

University of Illinois at Chicago

A 55 MW_e Combined Heat and Power Facility



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University of Illinois

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Combined Heat and Power
A Workshop for Illinois Businesses

University Of Illinois at Chicago

Why We Did What We Did ...

To Provide Lower Cost Energy More Efficiently and Reliably to Meet the Needs of a Growing Urban Campus



**The Public Research
University in the Great City
of Chicago**

Campus Size and Layout

- ☀ Total Enrollment -- 24,000 Students

- ☀ East Campus

- 3.8 Million sq. ft. of Building Space
- 18 MW_e Summer Peak
- 12 MW_e Winter Peak
- 400 °F Hot Water Loop

- ☀ West Campus (Medical Facilities)

- 5.5 Million sq. ft. of Building Space
- 27 MW_e Summer Peak
- 18 MW_e Winter Peak
- 150 °F Steam Loop

Site Development

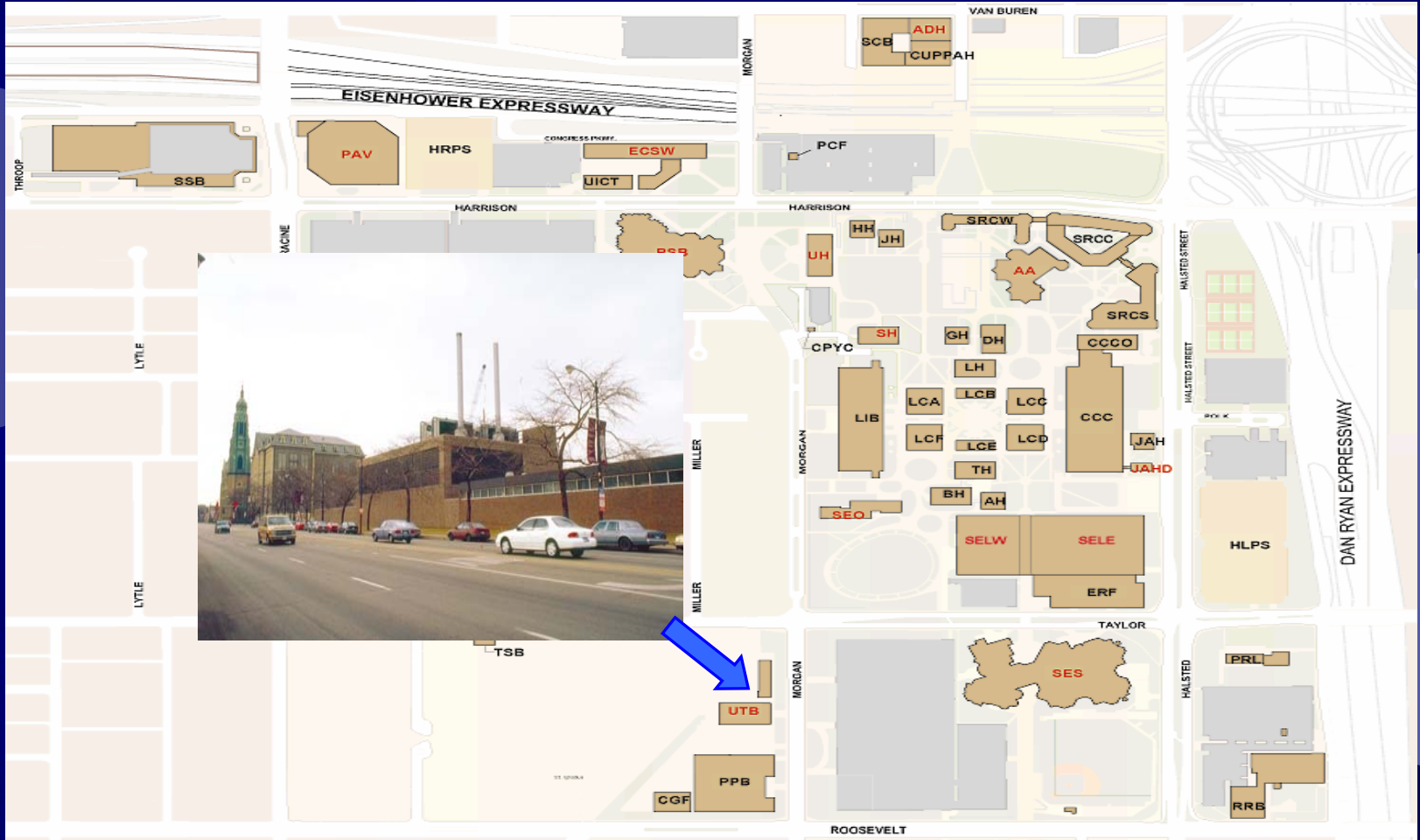
☀ Initial Site

- 12.6 MWe
- Hot Water Heating

☀ Today

- 20.2 MWe
- Electrically Cross Connected to New West Campus Facility
 - Additional 37.2 MWe
- Hot Water Heating
- Absorption Cooling

