Regional Land Use Conversion in the Context of Using Biomass for Energy

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Outline

Identify the research question

Examine distribution of current sources of energy

Modeling bioenergy feedstock consumption

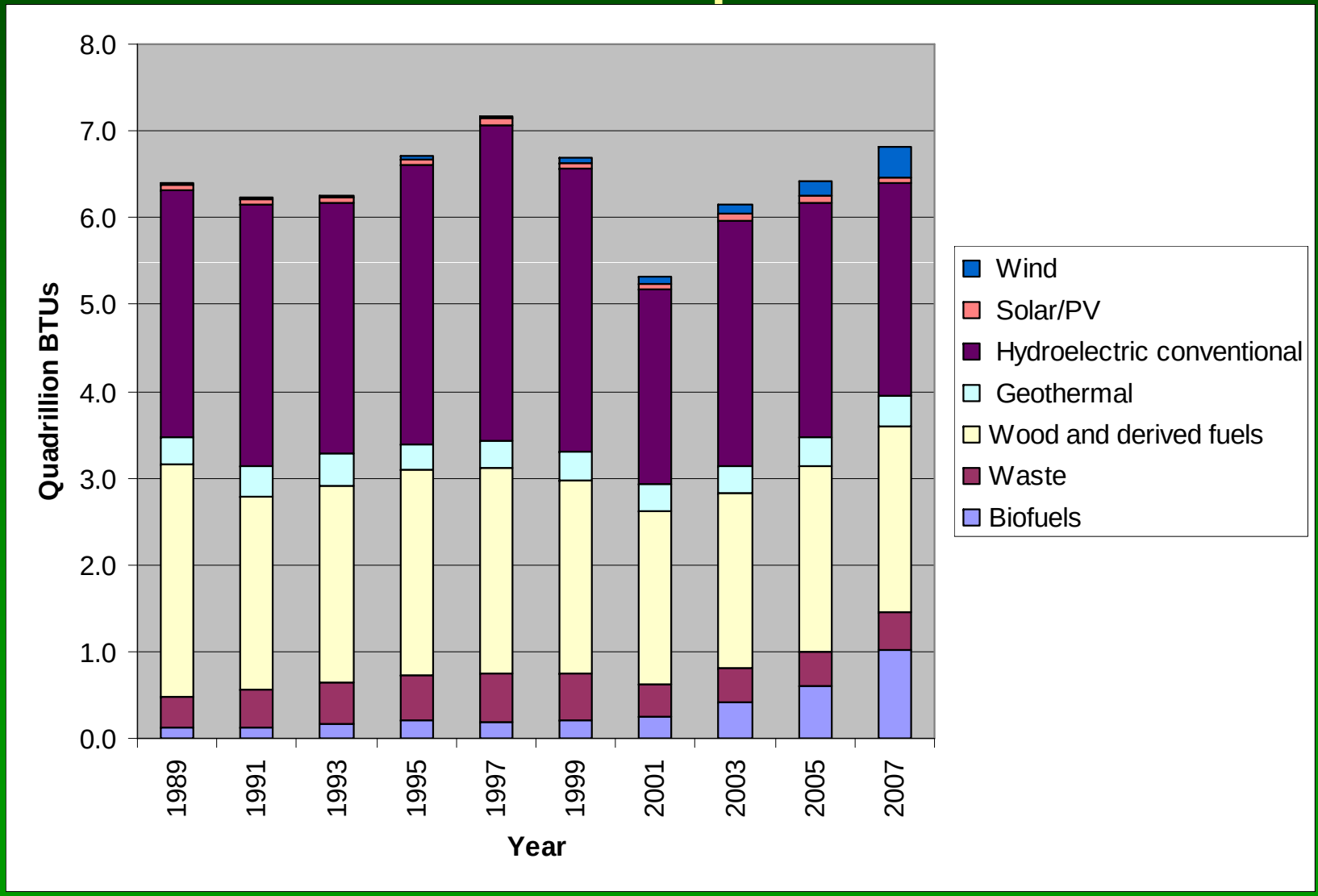
Projections of biomass feedstock use

Implications, conclusions, and caveats

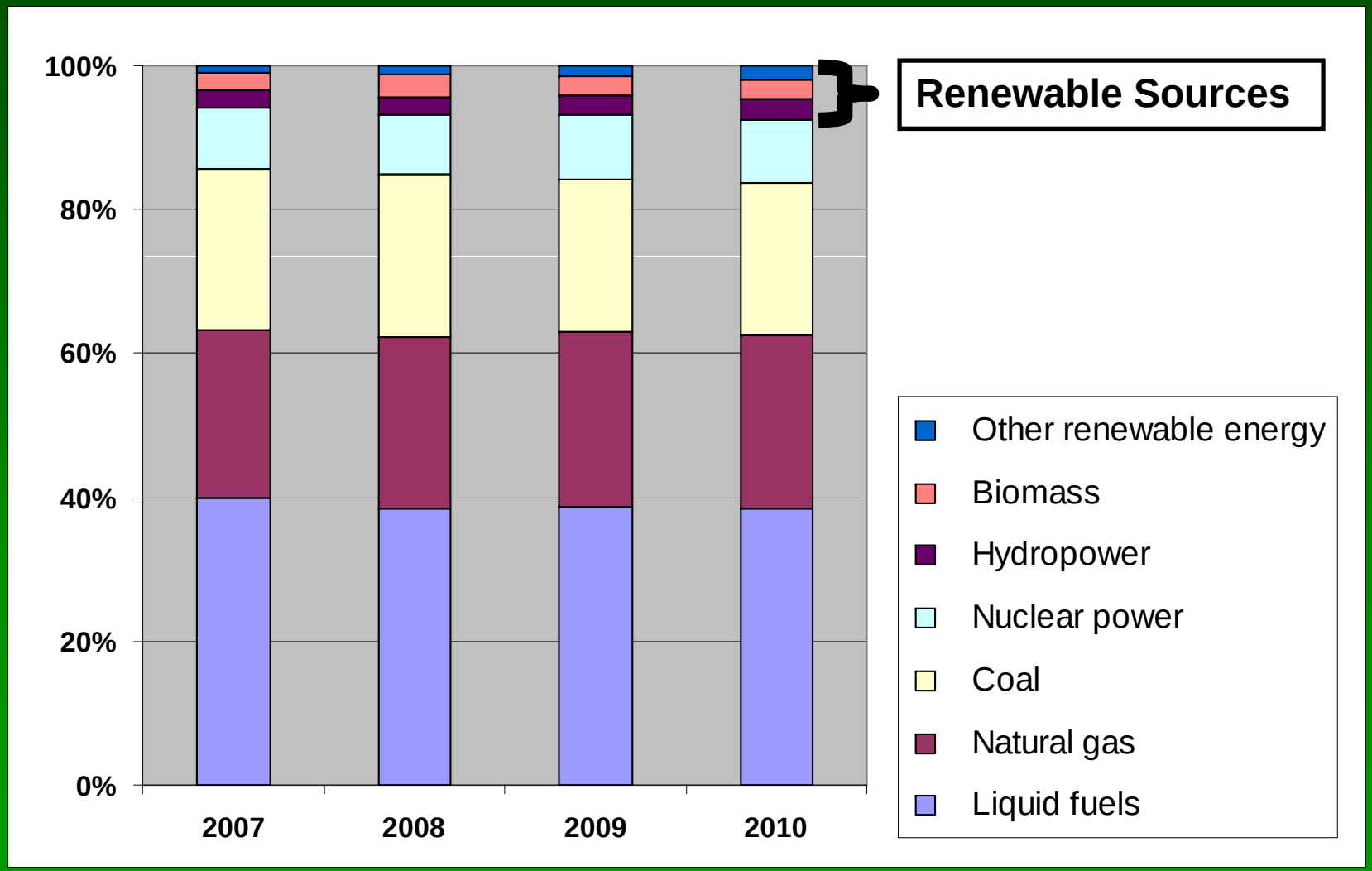
Research Question

What feedstocks might be consumed and what harvest and land use changes might result from increased demand for bioenergy?

