

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

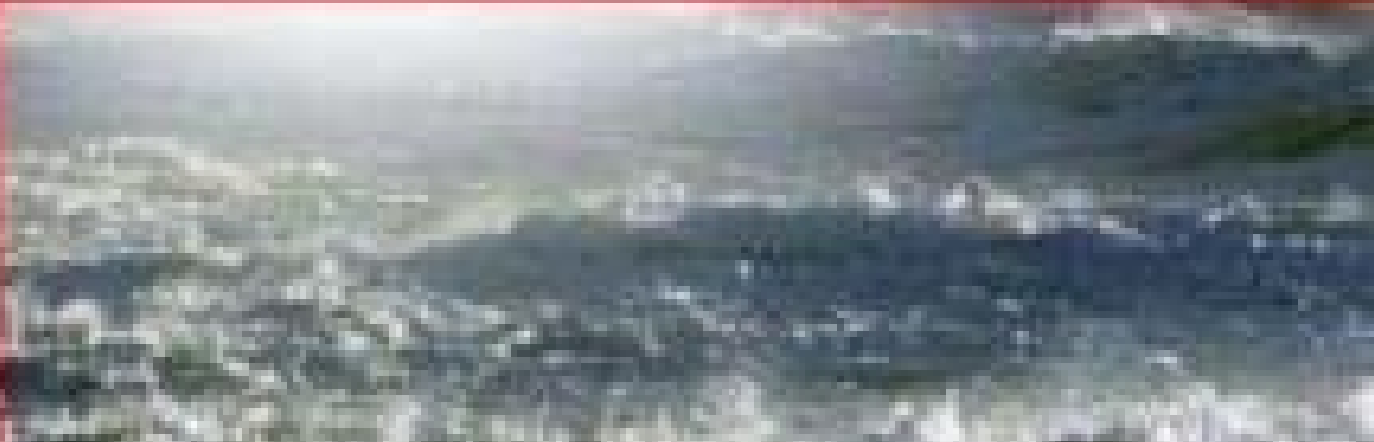
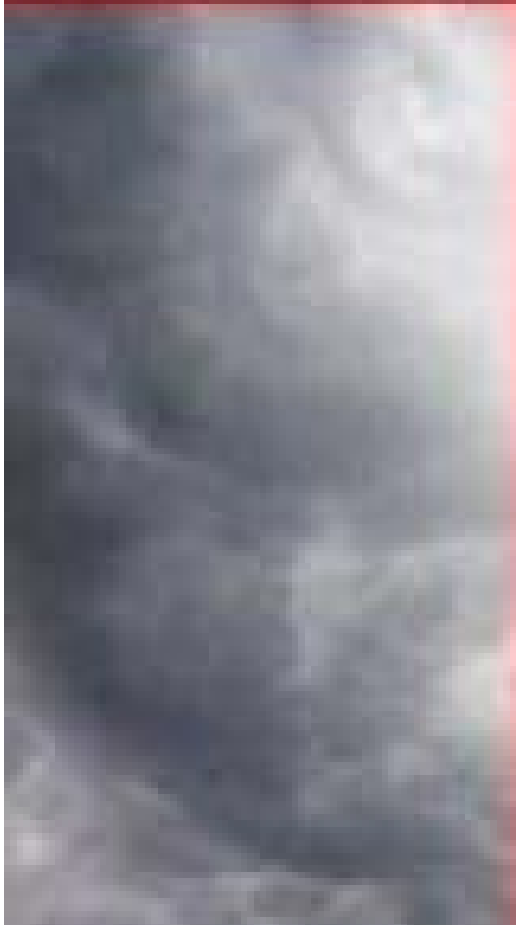
September 9-10, 2009
University of Minnesota

