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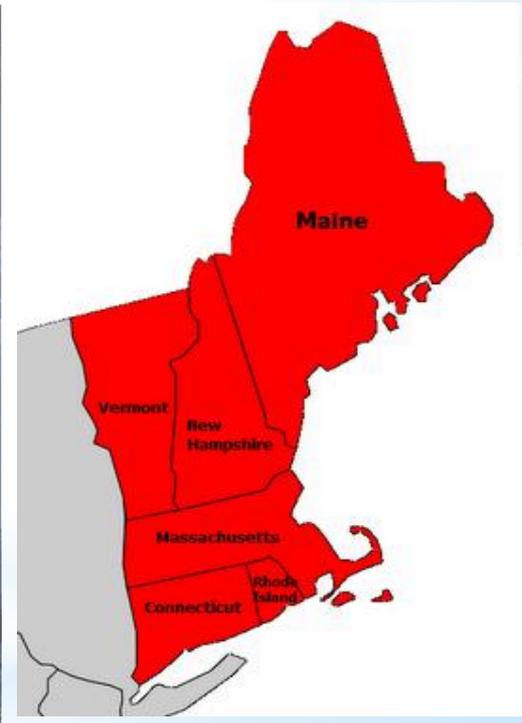
# Biomass Markets in New England

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# NEW ENGLAND



A small northeastern region of the U.S. consisting of six states: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont



# About New England

## *Demographics*

	New England	Netherlands
Area ('000 sq.km)	186	42
Population (million)	15	17
GDP (US\$ billion)	820	840

- Largely rural north (ME, NH, VT), urban south (CT, MA, RI)
- Economy principally commercial, light industry, natural resources-agriculture (forestry, dairy, fishing), tourism
- International center for higher-education (300+ schools), computer-high technology, medicine
- No indigenous carbon resources
- Common electric grid / dispatch (ISO-New England, Inc.)

