A national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy

National Renewable Energy Laboratory

Innovation for Our Energy Future

Net Metering 101

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Net Metering 101

- Movie clip of Net Metering
- Net Metering policy initiation
- Definitions of Net Billing and True Net Metering
- Period of true up – monthly or annually
- US net metering maps present and past
- Status of net metering in CO
- Interconnection Agreement
- Summary of 2002 study results on numbers of net metering customers
- Summary of PV Net Metering results from J. Thornton's home
- Recent trends in net metering policy
- What to do if no net metering policy exists?

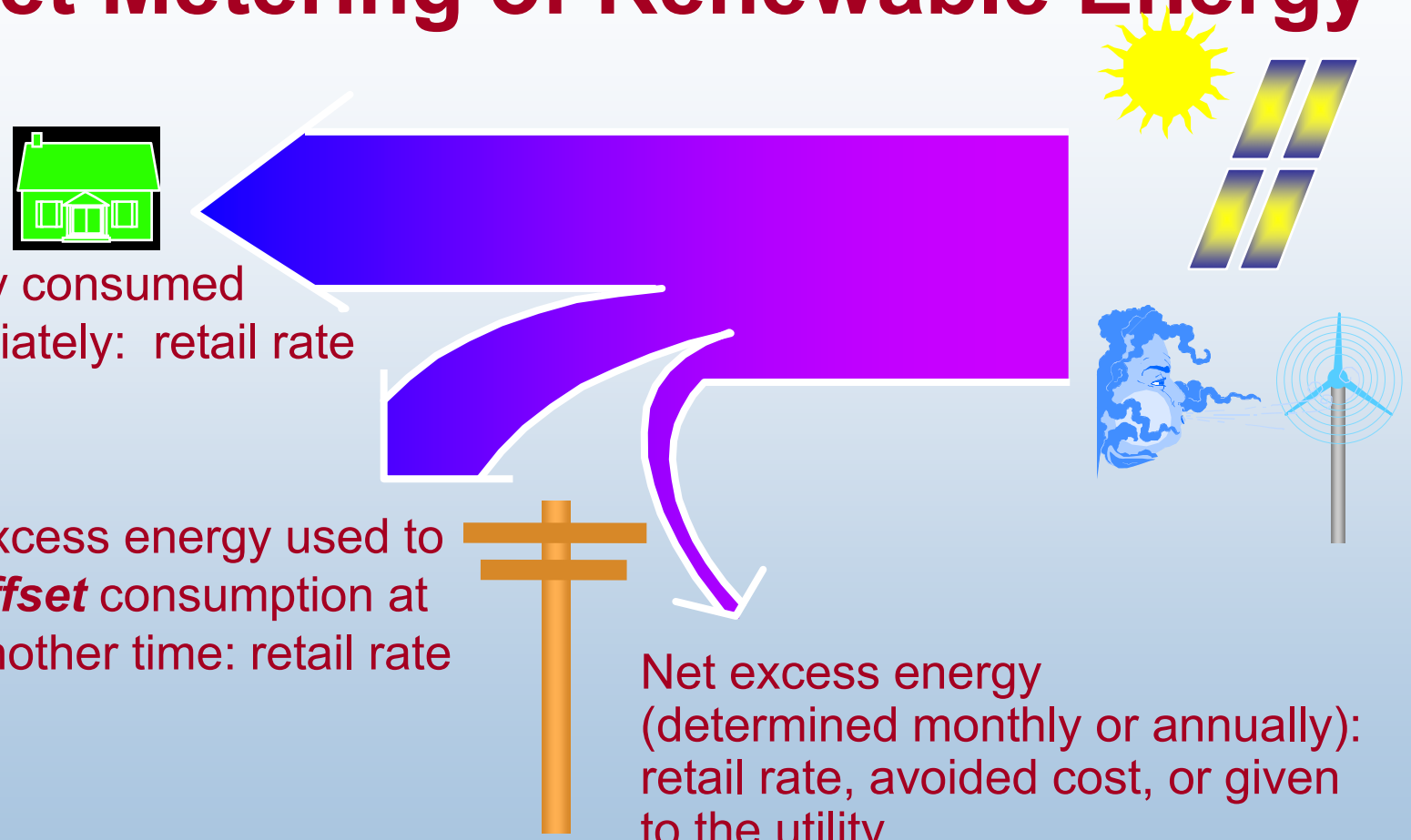
Net Metering Policy Initiation

- Dictated by the PUC
  - oversight of IOUs only
- Legislated for all or most utilities within a state
- Initiated by on utility trying to meet customer demand

