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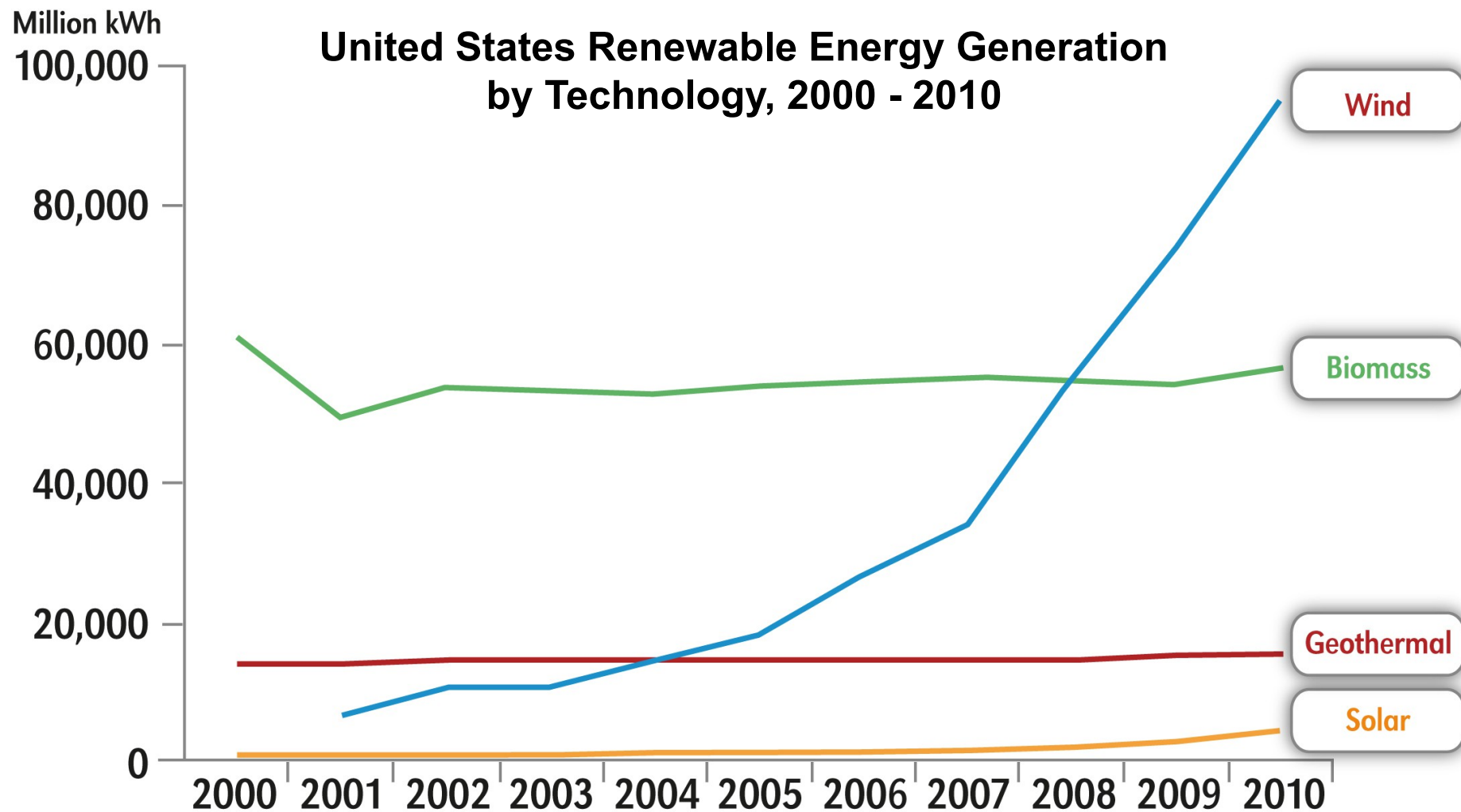
Woody Bioenergy in the Southeast: Implications for Climate & Biochar

