Ensuring Sustainability in the Development of Wood-based Bioenergy in the Lake States

September 9-10, 2009

University of Minnesota

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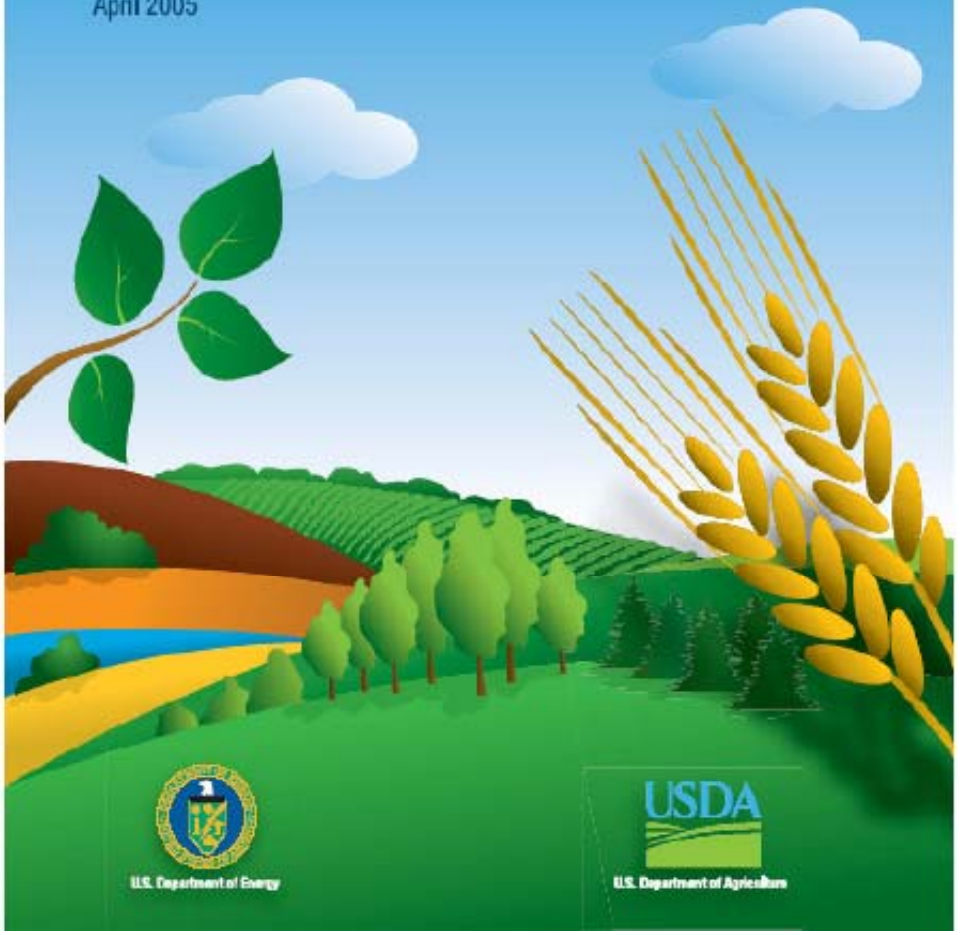
Washington, DC