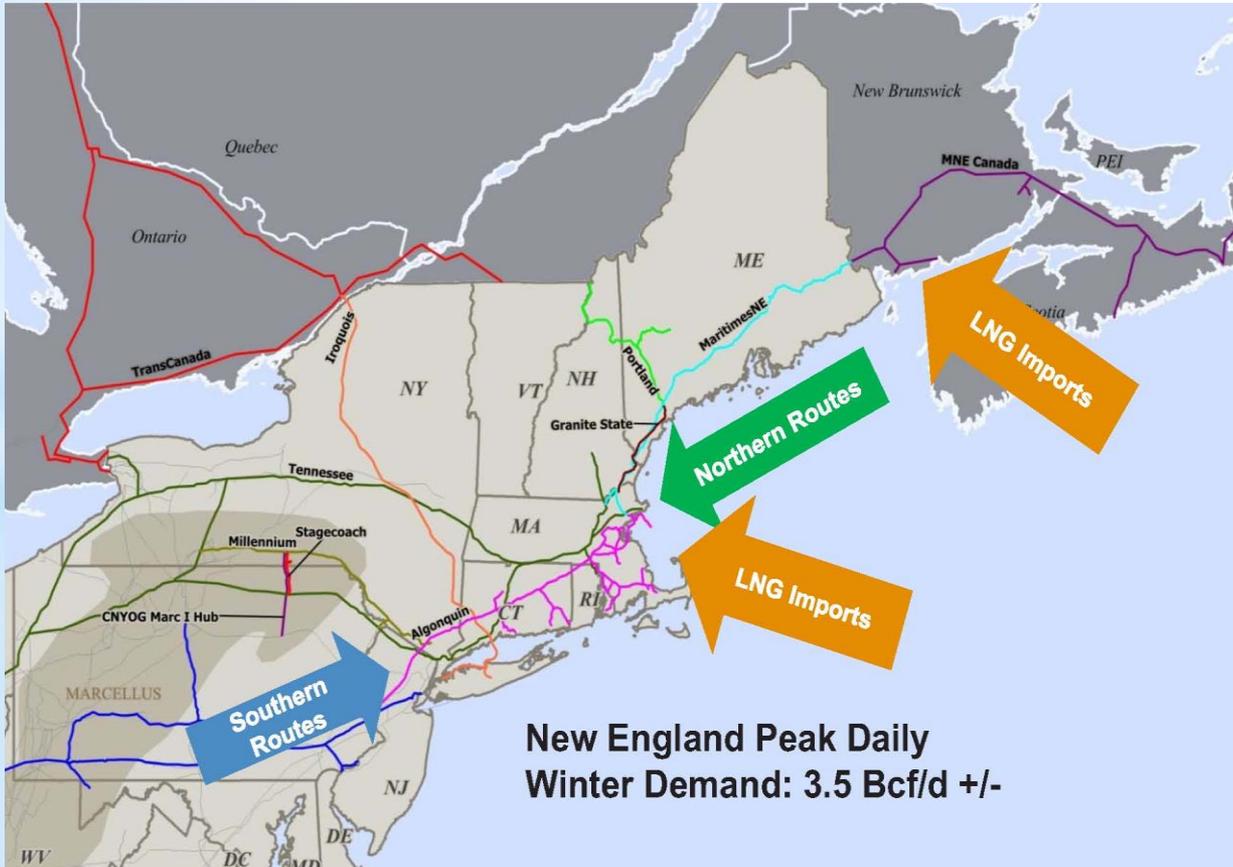


# About New England *Energy Policy Drivers*

- No indigenous carbon resources to promote
- High energy/electricity costs ('end-of-the-pipeline')
- Energy Security (move away from foreign oil / gas)
- National leadership on environmental and conservation issues  
(NEG/ECP Climate Change Action Plan)
- Energy/renewable technology as an economic driver
- Access to considerable Quebec/Newfoundland clean resources
- *Long-run*: significant (offshore) wind potential
- *Recent*: Infrastructure Resiliency (Hurricane Irene)