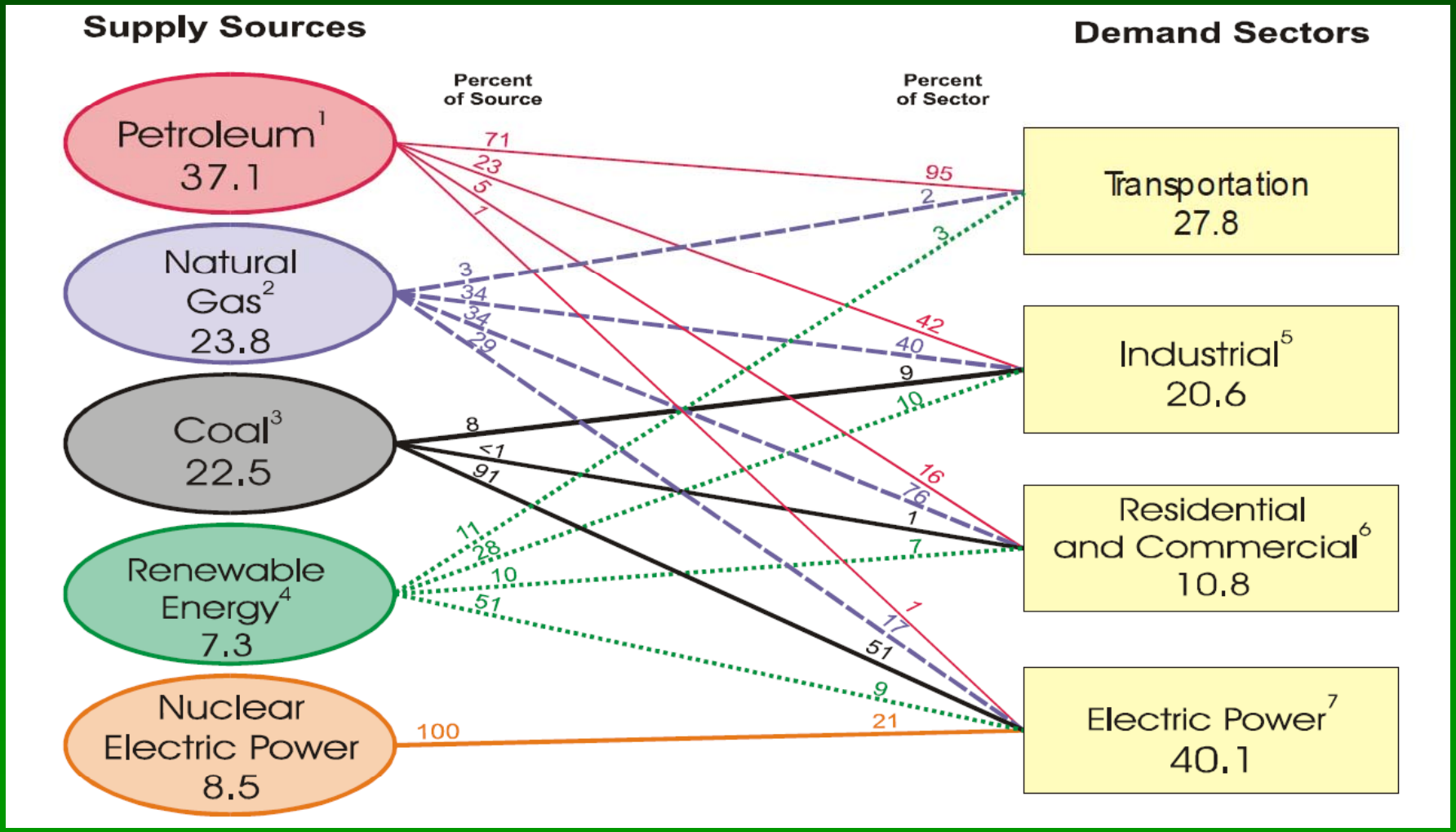
U.S. Renewable Energy Consumption



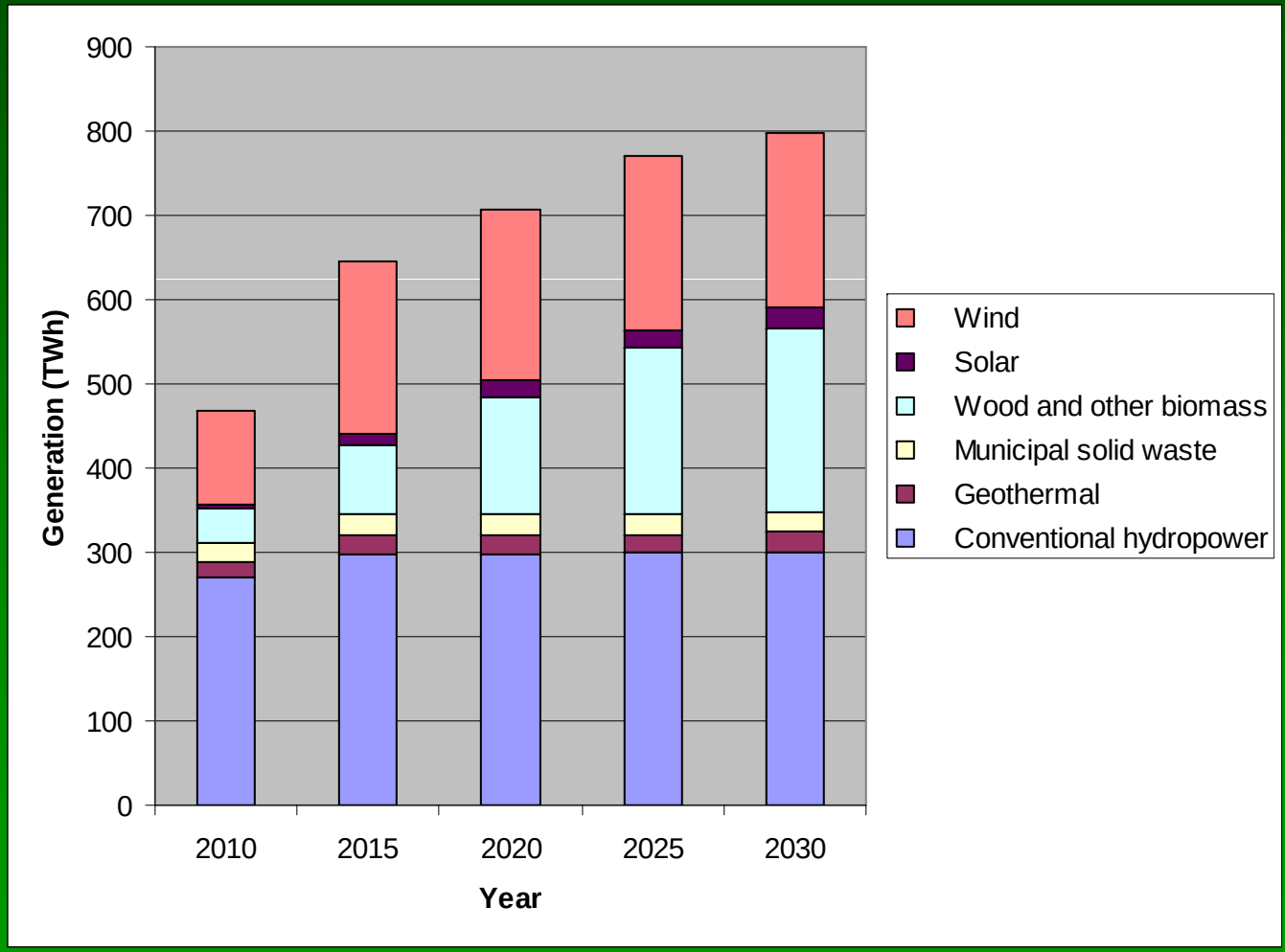
Energy Sources



Energy Sources and Sector Usage

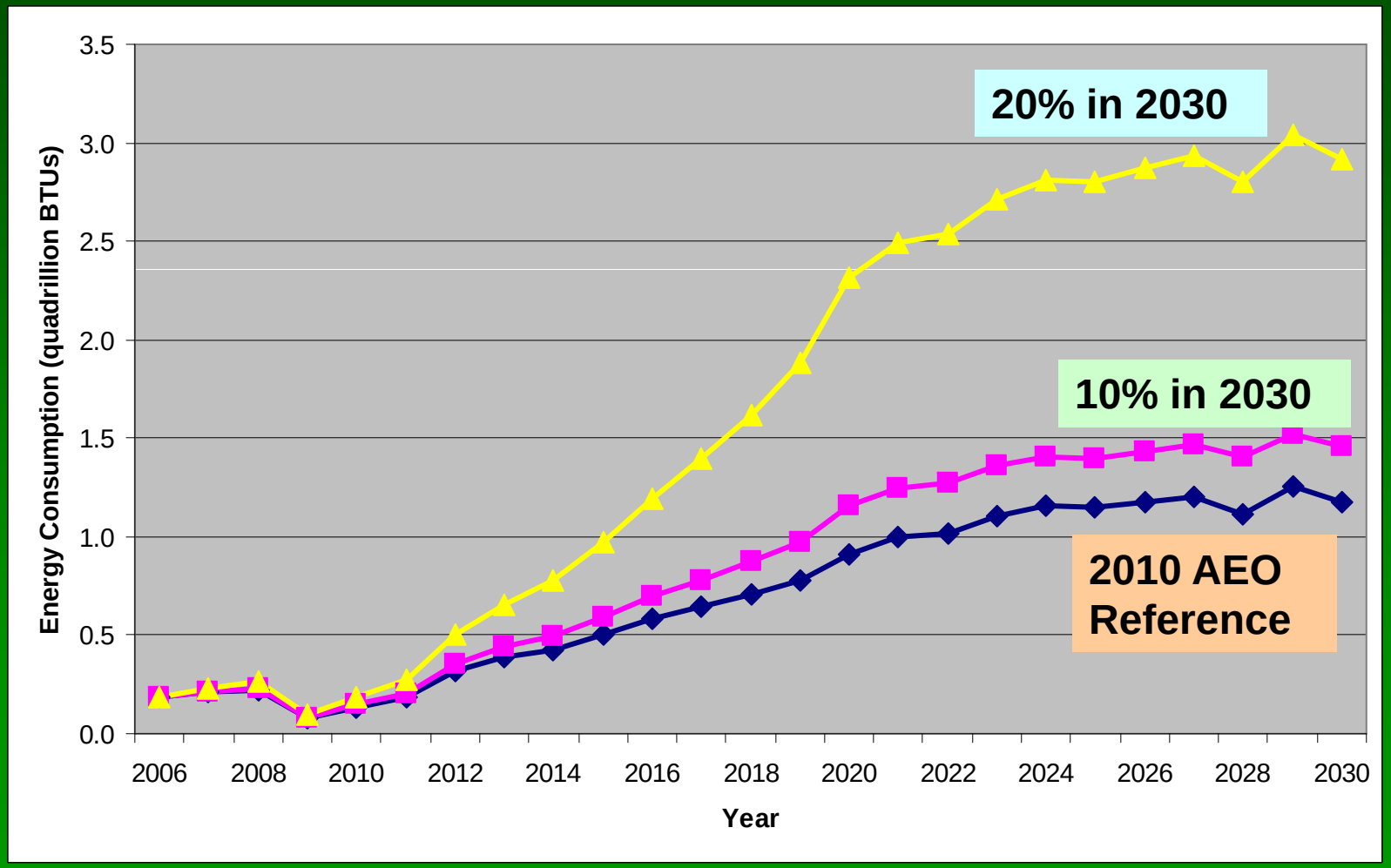


Electrical Sector Renewable Energy



Scenario Modeling

Bioelectricity Scenarios



FASOM-GHG

- Linked model of U.S. agriculture and forest sectors
- Utilizes a dynamic optimization approach to simulate markets for agriculture and forest products
- Regionally-explicit
- Tracks a variety of agriculture and forestry resource conditions and management actions
- Includes a bioenergy sector