Biochar Symposium Briefing

John Bonitz

Amherst MA – October 15, 2013

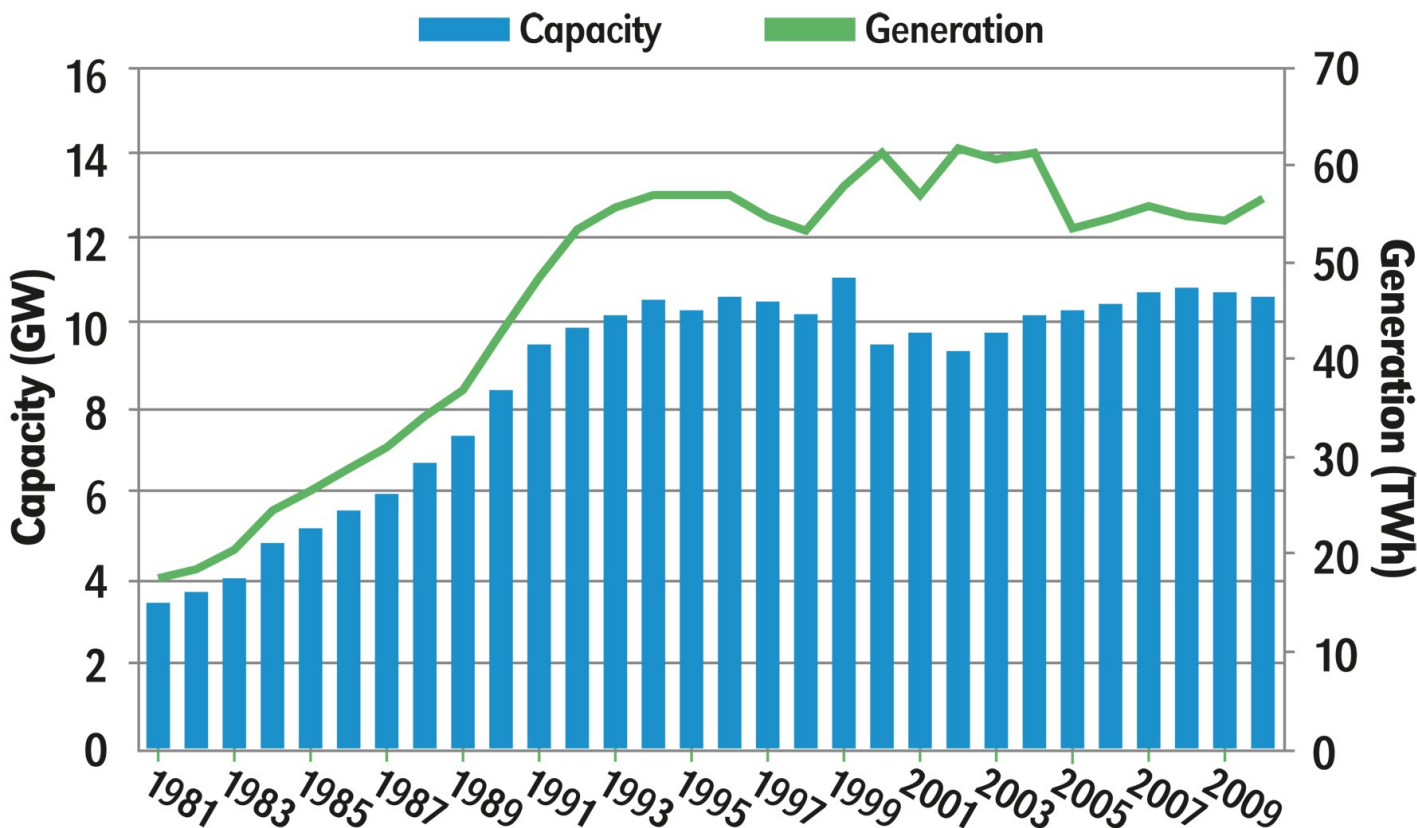
Recent History of Biopower in US



Source: NREL's 2010 Renewable Energy Data Book

Recent History of Biopower in US

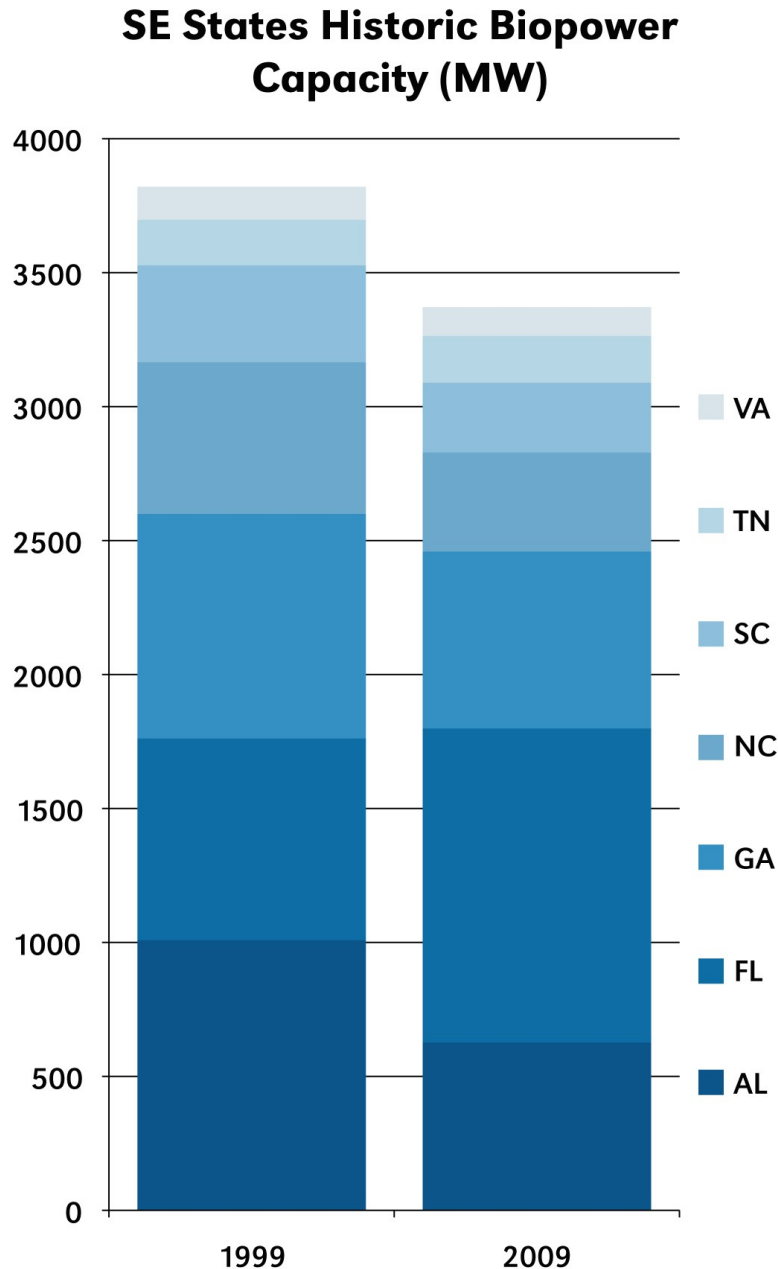
Capacity and Generation of Biopower in the United States, 1980 - 2010