# Gas Transmission Routes in New England



*While northeast natural gas production has increased 5-fold in 5 years due to Marcellus Shale development, gas pipeline capacity constraints from the north and southwest into New England creates a ‘gas island’ in the region, keeping supplies tight and prices firm.*



# Biomass in New England



# Biomass Resources



New England's woody biomass cover >80%:

- Maine – 86% (#1 in U.S.)
- New Hampshire – 78% (#2)
- Vermont – 76% (#4)

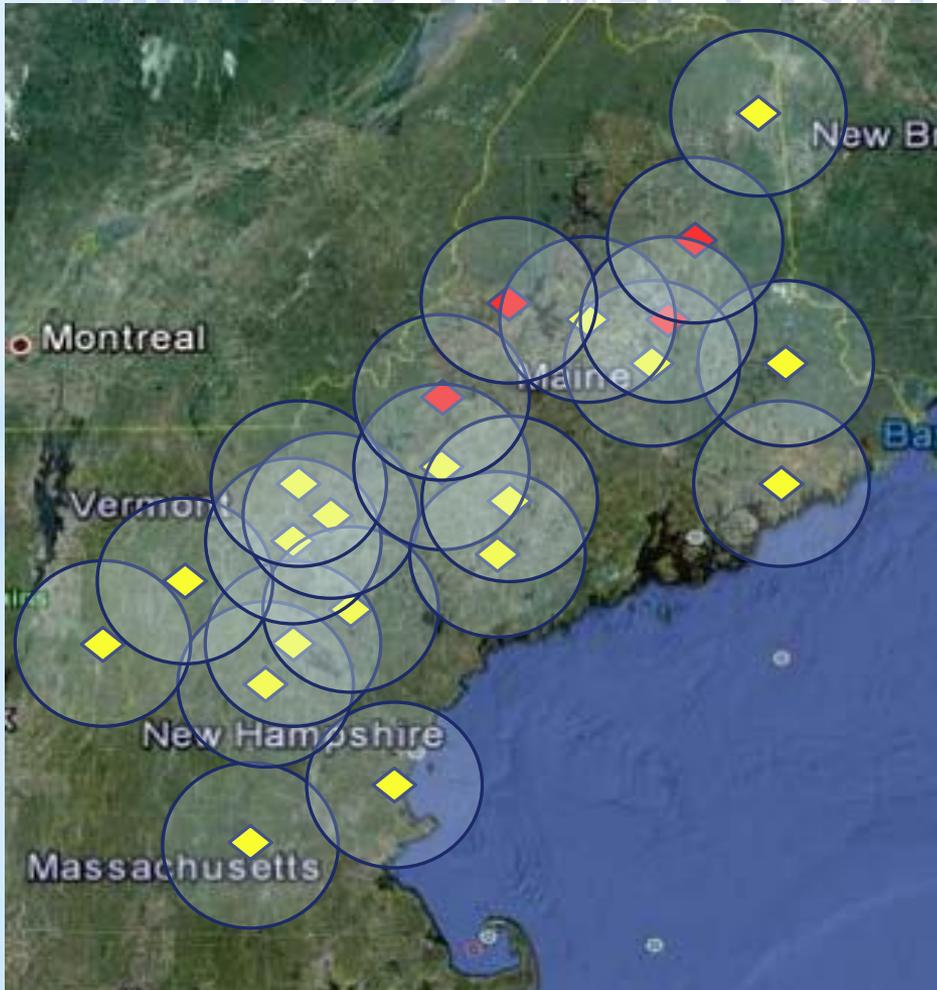
By comparison, the EU-27 has 37% woody biomass cover:

