



# ENDURANT ENERGY



Sustainable Development  
Efficient Development  
Planning and Design

# Carbon Footprint Methods

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- Carbon factors

- Energy consumption x Carbon Factor

- Example: Btu x kg/Btu = kg of CO<sub>2</sub>

- Sources for building carbon factors

- <http://www.ghgprotocol.org>



World Business Council for Sustainable Development

- <http://www.epa.gov/cleanenergy>



**eGRID**



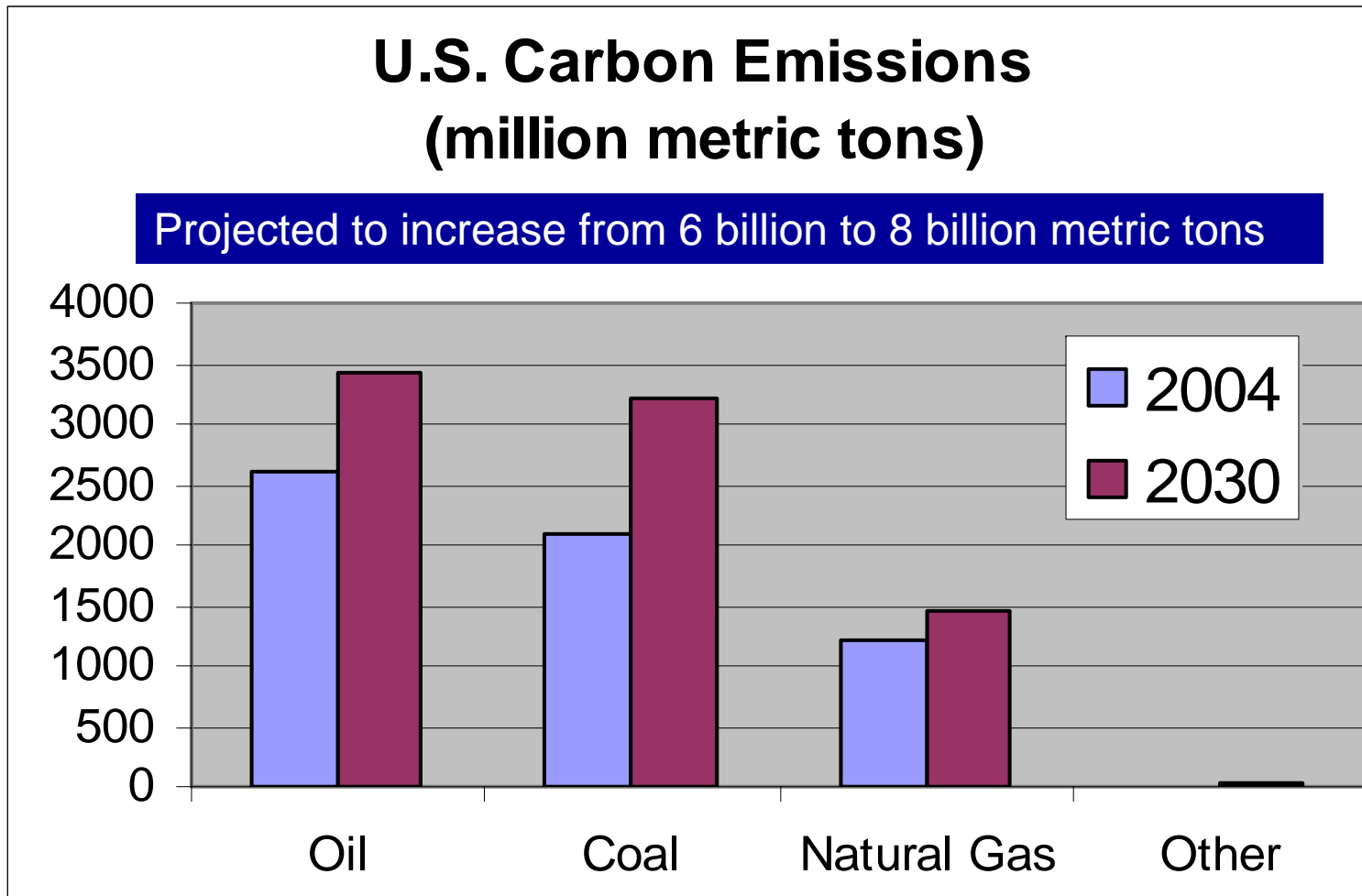
# Industry Response to Capacity Crunch

- New conventional coal fired generation\*
  - 19,000 MW recently built or under construction,
  - 46,000 MW permitted and planned, and
  - 73,000 MW projected by DOE EIA by 2030
    - Duke Power approved for 800MW at a current 200MW site
    - TXU proposes 9,000MW and gets 3,000MW
- >1 billion tons of carbon emissions annually

