

CHP Applications in the Midwest



Leslie Farrar

University of Illinois at Chicago
Midwest CHP Application Center

Associations of Energy Engineers
Illiana Meeting
May 8, 2002
Oak Lawn, Illinois





Different Views of DE

- Renewable
 - Solar
 - Wind
 - Biomass
- **Cooling, Heating, and Power**
 - Commercial
 - Industrial
- Demand Side Management
- Energy Efficiency
- Grid Support

**Renewable
Community**

**CHP
Community**

**Energy
Efficiency
Community**

**Electric
Community**



Where Does CHP Fit With DE?

- High Thermal Loads
 - Cooling, Heating, or Dehumidification
 - Steam, Hot Water, or Direct Heat
- High Electric Loads
- Coincident Thermal and Electric Loads
- Extended Operating Hours
- Where the Rates and Regulatory Climate are Favorable
- Central HVAC System
- Access to Fuels (Natural Gas or Byproducts)



Why Is There An Opportunity?

- DOE/EIA Project Over 360 GW of New Capacity
 - To Meet Growing Demand
 - To Compensate for Plant Retirements
- Today's Central Station Plants Lose 23 Quads of Thermal Energy
- Aging Electric Transmission/Distribution System
 - Difficult to Site New Lines
 - Capacity Constrained
 - Costly to Maintain



Why is There an Opportunity?

- Rising Concerns Over

- Blackouts/Brownouts
- Power Supply Constraints
- Electricity Prices

- Selected Power Outage Costs

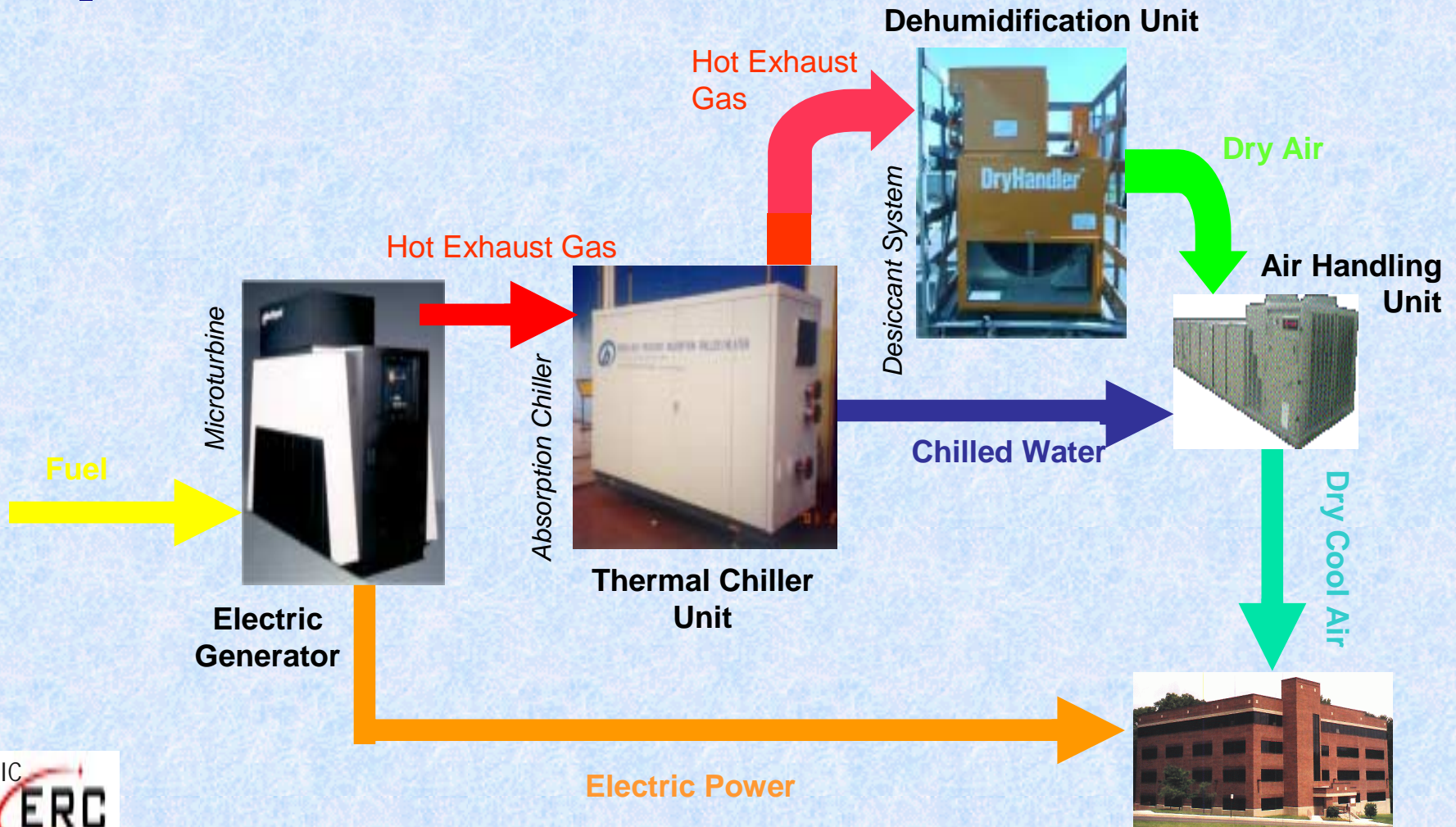
Industry	Avg. Cost of Downtime
Cellular Communications	\$41,000 per hour
Telephone Ticket Sales	\$72,000 per hour
Airline Reservations	\$90,000 per hour
Credit Card Operations	\$2,580,000 per hour
Brokerage Operations	\$6,480,000 per hour



What is CHP?