East Campus Facility



East Campus Facility

- ★ Meets the Electrical Demand of the East Campus
- ★ Electrically Tied to West Campus with 69 KV Line
- ★ 30 MMBTU/h Available to Offset the Heating & Cooling Demands of 3.8M ft² in 29 Buildings
- ★ 8 MMBTU/h Available to Adjacent School and Church

Cooling, Heating and Power Systems East Campus

2 Cooper-Bessemer
Reciprocating
Engine-Generators
(1993)

- Dual-Fuel
- 6.3 MW_e each



2 Wärtsilä
Reciprocating
Engine-Generators
(1999)

- Natural Gas
- 3.8 MW_e each

Cooling, Heating and Power Systems East Campus

4 Exhaust Gas Systems

- Total: 30 MMBTU/h



2 Jacket Water Systems

- Total: 8 MMBTU/h

Cooling, Heating and Power Systems East Campus

3 High Temperature Hot Water Generators (HTHWGs)

- Natural Gas or #6 Fuel Oil
- 2 at 75 MMBTU/h
- 1 at 50 MMBTU/h



Cooling, Heating and Power Systems East Campus

Absorption Chillers

Activated by Hot Water Loop

- 1 Trane Chiller (May 2001)
 - Two-Stage
 - 1000 RT
- Remote Building Chillers
 - Total of 1350 RT
 - 2 @ 500 RT on Engineering Research Facility
 - 1 @ 350 RT on Transportation Building



