Overview

• Overview
• International Implications
• U.S. Carbon Regulations
  – Clean Power Plan
• Clean Power Plan’s Impact
  – Price of Natural Gas
  – Price of Electricity
• Clean Power Plan Compliance Pathways with District Energy
• Opportunities
Opportunities for District Energy

Clean Power Plan a great opportunity to expand district energy in the US

District Energy is positioned to take advantage of carbon and energy market inefficiencies created with storage, non-covered resources, and highly efficient energy
International Carbon Goals

• US 26-28% below 2005 levels by 2025
• China commitment to peak emissions around 2030, and non-fossil energy consumption to ~20% by 2030.
• European Union to cut their emissions 40% by 2030.
• Mexico peak its overall net greenhouse gases by 2026
U.S. CARBON REGULATIONS
U.S. Carbon Reduction Programs

- *Clean Power Plan*: reduce power sector emissions 30% below 2005 levels by 2030.
- *Standards for Cars, Heavy-Duty Engines, and Planes*
- *Regulations to cut*: methane emissions economy
Clean Power Plan Under Clean Air Act

• Existing Power Plants

U.S. GREENHOUSE GAS POLLUTION INCLUDES:

- **CARBON DIOXIDE (CO₂)** 82%
  - Enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., manufacture of cement).

- **FLUORINATED GASES** 3%
  - Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes.

- **NITROUS OXIDE (N₂O)** 6%
  - Emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

- **METHANE (CH₄)** 9%
  - Emitted during the production and transport of coal, natural gas, and oil as well as from landfills.

TOTAL U.S. GREENHOUSE GAS EMISSIONS BY ECONOMIC SECTOR IN 2012

- **32% ELECTRICITY**
- **28% TRANSPORTATION**
- **20% INDUSTRY**
- **10% COMMERCIAL & RESIDENTIAL**
- **10% AGRICULTURE**

SOURCE: EPA

Energy Strategies
Clean Power Plan Covers Existing Electricity Generation Unit

• Nameplate capacity **25 MW** or greater & **33%** capacity factor & **219,000 MWh** to any utility power distribution system for sale.
EPA CPP State Goal

4 Building Blocks (2012 Baseline)

1. Reducing emissions rates of affected facilities
2. Changing the dispatch order from coal to NGCC
3. Increasing RE Generation
4. Increase Energy Efficiency

rate = \frac{\text{State CO2 emissions from covered fossil fuel fired power plants (lbs)}}{\text{State electricity generation from covered fossil plants} + \text{RE} + \text{nuclear*} + \text{EE} (\text{MWh})}

Note: RE denotes renewable; * small fraction of nuclear generation covered
Clean Power Plan Proposed Emission Rate lbs-CO2/MWH by State
Many regulatory paths and compliance measures to evaluate

EPA’s “flexibility” impacts emission targets, compliance approaches, and resource mix, creating numerous possible scenarios
CPP – “Compliance Cliff”

- 2012 Baseline
- Proposed Rule 2020-2030
- Building Block 1 & 2
  - 2020
- Building Block 3 & 4
  - 2020-2030

EPA Missouri Emission Target
CPP and Projected Capacity Additions 2014-2040

Projected U.S. electric capacity additions and retirements in two cases, 2014-40 gigawatts (cumulative)

- Reference
  - Coal: -46
  - Nuclear: -40
  - Wind: 167
  - Natural Gas: 49
  - Other: 48

- Clean Power Plan (CPP) Base Policy
  - Coal: -62
  - Nuclear: -90
  - Wind: 145
  - Natural Gas: 165
  - Other: 124
CPP and Annual Capacity Addition 2010-2040

Projected U.S. electric capacity additions and retirements in two cases, 2010-40
gigawatts

AEO2015 Reference case

Clean Power Plan (Base Policy)

Energy Strategies
CPP Impact on Natural Gas (Henry Hub)
CPP and Electricity Prices

2013 cents per kilowatthour

2005 2010 2015 2020 2025 2030 2035 2040

AEO CPP CPPEXT CPPNUC

Energy Strategies
Summary of EIA Report

- **3-7%** higher national electricity price
- **10%** higher electricity prices in certain regions including by 2030 (Florida and the Southeast, the Southern Plains, and the Southwest)
- By 2040, total electricity expenditures in the CPP case are slightly below those in the AEO2015 Reference case.
DISTRICT ENERGY AND CLEAN POWER PLAN
More Efficient = Less Carbon

STANDARD POWER PLANT EFFICIENCY

100% Fuel Input

66% Waste Heat

34% Useful Energy (electricity only)

DISTRICT ENERGY/COMBINED HEAT & POWER PLANT EFFICIENCY

100% Fuel Input

20% Waste Heat

80% + combined useful energy (electric, heating and/or cooling)
DE Opportunities – Waste Heat

Figure 1. Comparison of U.S. Power Plant Waste Heat to Total Energy Use in Other Countries.

The U.S. power industry is only about 34 percent efficient and rejects around 24 quadrillion Btus of waste heat annually (25 percent of total U.S. energy use). This waste heat from U.S. power generation exceeds the total national energy use in all but three of the world’s 216 countries.

* Per country average for remaining 196 countries
District Energy Opportunities

• foster fuel-switching from higher-emitting fuels to lower-emitting fuels
• operate as a proven demand-side energy efficiency resource
• improve the electric grid’s ability to accept greater levels of intermittent no-carbon renewable energy, such as wind and solar, by offering grid-balancing services, storage opportunities, and free up transmission space
District Energy Opportunities

- shift dispatch order by providing thermal storage

California RPS increase was 33% by 2020 to 50% by 2030
CPP Covered Units

- EIA Generators include Solar to Landfill Gas to Coal Units = 22,655 Units
- Nameplate capacity **25 MW** or greater & **33%** capacity factor & **219,000** MWh to any utility power distribution system for sale
- Total Covered Units = 3,108 Units
- CHP Cover Units = 394 Units
CPP Confined by Clean Air Act

CPP Covered Sources
- Base and Intermediate Load Resource
  - Coal and Natural Gas

CPP Non - Covered Sources
- District Energy
- Most CHP
- Most Peaking Units
- Biomass Generators
- Possibly New Natural Gas

\[
\text{rate} = \frac{\text{State CO2 emissions from covered fossil fuel fired power plants (lbs)}}{\text{State electricity generation from covered fossil plants} + \text{RE} + \text{nuclear} + \text{EE (MWh)}}
\]
State Compliance Plans – Rate Based

• If district energy and CHP is classified as energy efficiency in a State Compliance Plan every MWH generated could be counted as “carbon” free

• Important to work with state air regulators to develop the State Compliance Plans.
OPPORTUNITIES
Opportunities for District Energy

Clean Power Plan a great opportunity to expand district energy in the US

Energy storage is one of the next big opportunities in energy

Clean Power Plan will likely create inefficiencies in energy and carbon markets

District Energy is positioned to take advantage of these inefficiencies with storage, non-covered, and highly efficient energy
Next Steps

• EPA release final plan “August 2015”
• State (Air Quality Divisions) will be giving 1-2 years to submit a compliance plan
• Get involved with state stakeholder groups and educate air quality regulators about benefits district energy.
• Work with air regulators to incorporate district energy into State Compliance Plans
QUESTIONS

Energy Strategies

Gibson Peters

Power Through Ideas

Energy Strategies