- Integrated System
- Located At or Near A Building/Facility
- Provides a Portion of the Electrical Load
- Utilizes the Thermal Energy
 - Cooling
 - Heating
 - Dehumidification
 - Process Heat

Typical Commercial CHP System



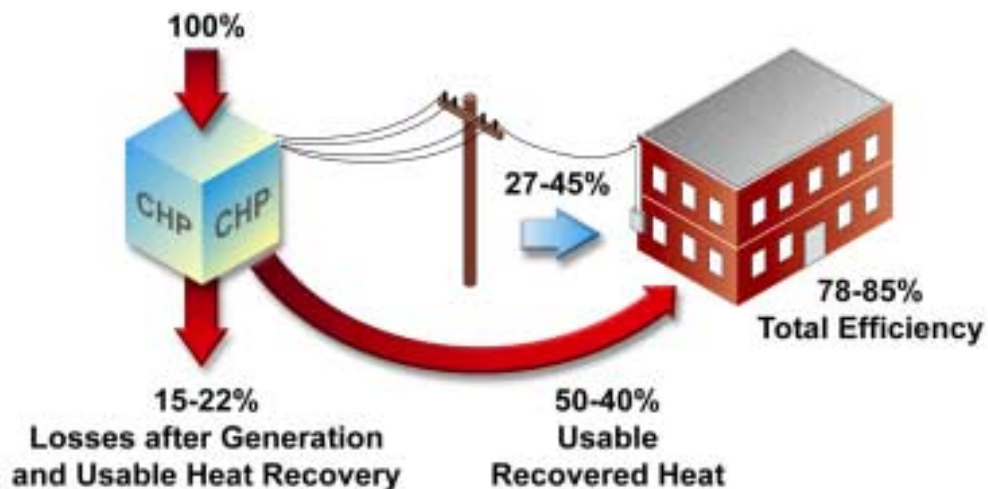


Why is CHP Better Than DE Alone?

- High Efficiency – Up to 80%
- Further Reduction on Summer Peak Grid Load
- Significant Emissions Reductions
 - 40% Less than Central Plants
- Improved Indoor Air Quality

***CHP is a IMPORTANT Part of the BIG
Distributed Energy Picture!***

How CHP Saves Energy





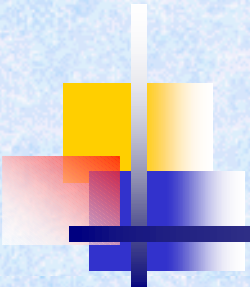
CHP Technologies

- Electric Generation Equipment
 - Reciprocating Engines
 - Turbines/Microturbines
 - Fuel Cells
- Heat Recovery Systems
 - Hot Water
 - Steam
- Cooling Equipment
 - Absorption Chillers
 - Desiccant Dehumidification
 - Mechanical Chillers
 - Thermal Storage

Electric Generation Devices Comparison

Technology Comparison	Diesel Engine	Gas Engine	Simple Cycle Gas Turbine	Microturbine	Fuel Cell
Product Rollout	Commercial	Commercial	Commercial	1999 – 2000	1996 – 2010
Size Range (kW)	20 – 10,000+	50 – 5,000+	1,000+	30 – 200	50 – 1000+
Efficiency (HHV)	36 – 43%	28 – 42%	21 – 40%	25 – 30%	35 – 54%
Genset Package Cost (\$/kW)	125 – 300	250 – 600	300 – 600	350 – 750*	1500 – 3000
Turnkey Cost – no heat recovery (\$/kW)	350 – 500	600 – 1000	650 – 900	600 – 1100	1900 – 3500
Heat Recovery Added Costs (\$/kW)	n.a.	\$75 – 150	\$100 – 200	\$75 – 350	incl.
O&M Cost (\$/kWh)	0.005 – 0.010	0.007 – 0.015	0.003 – 0.008	0.005 – 0.010	0.005 – 0.010