**US
biopower
capacity
essentially
flat since
early 1990s**

Source: NREL's 2012 Renewable Energy Futures, Volume 2, Figure 6-1

Recent History of Biopower in SE



**Biopower capacity
in Southeast
contracted over
the past decade**

Source: EIA and NREL data

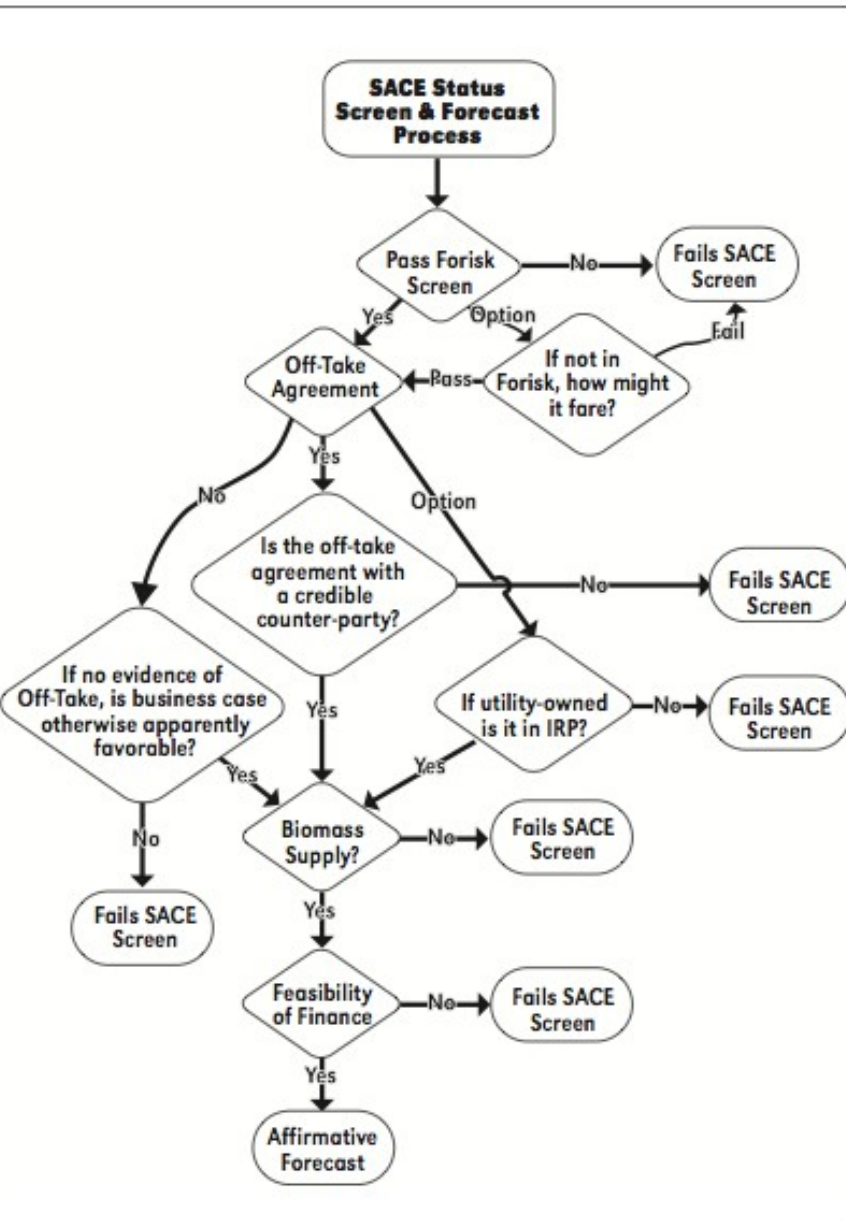
Inventory & Screening Methodology

1) Compiled a near-comprehensive list of woody biofuel, biopower, pellet, CHP & thermal plants & proposals in a 7 state region.

2) Shuttered vs Operational

3) Proposals Screened for Likelihood (objective measures of progress)

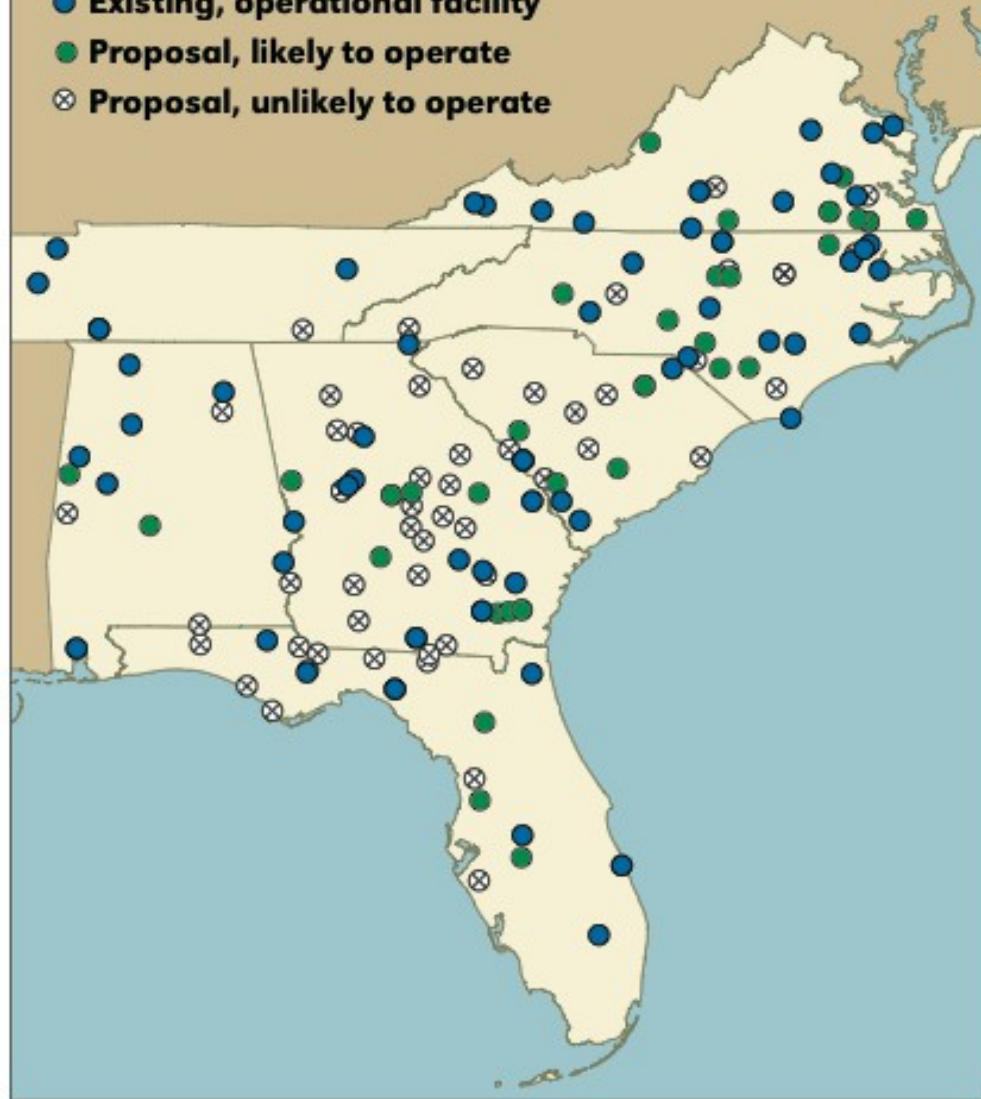
4) Proposals Screened for Forecast (subjective measures)