- Finland – 73% (#1 in EU)
- Sweden – 69% (#2)

*Question is not resource adequacy in New England, rather stewardship, transportation, emissions*



# Biomass Power Plants in New England



New England has nearly 600 MW of grid-connected biomass power plants, including several electricity-led cogen facilities.

- *All but one of the plants are located in northern New England (ME, NH, VT)*
- *Rule-of-thumb: biomass fuel uneconomical beyond 50-60 mile radius*
- *Biomass fuel prices tend to track diesel*

 Approx. 50-mile fuel gathering radius

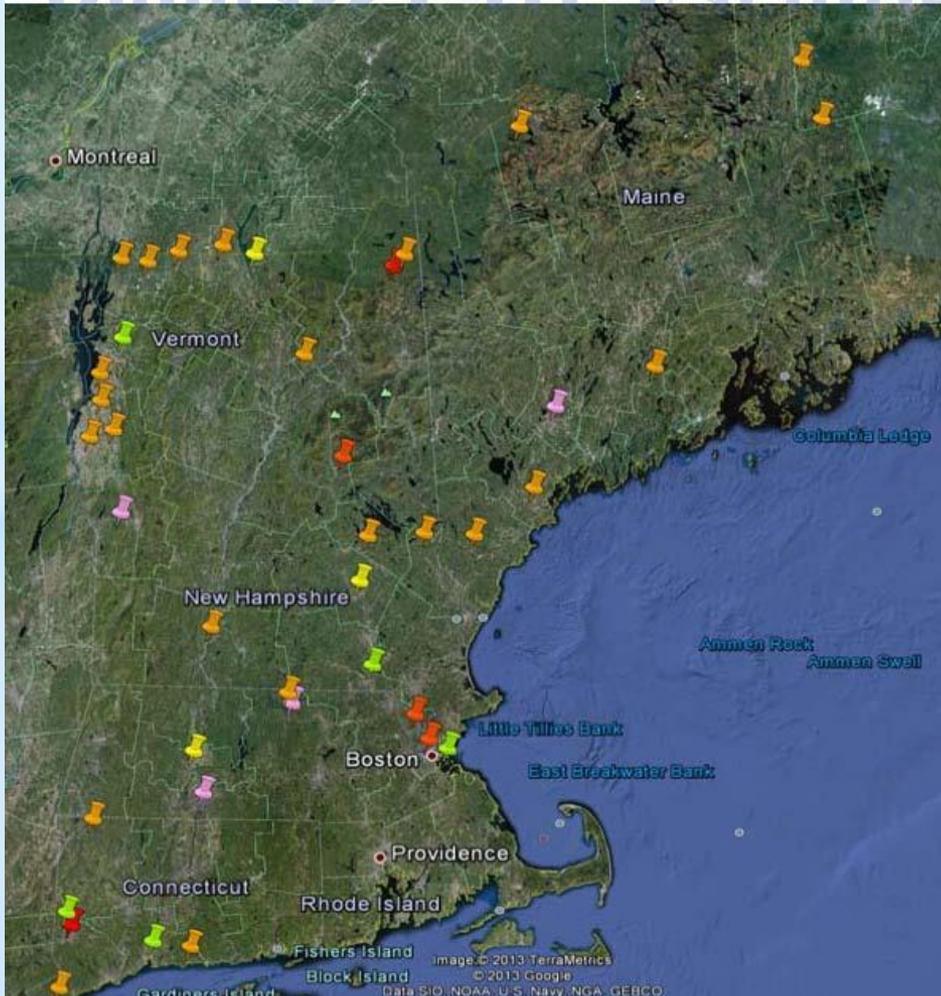
 Electric

 Cogeneration

Source: U.S. EPA NEEDS Database

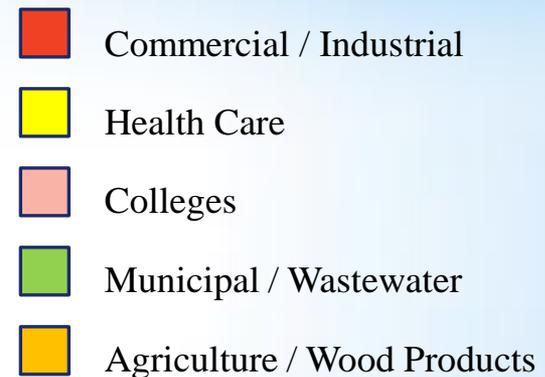


# Biomass CHP Facilities in New England



New England's Biomass-fueled CHP facilities are largely (by capacity) located in the northern states and are often utilized for agricultural and wood products processes.

- *Approx. 400 CHP facilities in the region, of which about 10% (40) are biomass*



Source: U.S. DOE



# (Biomass) CHP Market in New England

*(relative to the rest of the U.S.)*

- Higher electric rates / spark spreads
- Higher gas prices make biomass more competitive
- Many areas with limited access to natural gas
- Commercial/Institutional base more receptive to longer-term payback periods and moderate ROI
- Somewhat more receptive utility perspective on DG
- Strong environmental/efficiency policy focus



# Incentives and Barriers for Biomass



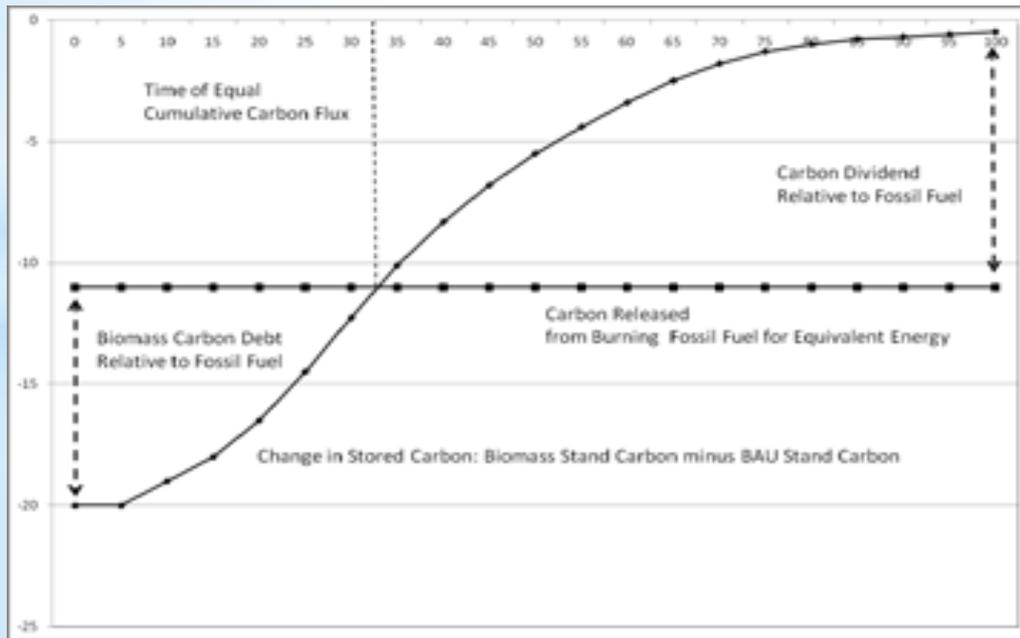
# Technologies Designated in State RPS Standards