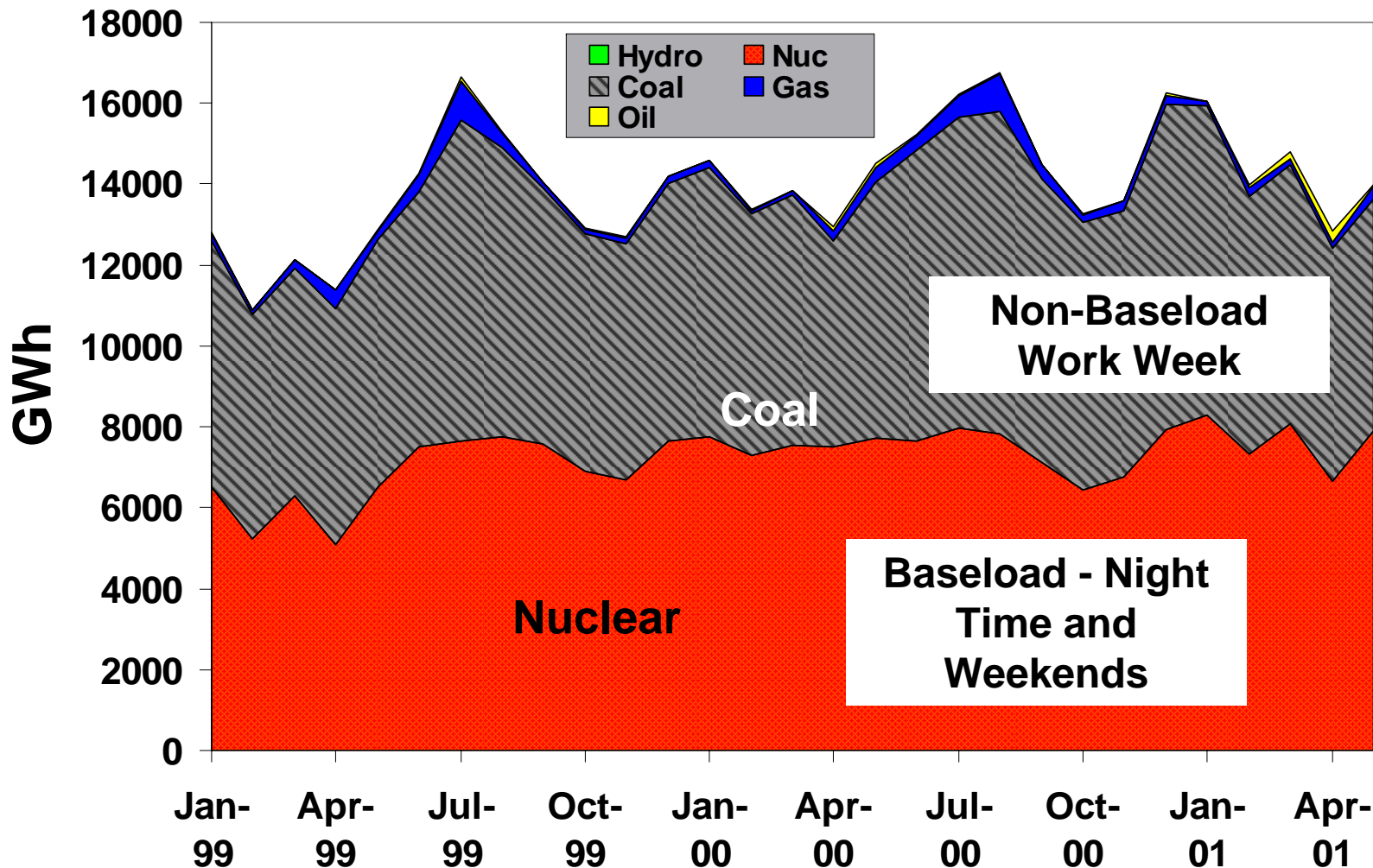
\* National Energy Technology 2007 Coal Report