Not All Proposals Get Built

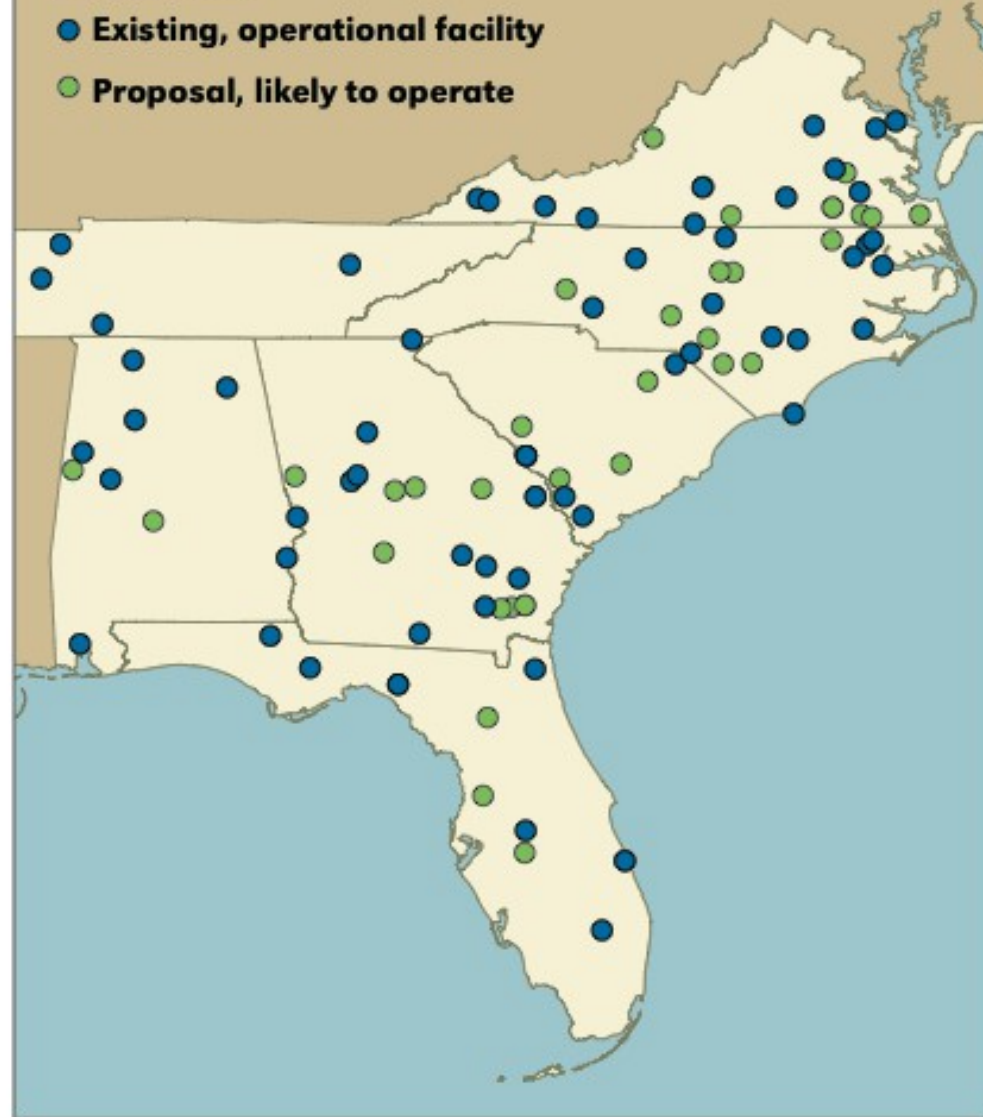
All Facilities

- Existing, operational facility
- Proposal, likely to operate
- ⊗ Proposal, unlikely to operate



