

The Importance of Carbon Footprint in Your Facility

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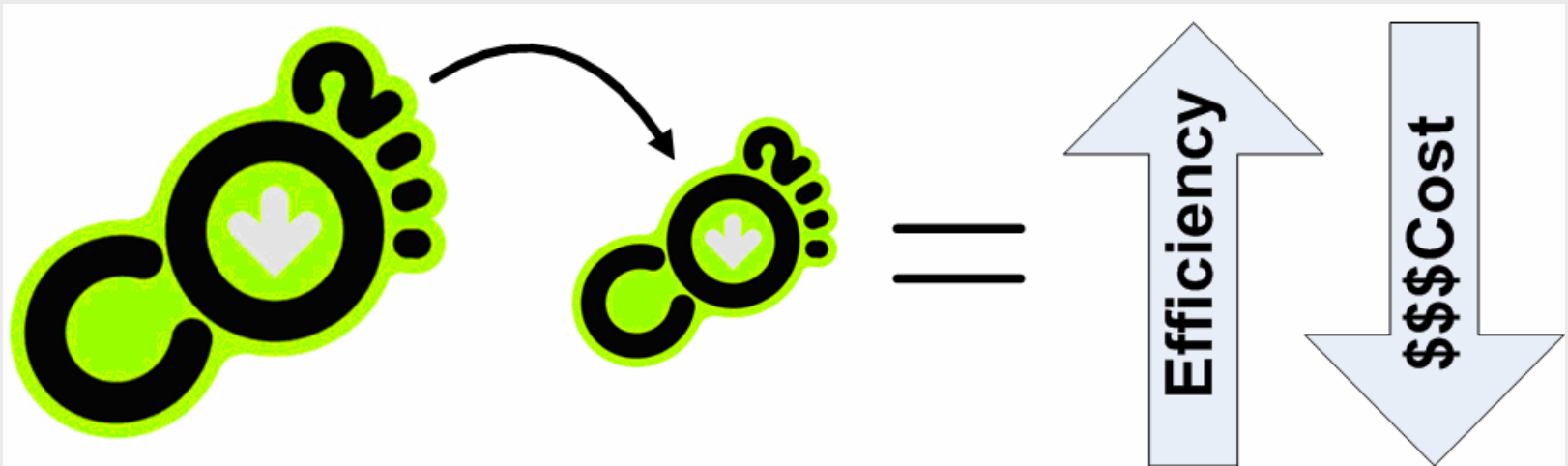
Carbon Footprint

- > What exactly is it?
- > Why is it important to a facility?
- > How is Carbon Footprint calculated?
- > CHP impact on Carbon Footprint
- > Closing Points

What is a Carbon Footprint?

- > Total amount of greenhouse gas emitted to the atmosphere
 - Measured in units of carbon dioxide (CO₂)
- > Deemed partly responsible for global climate change
 - Social Aspect: measures impact on the environment
- > Carbon Footprints
 - Personal
 - Products (life cycle – more complicated)
 - Buildings

Why is Carbon Footprint Important to a Facility?



- > Reducing Carbon Footprint optimizes energy efficiency and decreases cost
 - Wal-Mart (30% reduction in 4 yrs)
 - Vornado Realty Trust (developing plan)
 - Target (developing plan)

Why is Carbon Footprint Important to a Facility?



Mayors Climate Protection Center

- > The U.S. Conference of Mayors' Climate Protection Agreement
 - 600 U.S. Mayors signed as of July 2007
 - Pledge to reduce CO2 emissions by 7% below 1990 levels by 2012
 - Only climate protection agreement of its kind among U.S. elected officials
 - Expect new policies and legislation

How is Carbon Footprint calculated for a facility?

> Carbon factors

- Energy consumption x Carbon Factor
Example: Btu x kg/Btu = kg of CO₂ e

> Sources for building carbon factors



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



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

How is Carbon Footprint calculated for a facility?