PINCHOT INSTITUTE FOR CONSERVATION

CLIMATE
CHANGE

Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply

April 2005

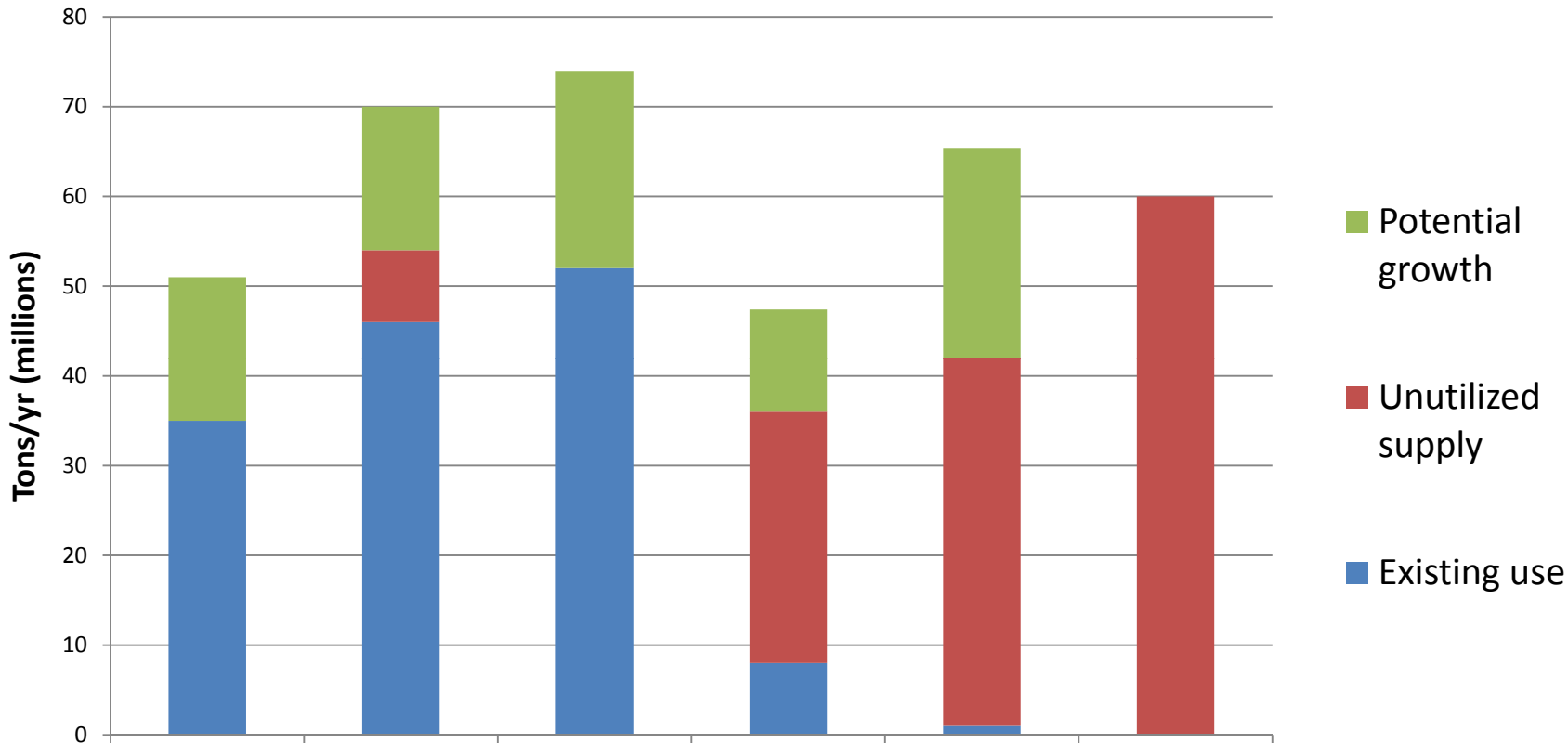


U.S. Department of Energy

USDA

U.S. Department of Agriculture

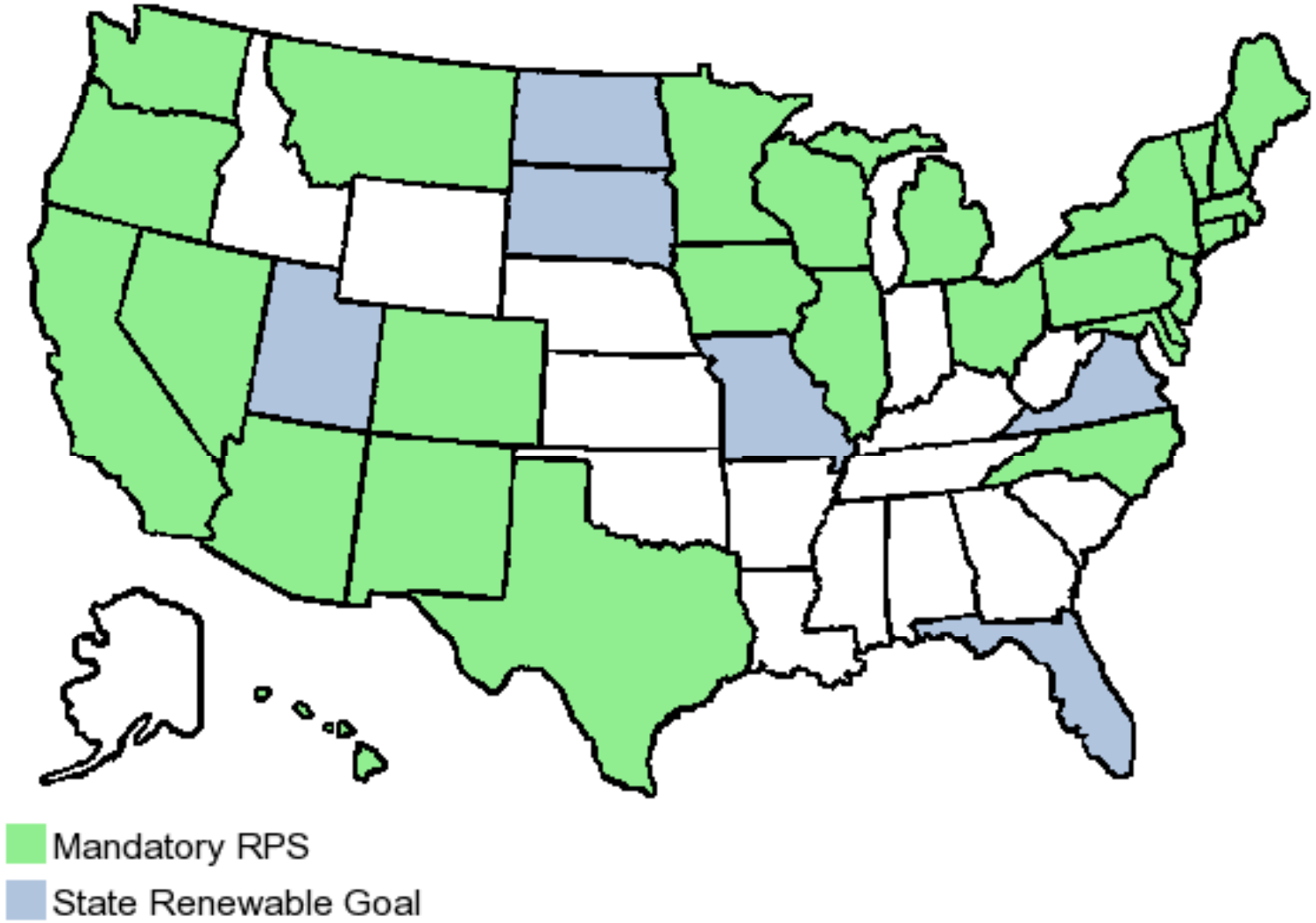
Figure 1. Current and potential wood supply for biomass energy