V. Alaric Sample
President, Pinchot Institute for Conservation
Washington, DC





CLIMATE CHANGE





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

April 2005

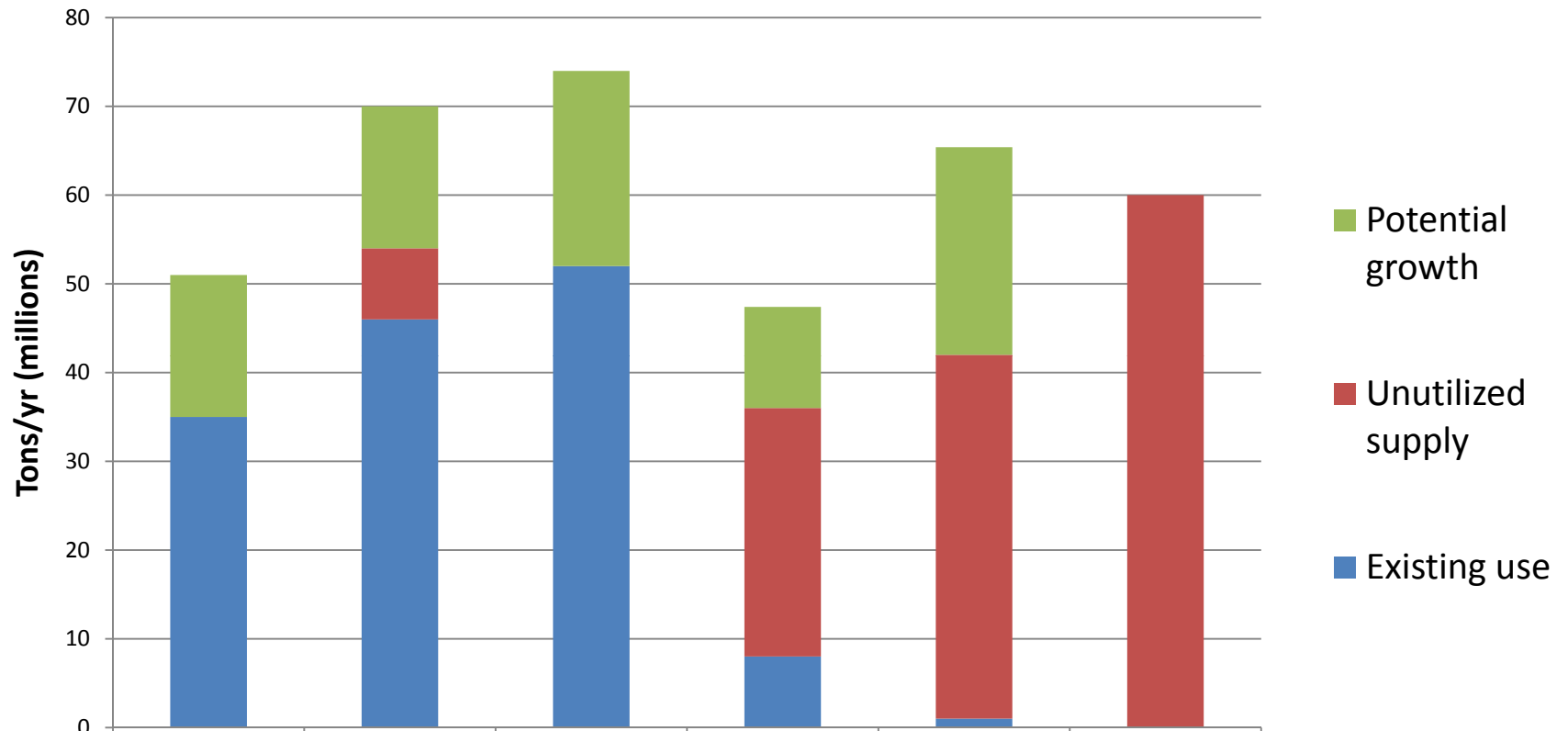


U.S. Department of Energy



U.S. Department of Agriculture

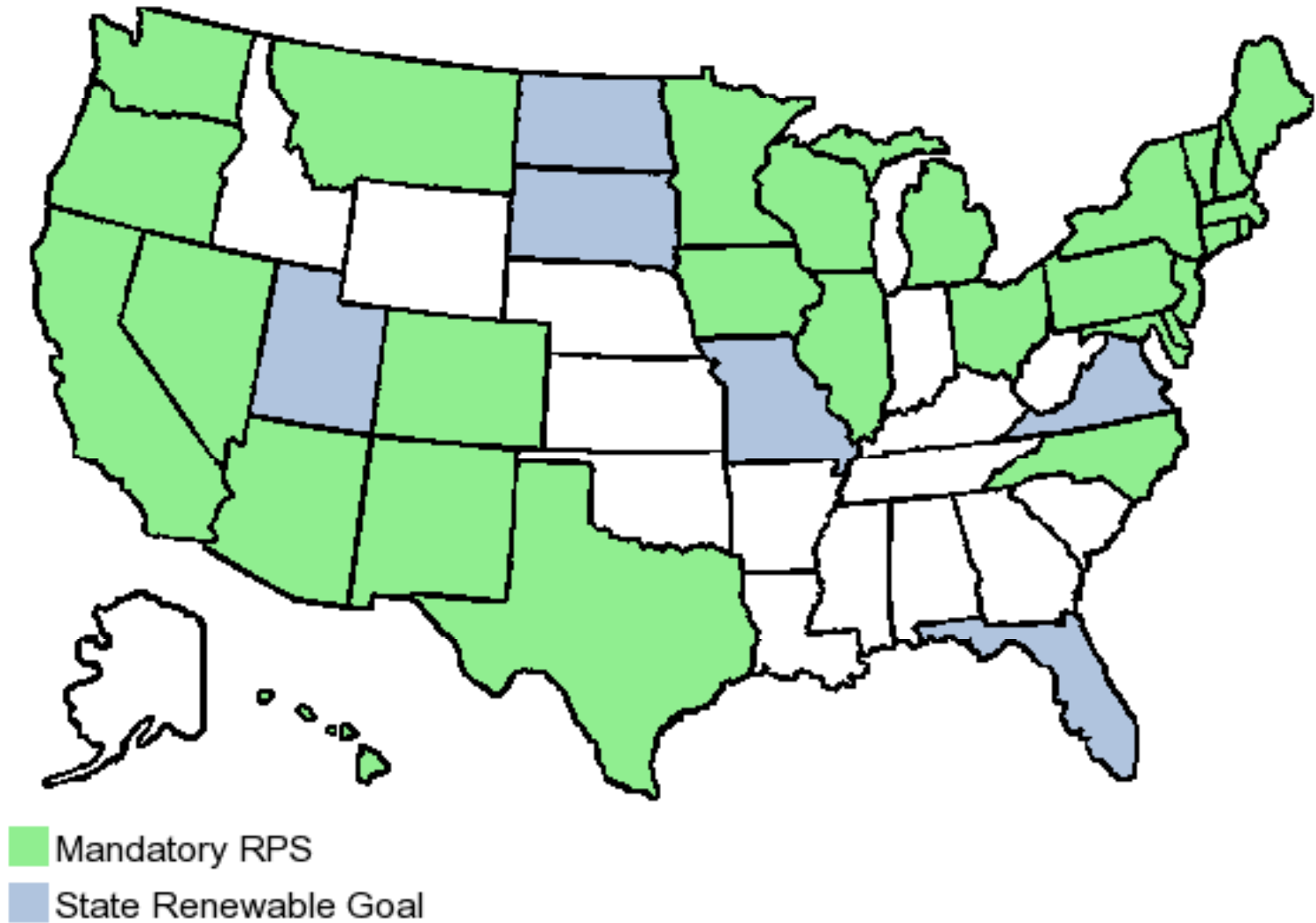
Figure 1. Current and potential wood supply for biomass energy