Biomass Energy Feedstocks

Agriculture residues

Production byproducts

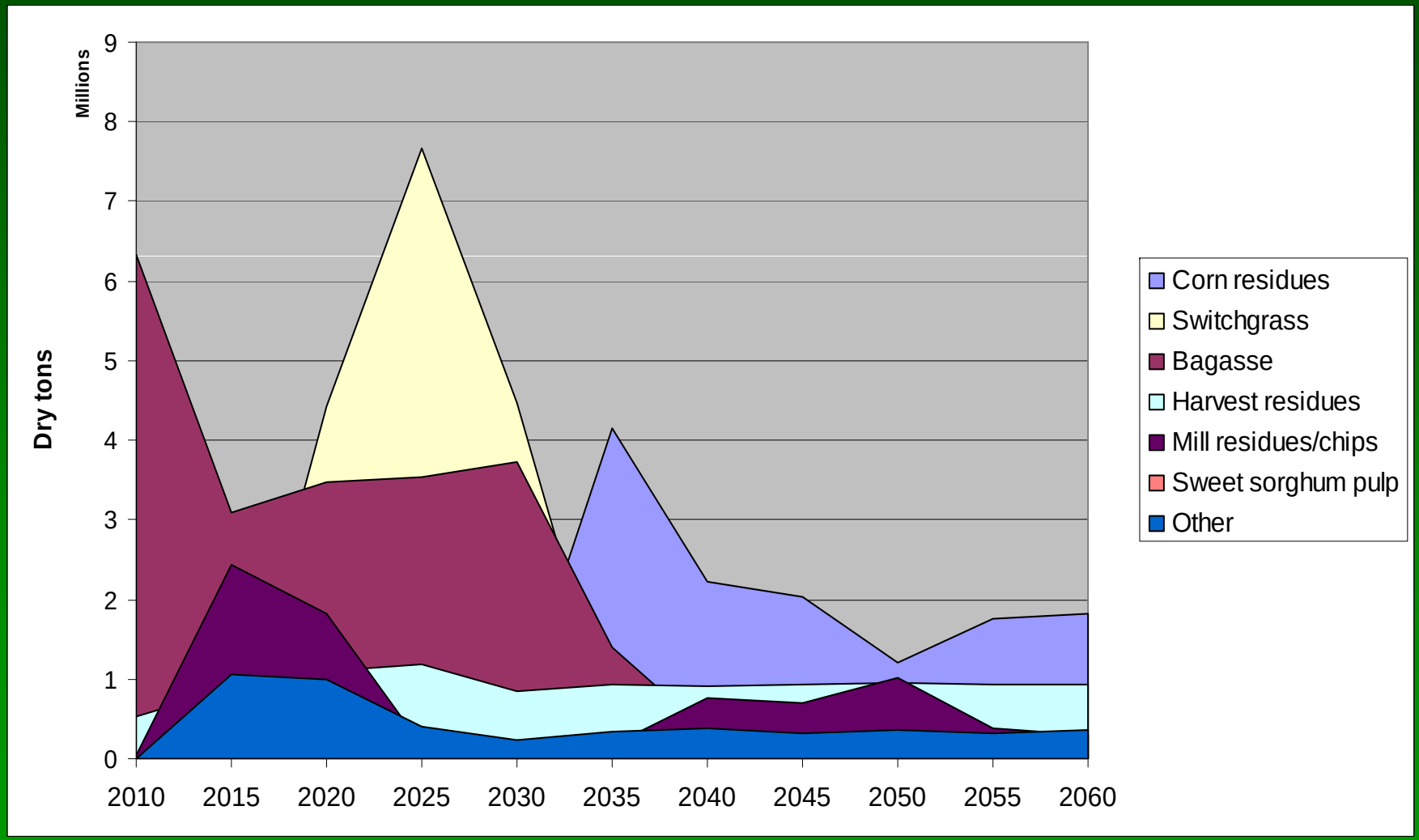
Forest harvest residues

Timber milling residues/chips

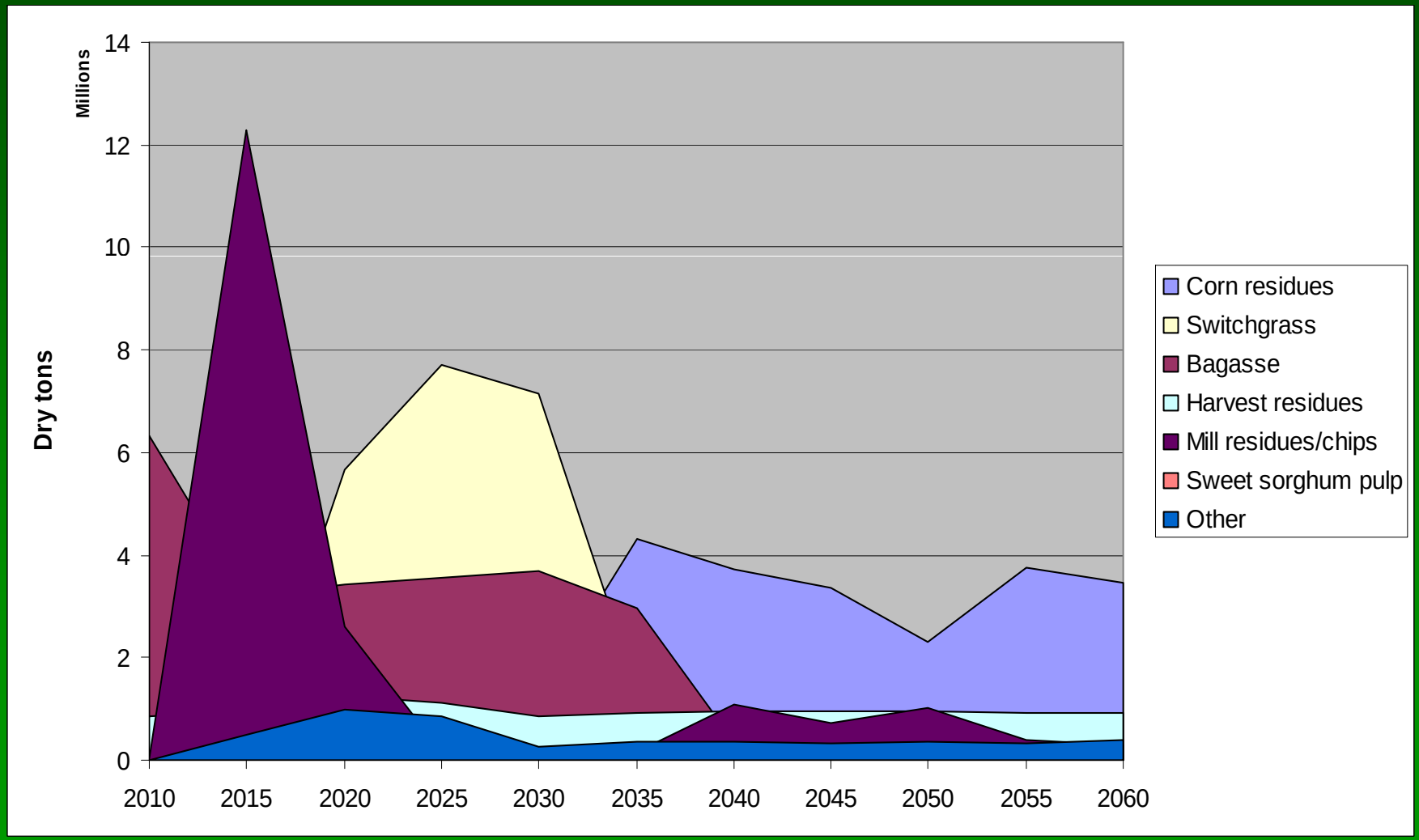
Energy crops

Projections