	Fuelwood (heating and electric utilities)	Secondary wood residues (forest industry)	Pulping liquors (forest industry)	Urban wood waste	Primary wood residues (logging and other)	Hazardous fuels treatments
Potential growth	16	16	22	11	23	
Unutilized supply		8		28	41	60
Existing use	35	46	52	8	1	

Source: Perlack et al. 2005. Biomass as Feedstock for a Bioenergy and Bioproducts Industry.

States with mandatory Renewable Portfolio Standard (RPS) or voluntary goals



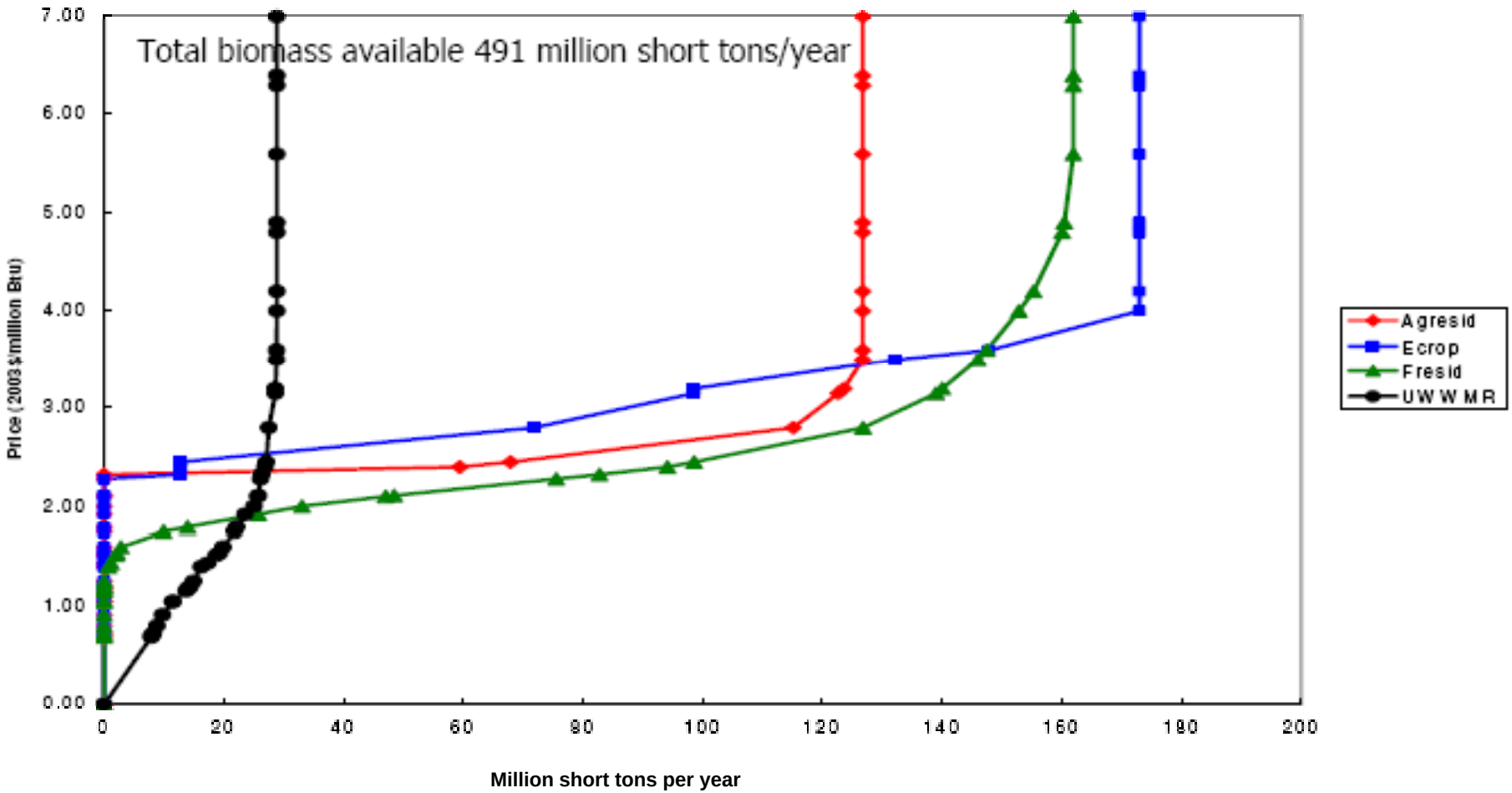
SR/OIAF/2007-05

Energy and Economic Impacts of Implementing Both a 25-Percent Renewable Portfolio Standard and a 25-Percent Renewable Fuel Standard by 2025