- > Direct CO2 emissions from stationary combustion
 - Boiler (WBC GHG Protocol)
 - Furnace
- > Indirect CO2 emissions from the consumption of purchased energy
 - Electricity (eGrid by State)
 - Steam and/or Heat (from utility)
- > Direct CO2 emissions from CHP
 - Prime Mover (from manufacturer)

CHP Impact on Carbon Footprint

- > Prototype building
 - Big-City Office Tower
 - 57 Stories
 - 2 million square feet
 - Peak Demand 9,400 kW
 - CHP System
 - > 6,000 kW, operating on peak
 - > Existing absorption chillers
- > Prototype building locations
 - IN, OH, IL, WI, IO, MI
 - % fossil fuel mix varies across states

CHP Impact on Carbon Footprint – Baseline (No CHP)


- > Baseline building model without CHP
 - Electricity purchased from IN utility
 - > Indiana generation mix is 99% fossil fuel
 - Heat from central boiler

Baseline Analysis – Office Tower in IN			
Energy Usage		C Factors	Emissions
Facility Electricity	48,689,600 kWh/yr	0.952 kg/kWh	46,335 tonnes CO2/yr
Facility Heat	119,317 MMBtu/yr	53.05 kg/MMBtu	6,330 tonnes CO2/yr
Total Carbon Footprint 		52,665 tonnes of CO2 annually	

CHP Impact on Carbon Footprint

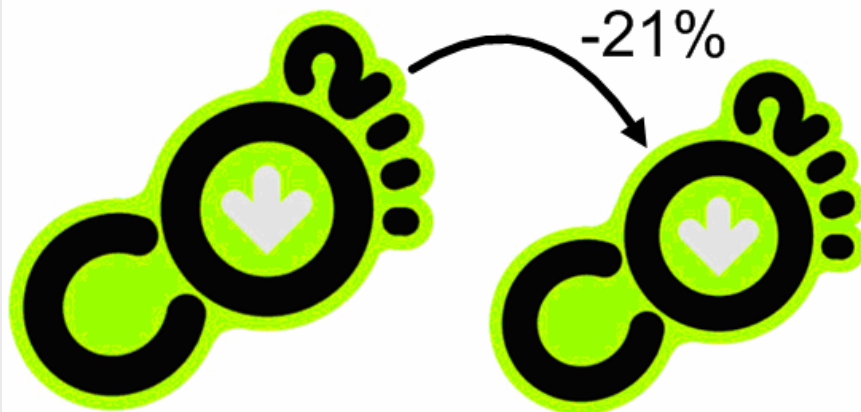
- > CHP building model
 - Electricity from CHP
 - > Heat recovery to DHW, space heating and absorption chillers
 - Electricity purchased from utility
 - Heat provided by central boiler


CHP Analysis – Office Tower in IN

Energy Usage		C Factors	Emissions
Facility Electricity	28,689,600 kWh/yr	0.952 kg/kWh	27,302 tonnes CO2/yr
Facility Heat	87,061 MMBtu/yr	53.05 kg/MMBtu	4,619 tonnes CO2/yr
Cogeneration	20,000,000 kWh/yr	0.483 kg/kWh	9,662 tonnes CO2/yr
Total Carbon Footprint 		41,583 tonnes of CO2 annually	