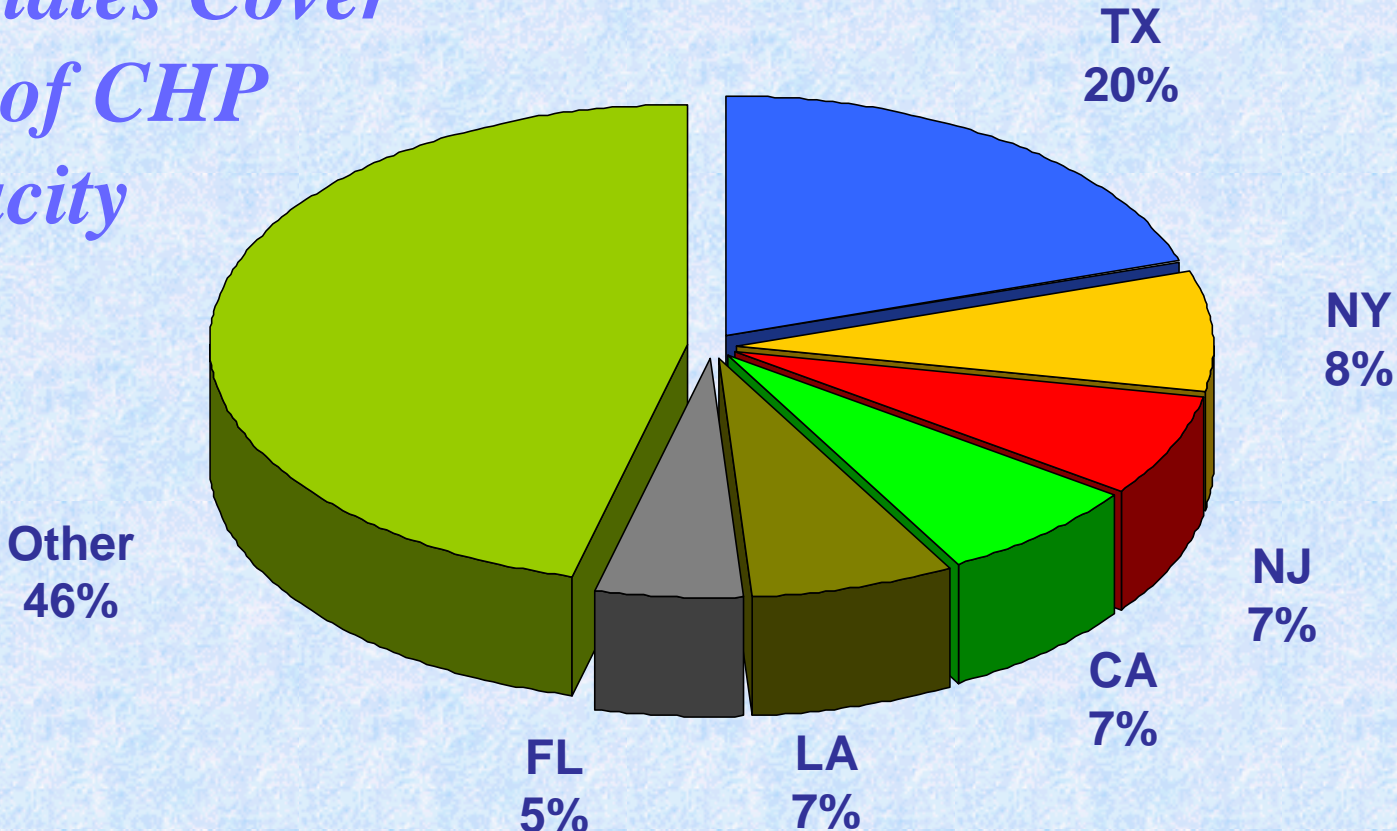
*Commercial target price



Existing Industrial CHP

45.5 GW

*Six States Cover
54% of CHP
Capacity*

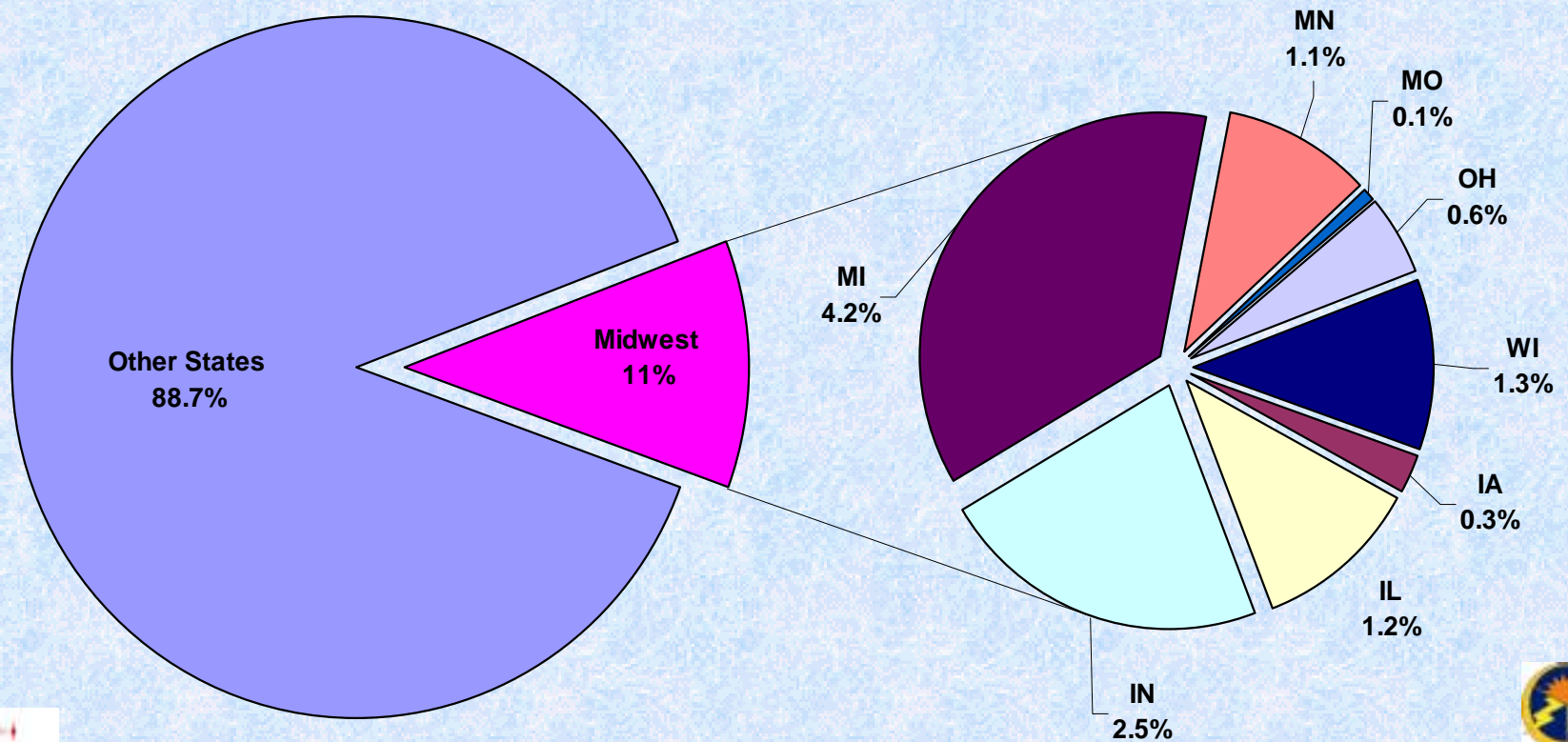