August 2007

Energy Information Administration
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

Figure 2. Availability of Biomass in the U.S.



Source: Energy Information Administration 2006

Biomass utilization in electric power and biofuels production, under both a 25 % RFS and 25 % RES, by 2025

[Millions of dry tons]

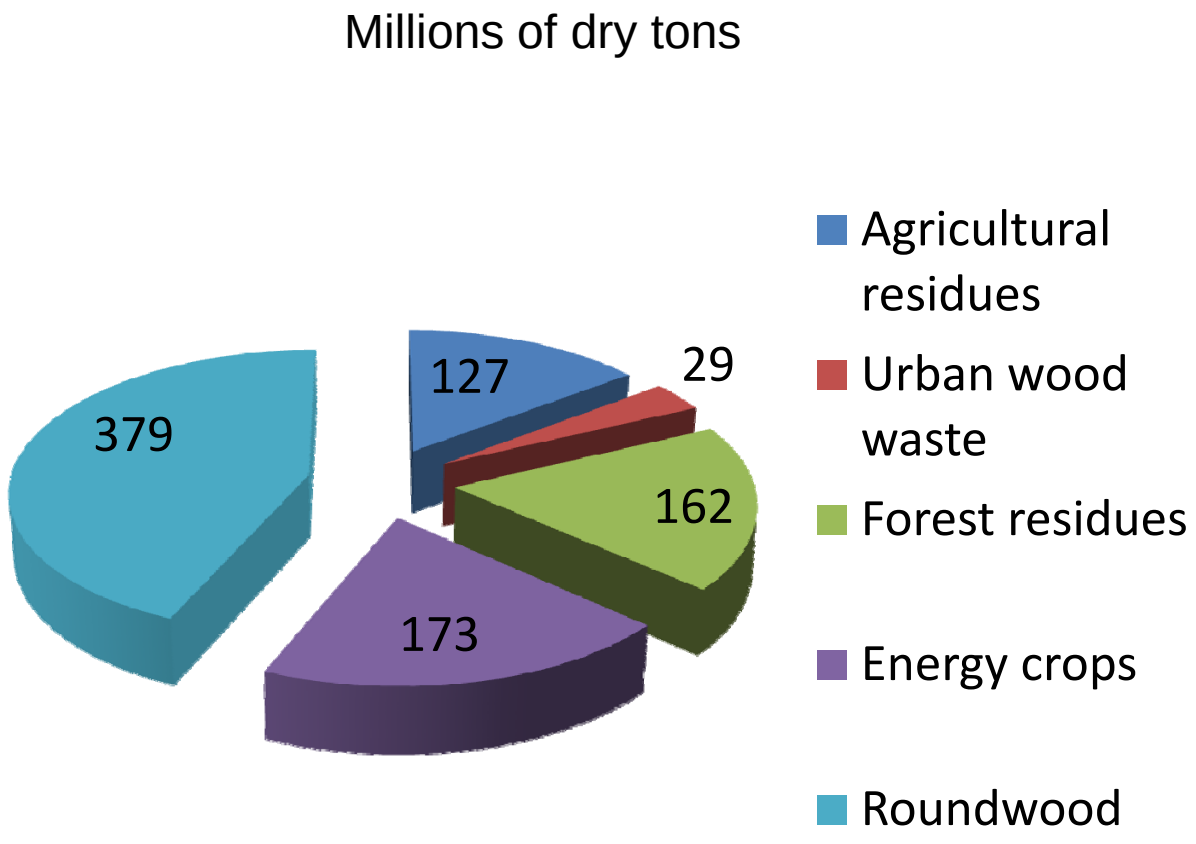
	2007	2025/1		
	Actual	25% RES/2	25% RFS/3	Total
Agricultural residues			127	127
Urban wood waste	8	25	4	29
Forest residues	47	120	42	162
Energy crops		71	102	173
Subtotal:	**55**	**216**	**275**	**491**
Wood	35	329	50	379
Total	**90**	**545**	**325**	**870**

