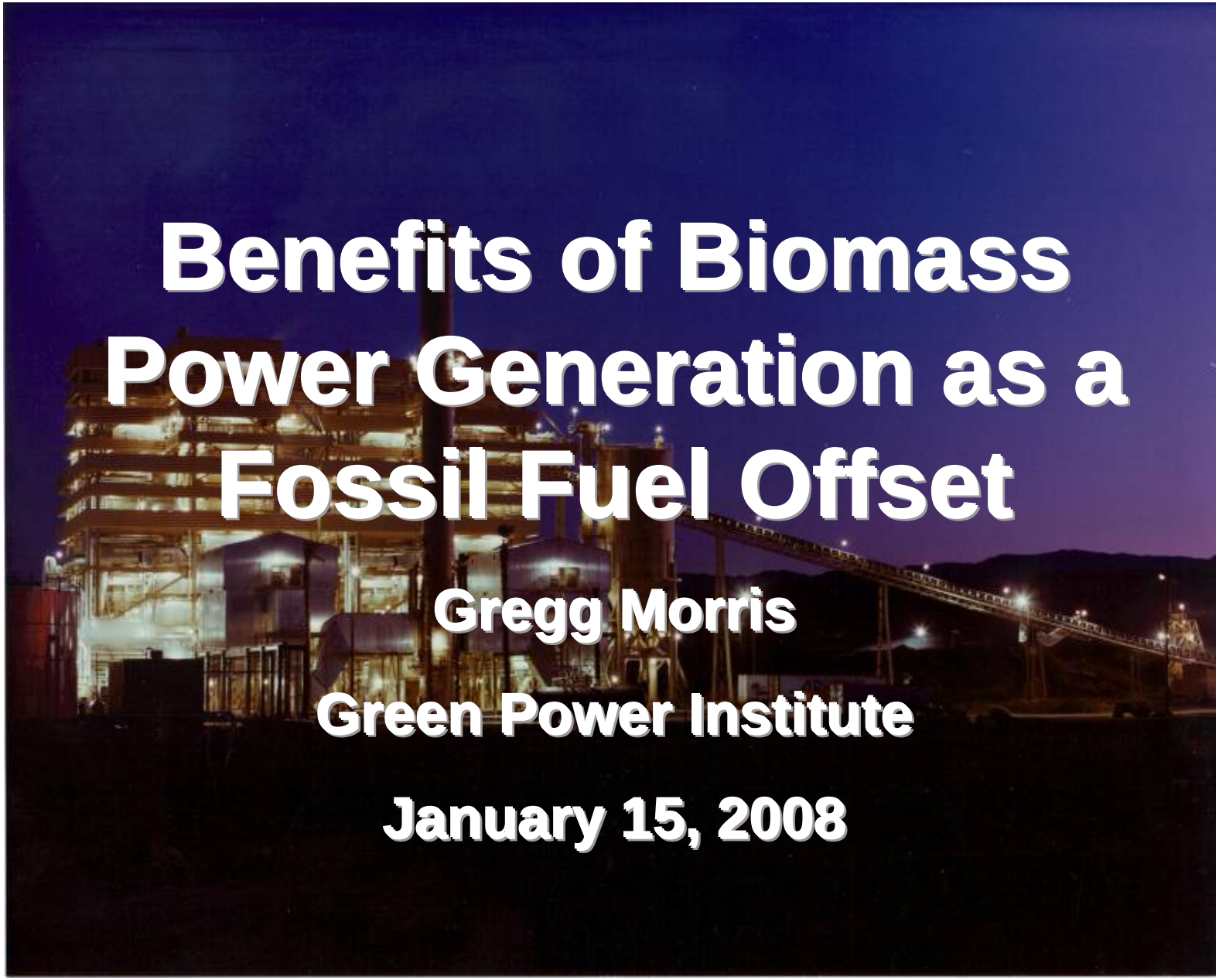
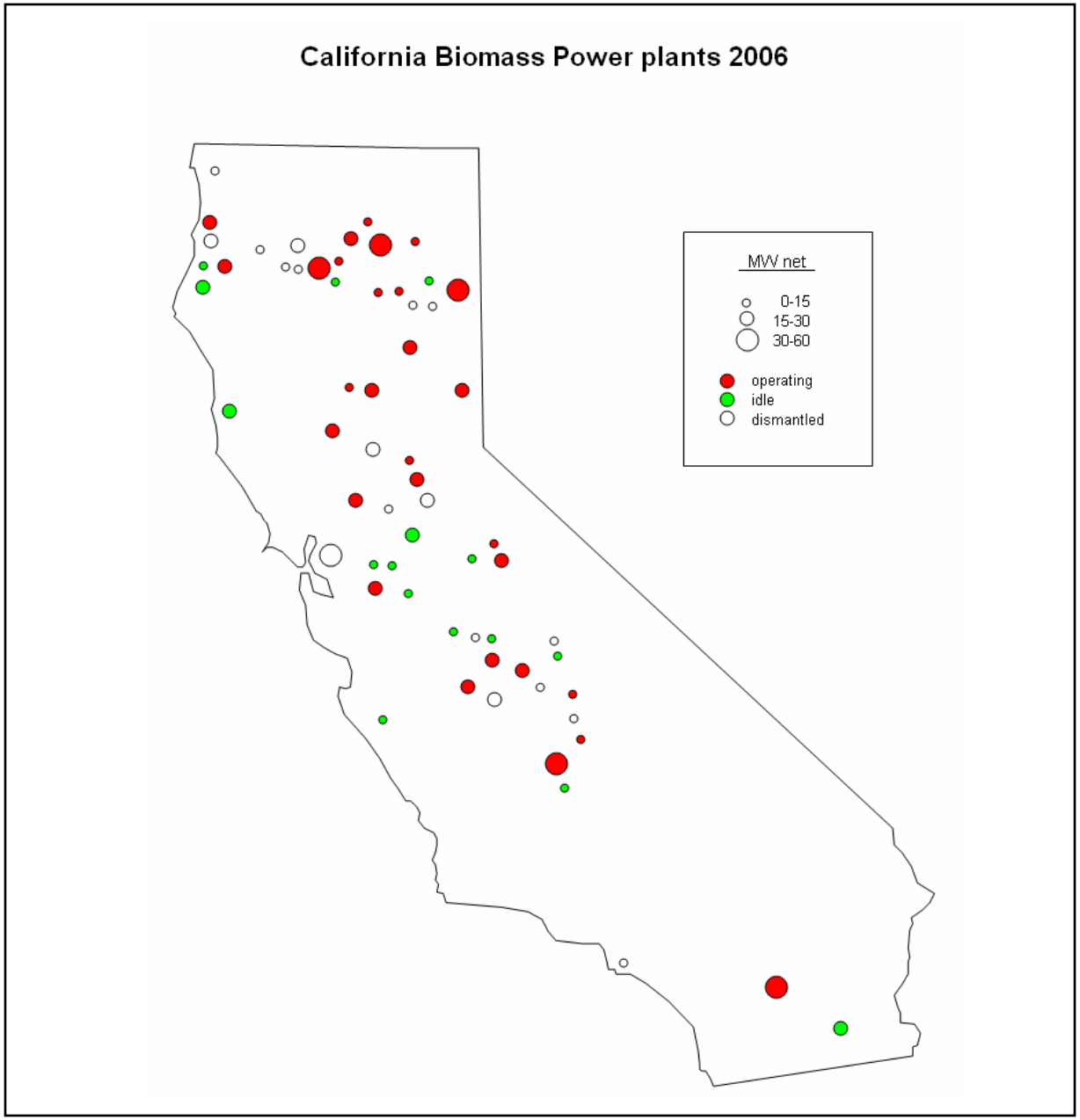