Source: Hagler Bailly, Nexus



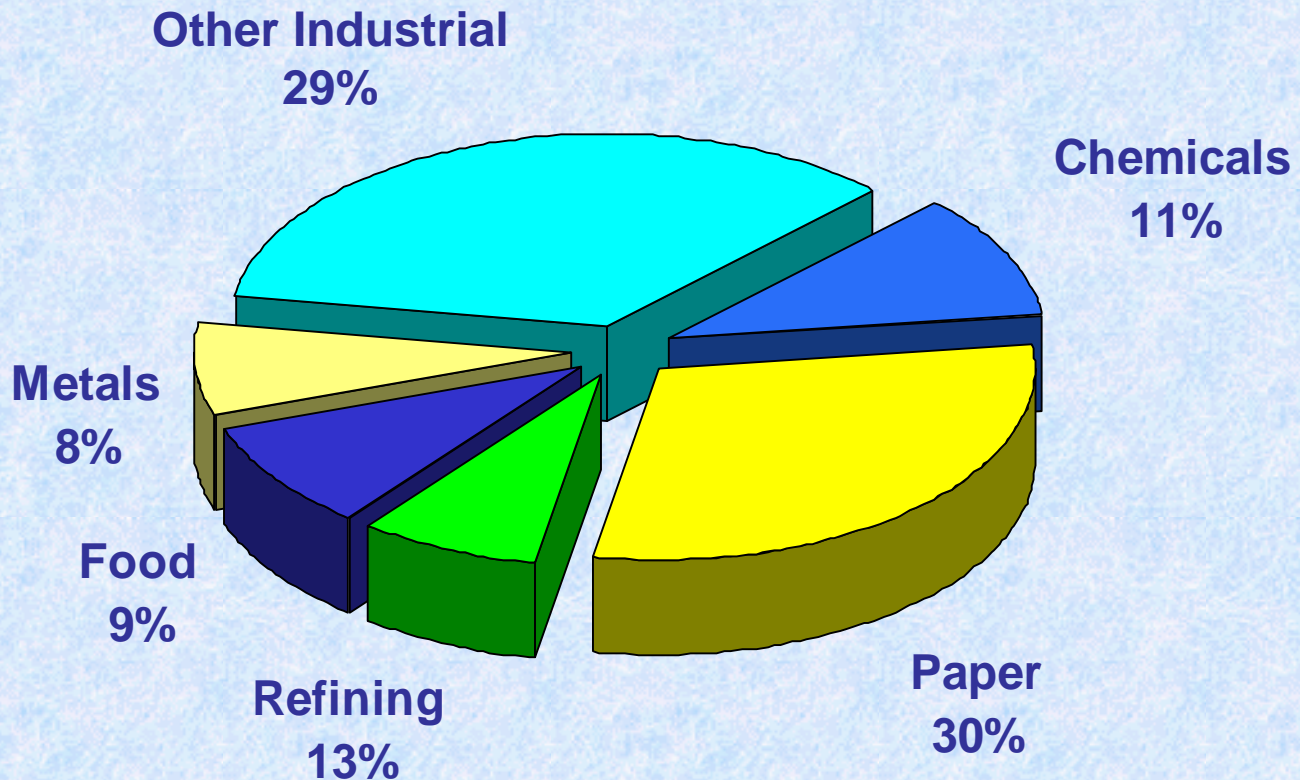
Existing Industrial CHP (Midwest)

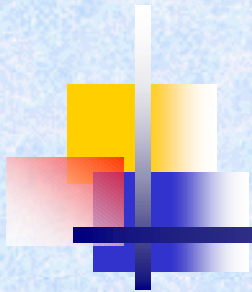
5.2 GW (11.3% of Total U.S.)
Installed – 45.5 GW



