ratio control

- Controls constant NOx emissions between 45% and 100% load
- Uses an algorithm of torque (Kw) over boost (air)
- Hysterisis set to retain control down to 35% on stopping





West Lincoln Hospital Ontario Canada

- 2 QSK 19 330 kW & Digital Master Control
- Hot water heat recovery
 - 2.9 mmbtu/hr via exhaust and HT water jacket.
- 7,000 hours per year
- Scheduled & unscheduled maintenance agreement



The Peaking Power Savings Calculation:

Cost to purchase all power from utility:

Peak energy:	$0.05022\$/kWh \times 3330hrs \times 350kW =$	\$58,530
Off-peak energy:	$0.02123\$/kWh \times 5430hrs \times 150kW =$	\$17,290
Summer demand:	$16.41\$/kW \times 4mo./yr. \times 350kW =$	\$22,975
Winter demand:	$12.85\$/kW \times 8mo./yr. \times 150kW =$	<u>\$15,420</u>
Sub-Total cost:		\$114,215
Total w/8% taxes & charges:		\$123,350

Cost to generate on-peak & purchase off-peak:

Peak energy:	$0.05022\$/kWh \times 3330hrs \times 20kW =$	\$ 3,345
Off-peak energy:	$0.02123\$/kWh \times 5430hrs \times 150kW =$	\$17,290
Summer Demand:	$16.41\$/kW \times 4mo./yr. \times 20kW =$	\$ 1,310
Winter demand:	$12.85\$/kW \times 8mo./yr. \times 20kW =$	\$ 2,055
Generation:	$0.045\$/kWh \times 3330hrs \times 330kW =$	<u>\$49,450</u>
Total cost:		\$73,450

Electric savings with optimized power supply:

Difference:	$\$123,350 - \$73,450 =$	\$49,900
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Cogen savings credits:

Gas use reduction in steam boiler:	$\$1215/mo. \times 12 =$	<u>\$14,580</u>
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Total Savings:	$\\$49,900 + \\$14,580 =$	\$64,480
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The Peaking Power Pro Forma Calculation:

350kW Power system cost:

Gas Genset:	\$400/kW x 330kW =	\$132,000
Installation cost:	\$600/kW x 330kW =	<u>\$198,000</u>
Total cost:		\$330,000

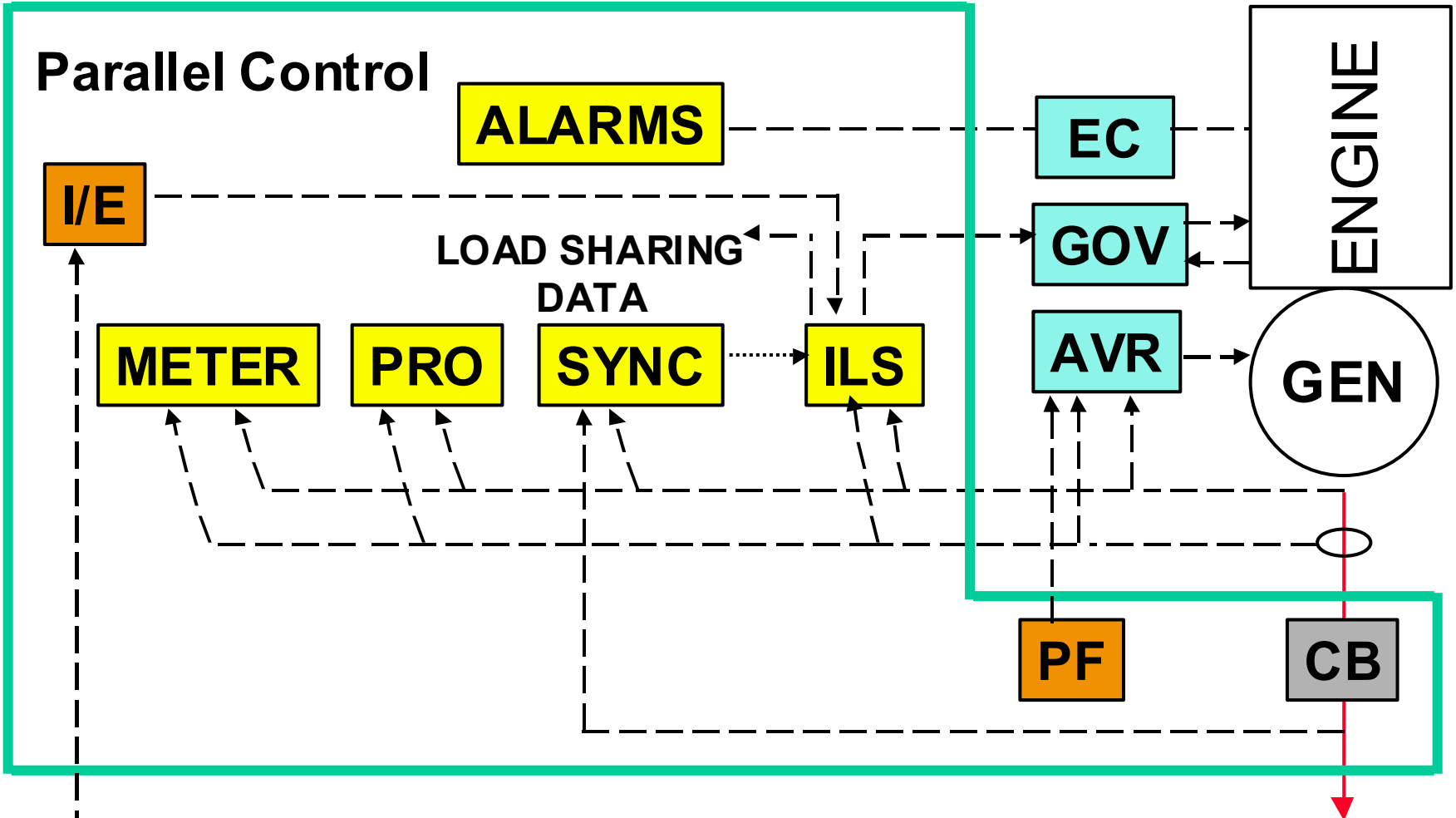
Total Net Cost(Deduct standby diesels, lost production and labor costs, etc.)	\$330,000 - credits =	\$Net Cost
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Pay off:

Lease payment on 7 year lease (LF=.0151):	\$4,983
Monthly gross savings (\$64,480 / 12 =):	\$5,373
Monthly net profit:	\$390

Annual net profit: \$4,680

ROI - 15yrs $(\$4,680 \times 15\text{yrs}) / (\$0 \times 84 \text{ mos.}) = 10,000,000\%$



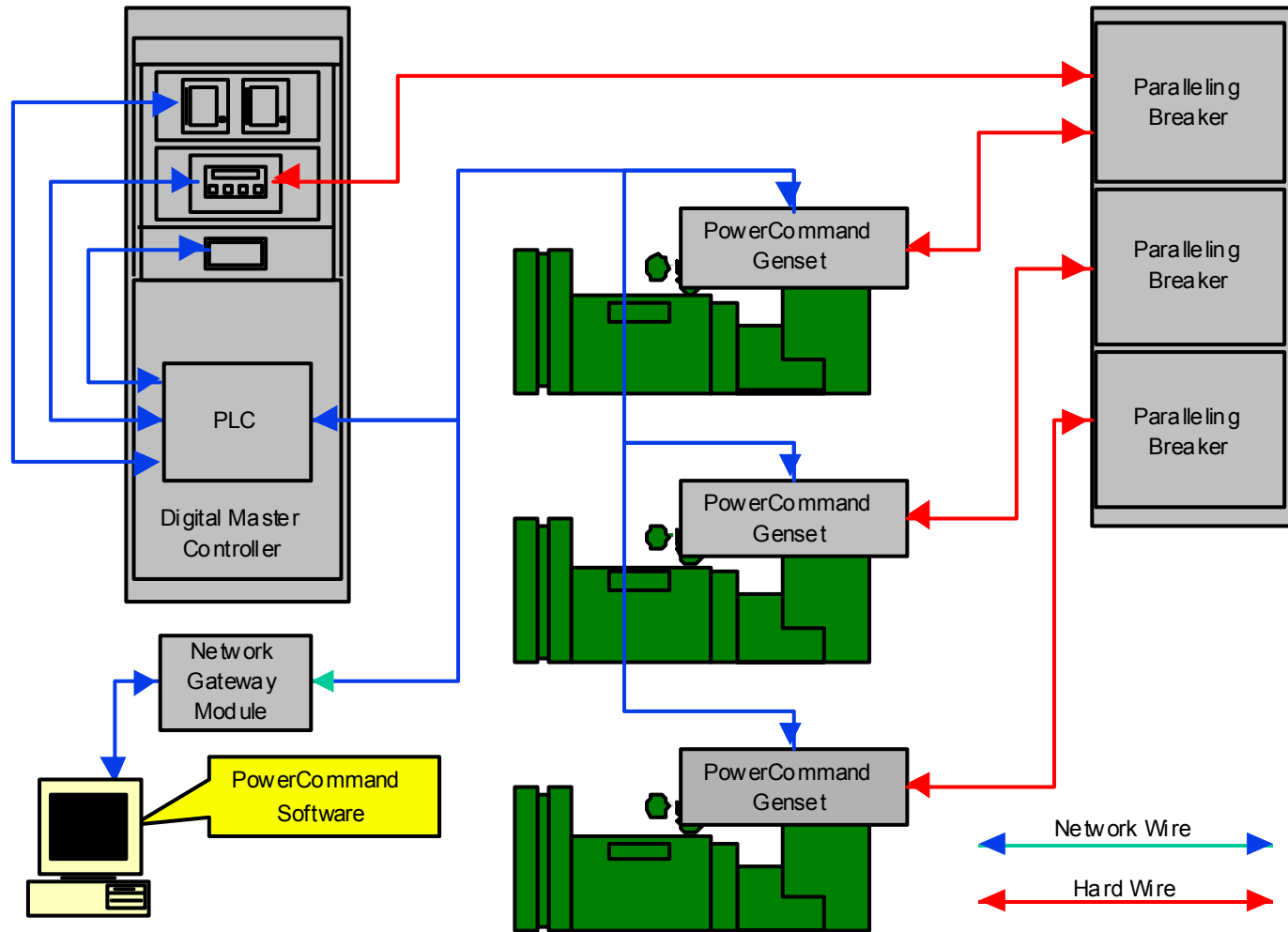
External Reference (optional)

Many Components Added

- *Directly Operate on One Genset*
- *Split Location and Responsibility*

POWER TO LOADS

Networks in Paralleling



PowerCommand Network

- **Echelon LonWorks Network**

- **Peer to Peer**

- **High Speed Control (not just monitoring)**

- **Data Sharing Between Components**

- **Lower Installation Cost**

- **Easy Building Automation System**

- Integration**

- **ANY genset, ANY ATS**

- **LonMark Compliant**