Net Metering Definitions

- Excess wind power turns the electric meter backward
- Bill is based on the “net” energy consumption/generation (monthly or annually)
  - NEG – Net Excess Generation
- Net metering of wind energy is available to:
  - All residential (including rural) customers in 29 states
  - Some residential customers (mostly urban) in 13 other states

Net Metering of Renewable Energy



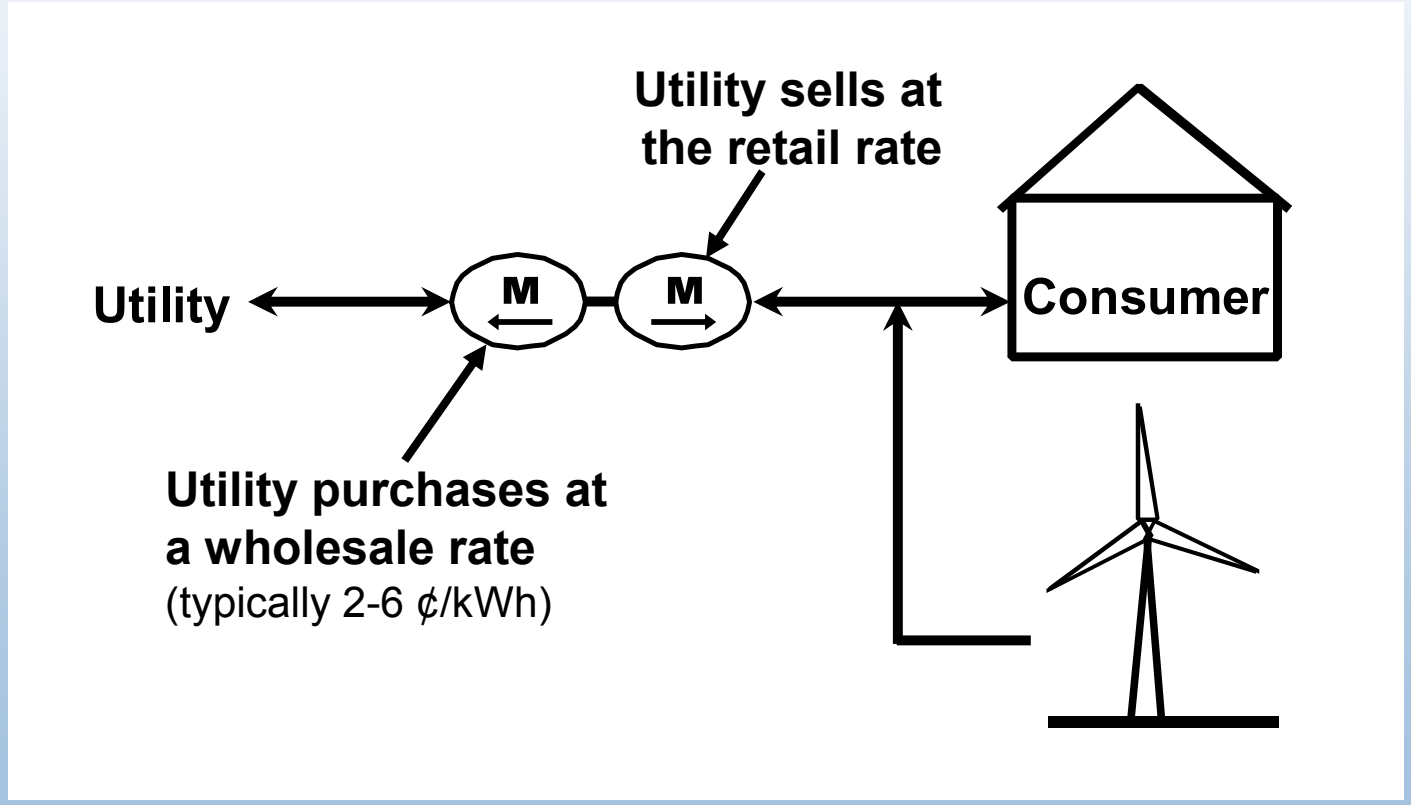
Energy consumed immediately: retail rate