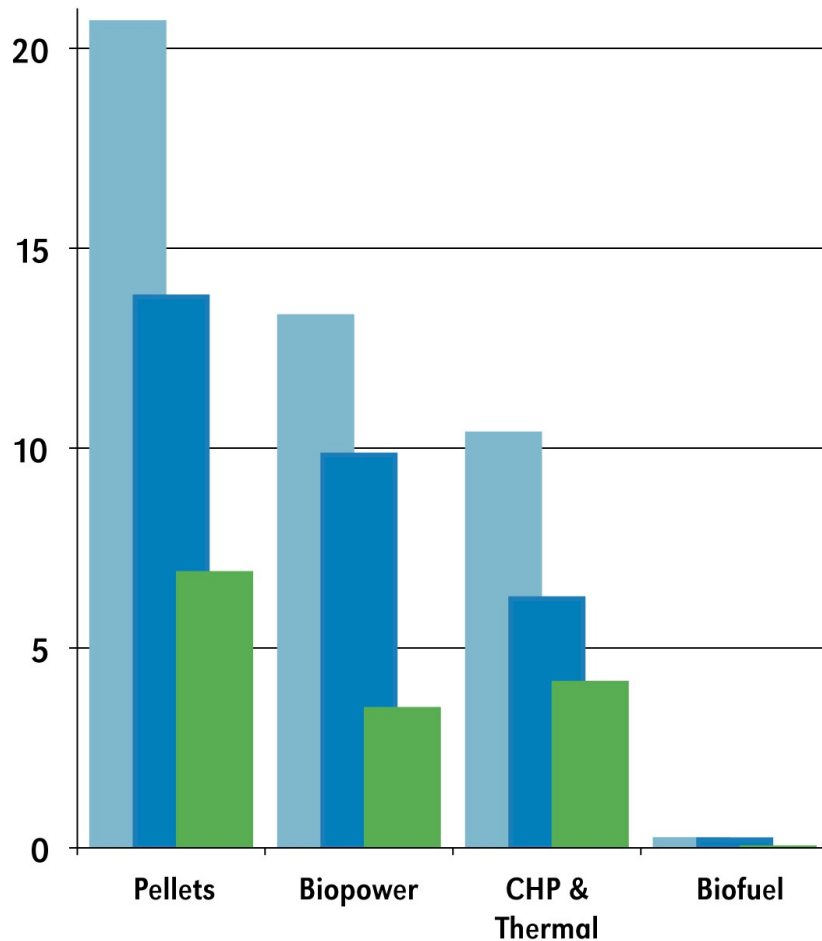
All Facilities

- Existing, operational facility
- Proposal, likely to operate



What's Really Happening?

**Woody Bioenergy
Demand Comparisons**
(Millions of Green Tons Per Year)

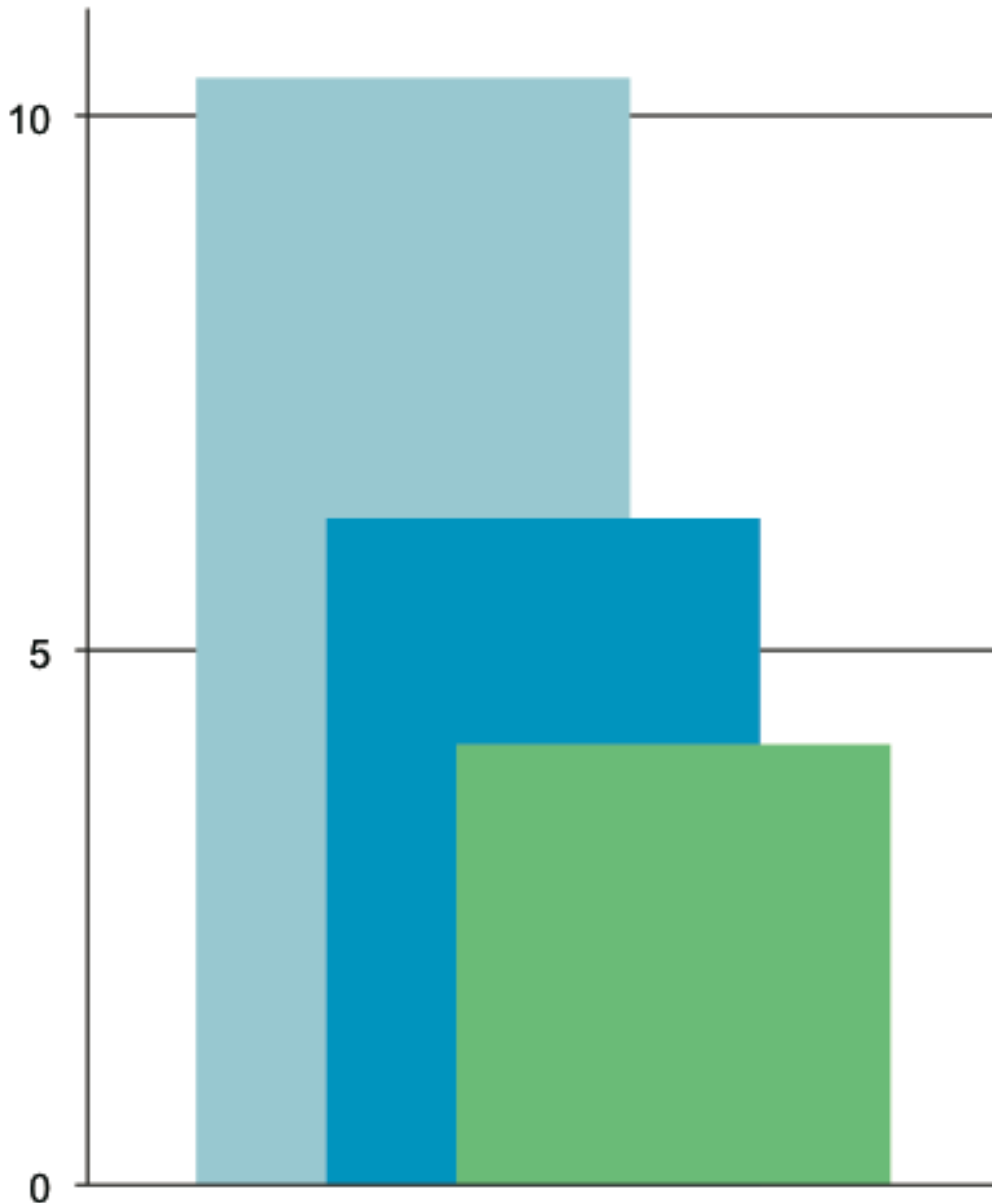


- **Pellet exports are growing rapidly**
- **Biopower growing modestly**
- **CHP/Thermal grew well, maybe more**
- **Biofuels?**

Source: SACE's *SE Woody Bioenergy Inventory Report*

■ Total (Proposed + Operating)
■ SACE Projection
■ Current Demand

CHP/Thermal Demand for Woody Biomass (Millions of Green Tons Per Year)



Biomass CHP / Thermal is Best

- Wood Pellets are energy & CO2 intensive
- Standalone Biopower is inefficient
- + Biomass CHP & Thermal are highly efficient, smaller scale, favorable for climate mitigation.