Cooling, Heating and Power Systems

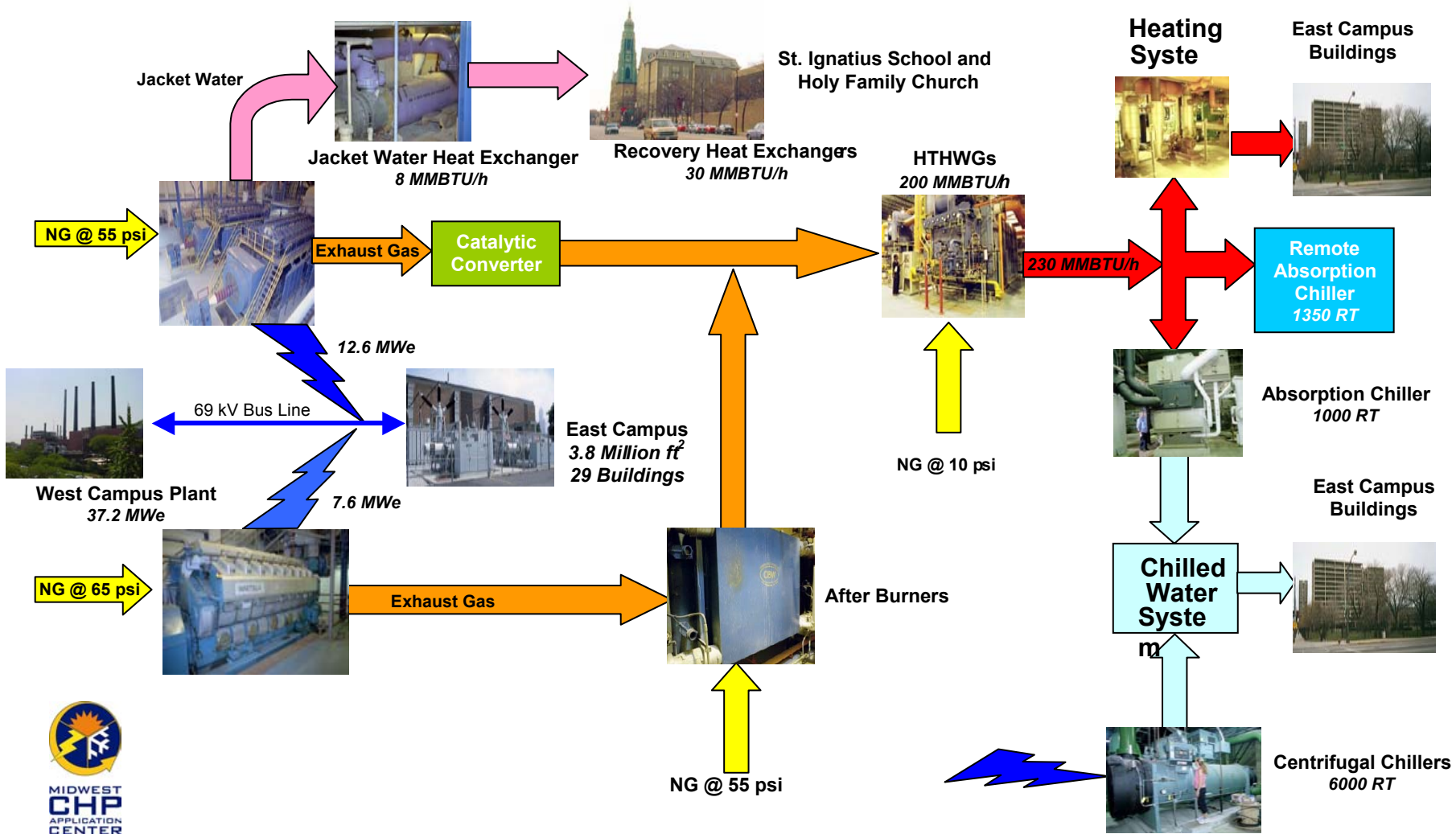
East Campus

Electrical Centrifugal Chillers

- 3 York International
- 2000 RT *each*



University of Illinois at Chicago East Campus



Cooling, Heating and Power Systems West Campus

3 Wärtsilä Reciprocating Engine-Generators

- Natural Gas
- 5.4 MW_e each



Cooling, Heating and Power Systems West Campus

3 Solar Taurus Turbines

- Natural Gas
- 7.0 MW_e each



Cooling, Heating and Power Systems West Campus

3 Exhaust Gas Systems with Duct Burners

- Solar Taurus Turbines Only
- Total Capacity 90,000 lb/hr to 360,000 lb/hr of Steam