Technology	CT Classes			MA Classes <sup>(a)</sup>			ME Classes		RI	NH Classes			
	I	II	III	I	IIa	IIb	I	II		I	II	III	IV
Solar thermal	✓			✓	✓		✓		✓	✓	✓		
Photovoltaic (PV)	✓			✓	✓		✓		✓	✓	✓		
Ocean thermal	✓			✓	✓				✓	✓			
Wave	✓			✓	✓				✓	✓			
Tidal	✓			✓	✓		✓		✓	✓			
Marine or hydrokinetic				✓	✓								
Hydro	<5 MW	<5 MW		<25 MW <sup>(a)</sup>	<5 MW <sup>(a)</sup>		✓ <sup>(b)</sup>	✓	<30 MW	incremental			<5 MW
Wind	✓			✓	✓		✓		✓	✓			
Biomass, biofuels	Sustainable, advanced conversion, low NO <sub>x</sub> emissions <sup>(c)</sup>	✓		Low-emission, advanced technology <sup>(d)</sup>	✓ <sup>(d)</sup>		✓	✓ <sup>(e)</sup>	✓ Includes cofiring with fossil fuels	Low NO <sub>x</sub> and PM emissions		<25 MW, low NO <sub>x</sub> and PM emissions	
Landfill gas	✓			✓	✓		✓		✓	✓ <sup>(f)</sup>		✓ <sup>(f)</sup>	
Anaerobic digester				✓	✓				✓	✓		✓	
Fuel cells <sup>(g)</sup>	✓			w/ renewable fuels	✓		✓		w/ renewable resources				
Geothermal				✓	✓		✓		✓	✓			
Municipal solid waste		✓				✓		✓ w/ recycling					
Cogeneration, combined heat and power (CHP)			Customer sites, minimum 50% fuel efficiency	✓				✓ <sup>(e)</sup>					
Energy efficiency			✓										



# Biomass Treatment under MA RPS

*Massachusetts revised its RPS treatment of biomass based on a study by the Manomet Center, which concluded that biomass combustion is not carbon neutral.*



## Principal Criteria for Biomass Eligibility under MA RPS:

½ REC: 50% overall efficiency  
 40% for 'advanced' tech<sup>1</sup>

1 REC: 60% overall efficiency

Plus must meet stipulations related to:

- GHG reduction of 50% over 20 years
- Eligible biomass materials only
- Other harvesting, soil stipulations

<sup>1</sup> Advanced fuel-to-energy conversion, emission controls, etc.

*Biomass initially creates a 'CO2 debt' due to higher emissions, which is reduced by re-growth over time.*



# Biomass Thermal an Opportunity

Massachusetts has begun to address opportunities for renewable thermal markets, and has identified efficient, low-emission European equipment & processes as an opportunity:

*“ Massachusetts stakeholders suggest that by incorporating European biomass heating technologies into the northeast market, policy-makers could stimulate growth of high-efficiency, low-emission biomass heating systems.<sup>1</sup> “*

1) Draft MA DOER Renewable Thermal White Paper



# Biomass Thermal an Opportunity (cont.)

The Massachusetts White Paper also Identified Barriers/Solutions:

*Barrier:* No federal tax incentive (30%, RHC except biomass) and lack of MA state supports inhibit growth

*Solution:* Construct Programs / Solutions to support biomass RCH

*Barrier:* High up-front costs caused largely by lack of economies of scale discourage investments

*Solution:* Remove barriers / Improve Incentives to Attract Manufacturers and Developers

*Barrier:* Incompatibility of equipment standards deters European manufacturers

*Solution:* Follow VT & NH example and allow European certification to apply in states