Excess energy used to ***offset*** consumption at another time: retail rate

Net excess energy (determined monthly or annually): retail rate, avoided cost, or given to the utility

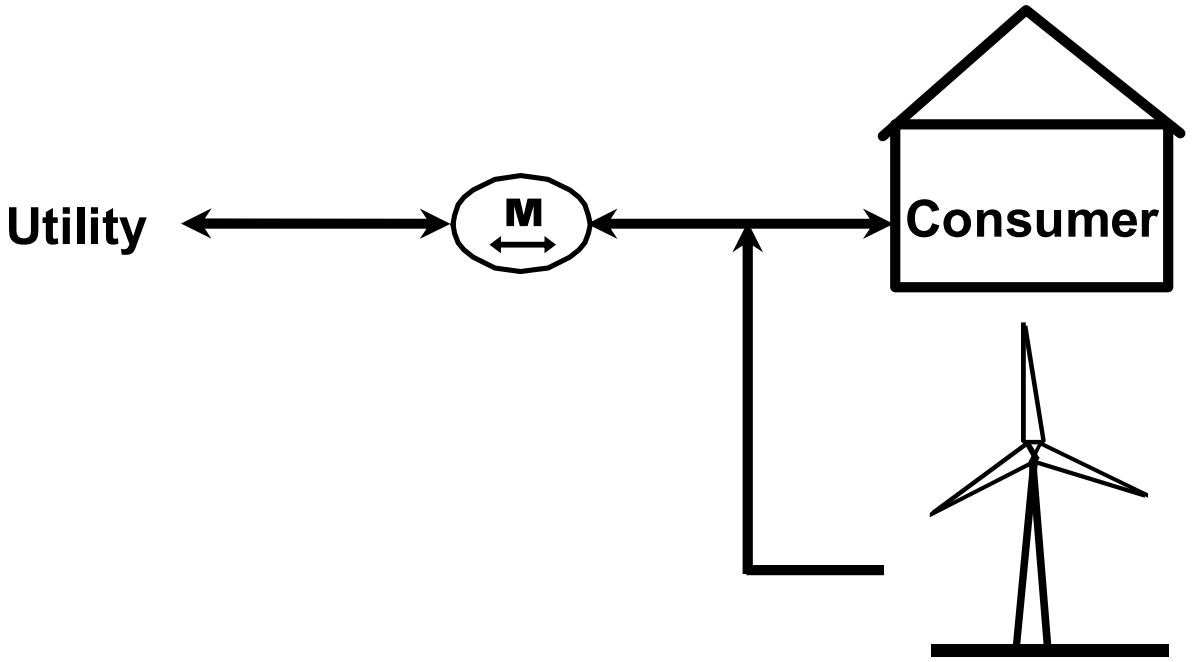
Meter Configuration For Net Billing

Two meters, two rates.
"Net" refers to net $.
(billing = $)