# Carbon Dioxide Emissions



# Illinois Generation Dispatch



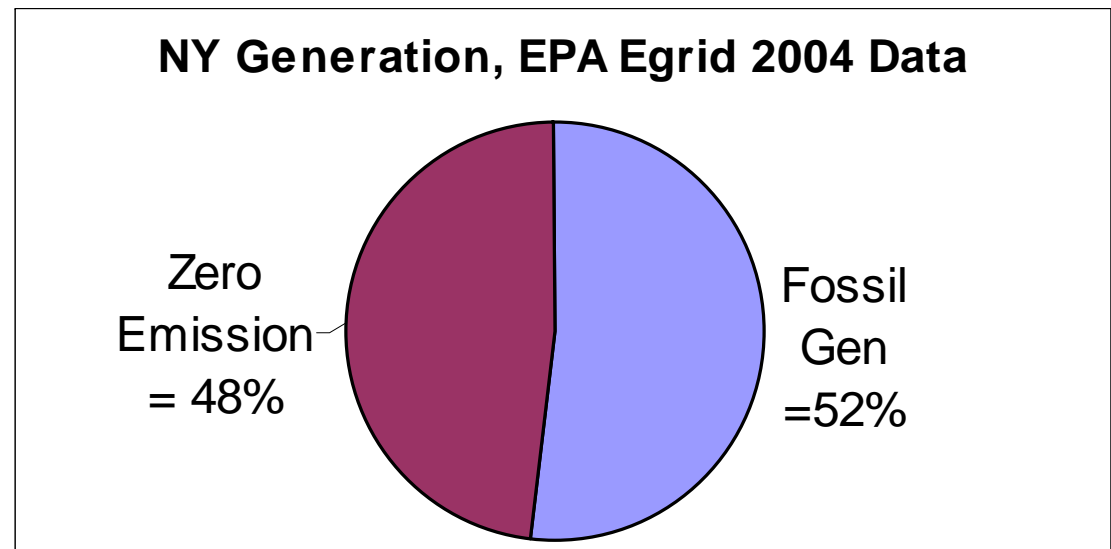
## EPA EGRID Carbon Factors (lbs/MWh), 2004

State	Average	Non-Baseload	% Coal 2001
Illinois	1,200	2,200	46%
Indiana	2,100	2,200	96%
Iowa	1,900	2,400	84%
Michigan	1,400	2,000	65%
Minnesota	1,500	2,000	65%
Missouri	1,900	2,100	83%
Ohio	1,800	2,000	87%
Wisconsin	1,700	2,100	71%
<b>Natural Gas DG</b>	<b>1,240</b>	<b>1,240</b>	
CHP	900	900	