■ Total (Proposed + Operating)
■ SACE Projection
■ Current Demand



What's Really Happening?

- Pellet Mills showing ~60% success (due to export demand).
- Biopower: 28% may succeed, even fewer will be built.
- CHP/Thermal: 53% likely to succeed & be built.

Source: SACE's *SE Woody Bioenergy Inventory*

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<http://bit.ly/BioenergyInventory>

Climate is Changing – Faster than Predicted

Times

Washington Edition

Today, cloudy, showers, thunderstorms, high 78. Tonight, showers, storms, then clearing, low 54. Tomorrow, cooler, clouds and sun, high 68. Weather map, Page A18.

\$2.50

Heat-Trapping Gas Passes Milestone, Raising Fears

*CO₂ at Level Not Seen in Millions of Years,
Portending Major Climate Changes*

By JUSTIN GILLIS

The level of the most important heat-trapping gas in the atmosphere, carbon dioxide, has passed a long-feared milestone, scientists reported Friday, reaching a concentration not seen on the earth for millions of years.

the high level.

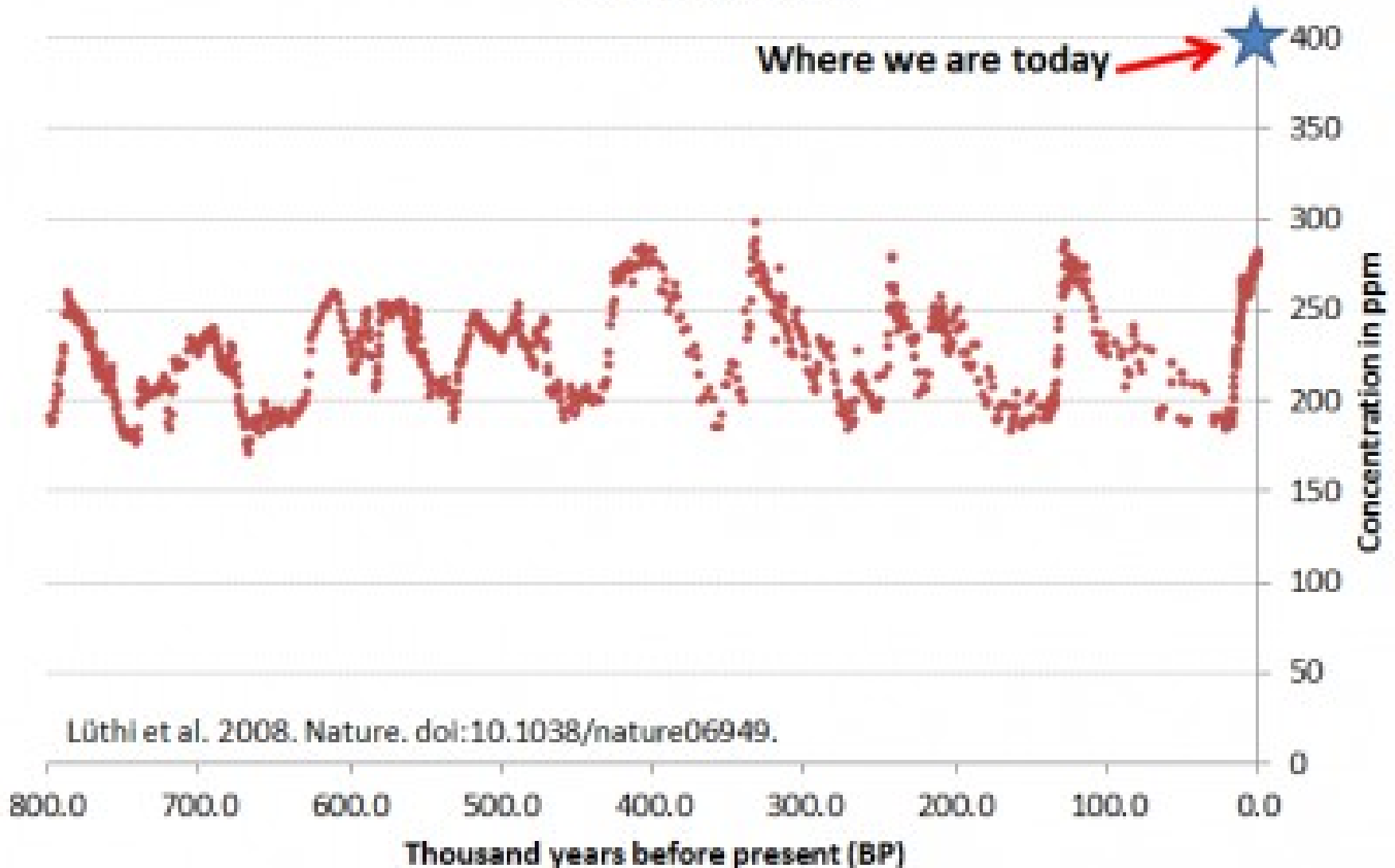
The new measurement came from analyzers atop Mauna Loa, the volcano on the big island of Hawaii that has long been ground zero for monitoring the worldwide trend on carbon dioxide, or

THE NUMBERS:

- 400 parts per million
- The highest levels of CO₂ in human existence
- 350 parts per million

How do we climb down from 400ppm?