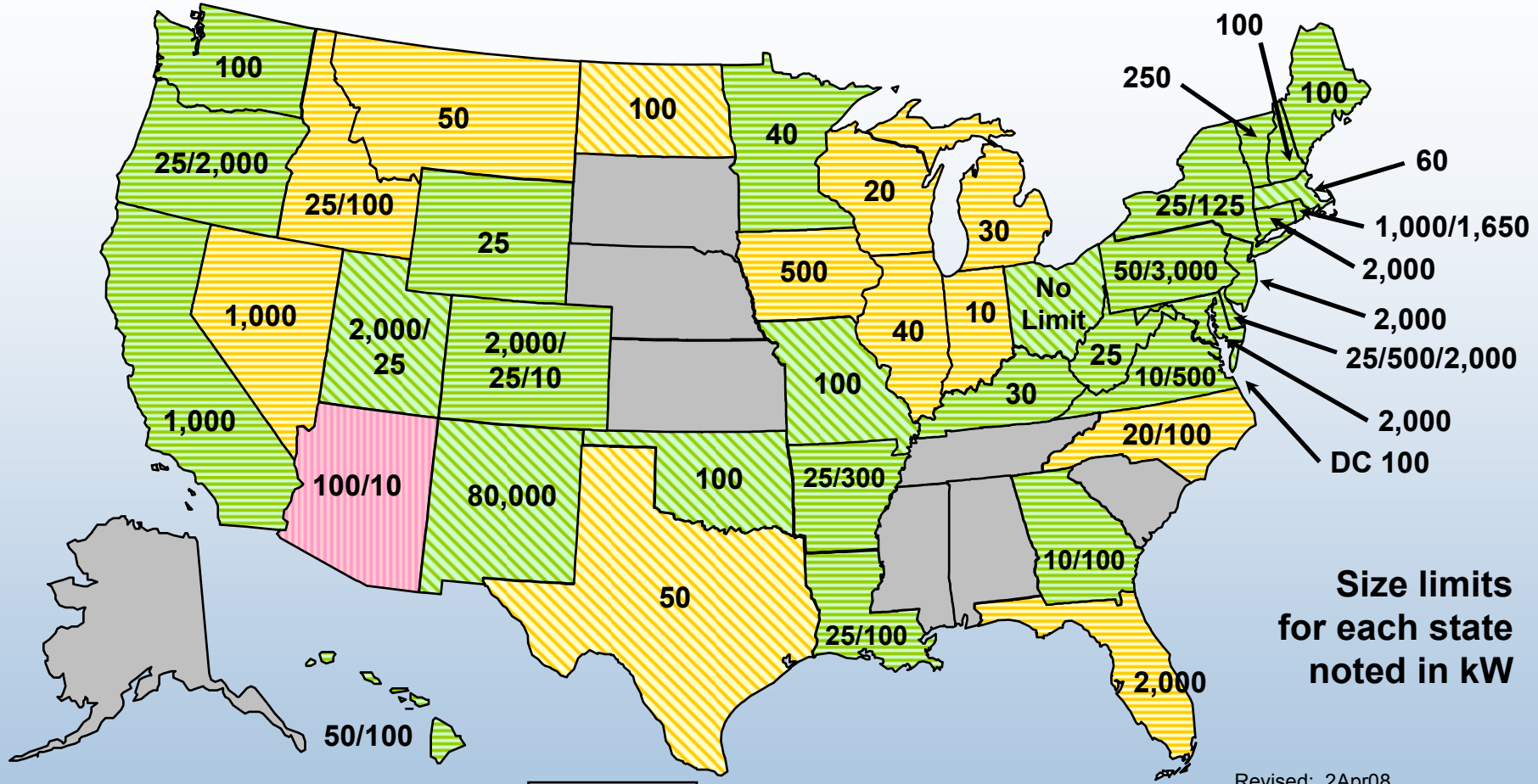
Meter Configuration For Net Metering

One meters, one rate.
"Net" refers to net kWhs.
(meter = kWhs)



Net Metering for Wind

29 states have net metering for all rural consumers



Size limits for each state noted in kW

Revised: 2Apr08
Source: www.dsireusa.org

Treatment of Net Excess Generation:

- Monthly
- Annual or monthly @ retail rate
- Varies by utility

- None
- Individual Utilities
- Investor-Owned Utilities Only, Not Rural Cooperatives
- Investor-Owned Utilities and Rural Cooperatives