1/ Energy Information Administration, 2007

2/ 495 billion KWh = 545 million bdT of biomass (assumptions: 2.2 gT=1000 KWh, 1.1 bdT=1000 KWh)

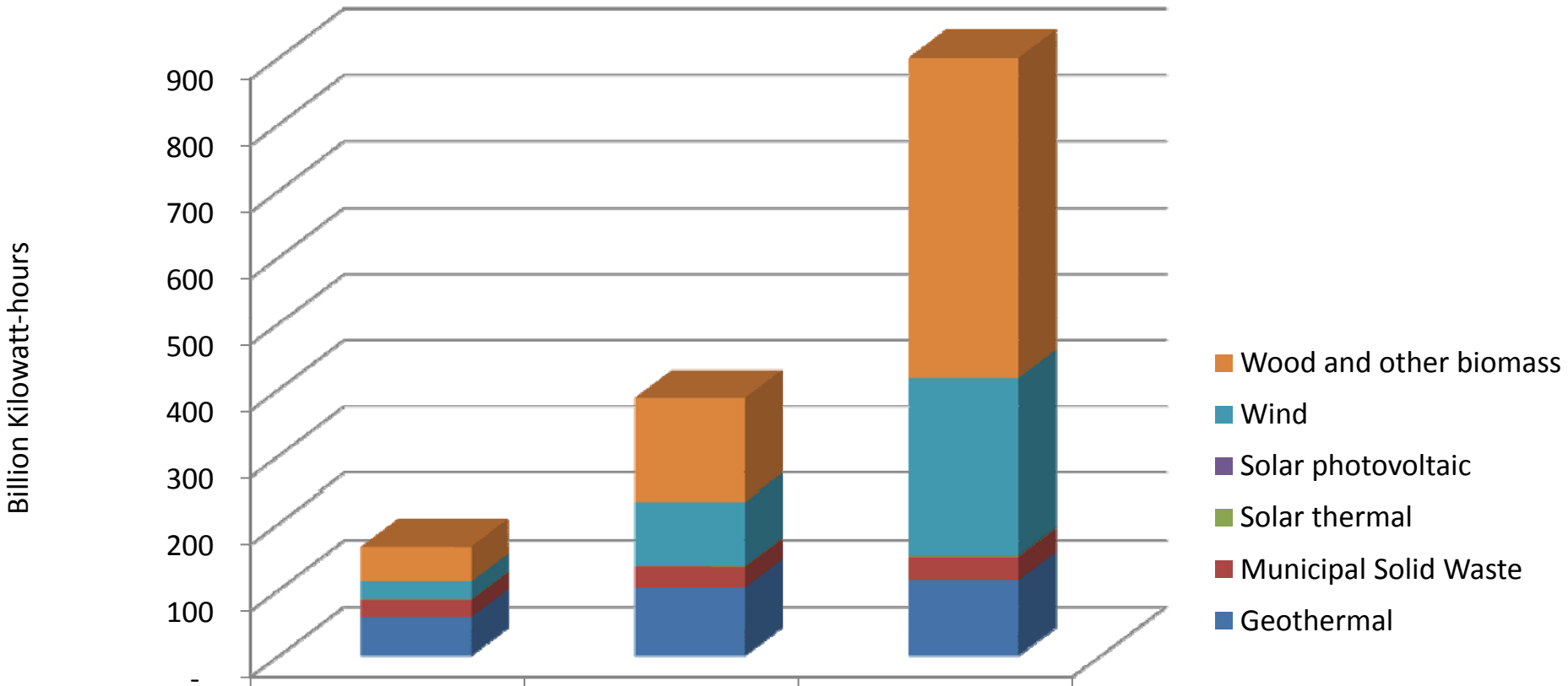
3/ 28 billion gallons ethanol = 325 million bdT of biomass (assumptions: 1 gT=43 gal, 1 bdT=86 gal)

Figure 3. Energy production from biomass and roundwood under a 25 % RFS and RES, 2025