| | 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

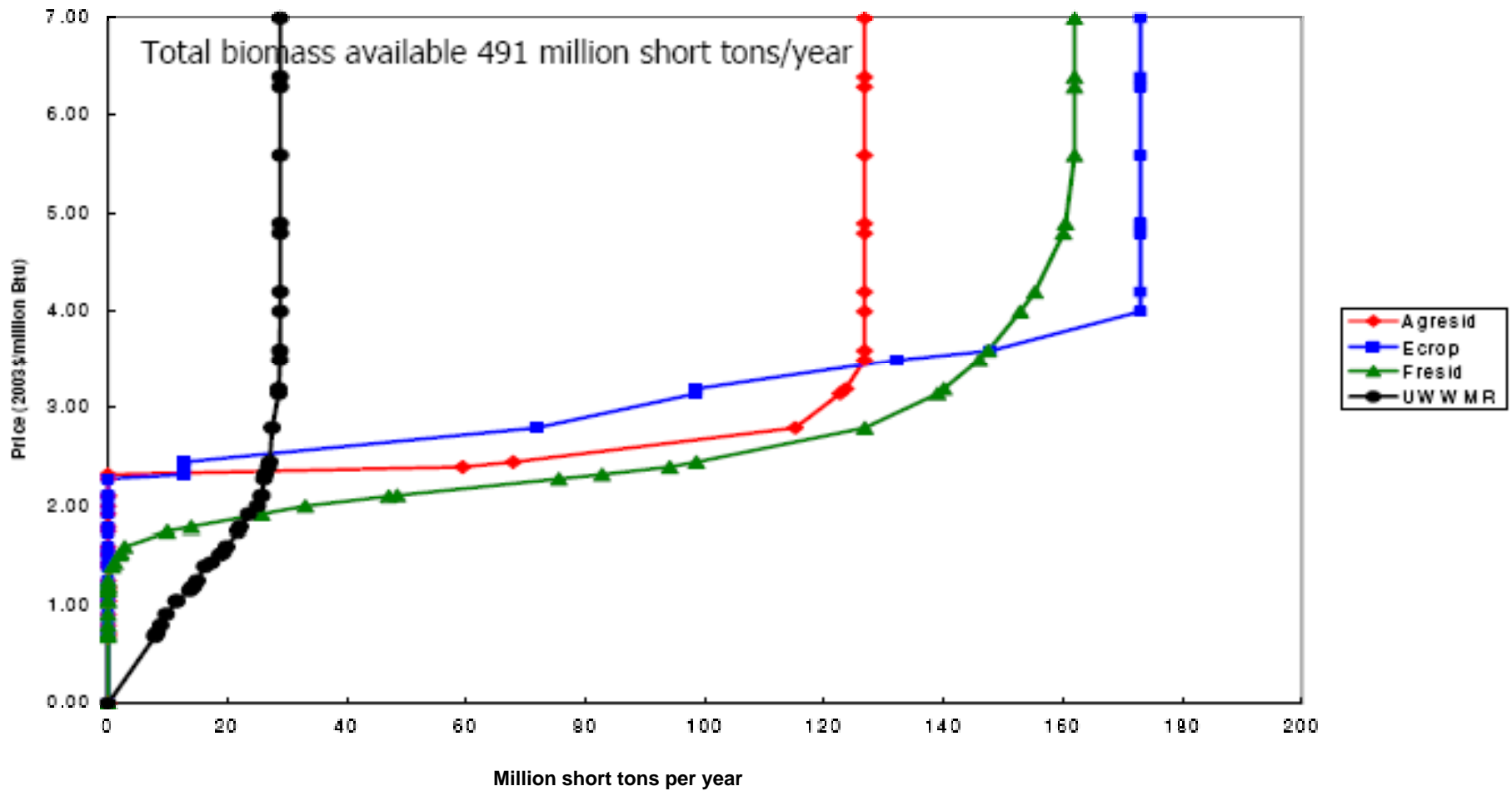


**Energy and Economic Impacts
of Implementing Both a 25-Percent
Renewable Portfolio Standard and a 25-
Percent Renewable Fuel Standard by 2025**

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]

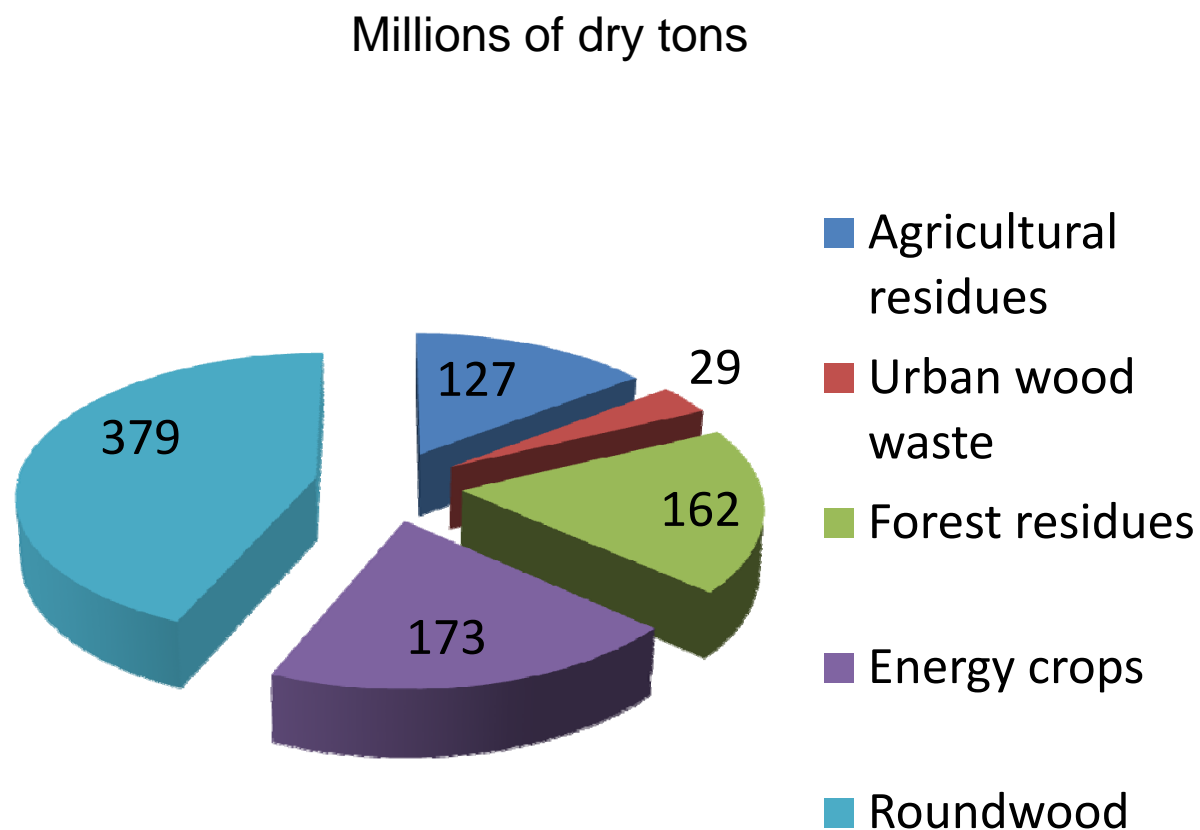
| | 2007 Actual | 2025/1 | | Total |
|-----------------------|----------------|------------|------------|------------|
| | | 25% RES/2 | 25% RFS/3 | |
| Agricultural residues | | | 127 | 127 |
| Urban wood waste | 8 | 25 | 4 | 29 |
| Forest residues | 47 | 120 | 42 | 162 |
| Energy crops | | 71 | 102 | 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)