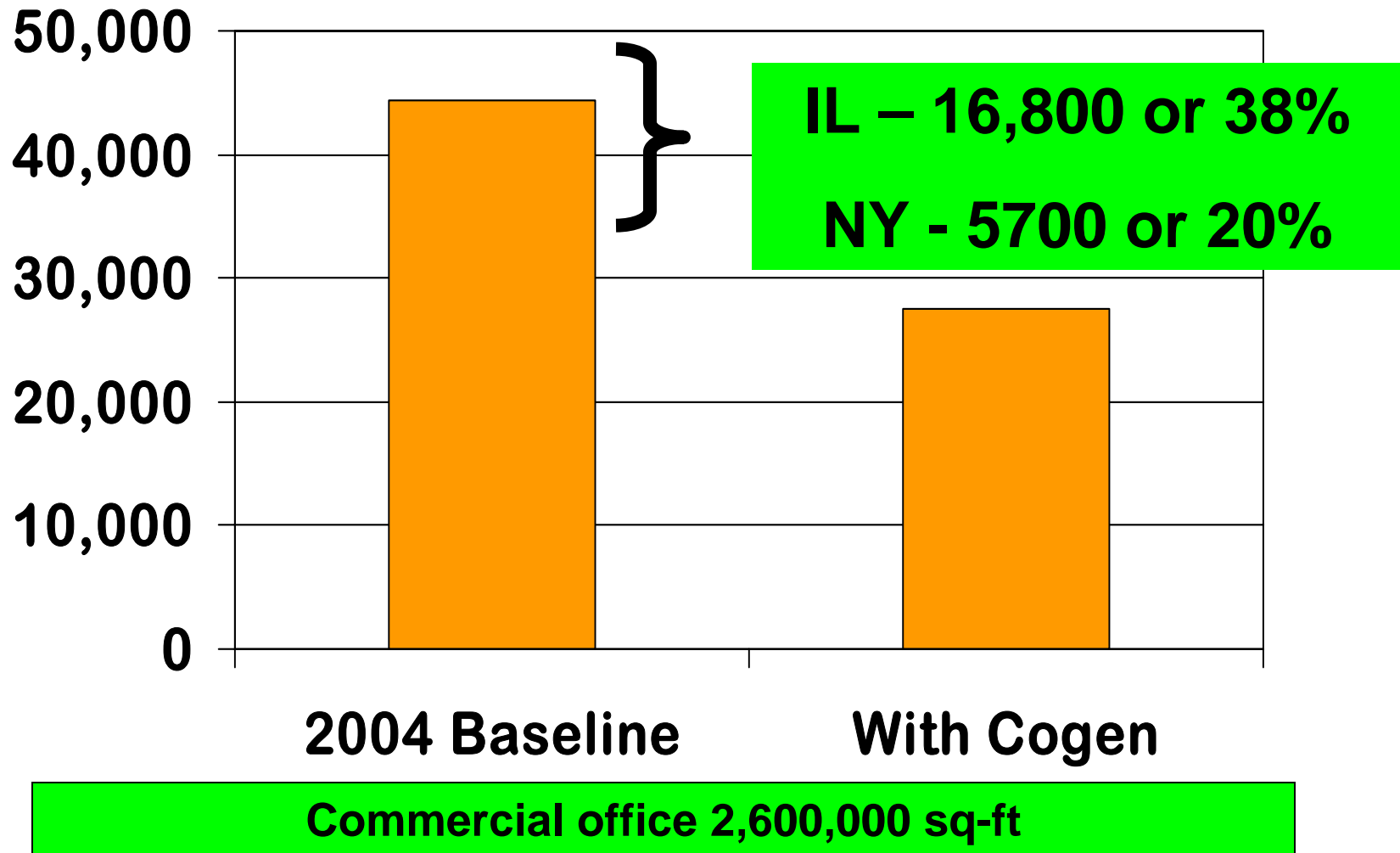


# On-Peak Versus Off-Peak Generation

- Roughly half of the electricity in NYC is produced by sources with no carbon emissions – hydro and nuclear
- Hydro and nuclear provide base load or off-peak electricity
- Non-base load electricity is supplied from coal, natural gas and oil fired generation with efficiency around 30%