Potential for Industrial CHP is Large

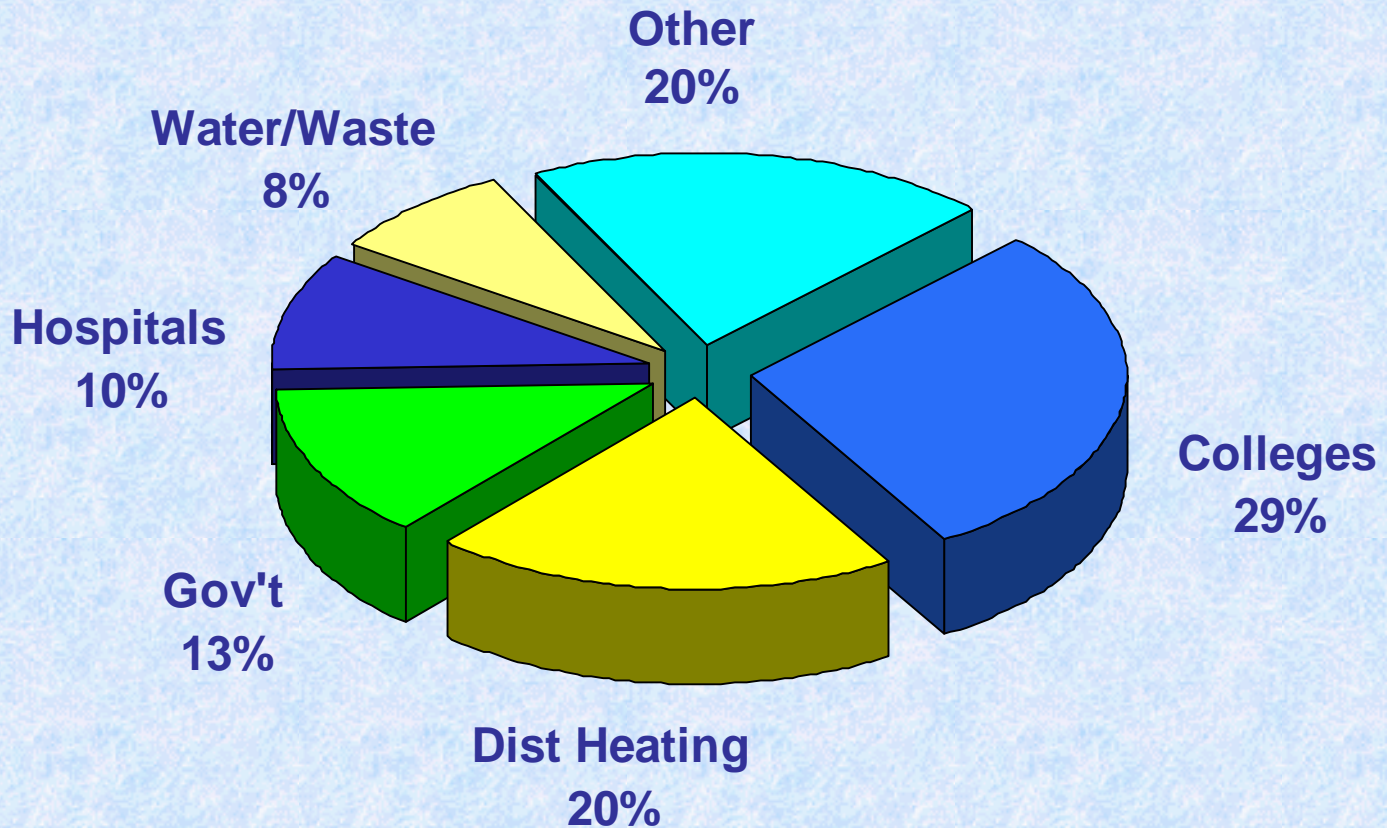
Estimated CHP Potential: 88 GW





Existing Commercial CHP

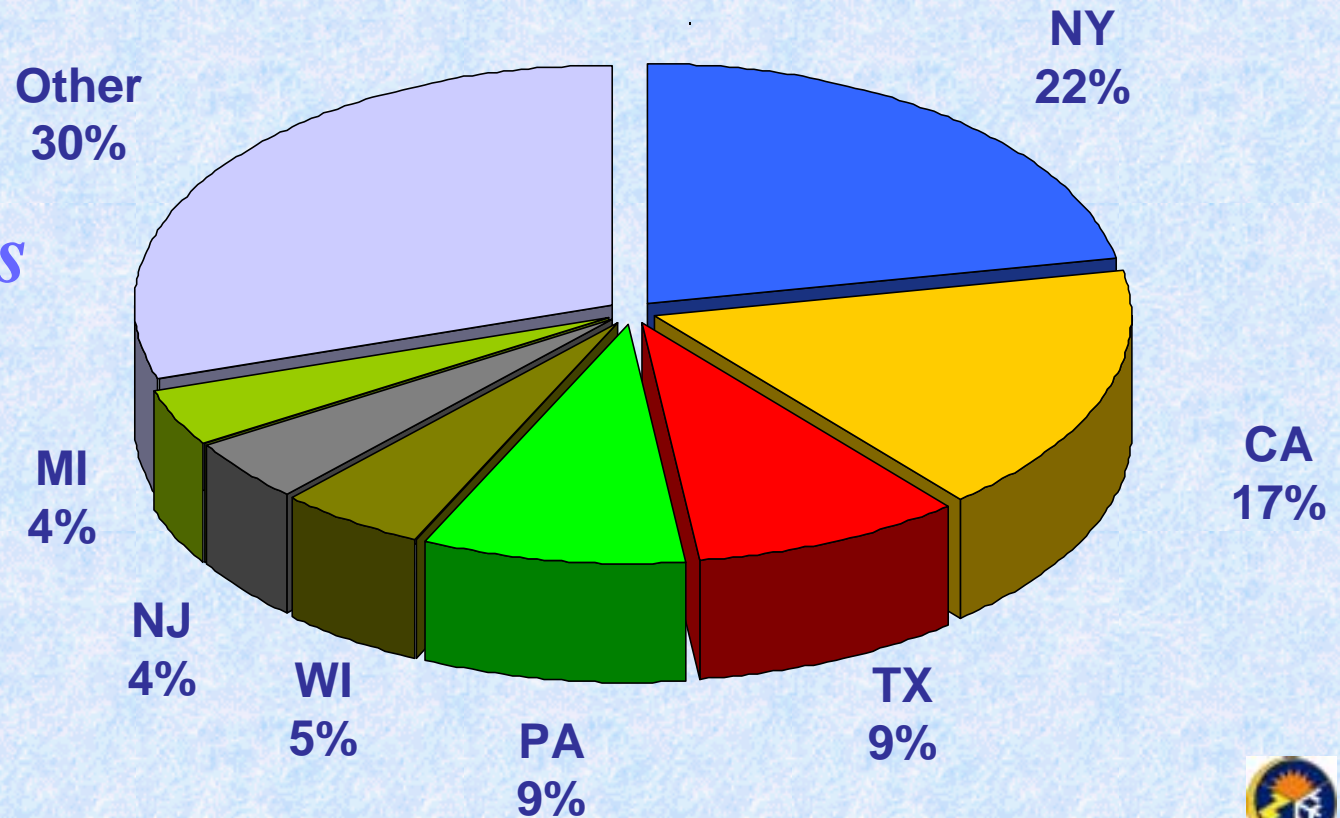
Existing Commercial CHP Capacity 4.93 GW