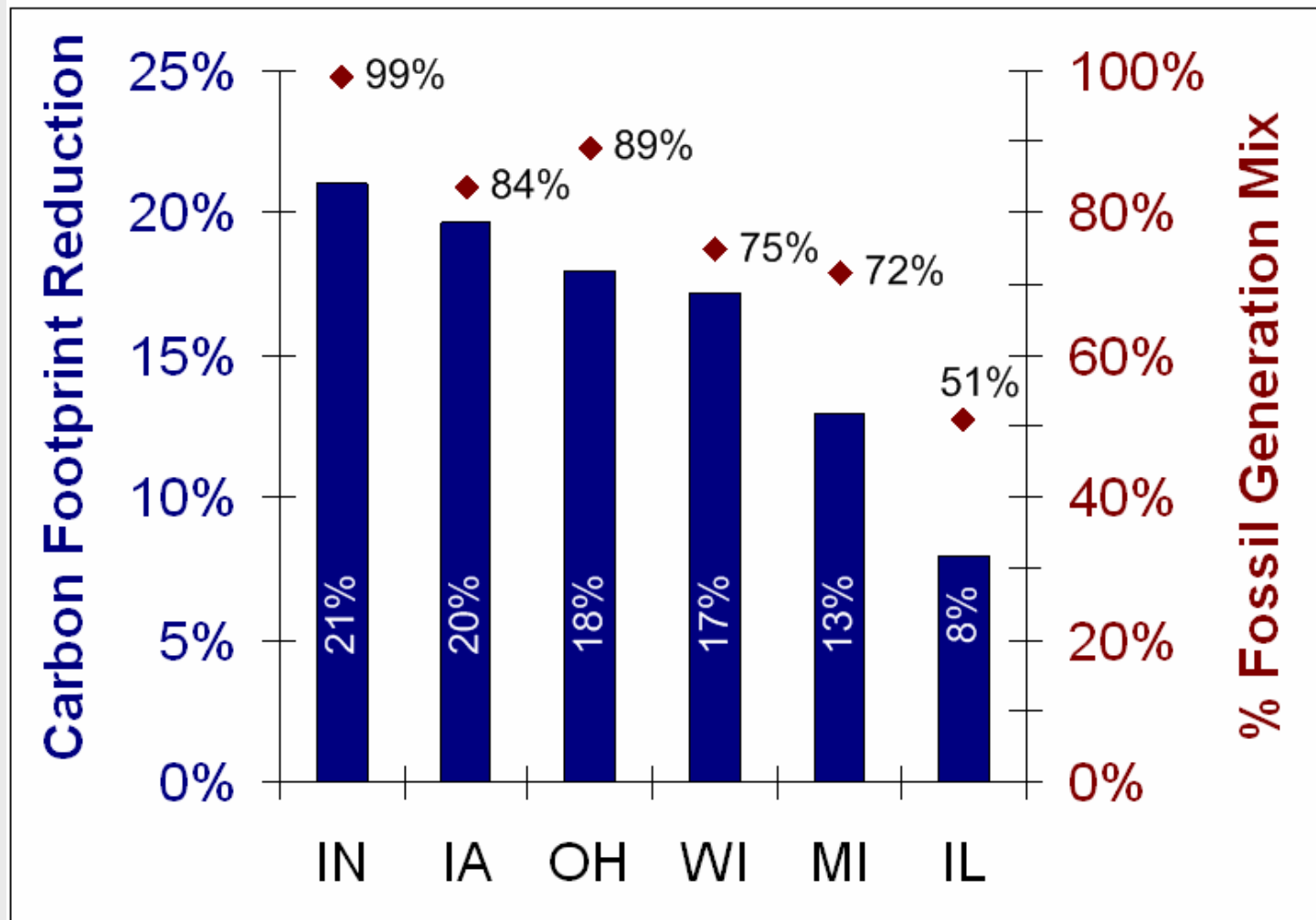
CHP Impact on Carbon Footprint - IN

Baseline Carbon Footprint	52,665 tonnes of CO2 annually
CHP Carbon Footprint	41,583 tonnes of CO2 annually
Carbon Footprint Reduction	21%



 21% Offsets
2,463 cars/yr
@ 20 mpg

CHP Impact on Carbon Footprint – Midwest States



Closing Points

- > Carbon Footprint: slogan for global climate change (environmental impact)
- > Major companies setting Carbon Footprint reduction plans
- > Expect new policies and legislation
- > 10% to 20% Carbon Footprint reduction feasible for large facilities with CHP
- > CHP in one large facility could offset 1,000 to 2,000 cars/yr in the Midwest

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