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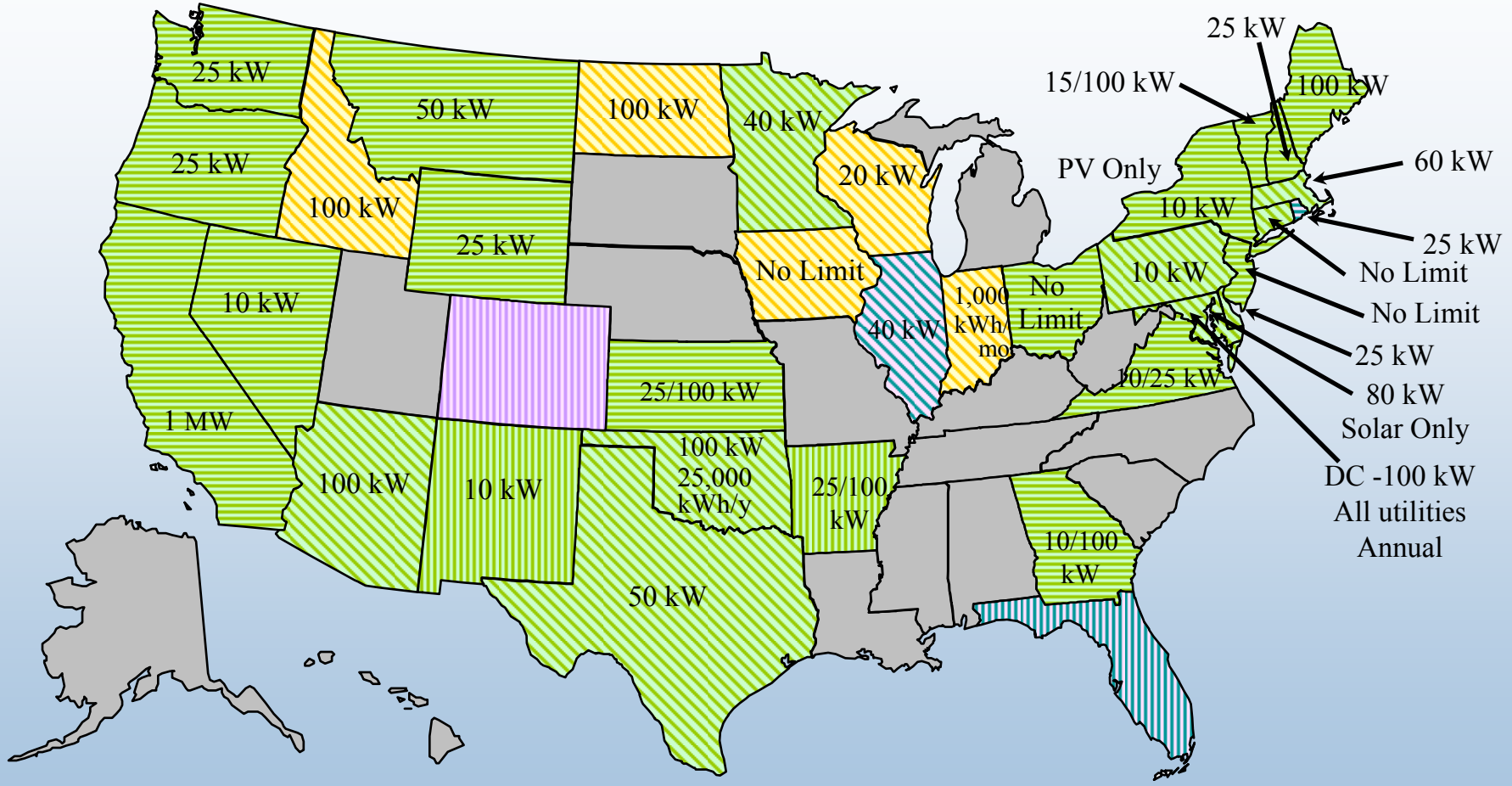
Net Metering By State as of May 31, 2001



Monthly Net Metering
Annual Net Metering
Varies by Utility or Unknown

None
Individual Utilities
IOUs Only, not RECs
All IOUs and RECs

Revised: 31 May 01

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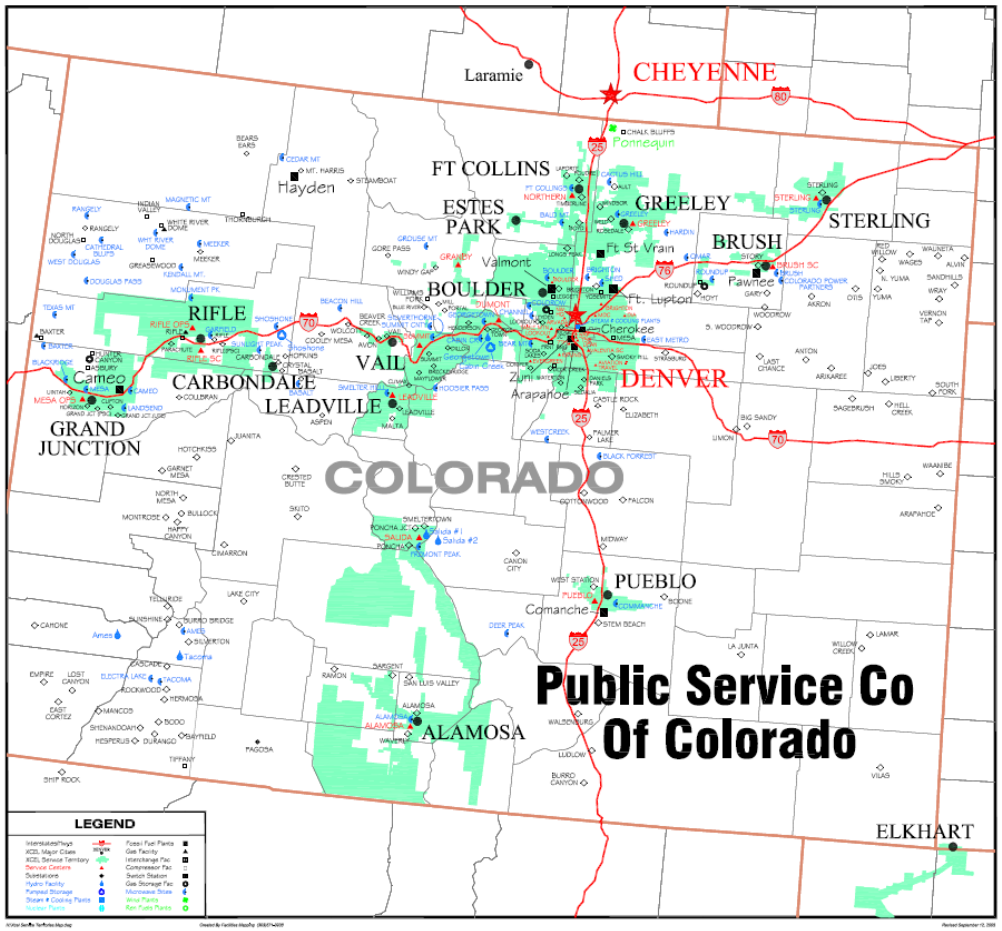
Xcel Energy