Existing Commercial CHP

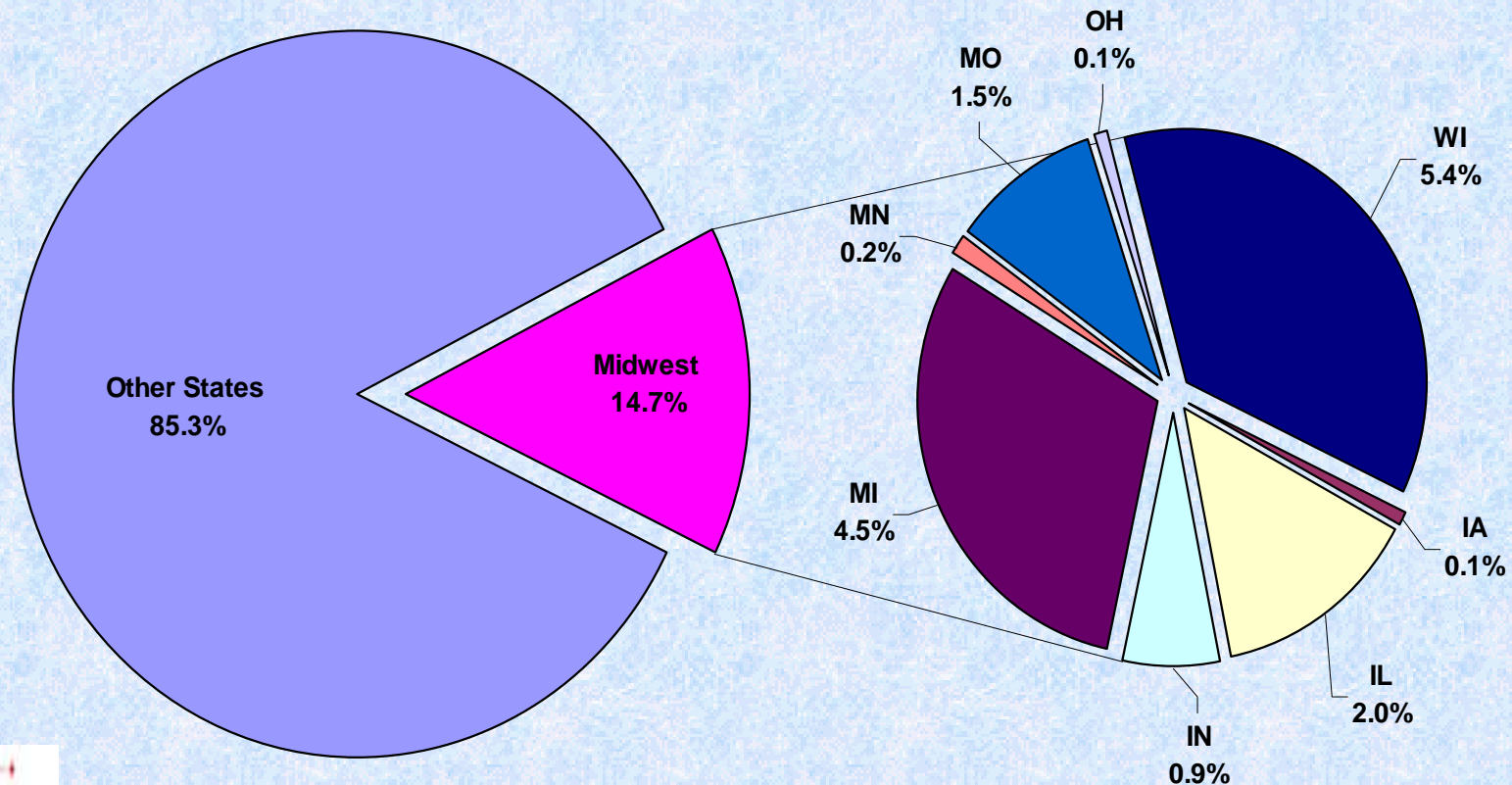
Existing Commercial CHP Capacity: 4.93 GW