Carbon Dioxide in the Atmosphere for the Past 800,000 Years



Bioenergy is Indispensable for Climate Mitigation

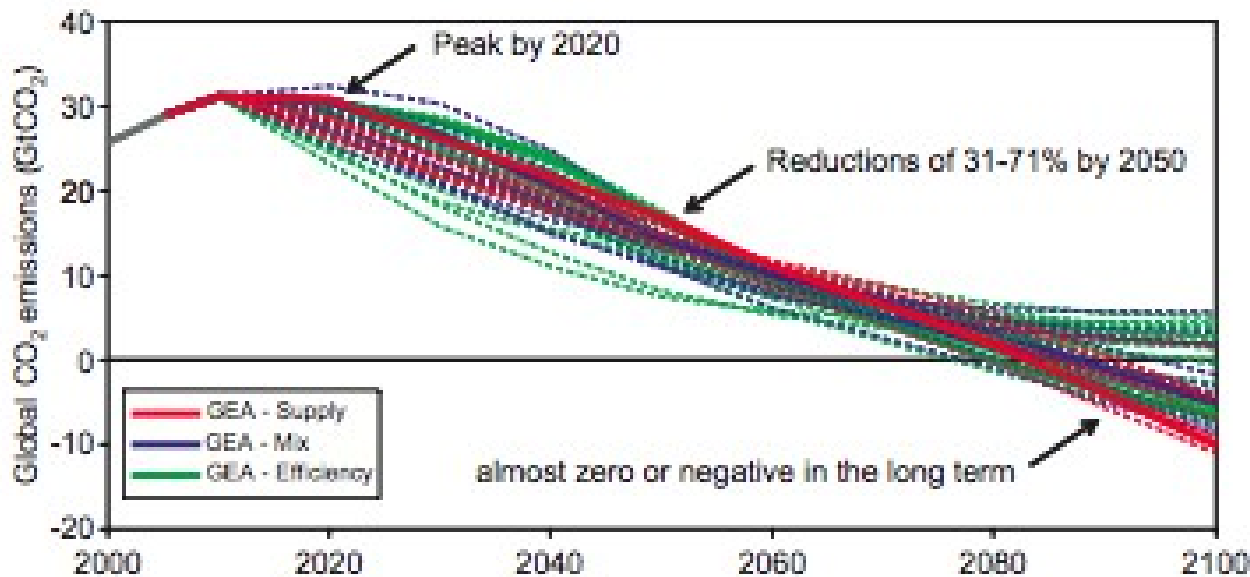
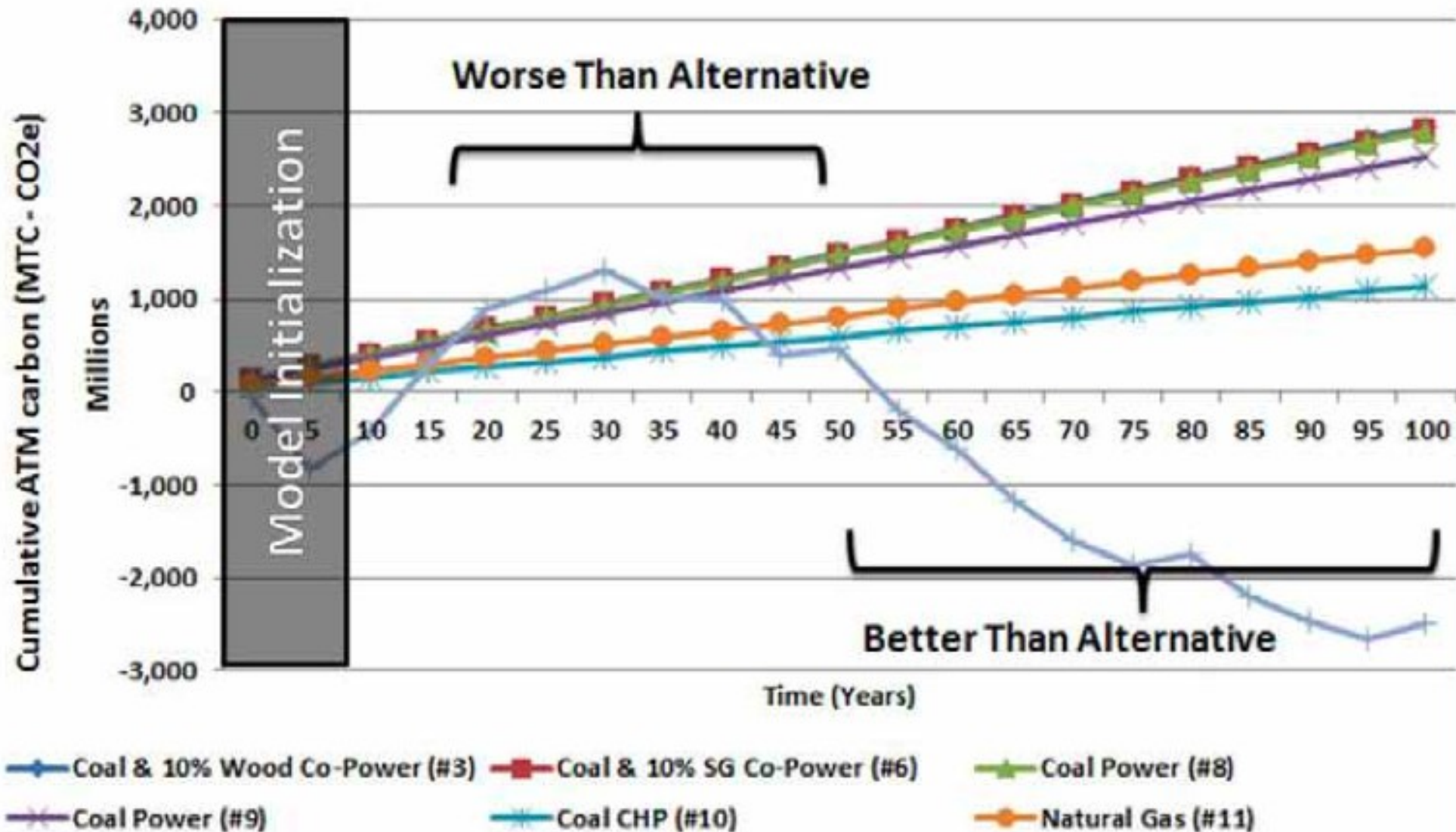