PSCO SERVICE TERRITORY



Colorado Utilities Offering Net Metering prior to HB 1160

- Municipal Utilities:
  Colorado Springs - 10/25 kW, 50 customers
  Ft. Collins - 10 kW, 25 customers
  Longmont Power - 50 kW
- Rural Cooperatives:
- Delta Montrose - 1000 kW “true” net metering
- Empire - 10 kW “true” net metering
- Grand Valley - 10 kW
- Gunnison County - 10 kW “true” net metering
- Holy Cross - 25 kW annualized, purchase excess at retail rate
- La Plata - 25 kW “true” net metering
- San Miguel - 10 kW net billing
- Southeast Colorado – 25 kW “true” net metering

Colorado Utilities Offering Net Metering

- Investor Owned Utilities:
  Xcel, Aquila - 2 MW, annual net
  - Xcel NEG is 3.4 cents/kWh
- HB 1160 enacted 3/26/08 for all RECs and munis with 5,000 customers or more
  - 10 kW residential,
  - 25 kW commercial/industrial
  - Annual net metering, each utility chooses it's annual period
  - Each utility chooses how to handle NEG

Interconnection Agreement (contract)

- Needed document to interconnect your solar/wind systems to utility grid
- Vary in length and complexity
- Covers a variety of things
  - Location of DG,
  - Disconnection requirements
  - Insurance and liability
  - Inspection and testing
  - Typically references tariffs for billing & payment
- Xcel Interconnection Agreement
  - http://www.xcelenergy.com/docs/retail/conmrkts/InterconnectionAgreement.pdf - interconnection agreement