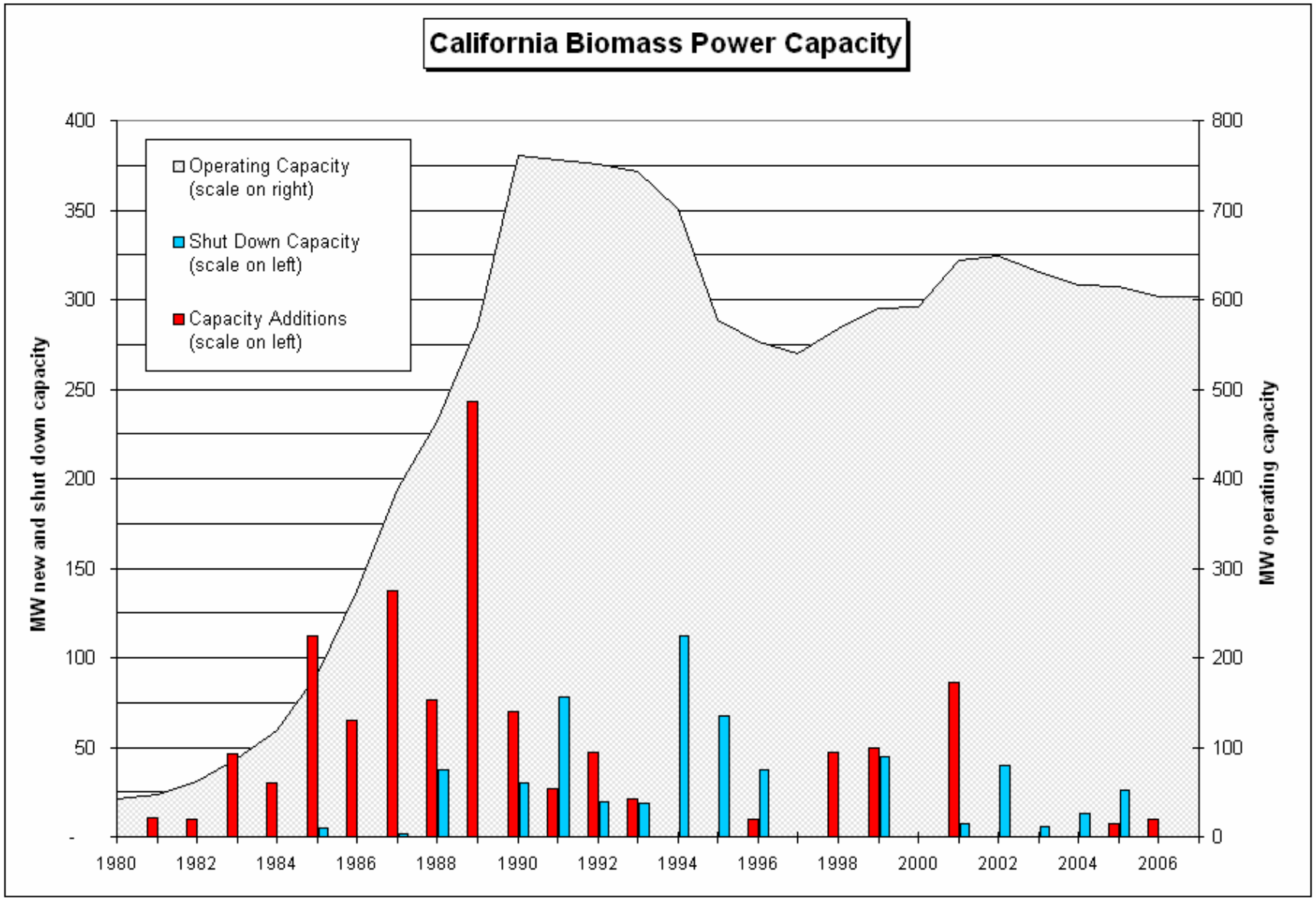
Benefits of Biomass Power Generation as a Fossil Fuel Offset