Figure **TS-7** | Development of global CO₂ emissions from energy and industrial sources to limit temperature change to below 2°C (with a probability of >50%). Shown is that the emissions need to peak by around 2020 (or earlier) and decline toward zero during the following four to five decades. The later the peak occurs, the steeper the decline needs to be and higher the net 'negative' emissions. The latter can be achieved in the energy system through CCS in conjunction with the use of sustainable biomass. Source: Chapter 17. For further details of the GEA pathways see the interactive web-based GEA scenario database hosted by IIASA: www.iiasa.ac.at/web-apps/ene/geadb.

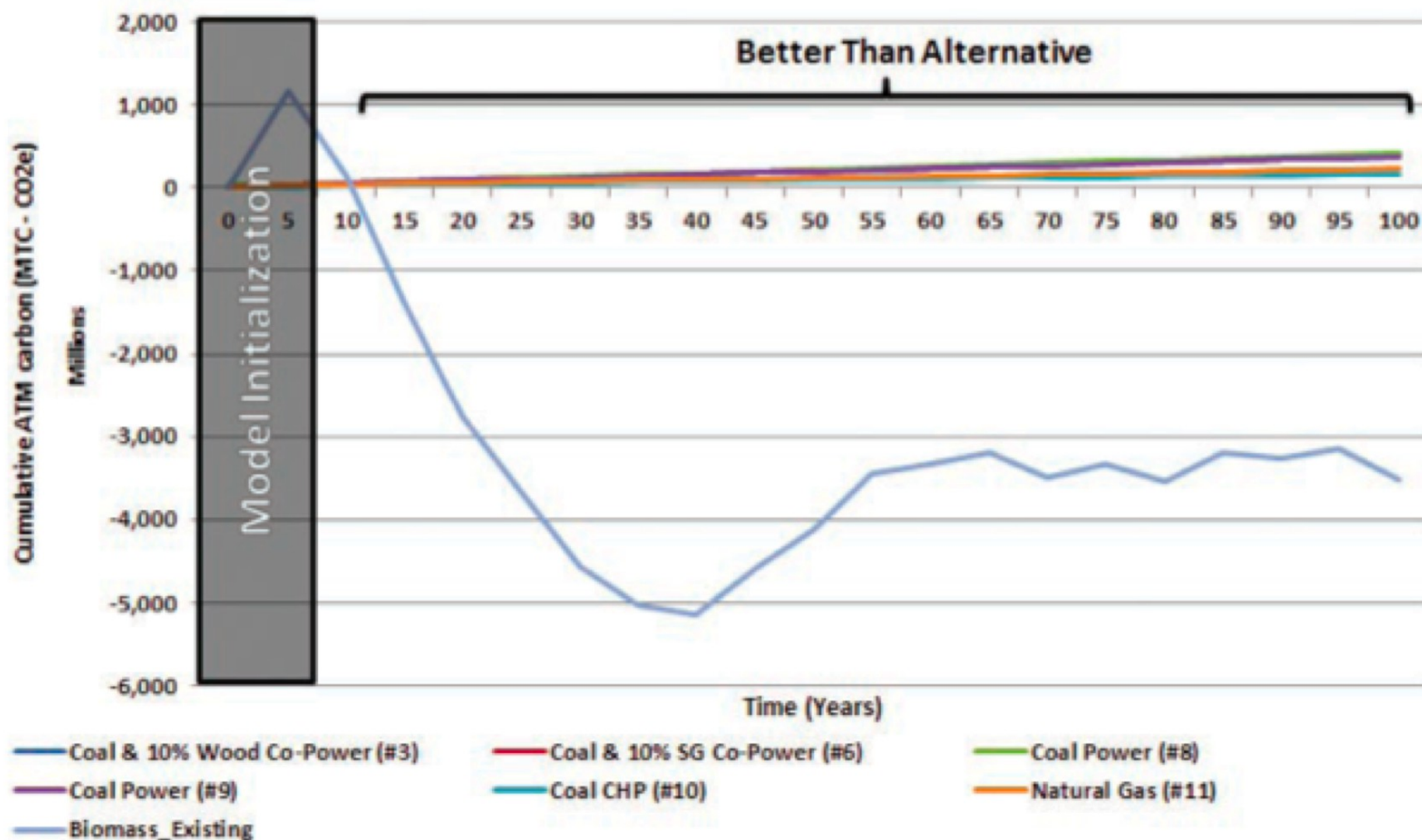
To keep warming below 2°C, we must not only decarbonize our energy system, we will need net negative emissions.

Bad Bioenergy is Possible



Source: BERC *et al*, <http://tiny.cc/SEcarbon> (Figure 22)

Climate Benefit of Bioenergy



Source: BERC *et al*, <http://tiny.cc/SEcarbon> (Figure 18)

Suggestions for Biochar Sustainability

- Pursue business models with multiple & diverse revenue streams (i.e., CHAB, different biochar mkts): Greater economic efficiency, greater climate benefit.
- Pursue lowest-cost resources (i.e., avoid pulpwood, roundwood, etc.) to insure greatest climate benefit.
- Prepare for commoditization of biochar.

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Questions?

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