# Carbon Footprint, metric tons



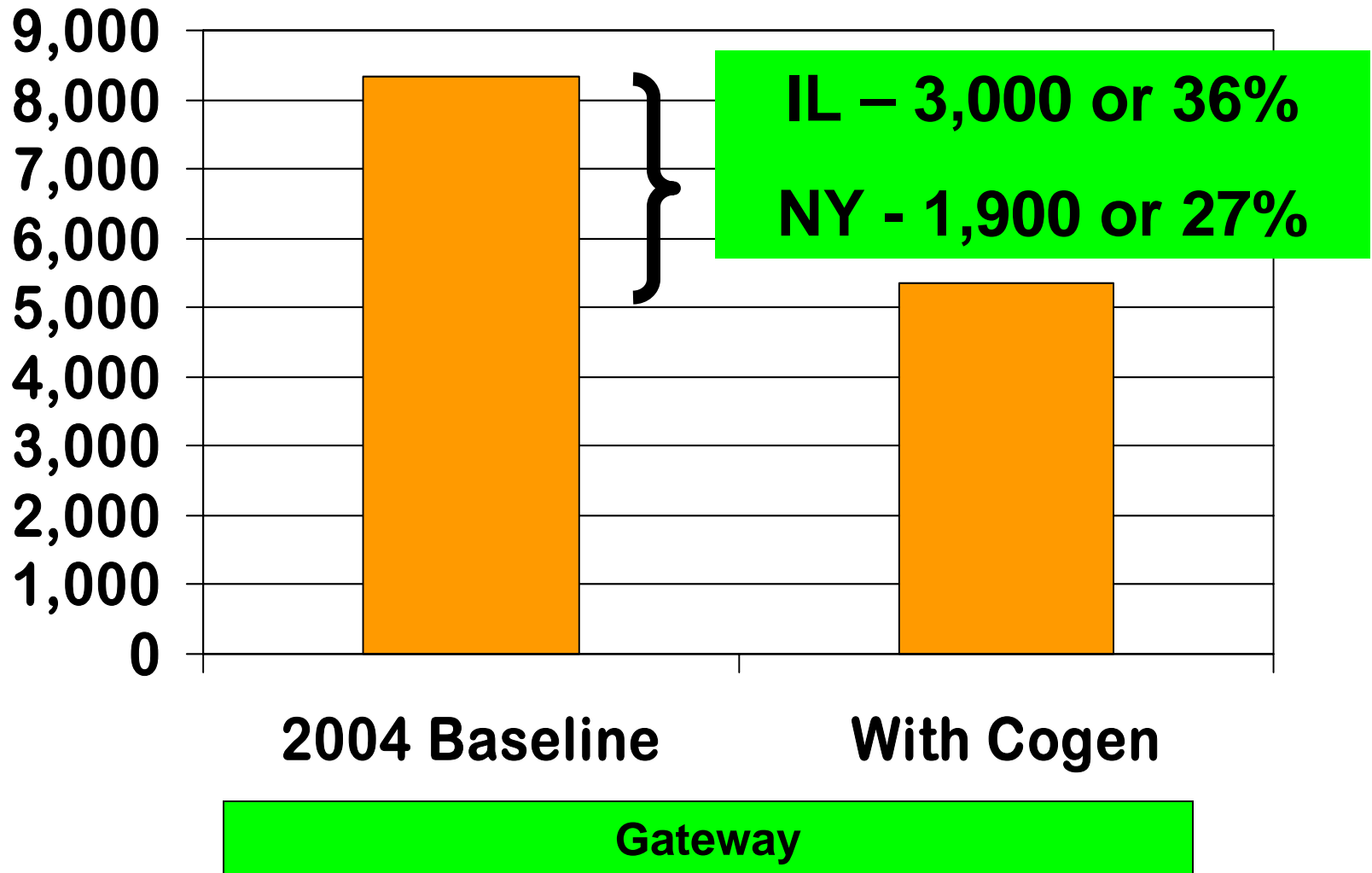
## Carbon Footprint, metric tons

Source	2004 Baseline (metric tons)	With Cogen (metric tons)	Delta
On-peak Electricity	34,400	8,000	-26,400
Baseload Electricity	3,700	3,700	0
Steam	6,300	4,600	-1,700
Natural Gas	0	11,300	+11,300
<b>Total</b>	<b>44,400</b>	<b>27,600</b>	<b>- 16,800</b>