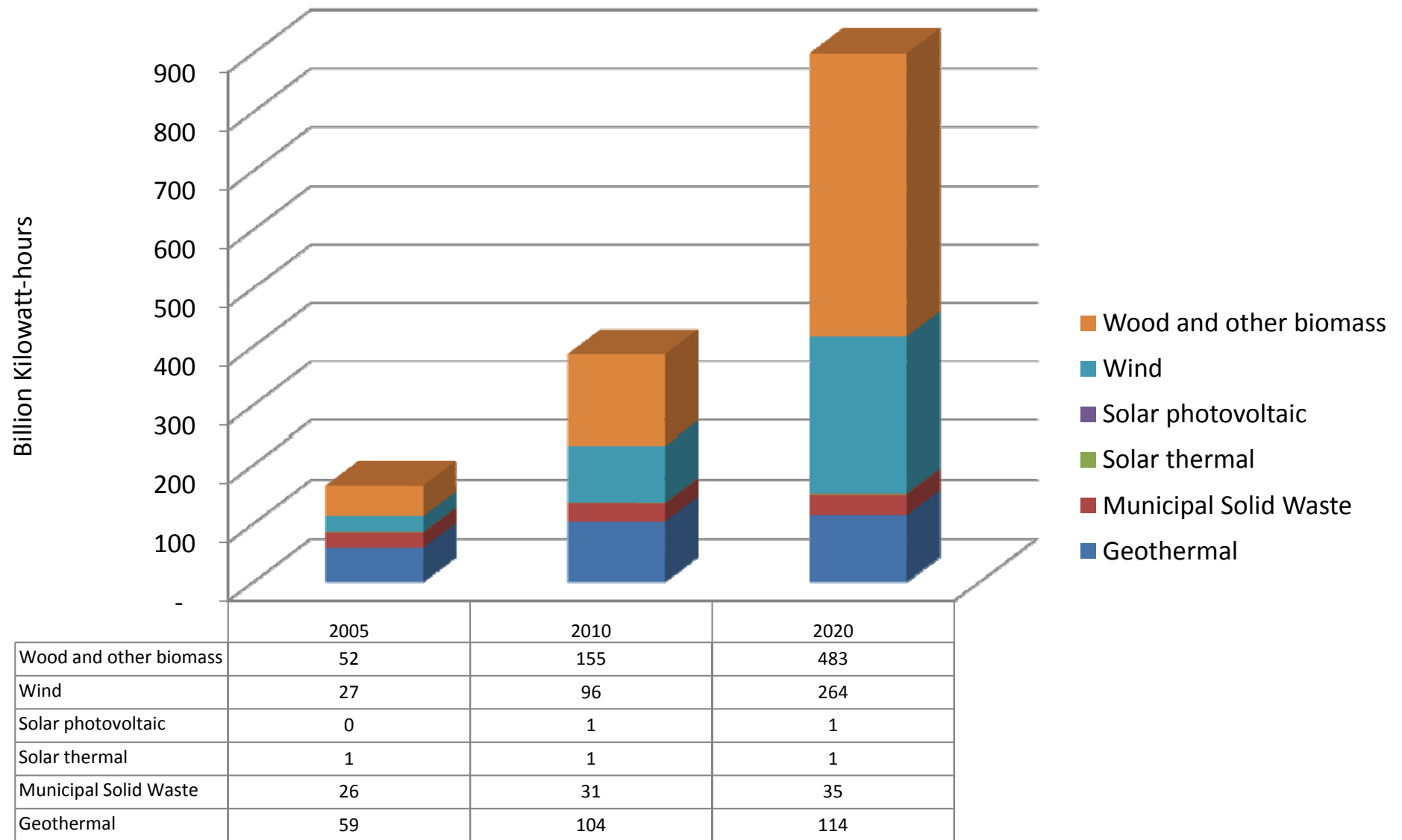
3/ 28 billion gallons ethanol = 325 million bdT of biomass (assumptions: 1 gT=43 gal, 1 bdT=86 gal)