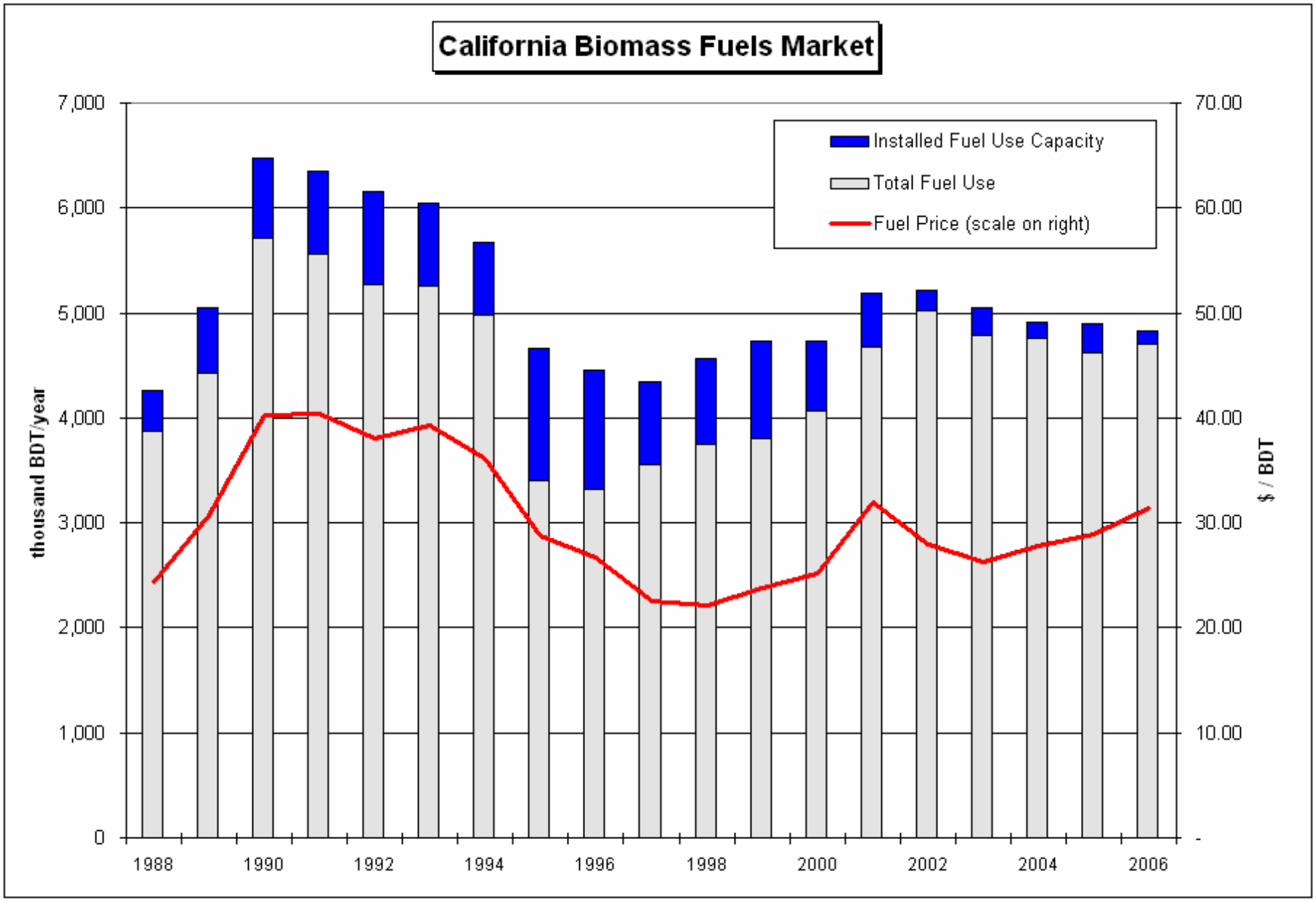
Gregg Morris

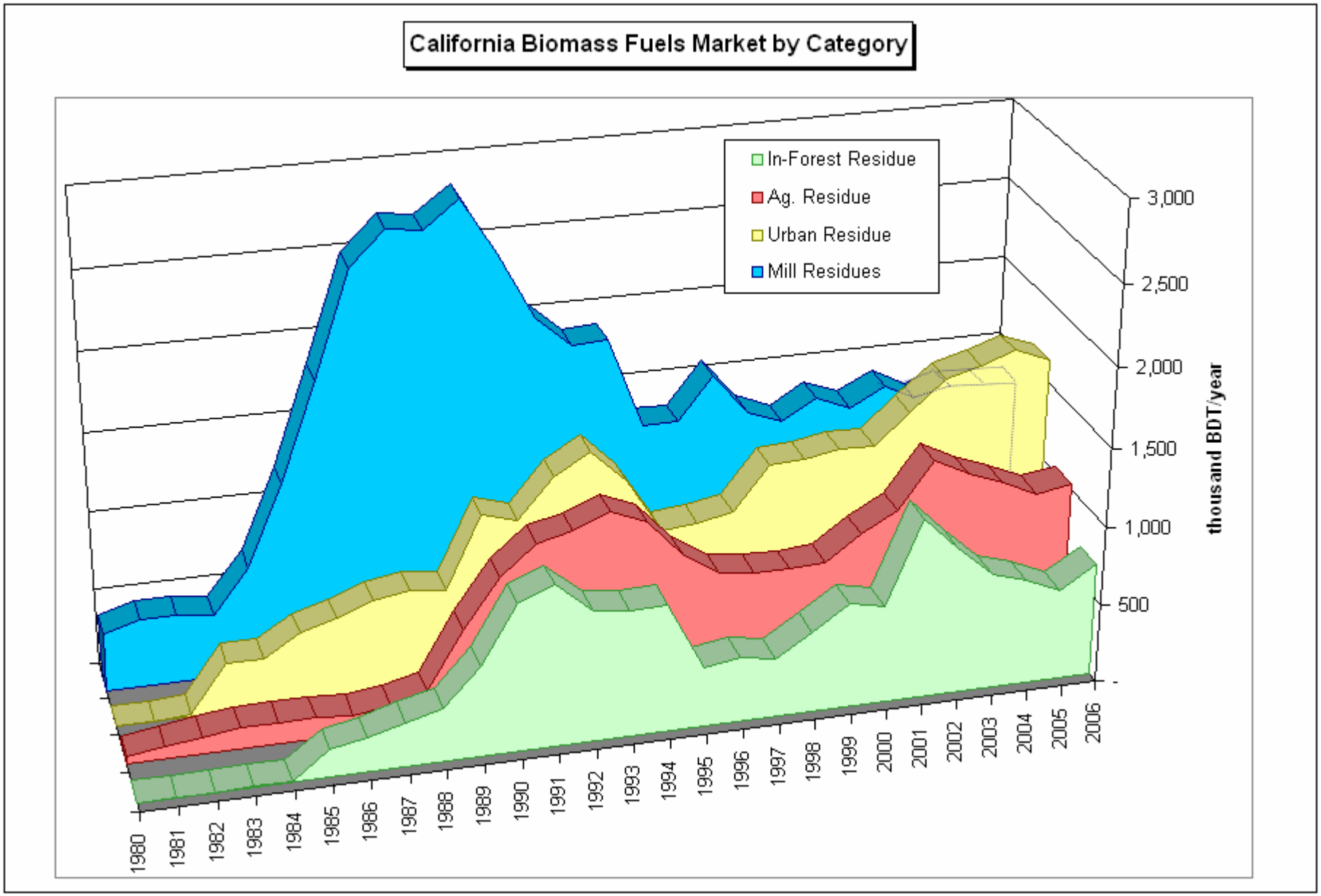
Green Power Institute

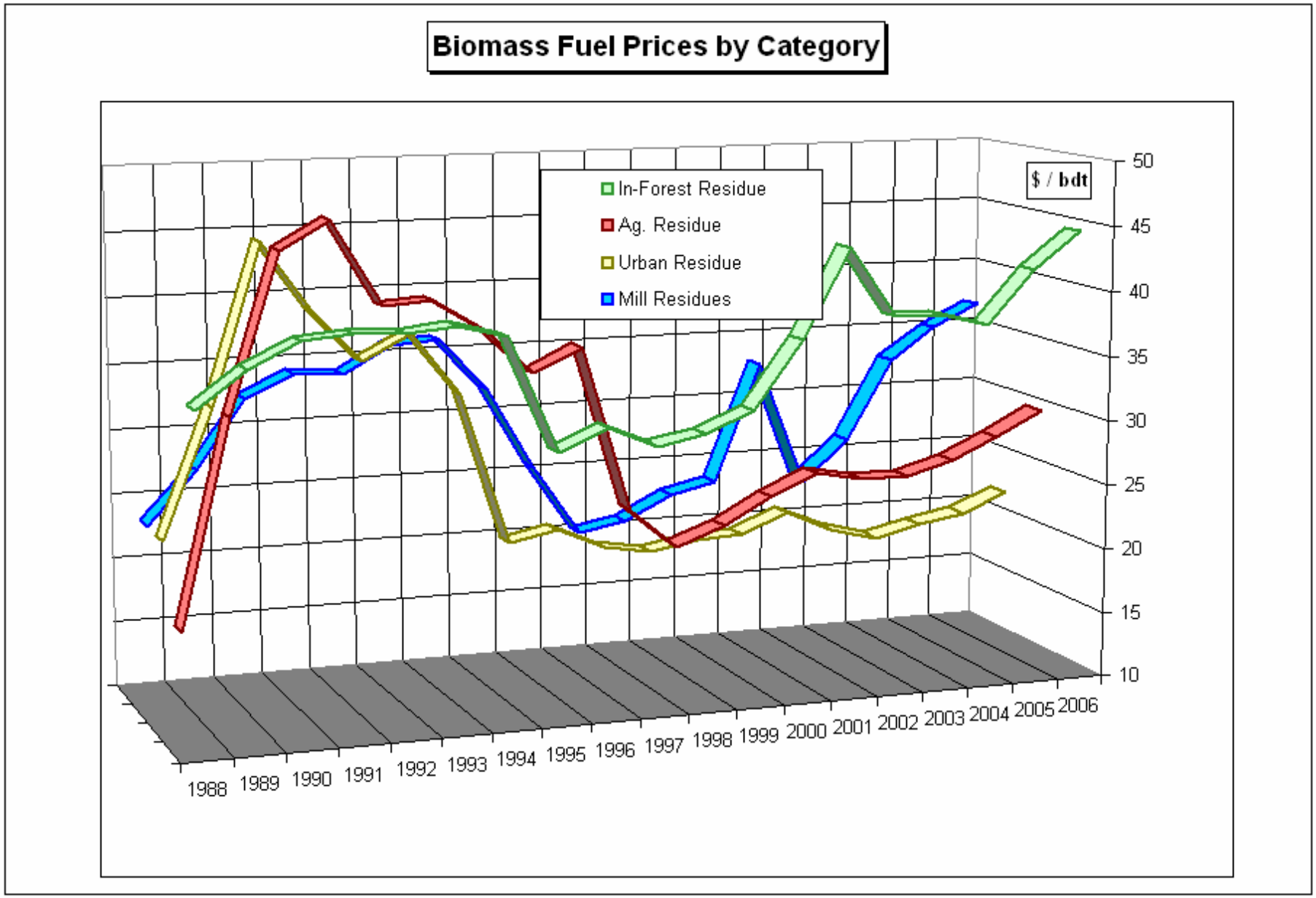