# Case Study: Cooley Dickinson Hospital

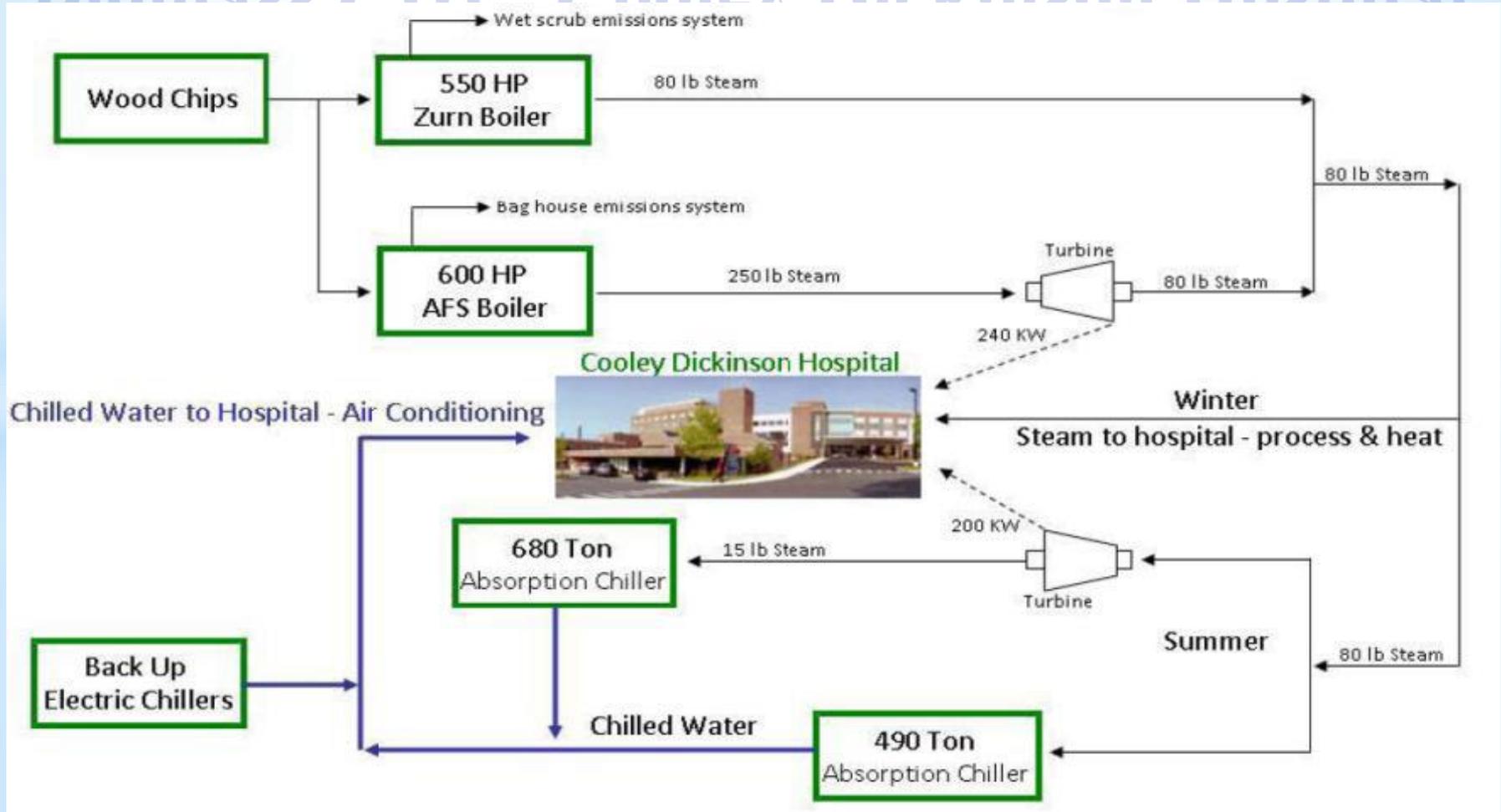


# Biomass CHP: Cooley Dickinson Hospital

- CHP Biomass facility supplies thermal/cooling load and electricity
- Located near significant sources of wood chips
- Hospital owns considerable land in moderately-populated area
- 12-month consistent steam load (heating, cooling, food, sterilization)
- Produces about 15% of annual electric load
- Two biomass boilers:
  - Zurn 550 HP (inst. 1984, thermal only)
  - AFS 600 HP high-pressure boiler (inst. 2006)
    - High-pressure steam drives 2x250 kw Carrier Micro Steam Turbines
- 680 Ton Absorption Chiller (inst. 2009)
- Two boilers allow wood burning rather than oil during maintenance
- Interconnected to grid with automatic backup (multiple diesel/gas generators)



# Biomass CHP: Cooley Dickinson Hospital





# Biomass CHP: Cooley Dickinson Hospital





# Conclusion



## Summary

- New England has a rich biomass resource and a largely underdeveloped biomass CHP/thermal potential
- Market Factors in New England and (Future) Incentives in New England are Favorable
- There is a policy and regulatory need for a greater presence of high efficiency / low emission European technologies and processes to bring down costs and ignite the New England market



# Questions?

Feel free to contact me with any comments or questions:

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*Many thanks to all the staff at **EUROHEAT & POWER***