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



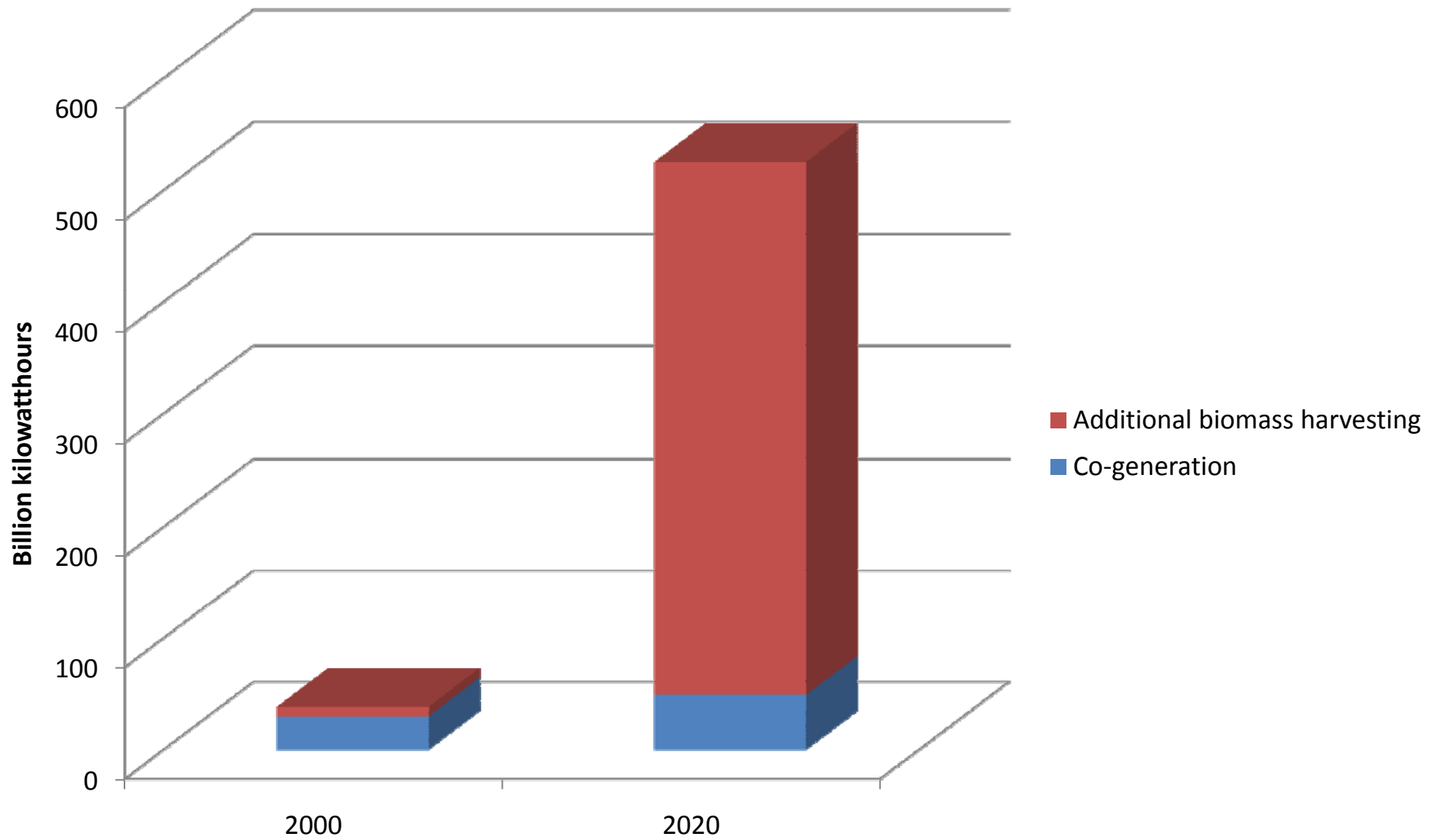
Source: Energy Information Administration, 2007