January 15, 2008

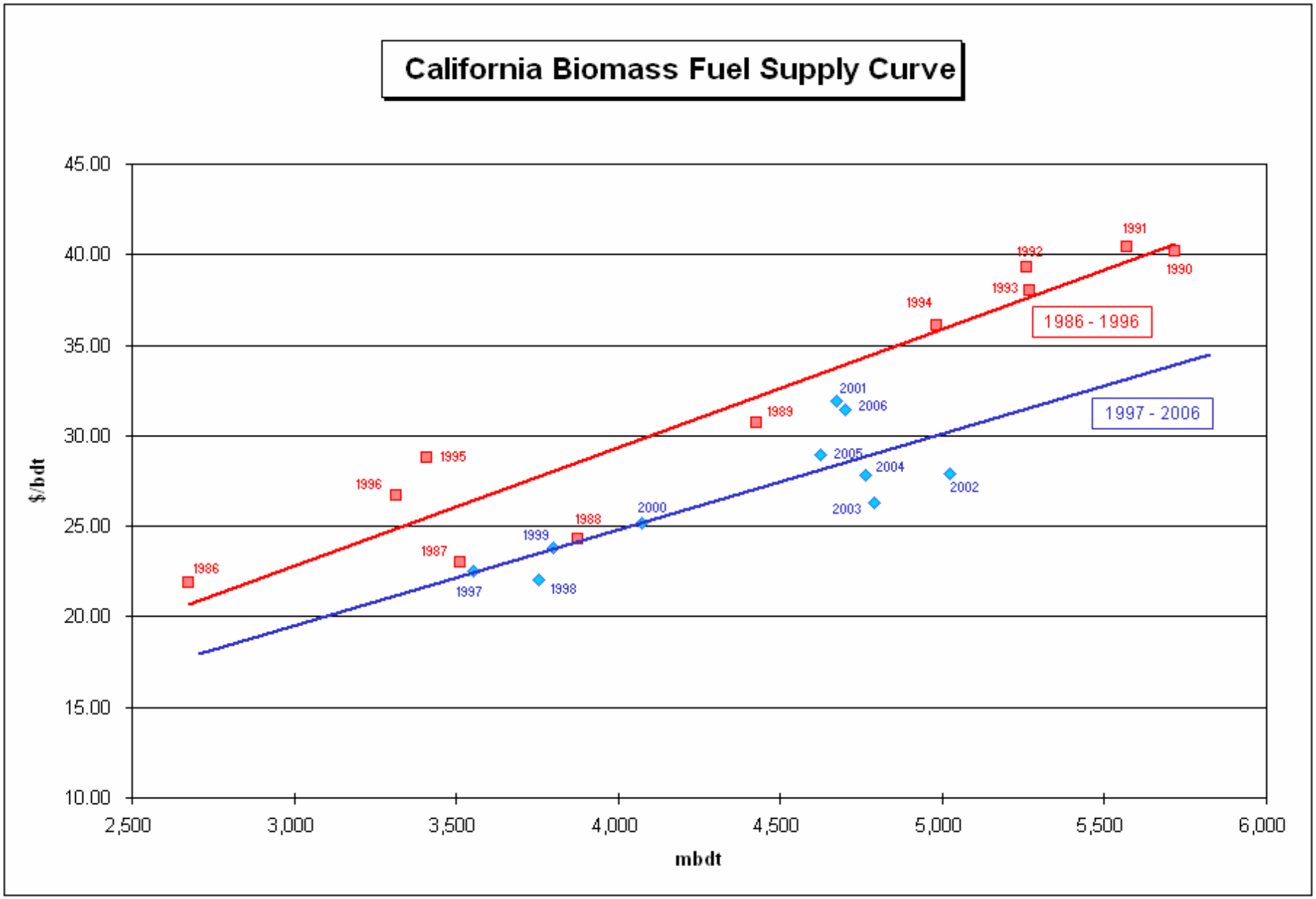

California Biomass Power plants 2006
MW net
0-15
15-30
30-60
operating
idle
dismantled