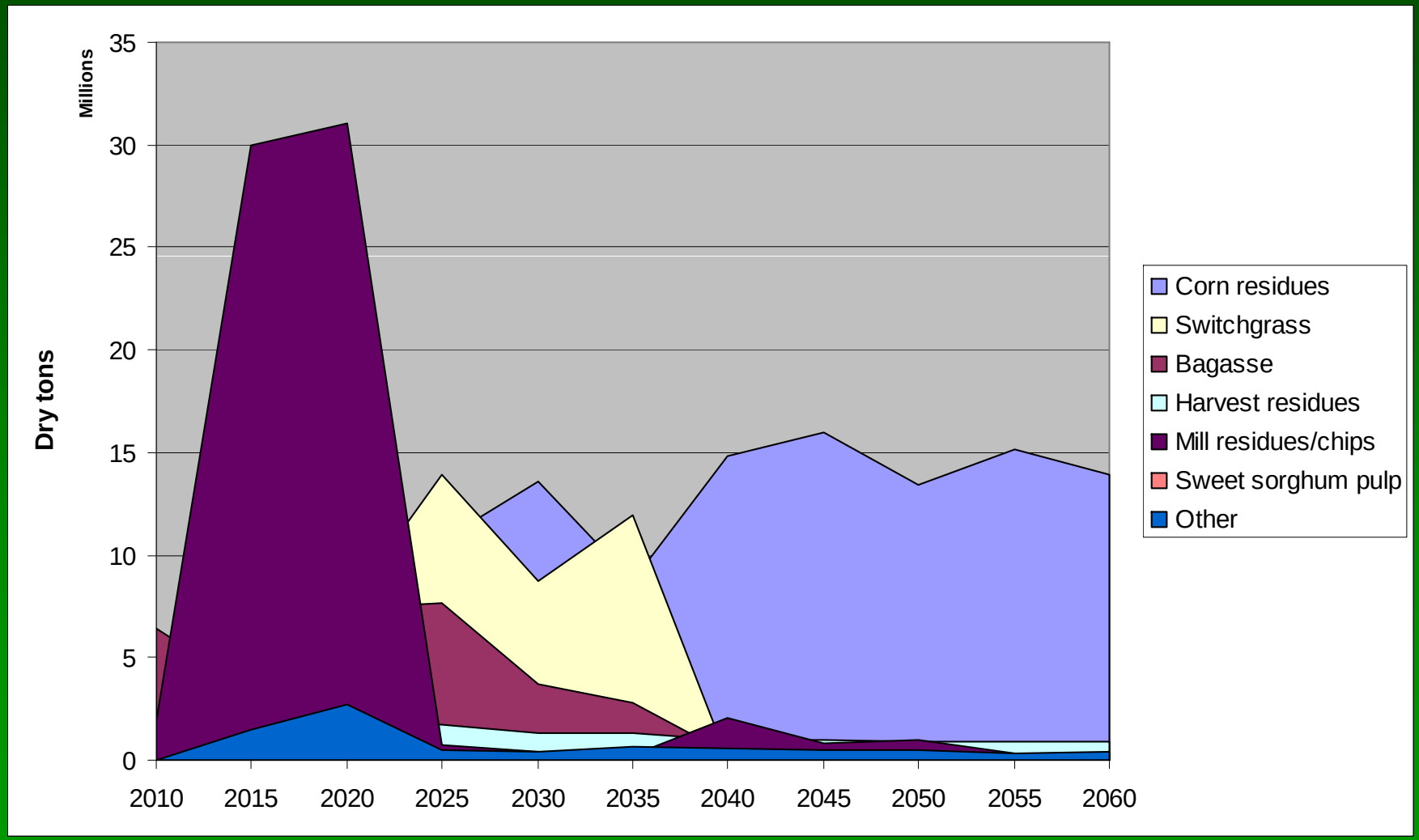
2010 AEO Reference



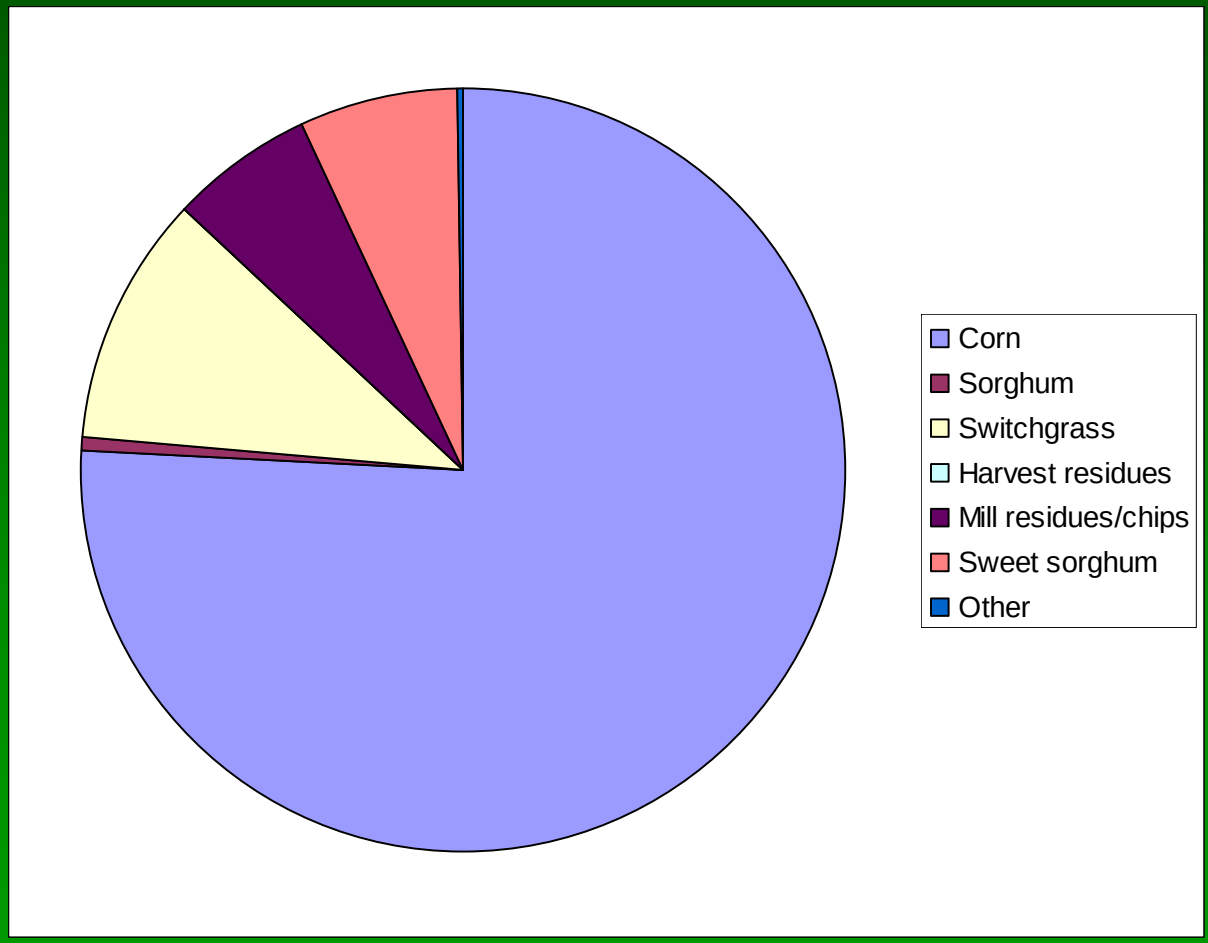
Renewable Electricity 10%



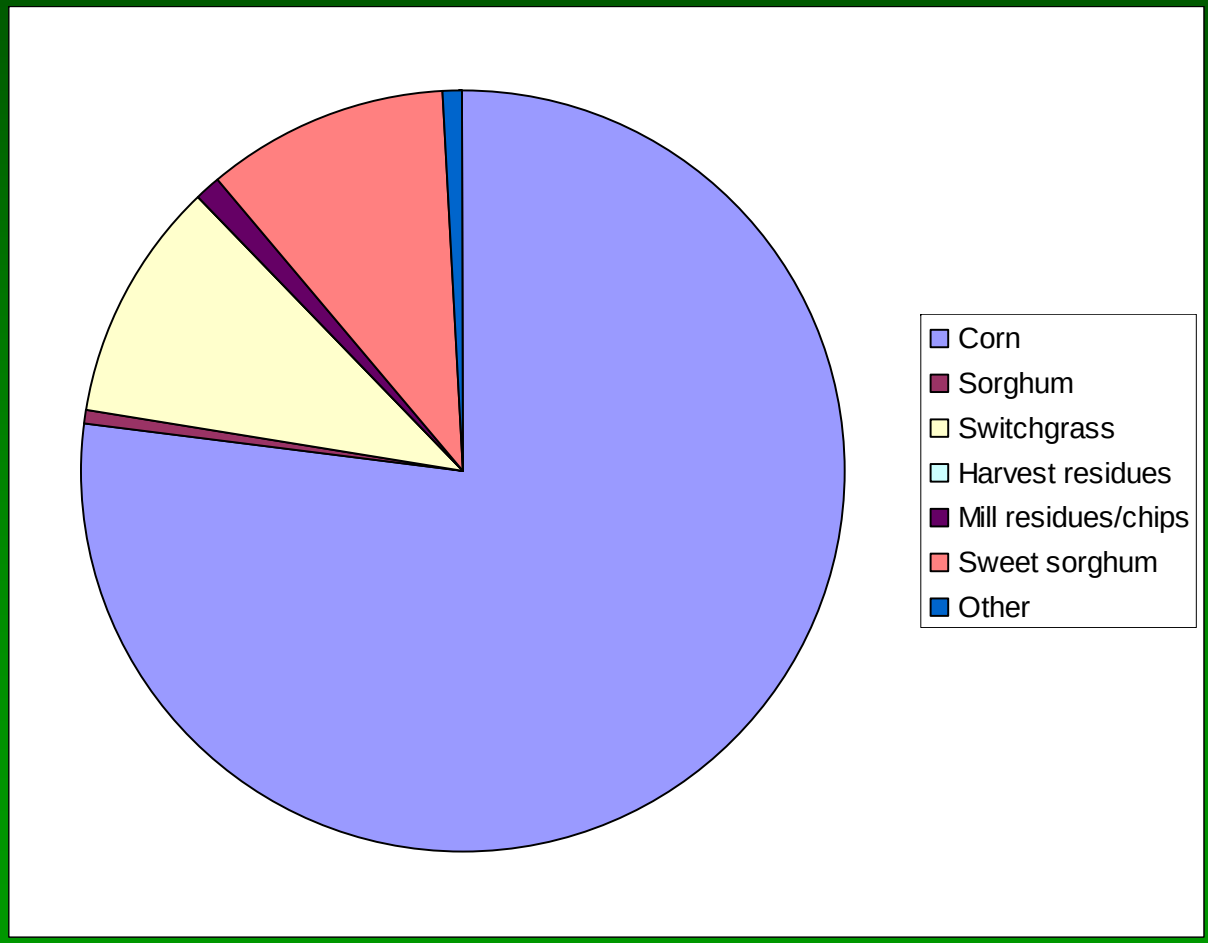
Renewable Electricity 20%



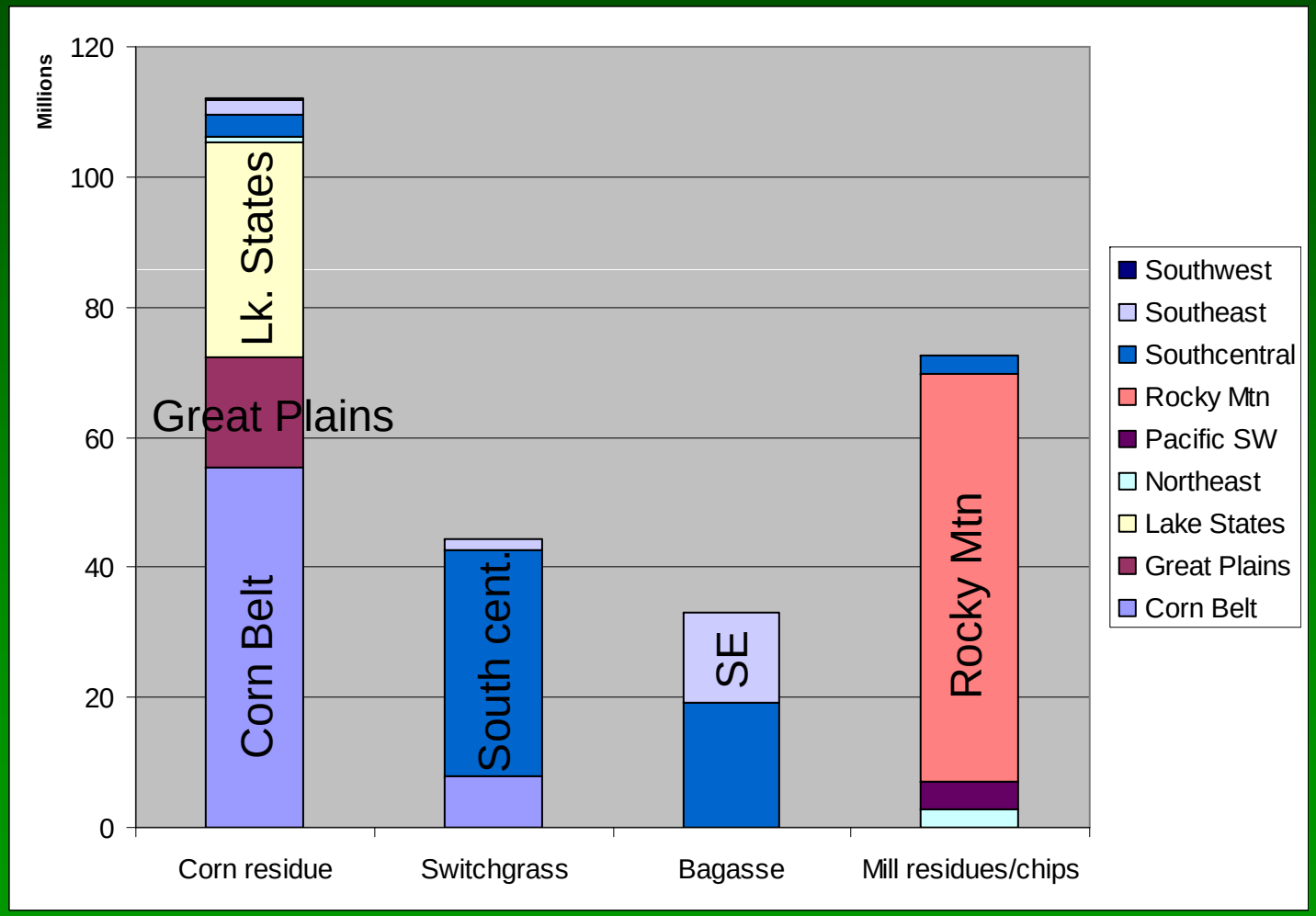
Ethanol Feedstock, RES 10%



Ethanol Feedstock, RES 20%



Regional Electricity Feedstocks



Projected Timber Harvest Volumes

- Very small percentage increases relative to the baseline at the national level between 2010 and 2060
- Greater harvest volumes relative to baseline projected over the next 15 years, followed by declines
- Largest percentage increases projected for hardwood pulpwood and fuelwood
- Lake States and Rocky Mountain regions projected to experience the greatest percentage increases in harvest