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



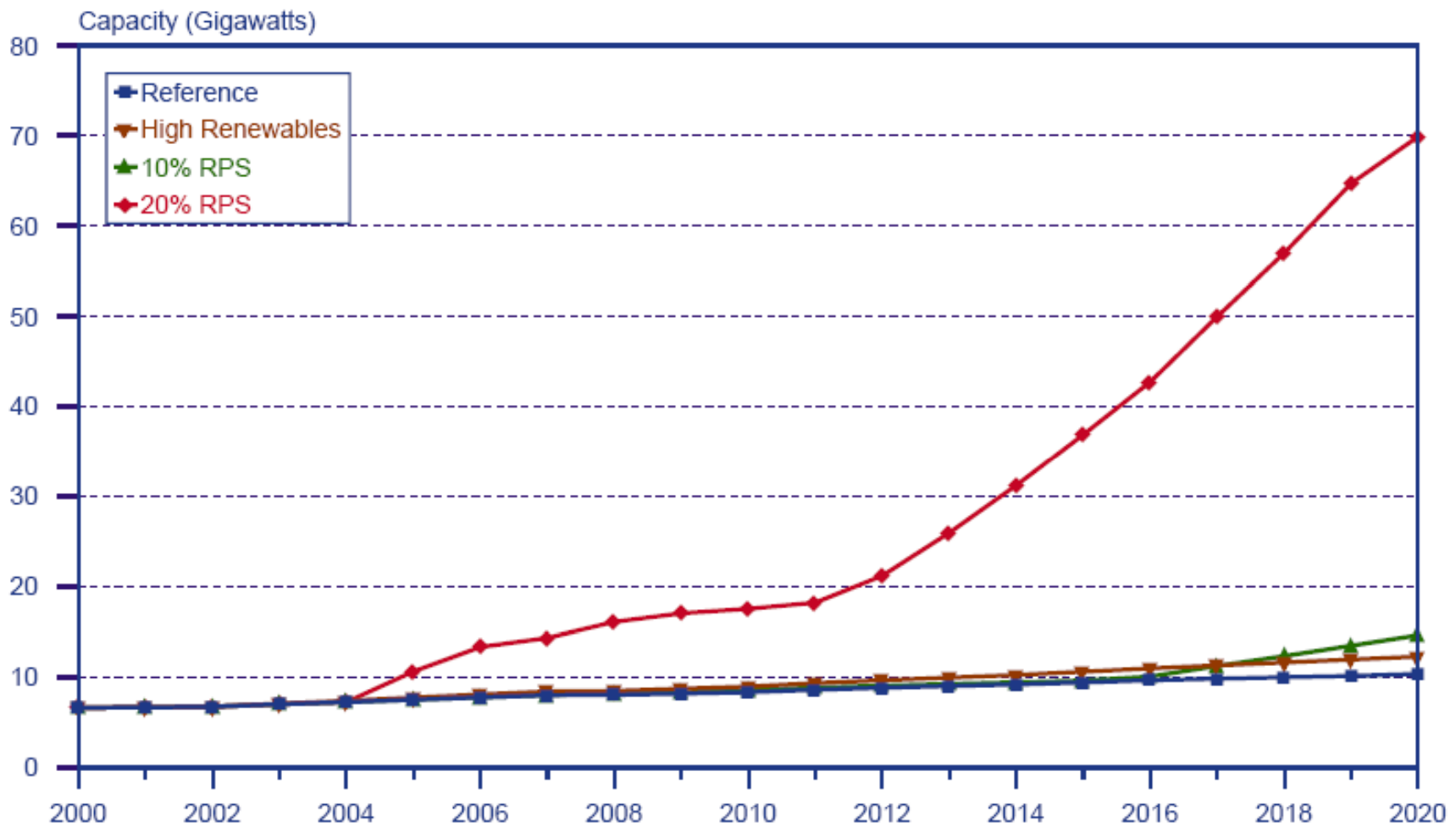
Source: Energy Information Administration 2002