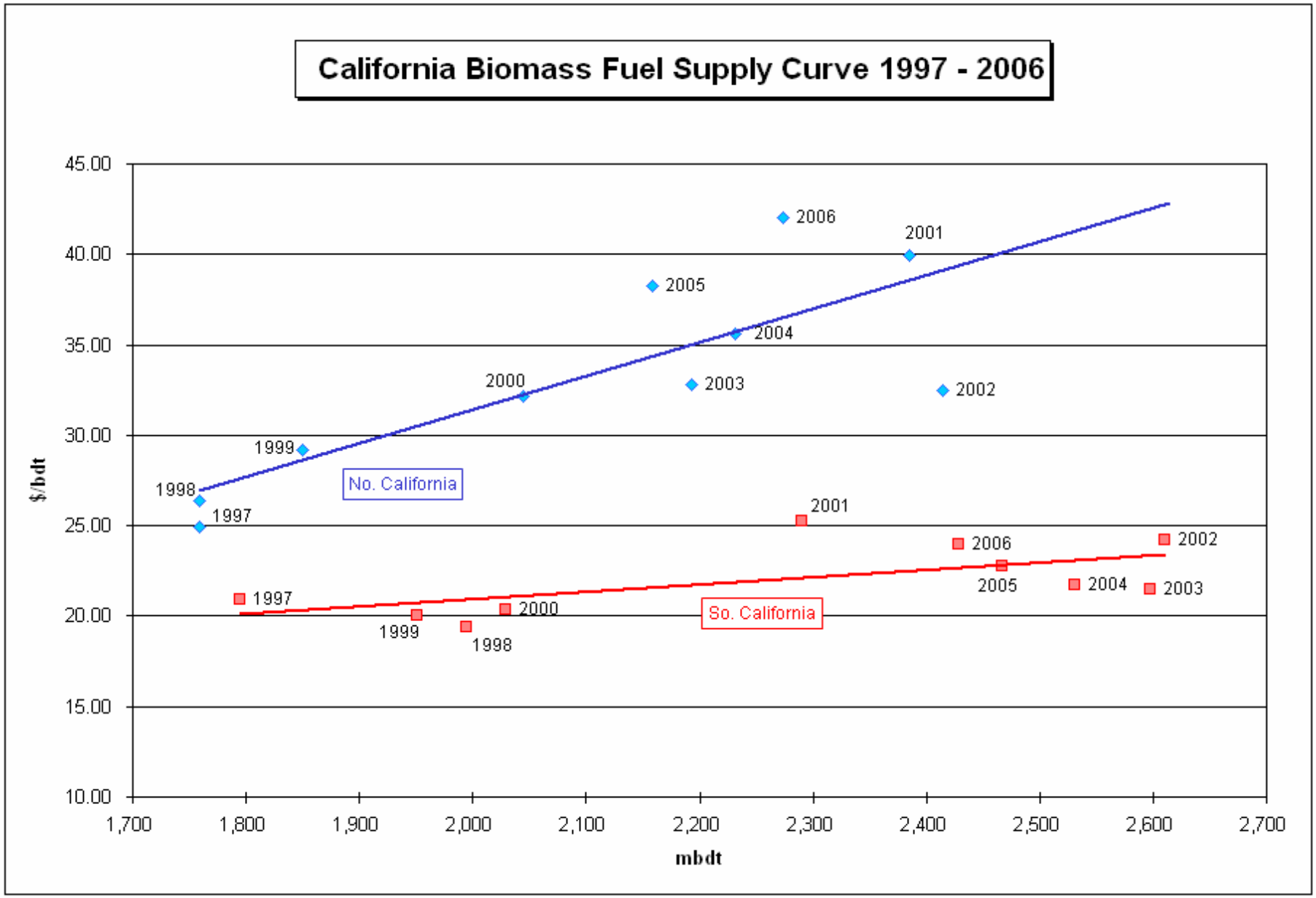

California Biomass Power Capacity
Operating Capacity (scale on right)
Shut Down Capacity (scale on left)
Capacity Additions (scale on left)
MW new and shut down capacity
MW operating capacity
400
350
300
250
200
150
100
50
-
800
700
600
500
400
300
200
100
0
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006


California Biomass Fuels Market
Installed Fuel Use Capacity
Total Fuel Use
Fuel Price (scale on right)
thousand BDT/year
$ / BDT
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
70.00
60.00
50.00
40.00
30.00
20.00
10.00
-
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006


California Biomass Fuels Market by Category
In-Forest Residue
Ag. Residue
Urban Residue
Mill Residues
3,000
2,500
2,000
1,500
1,000
500
-
thousand BDT/year
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006


Biomass Fuel Prices by Category
In-Forest Residue
Ag. Residue
Urban Residue
Mill Residues
$ / bdt
50
45
40
35
30
25
20
15
10
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006


California Biomass Fuel Supply Curve
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
$/bdt
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
mbdt
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
1986 - 1996
1997 - 2006


California Biomass Fuel Supply Curve 1997 - 2006
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
$/bdt
1,700
1,800
1,900
2,000
2,100
2,200
2,300
2,400
2,500
2,600
2,700
mbdt
2006
2001
2005
2004
2000
2003
2002
1999
1998
1997
No. California
2001
2006
2002
1997
2005
2004
2003
2000
1999
1998
So. California