- Following slides are from a paper entitled

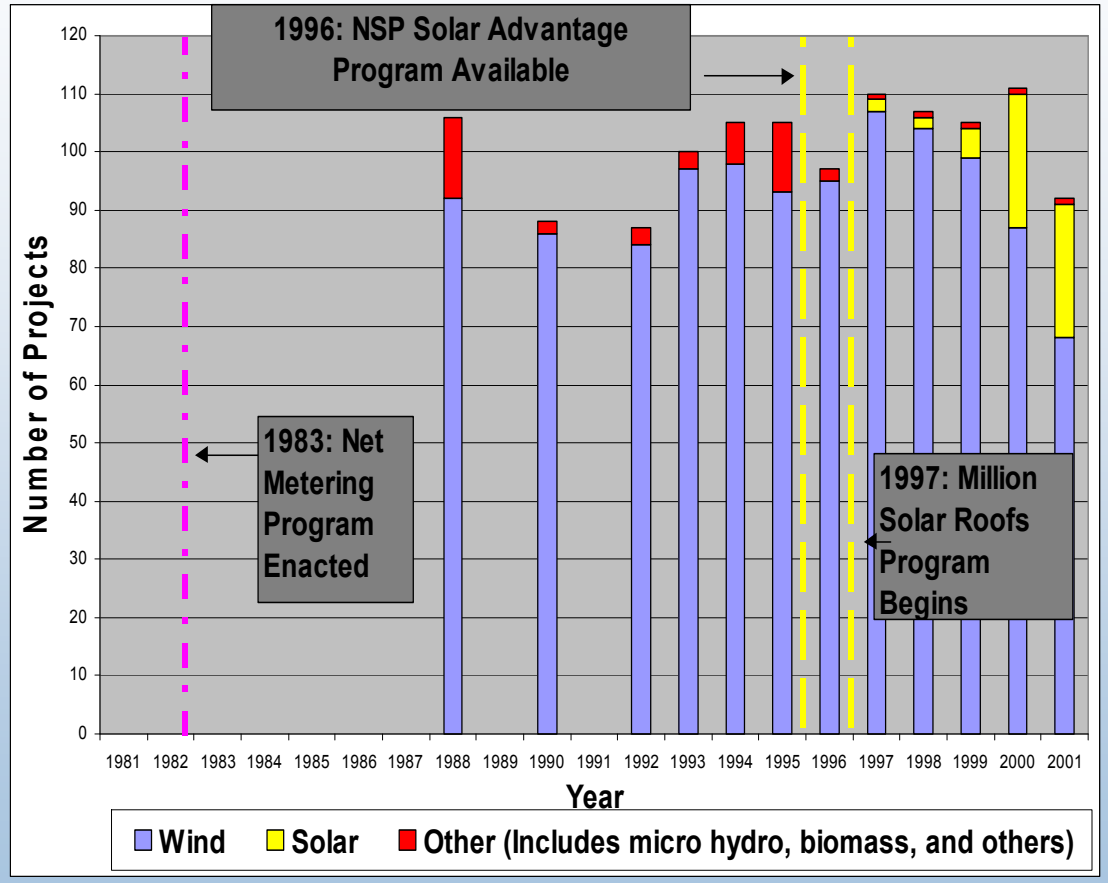
  The Effects of Net Metering on the Use of Small-Scale Wind Systems in the United States