Source: Energy Information Administration, 2007

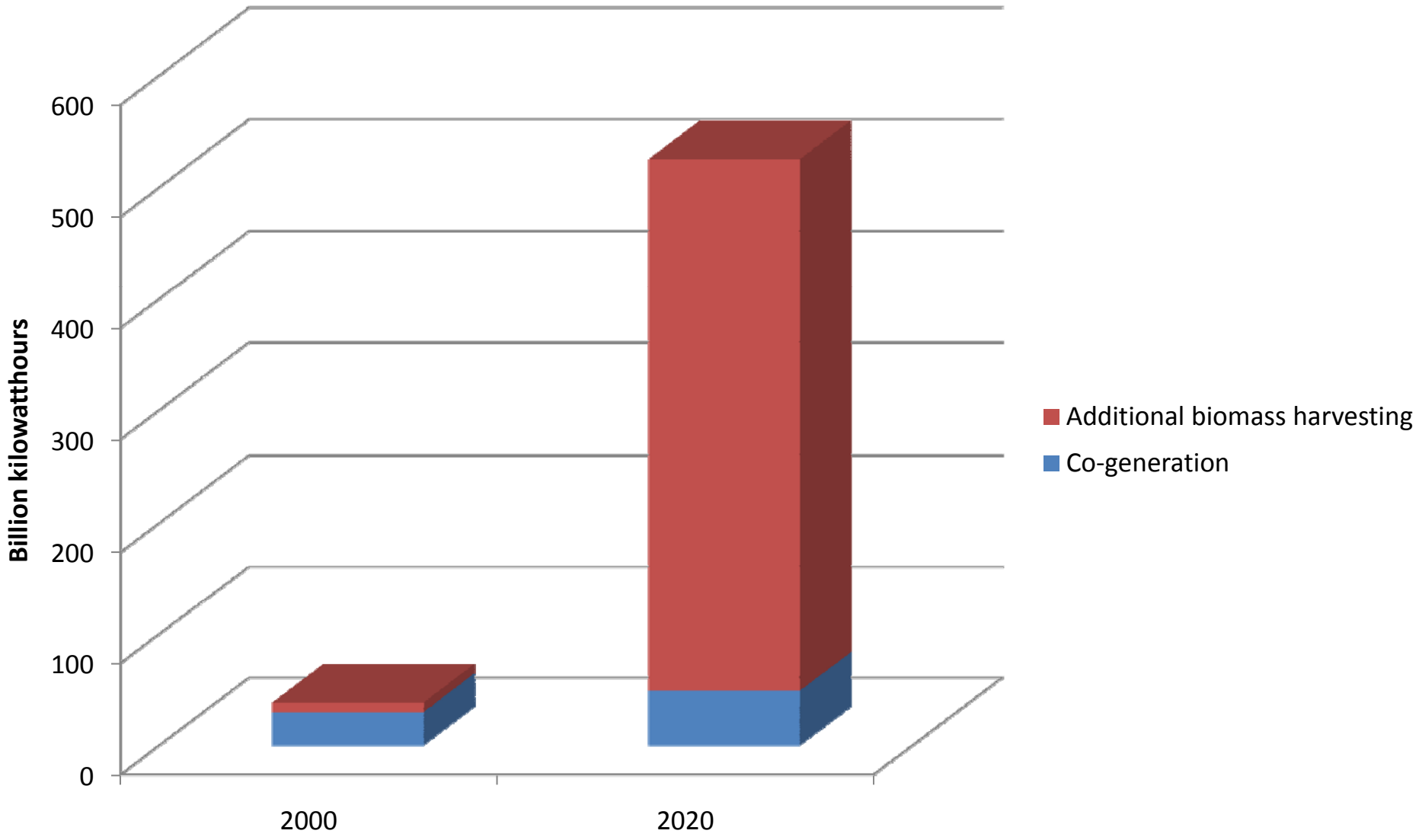
Figure 4. Projected Renewable Electricity Sources to 2020, with 20% RPS



	2005	2010	2020
Wood and other biomass	52	155	483
Wind	27	96	264
Solar photovoltaic	0	1	1
Solar thermal	1	1	1
Municipal Solid Waste	26	31	35
Geothermal	59	104	114