California RPS 2006

IOUs: 13.5 % renewable

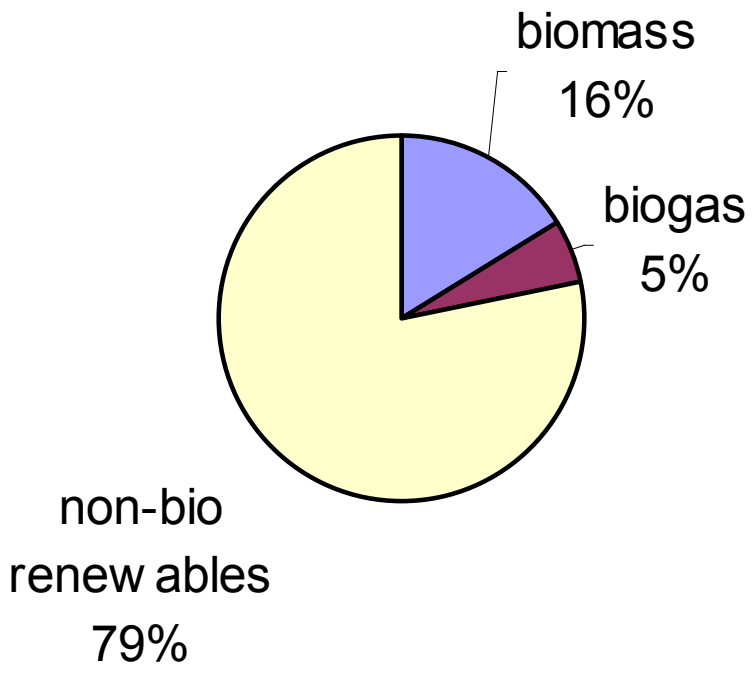
Statewide: ~ 10 % renewable

(most of renewables in CA today are procured by the three IOUs)

SB 107: 20 % statewide by 2010

Renewable Production to Double

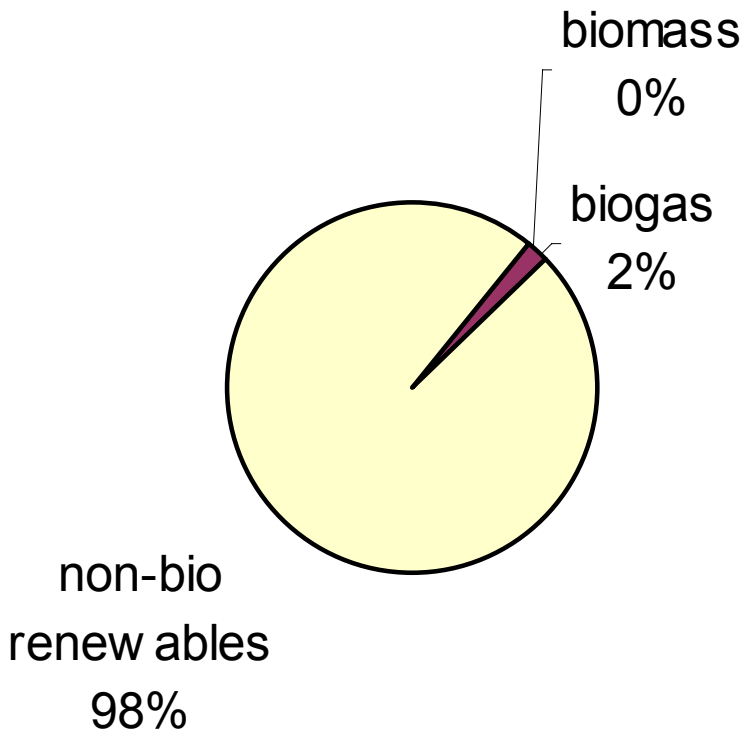
CA IOUs, Renewable Portfolio 2006



Executive Order S-06-06

Maintain bioenergy at 20% of RPS portfolio

CA IOUs, Projected New Renewables 2007 – 2010

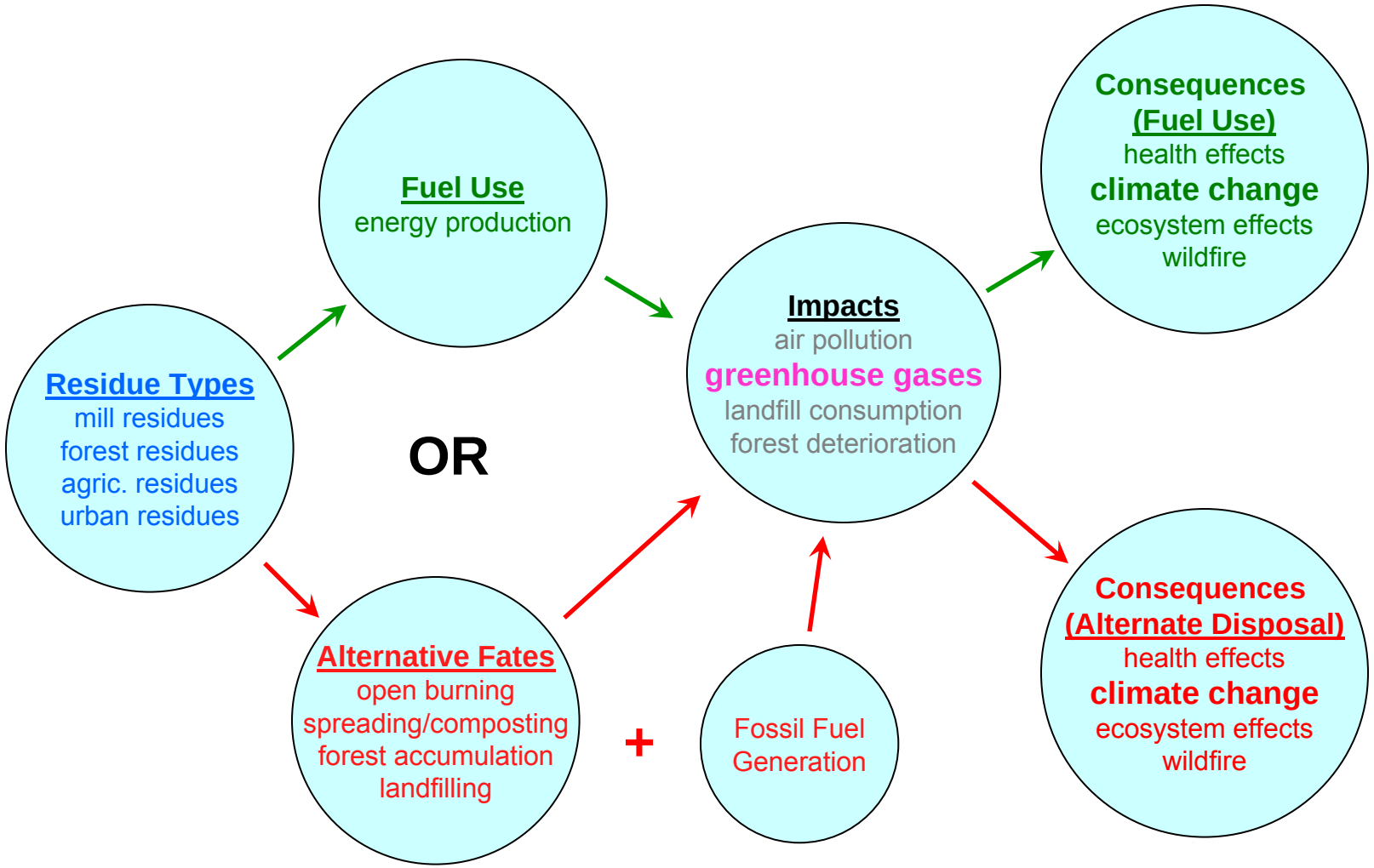


The Essential Dilemma

Biomass Energy is expensive to produce.