  http://www.nrel.gov/docs/fy03osti/32471.pdf

  November 2002

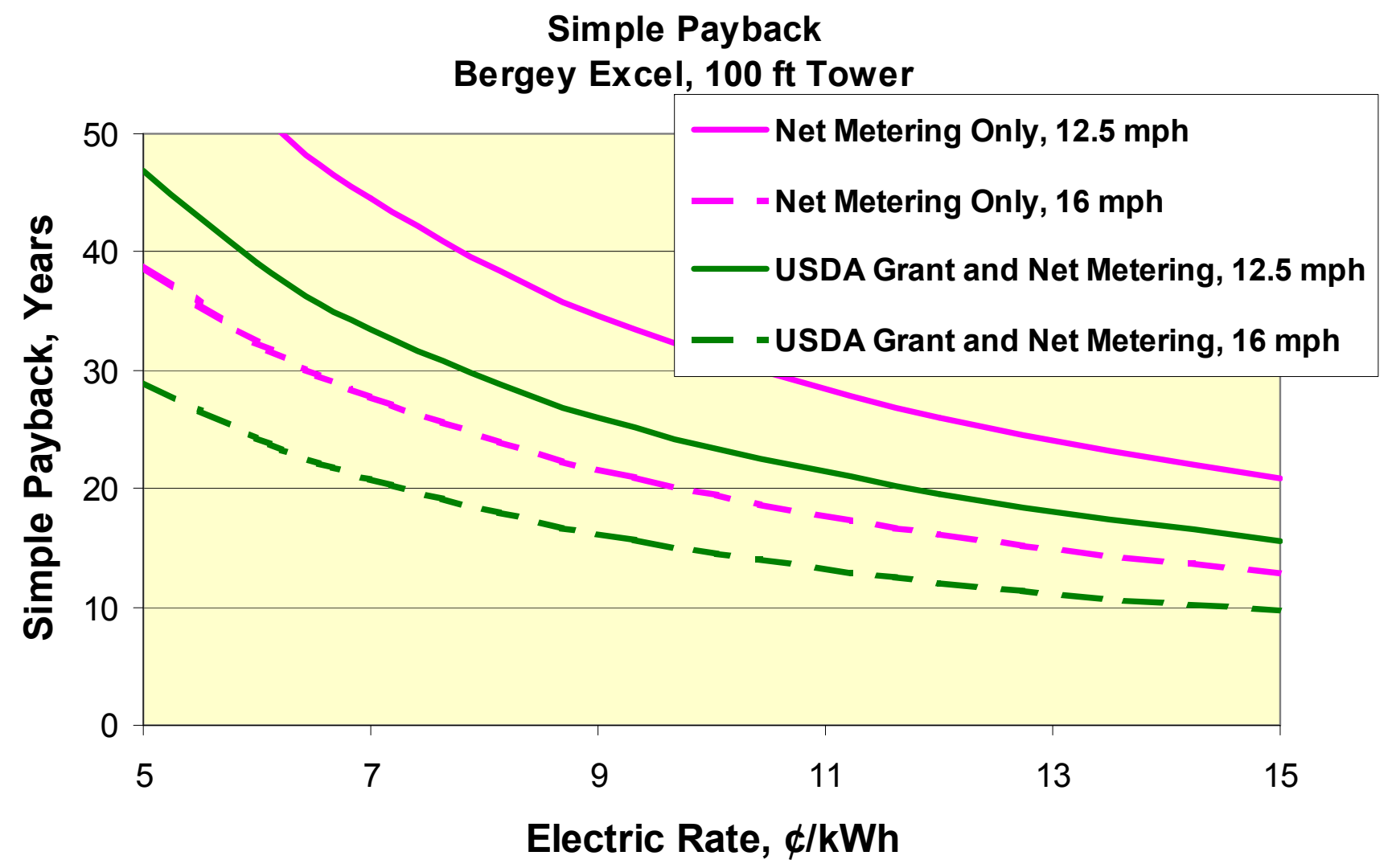
Minnesota Net Metering

- 40 kW capacity limit, monthly NEG purchased at average retail energy rate
- In 1997, Million Solar Roofs started
- NSP had solar lease program – '96 only
- MN had wind advocates who got net metering in place
- Over time, maintenance costs for used equipment were too high
- Small residential size turbines too small for agricultural community applications



Small Wind Economics

Bergey Excel on 100ft Tower



Thornton House – Installing the PV System

Thornton House - Cost Details

Total system cost		$19,600
System installed	$18,103	
Sales tax	$1,137	
Electrical permit	$361	
Xcel rebate		($11,610)
After rebate cost		$7990
Federal tax credit		($2000)
Final cost to owner		$5990

System size is 2.58 KW.

Thornton House - Energy Use (kWh)

Mon & Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Tot For Year
2004	895	659	688	568	601	621	677	698	652	601	673	877	8210
2005	936	629	590	519	548	639	753	884	812	670	719	750	8449
2006	813	606	607	589	448	728	678	707	609	624	545	685	7639
2007	966	506	418	342	286	280	369	260	260	276	417	675	5075
2008	804	424	343	208	-	-	-	-	-	-	-	-	-

Period of PV operation = 4,707 kWh

Thornton House – Financial

- Estimated energy produced in 2007: 3,673 kWh
- Cost of energy saved annually based on 3,673 kWh @ 9.5 cents/kWh: $349
- Time to breakeven based on $349: 17.2 years
- Contract with Xcel: 20 years

Thornton House – Environmental Benefits

- Avoids emissions equivalent to 27 lbs of nitrous oxides, 31 lbs sulfur dioxide and 6,449 lbs of carbon dioxide annually
- Reduces carbon dioxide emissions equivalent to driving 8008 miles per year in average passenger car
- Offsets the carbon dioxide absorbed by 1.3 acres of trees in one year

Recent Trends

- Increase in maximum capacity – following FERC regulations of under 2 MW
  - Benefit consumers/businesses since turbine system costs decrease as the turbine size increases
- Increase in numbers of municipal and rural electric cooperatives with net metering policies
- Proposed net metering legislation that would allow third-party use of NEG or aggregation of electric meters
- Policy that has not end of life for net metering
  - No period of annual true up so kWhs continued to be valued at retail rate
- Other cost items
  - Liability insurance
  - Meter expenses
  - Interconnection fees

What to do if you don't have net metering?

- Work with your utility company
  - From NRECA research there are a number of RECs who will net meter on an individual basis
  - One indicator of likelihood to net meter is average age of REC board members
- Find others in your utility service territory that are interested in net metering – work together
- May need to find an interconnection agreement if local utility doesn't have one
  - www.nreca.org, search under Interconnection Agreement
    - Long form and short form