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



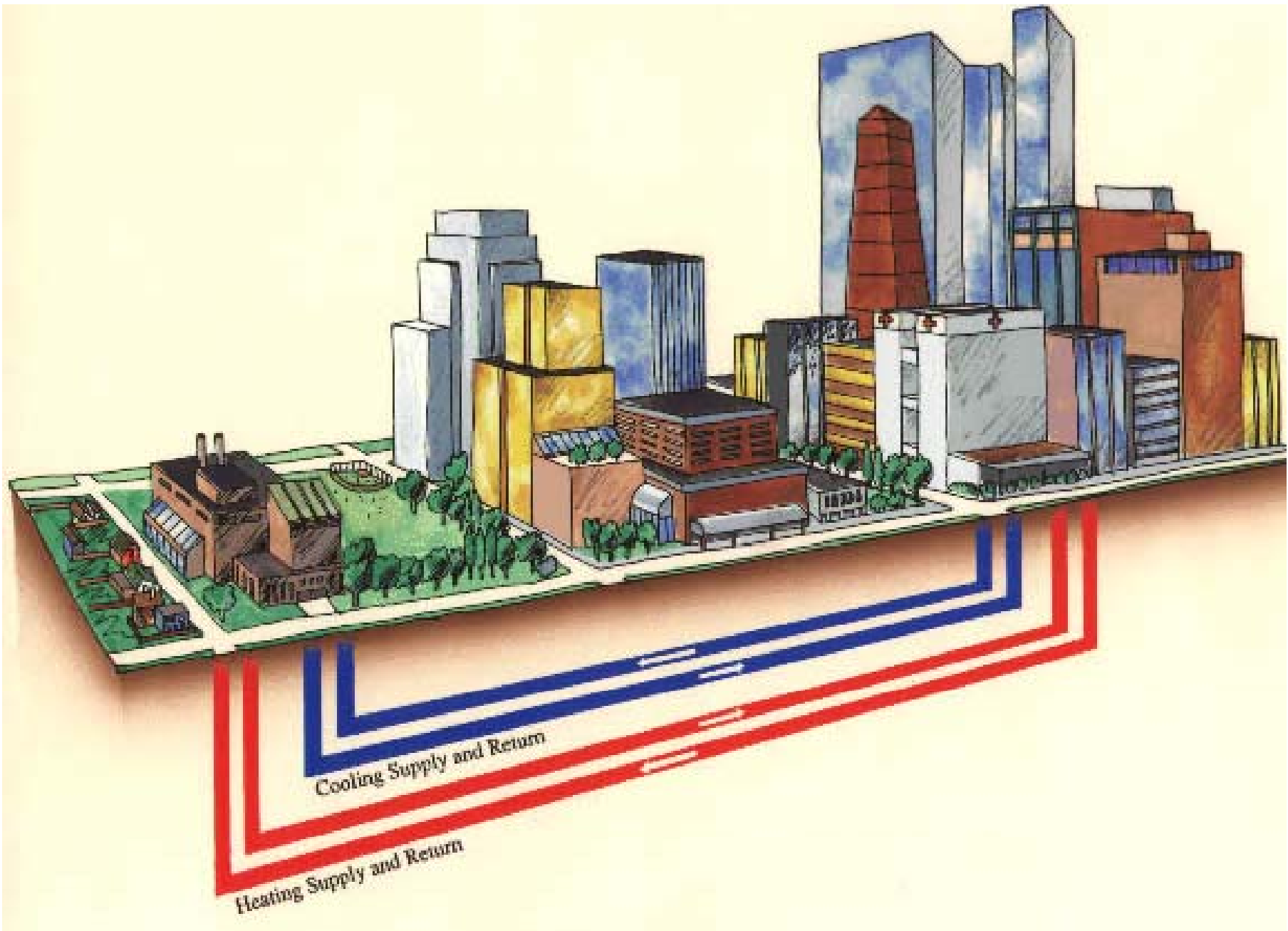
Source: EIA , 2003. Biomass for Electricity Generation

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 electrical 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.





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

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

www.pinchot.org/bioenergy_paper

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