Land Use Changes

- Projected large increases in acres where corn residue is removed
- Projected slightly lower rates of deforestation for agriculture at the national level under increased bioelectricity
- Projected decrease in the number of idle cropland acres
- Projected decrease in the conversion of cropland to pasture land

Implications/considerations

- Increased use of milling residues and chips by the electrical sector may reduce the availability of those residues for other products
- Will there be reductions in soil productivity because of increases in residue removal?
- How might disturbance change the supply of woody biomass and over what time horizons?

Conclusions

Very small projected increases in harvest volumes on private lands under increased bioelectricity scenarios

Initial increases in feedstock requirements are projected to be met by currently available material, with changes to switchgrass over medium timeframes and agriculture residues in the long term.

Increased bioelectricity production not projected to lead to significant changes in forest to agriculture conversion

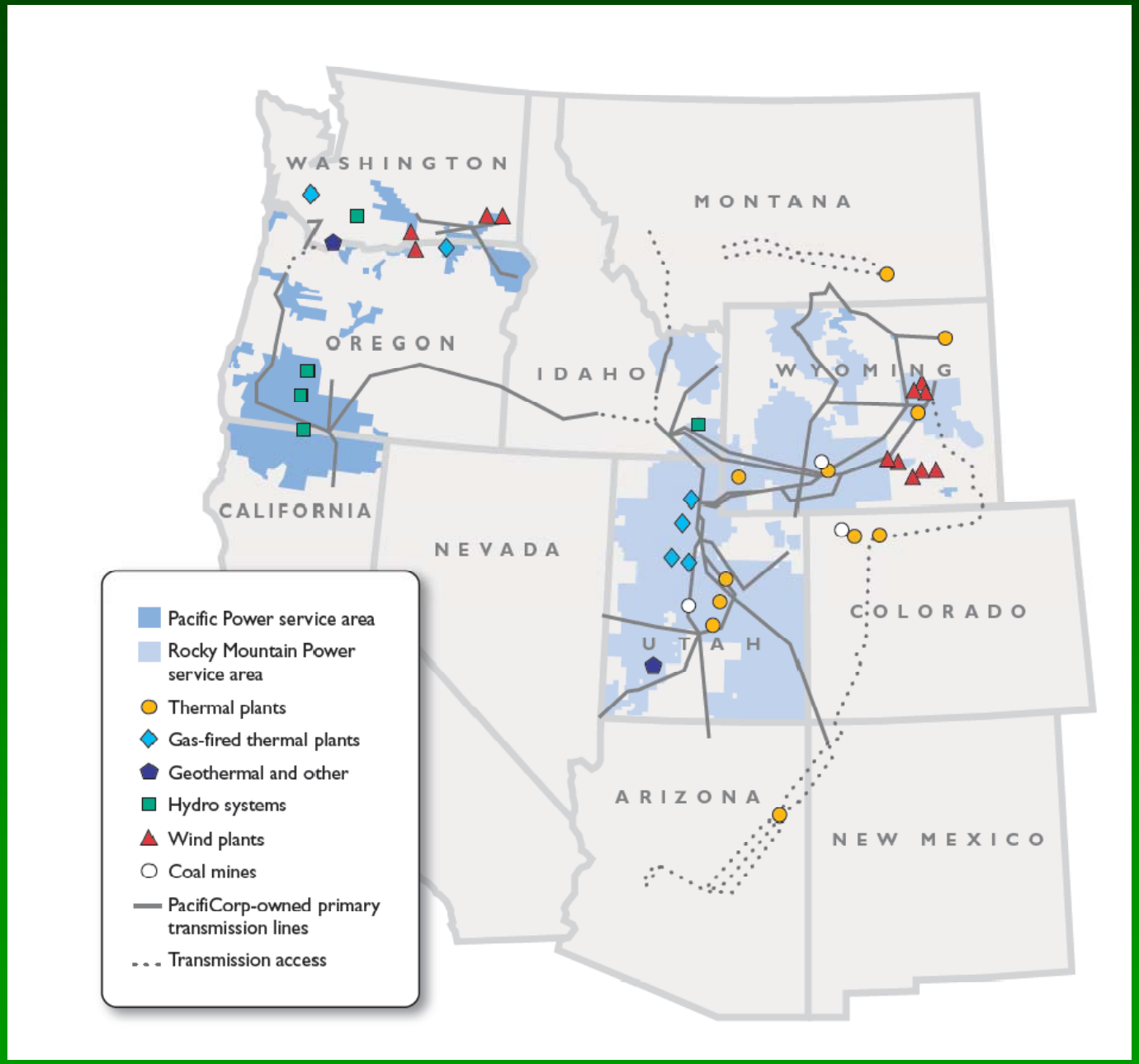
Caveats

Projections represent what could be achieved, not necessarily what will happen

Model results reflect current model input and assumptions

Specific policies and legislation may shape future bioenergy feedstock consumption

Service area for PacifiCorp



Renewable Energy Sources

Bio-ethanol production by fermentation of ricotta cheese whey as an effective alternative non-vegetable source

Stefano Curcio, Vincenza Calabrò, Gabriele Iorio

University of Calabria, Ponte P. Bucci, Cubo 42/A, 87036 Rende, Cosenza, Italy

Biodiesel from microalgae beats bioethanol

Yusuf Chisti

School of Engineering, Massey

NREL/PIX 00033