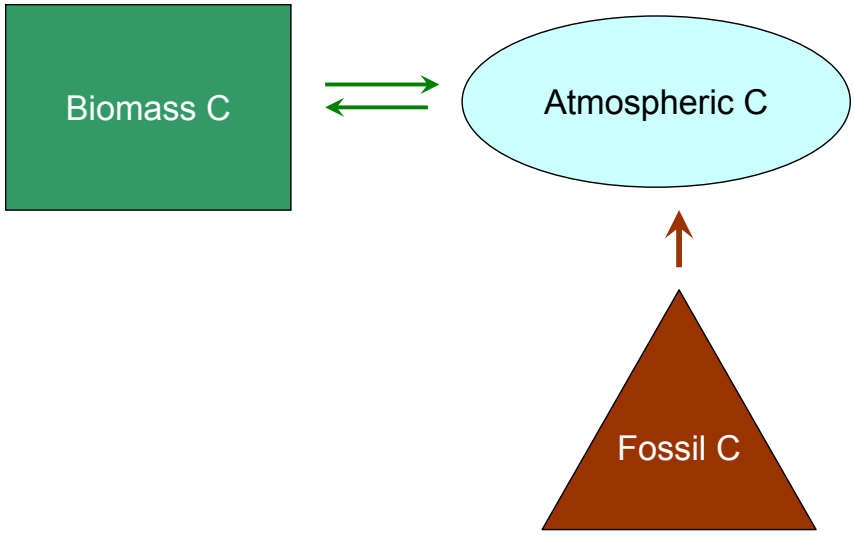
Not producing energy from biomass is expensive, in terms of the health and environmental costs of alternative disposal.

Net Benefits Framework



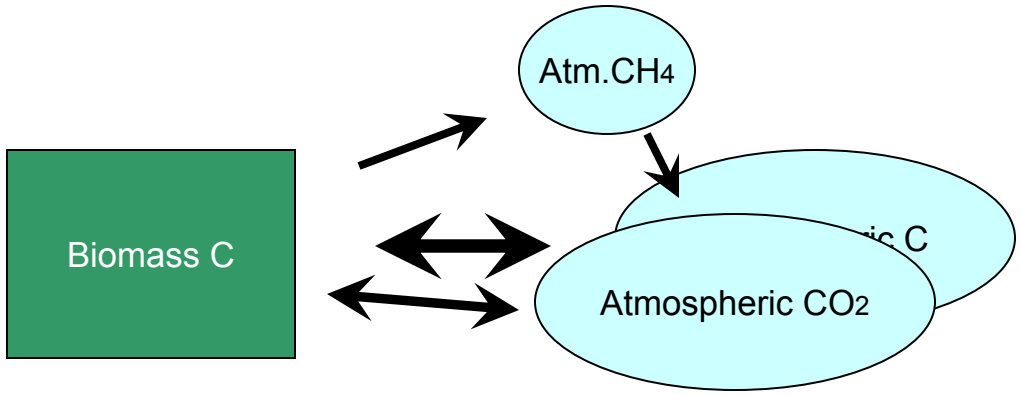
GHGs and Biomass

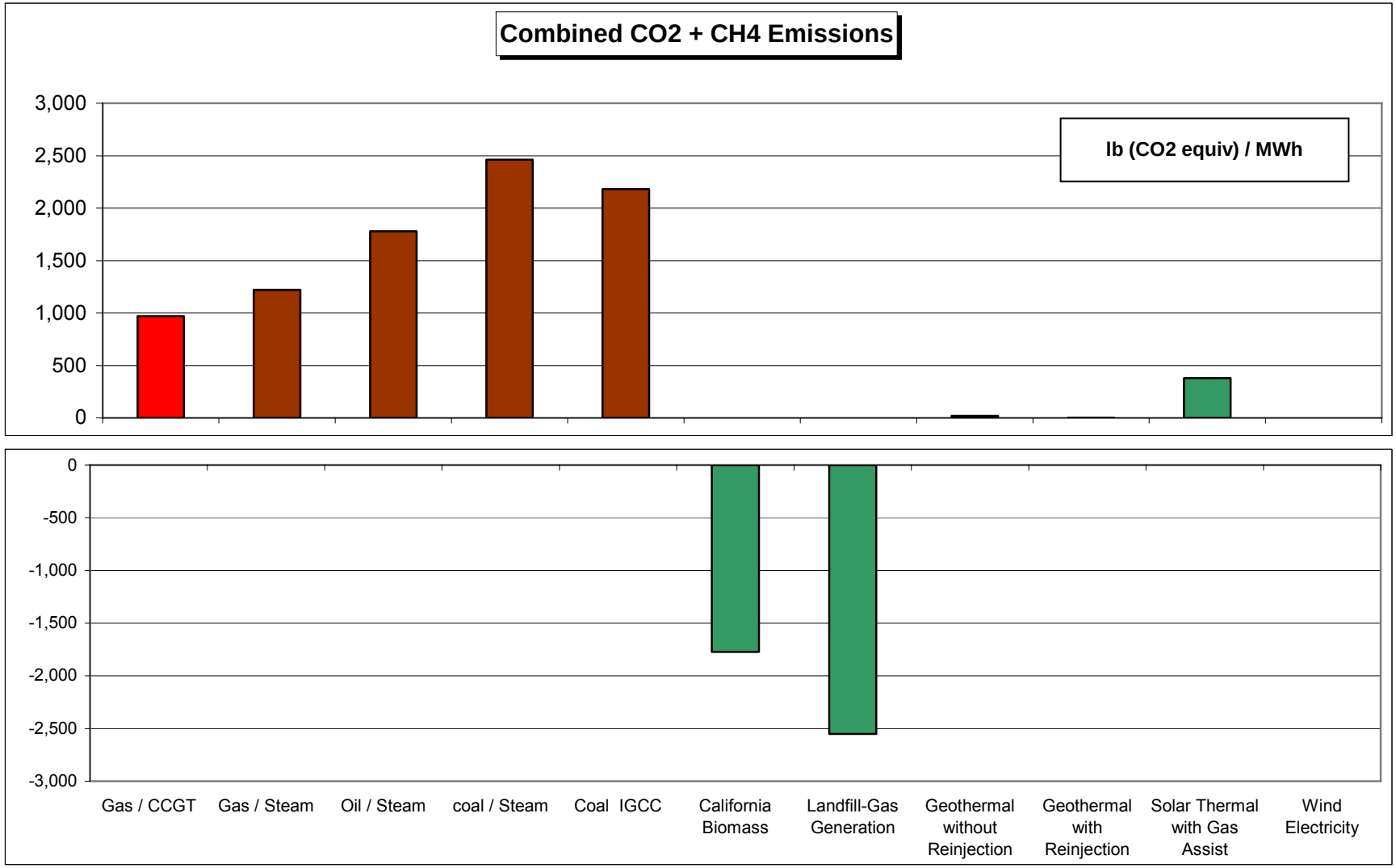
- Biomass is Carbon Neutral
  - Carbon stocks in the biosphere and atmosphere are already linked and in rapid exchange. No new carbon is being added to the system.