*Seven States
Cover 70%
of CHP
Capacity*



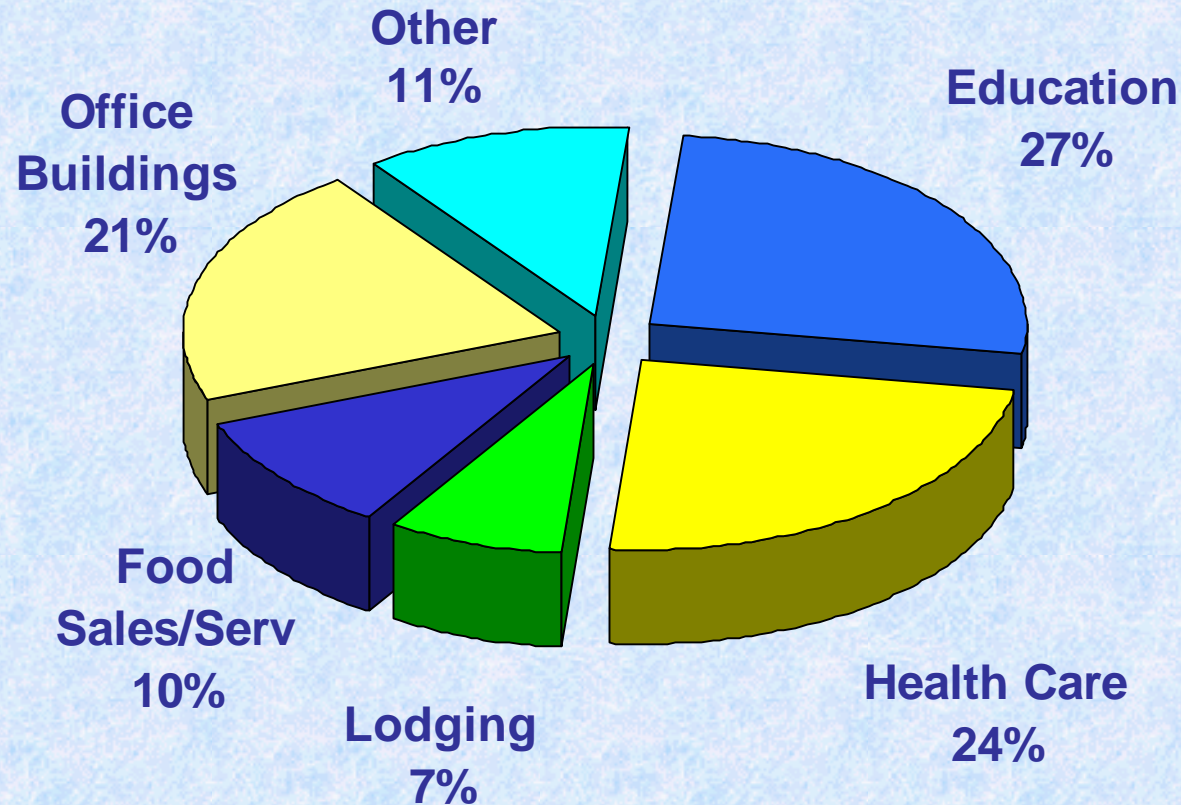
Existing Commercial CHP (Midwest)

.7 GW (14.7% of Total U.S.)
(Installed – 4.93 GW)



Potential for CHP in Commercial Applications Is Large

Estimated CHP Potential: 75 GW





Critical Policy Issues

- Tariff Design
 - Standby / Back-up Power Rates
- Renegotiated Rates
- Interconnection Requirements
- Stranded Cost Recovery and Exit Fees
- Environmental Permitting



Critical Market Challenges

- Education and Awareness
 - Technical Feasibility
 - Financial Viability
 - Other Benefits
- Identifying Full Economic Value
- Financing
- Market Uncertainty



Significant Barrier - Misconceptions

- Poor/Middle Class will Pay More as Customers Unplug
 - Shoulder Larger Share of T&D Costs Stranded Assets
- Loss of Grid Sales
- Distributed Energy Will Displace New Low Emission Central Station Generation
 - Increase Emissions in Urban Areas



What is Not Communicated

- Important Role in Moderating Prices
 - Reduce Peak Loads in Critical Areas
 - Reduces Grid Infrastructure Costs
 - Increasing Supply to Reduce Growth
 - CHP at Best Could Displace 10% to 15% of the Projected Growth
 - Meets Energy Needs at a Lower Cost
 - Provides Part of Electricity Needs
 - Fully Utilize Waste Heat



What is Not Communicated

- Decrease Grid Costs
 - Improve Grid Utilization
 - Peak Shaving
- Diversify Supply
- Positive Impact on Emissions
 - Lower NO_x, CO₂, SO₂
 - Over Most States Current Generation Mix
 - Excludes Diesel Fueled Generators



Outreach Programs in the Midwest

Midwest CHP Application Center

- DOE Funded Project
- UIC/ERC & GTI



Midwest CHP Initiative

- Coalition (Voluntary)
- Founding Members
 - GTI
 - UIC/ERC
 - Delta Institute
 - ELPC
 - NiSource

Promote the Use of CHP in the
Midwest



Midwest CHP Initiative

- Voluntary Coalition of Interested Organizations
 - GTI
 - UIC/ERC
 - Delta Institute
 - ELPC
 - US DOE Chicago Regional Office
 - NiSource
 - Peoples Energy
 - Northeast/Midwest Institute
 - Illinois DCCA
 - Indiana Department of Commerce
 - Wisconsin Division of Energy
 - Michigan Public Service Commission
 - Minnesota Department of Commerce
 - US EPA
 - US EPA Region V