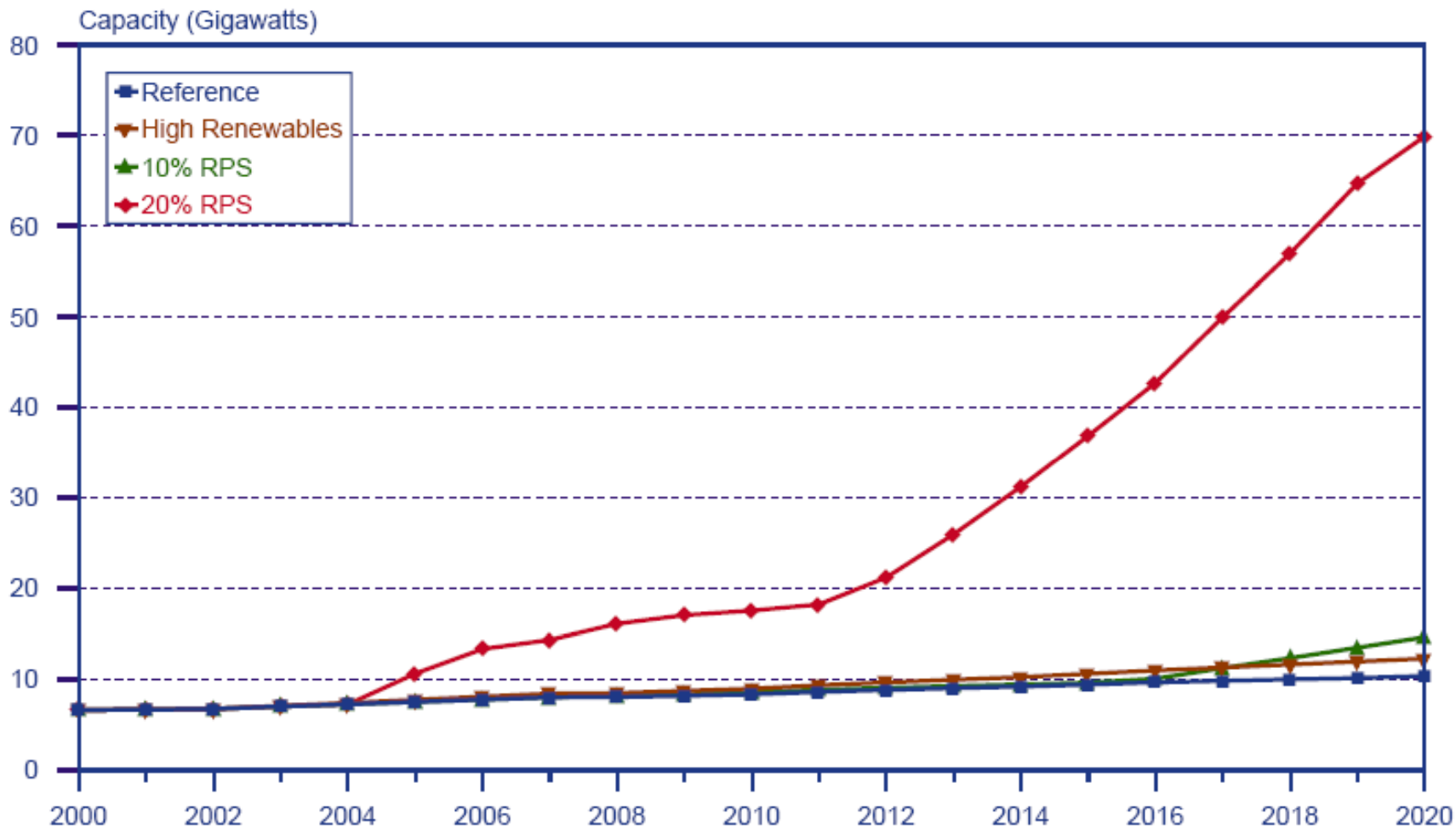
Source: Energy Information Administration 2002

Figure 5. Electricity Generation from Biomass with 20% RES



Source: Energy Information Administration 2003

Figure 7. Projections of Biomass-Fired Generating Capacity in Four Cases, 2000-2020