Commercial office 2,600,000 sq-ft



# Carbon Footprint, tons

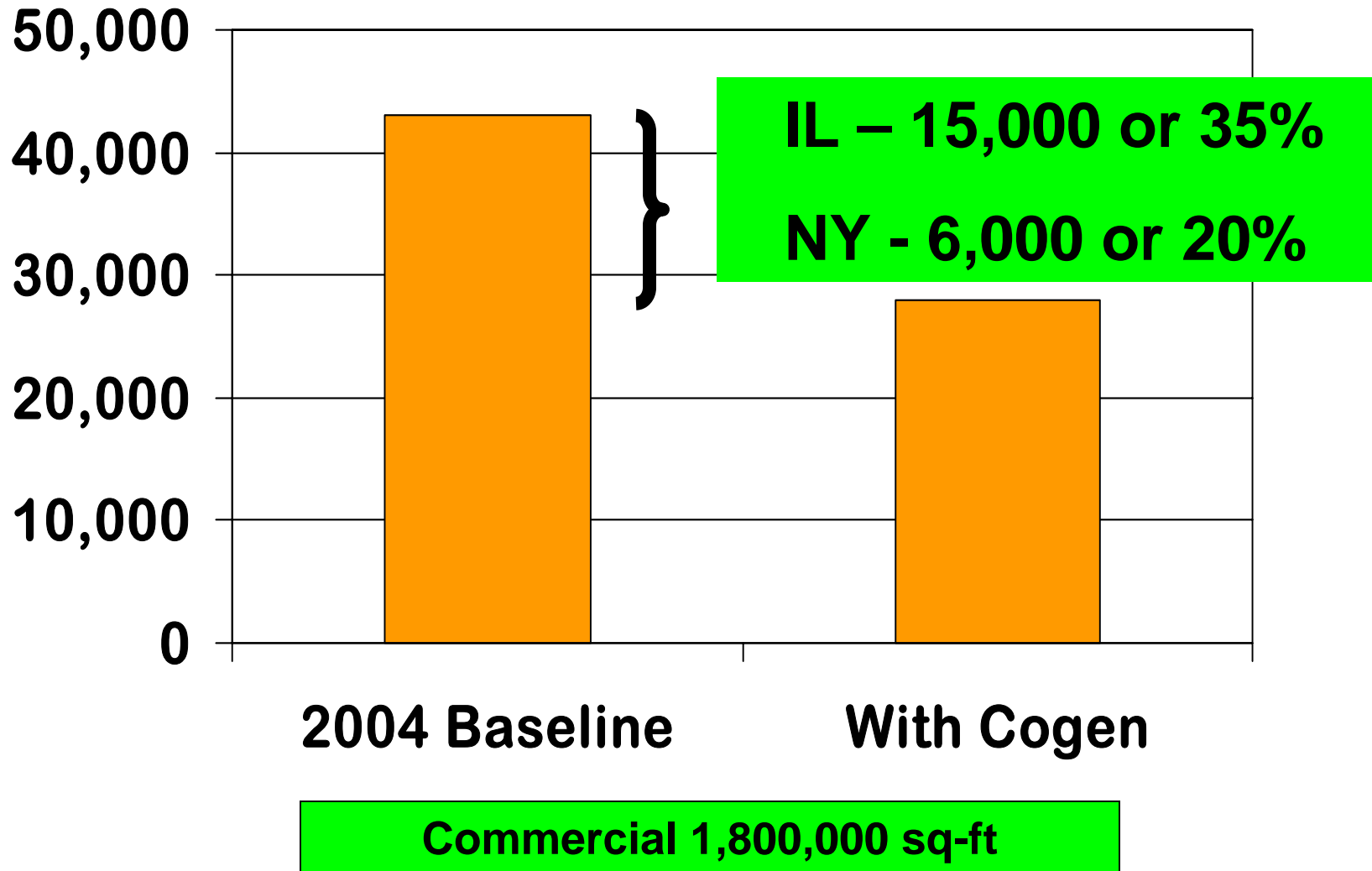


## Commercial Carbon Footprint, tons

Source	2004 Baseline (tons)	With Cogen (tons)
On-Peak Grid Electricity	6,300	1,100
Baseload Grid Electricity	900	900
Natural Gas Building	1,200	500
Natural Gas Cogen	0	2,900
<b>Total</b>	<b>8,400</b>	<b>5,400</b>
	<b>Delta</b>	<b>- 3,000</b>



# Carbon Footprint, tons



# Rudin 345 Park Carbon Footprint

Source	2004 Baseline (tons)	With Cogen (tons)
On-Peak Grid Electricity	30,400	9,000
Baseload Grid Electricity	3,200	3,200
Steam	9,400	6,800
Natural Gas Cogen	0	9,000
<b>Total</b>	<b>43,000</b>	<b>28,000</b>
	<b>Delta</b>	<b>- 15,000</b>

**Commercial 1,800,000 sq-ft**



# Conclusion

- Cogeneration offer building owners in the Midwest with a huge opportunity for carbon savings
  - >35% reduction in Midwest operating on-peak
  - Savings can dramatically increase for baseload cogeneration (except IL)
- Also provides a means for gaining 4 to 10 EPA Energy Star points