Cooling, Heating and Power Systems West Campus

3 Boilers

- Natural Gas or #6 Fuel Oil



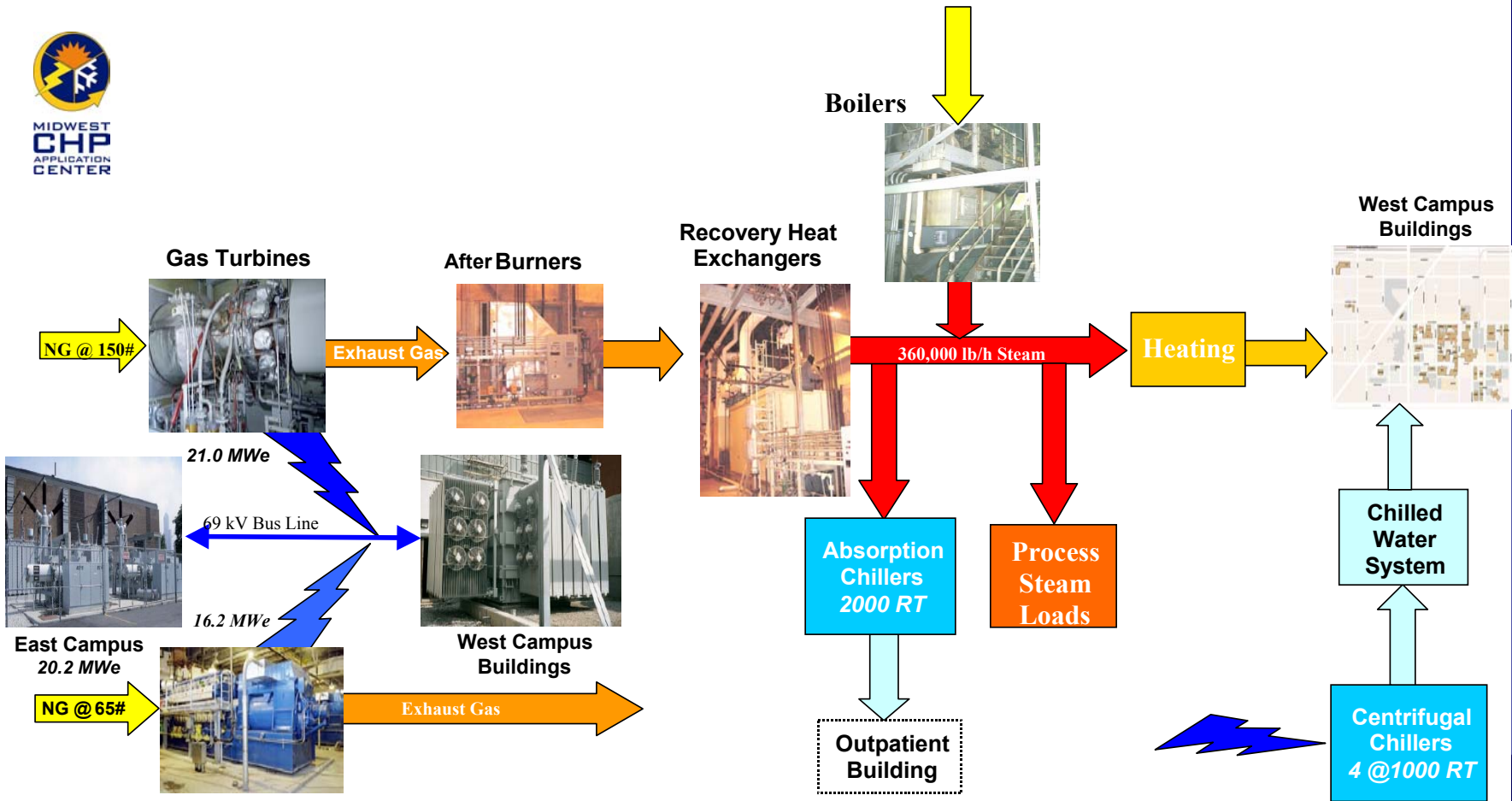
Cooling, Heating and Power Systems

West Campus

Remote Absorption Chillers

- Activated by Steam Loop
- University of Illinois Hospital
Outpatient Building
 - 3 Carrier Units (Total of 2000 RT)
 - 2 @ 500 RT
 - 1 @ 1000 RT

University of Illinois at Chicago West Campus



Financial Statistics

★ Original 12.6 MW East Campus Plant *(Operational in 1993)*

- Total Cost: \$15M
- Original Goal: Payback in 10 years
- Actual Performance: Payback in 7.5 years
- Operating Savings: Approximately \$2M/yr

Financial Statistics

★ Additional 7.6 MW East Campus Plant *(Operational in Mid-2000)*

- Total Cost: \$10.7M
- Original Goal: Payback in 10 years
- Actual Performance: First Full Year 2001
- Operating Savings: \$1.9M for 2000*

* *(With only 6 months of operation with the additional 7.6 MWe and all time high gas prices.)*

Financial Statistics

★ New 37.2 MW West Campus Plant *(Operation Expected in Late 2001)*

- Total Cost: \$38M
- Original Goal: Payback in 7 years
- Actual Performance: First Full Year 2002
- Operating Savings: Estimated \$7M

Operating Financial Strategy

- ★ CHP Facilities Financed Through University Issued Bonds
- ★ Payback Bond Debt Through Operational Savings
 - All Three Phases Under 10 Years Each
- ★ Facilities Annual Budget Set at What Non-CHP Utility Bill Would Be
- ★ Efficient CHP Operation and Facilities Annual Budget Savings Results In:
 - Early Payoff of Bonds
 - No Increase in Annual Utility Budget for University
 - Investing Savings in Other Improvements in Utilities Infrastructure