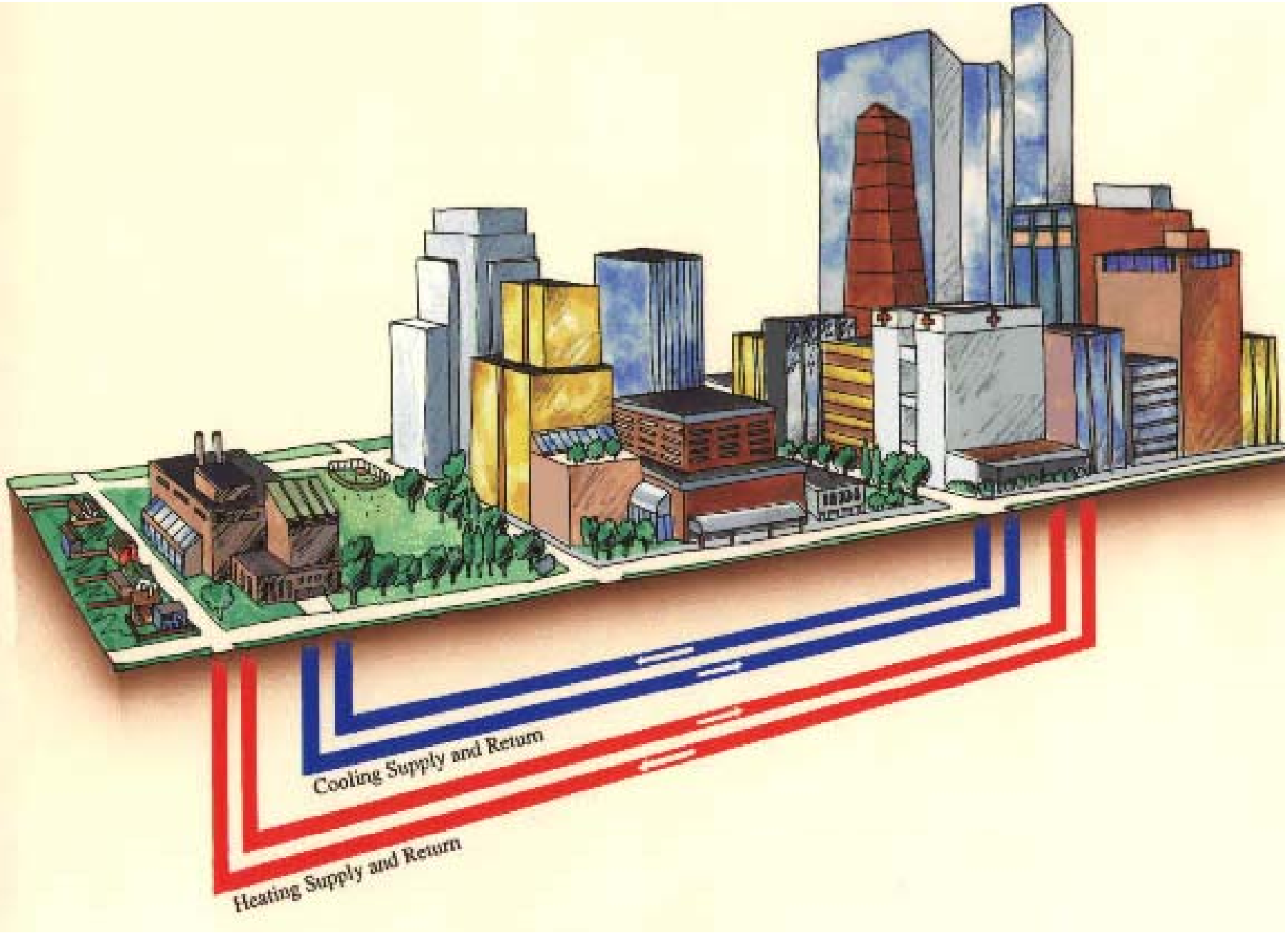
Source: EIA , 2003. Biomass for Electricity Generation

Figure 8. Relative efficiency of electricity, thermal, and cogeneration (CHP) facilities

	Size (MW)	Wood use (Green tons/yr)	Capital cost (US$millions)	Operations cost (US$millions	Efficiency (Percent)
Electricity only					
Utility plant	10-75	100,000-800,000	20-150	2-25	18-24
Industrial plant	2-25	10,000-150,000	4-50	4-50	20-25
School campus	N/A	N/A	N/A	N/A	N/A
Commercial/industrial	N/A	N/A	N/A	N/A	N/A
Thermal only					
Utility plant	14.6-29.3	20,000-40,000	10-20	2-4	50-70
Industrial plant	1.5-22.0	5,000-60,000	1.5-10	1-3	50-70
School campus	1.5-17.6	2,000-20,000	1.5-8	0.15-3	55-75
Commercial/industrial	0.3-5.9	200-20,000	0.25-4	0.02-2	55-75
Combined heat and power/1					
Utility plant	25(73)	275,000	50	5-10	60-80
Industrial plant	0.2-7(2.9-4.4)	10,000-100,000	5-25	0.5-3	60-80
School campus	0.5-1(2.9-4.4)	5,000-10,000	5-7.5	0.5-2	65-75
Commercial/industrial	0.5-2(2.9-7.3)	5,000	5	0.5-2	65-75

1. Sizes for combined-heat-and-power (CHP) facilities are a combination of electical and thermal capacity; the first figure is electrical and the figure in parentheses is thermal. 1 MW = 3.413 Btu/hour.

Source: USDA Forest Service. 2004. Techline: Wood Biomass for Energy WOE-1. Forest Products Laboratory, Madison, Wisconsin.


Cooling Supply and Return
Heating Supply and Return

Workshop focus

1. Calculating consistent, reliable estimates of woody biomass supply in the context of sustainable forest management
2. Accurately communicating complete information to decision makers in energy industry and local government
3. Exploring the full array of options for efficient, financially viable utilization of wood for bioenergy

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Workshop focus

4. Exploring sustainability safeguards and potential role of third-party certification for bioenergy/biofuels industry
5. Informing national-level renewable energy policy processes, and supporting the ongoing development of a regional sustainable wood bioenergy strategy in the Lake States

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www.pinchot.org/bioenergy_paper

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