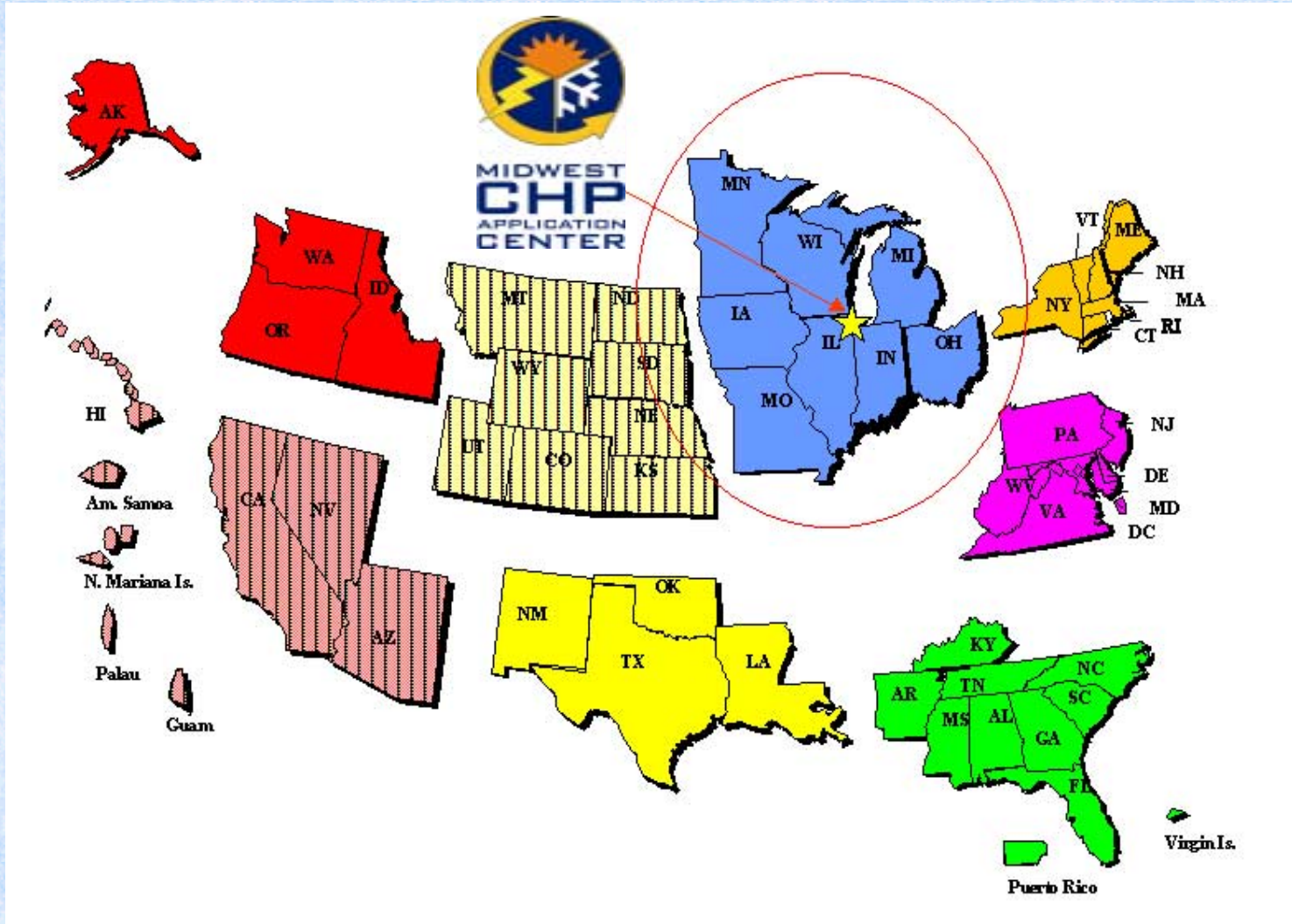




Midwest CHP Initiative

- **Mission:** Double the Amount of CHP in the Midwest by 2010
- **Focus:** Work to Remove Marketplace and Government Barriers to CHP Development
- **Committees:**
 - Permitting
 - Education
 - Policy
 - Market Development
- **Bimonthly Meetings**
- **Develop/Implement Action Plans**

Midwest CHP Application Center





Midwest CHP Application Center

Mission:

Develop Technology Application Knowledge and the Educational Infrastructure Necessary to:

- Reduce Perceived Risks
- Foster CHP for Buildings as a Viable:
 - Technical and Financial Option
 - Energy and Environmental Option

Focus: *(Foster Project Identification)*

- Education
- Information
- Project Assistance

“The MAC”



Midwest CHP Application Center

- **Partnership:**

- University of Illinois at Chicago
Energy Resources Center --- UIC/ERC
and
- Gas Technology Institute --- GTI

- **Sponsorship:**

- DOE Office of Power Technologies

- **Technical/Program Guidance:**

- Oak Ridge National Laboratory --- ORNL



MAC Project Support *(Services)*

- Technology Education
- Screening Assessments
- Site Assessment Visits
- Viability Assessments
- Project Justification Assistance
- Partnership Assistance
- SWAT Team Assistance
- Case Studies



MAC Activities

- Baseline Assessments (Illinois/Michigan)
- Midwest State Grid Interconnection Workshop
- US EPA CHP Partnership Program
 - July 9th Illinois Workshop
- Website –
www.CHPCenterMW.org



For Further Information

Midwest CHP Application Center

www.CHPCenterMW.org

Leslie Farrar (UIC/ERC): (312) 413-5448

Midwest CHP Initiative

www.NEMW.org/USCHPA/regional.htm

Ted Bronson (GTI): (847) 768-0637