GHGs and Biomass

- It's More Complicated than that
  - Biomass stocks can grow or decline over time, either sequestering or releasing net carbon to the atmospheric stock.
  - Carbon can be emitted to the atmosphere in either oxidized (CO_2) or reduced (CH_4) form. Reduced is 25 times more potent as a greenhouse gas.



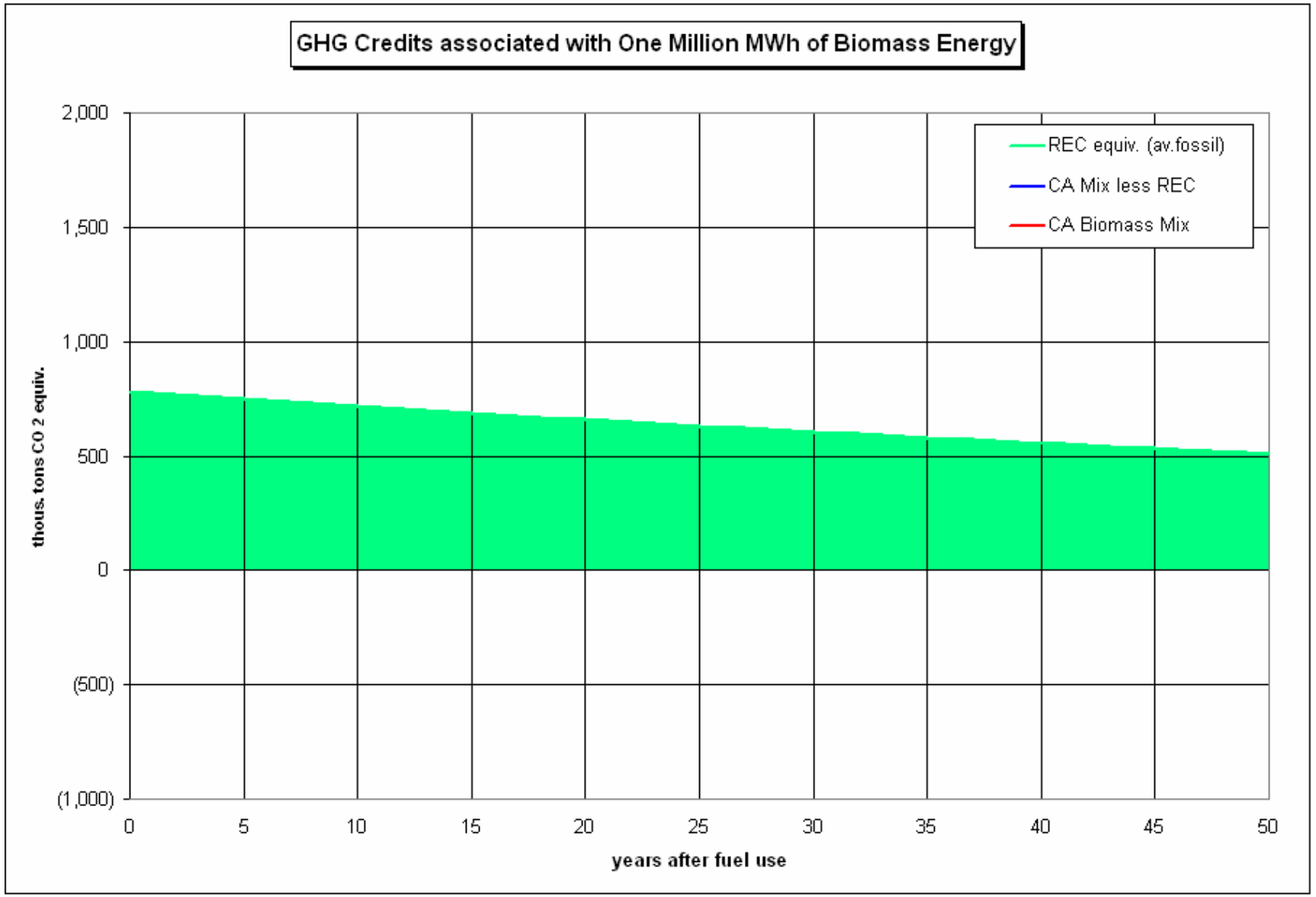

Combined CO2 + CH4 Emissions
lb (CO2 equiv) / MWh
3,000
2,500
2,000
1,500
1,000
500
0
0
-500
-1,000
-1,500
-2,000
-2,500
-3,000
Gas / CCGT
Gas / Steam
Oil / Steam
coal / Steam
Coal IGCC
California Biomass
Landfill-Gas Generation
Geothermal without Reinjection
Geothermal with Reinjection
Solar Thermal with Gas Assist
Wind Electricity

GHG Credits from Biomass

- REC: common currency for renewables, credits based on avoided fossil fuel use:

  450 – 1,100 tons CO_2 equiv. / th.MWh

- If the total net ghg credits attributable to biomass exceed those in the REC, then those additional credits should be available to the generators.


GHG Credits associated with One Million MWh of Biomass Energy
2,000
1,500
1,000
500
0
(500)
(1,000)
thous. tons C0 2 equiv.
0
5
10
15
20
25
30
35
40
45
50
years after fuel use
REC equiv. (av.fossil)
CA Mix less REC
CA Biomass Mix

Conclusion

- Biomass provides more than twice the ghg benefits of other renewables
- Biomass also provides reductions in landfilling, open burning of agricultural and forestry residues, improved forest health and fire resilience, and rural development and employment opportunities

Next Steps - RPS

Implement program to achieve EO S-06-06 targets in the RPS program (bioenergy @ 20% of renewables).

- Continued support for existing facilities
- Bioenergy band within RPS
- General credit for bioenergy
- Targeted credits for specific biomass fuels (e.g. forest fuels, agricultural residues)

Next Steps - GHGs

Ensure that bioenergy is given proper treatment in the state's developing ghg programs

- California rules reserve the benefits beyond the REC for the generator
- The next big step is formulating the rules for ghg credits from biomass
- Credits tradable in robust market