UTILITY SECTOR ENERGY EFFICIENCY IN MINNESOTA:

DOING WELL….MANY REASONS TO DO MORE

Presentation to the Minnesota Legislature

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by

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Senior Fellow

American Council for an Energy-Efficient Economy

The American Council for an Energy-Efficient Economy (ACEEE)

- Nonprofit 501(c)(3) dedicated to advancing energy efficiency through research, communications, and conferences. Founded in 1980.
- ~40 staff in Washington DC, + field offices in DE, MI, and WI.
- Focus on End-Use Efficiency in Industry, Buildings, Utilities, and Transportation; and State & National Policy
- Funding: Foundations (34%), Federal & State Grants (7%), Contract work (21%) Conferences and Publications (34%), Contributions and Other (4%)

Martin Kushler, Ph.D. (Senior Fellow, ACEEE)

- 30 years conducting research in the utility industry, including:
- 10 years as Director of the ACEEE Utilities Program
- 10 years as the Supervisor of the Evaluation section at the Michigan PSC
- Have assisted over a dozen states with utility EE policies
- Minnesota experience:
  - Advisor to Xcel CIP Advisory Board 2000-2008, 2012-present
  - Advisor to MN Legislative Auditor on CIP evaluation (2005)
  - Advisor to MNCEE, 2012-present

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TOPICS

- Minnesota's energy disadvantage
- Why energy efficiency should be the top priority
- Energy efficiency as a utility system resource
- Utility economic concerns regarding customer EE
- Regulatory mechanisms to address utility concerns
- Energy efficiency as economic development
- A few current 'hot topics'
- Grading Minnesota
- Opportunities for further progress

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KEY POINT #1: MINNESOTA HAS A BIG ENERGY PROBLEM

- Minnesota uses a lot of energy
  - Total cost $12 billion per year in 2000

    By 2010, had increased to $21 billion!!!

- **Minnesota is essentially totally dependent on fuels imported from other states and countries**

  Minnesota imports:

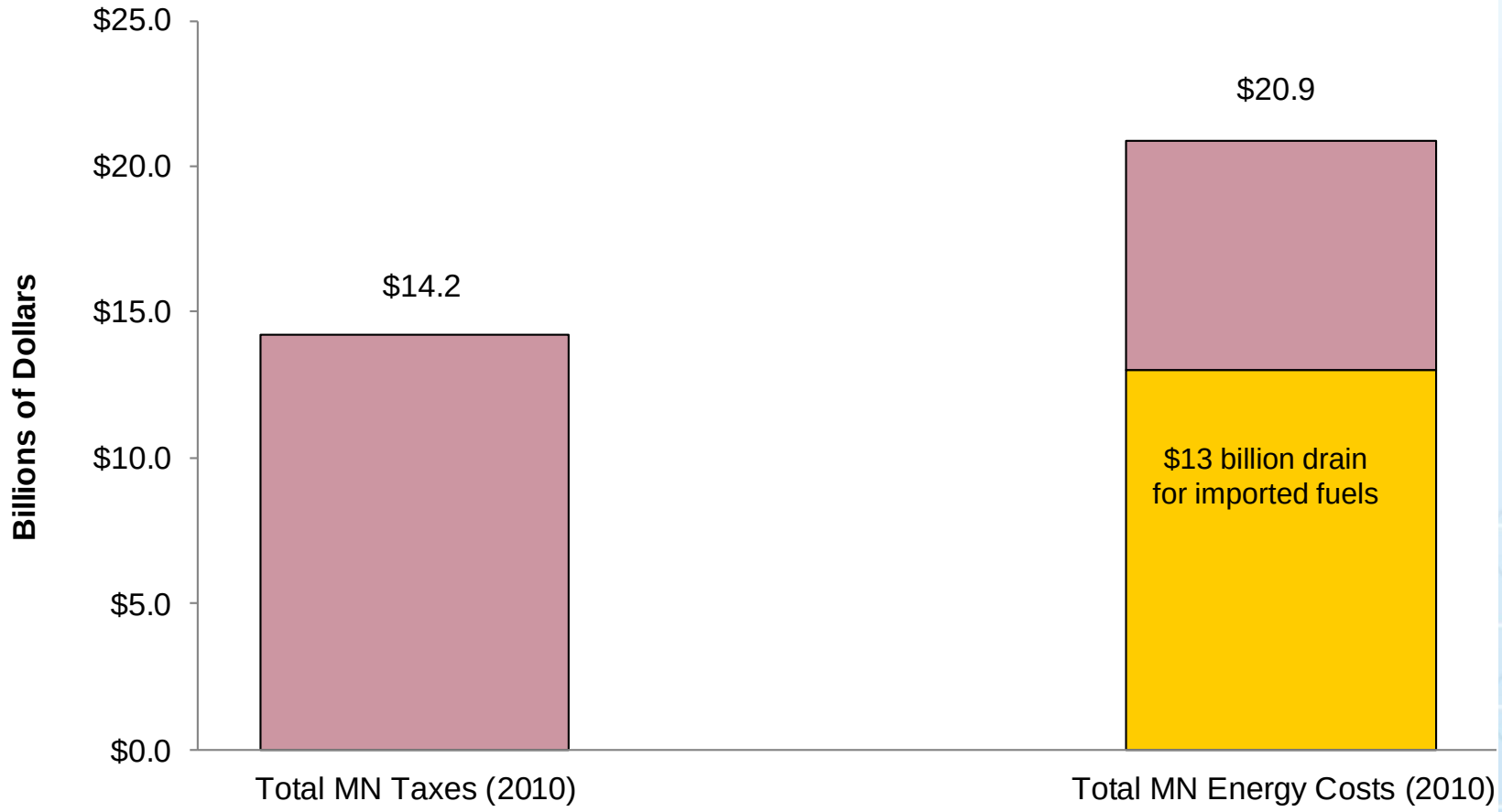
  - 100% of the coal and uranium used
  - 100% of oil & petroleum products
  - 100% of the natural gas

COST OF MINNESOTA'S ENERGY IMPORTS

- Before the new 'high energy cost' era (circa 2000), roughly $7 billion per year was leaving Minnesota to pay for fuel imports
- **At 2010 market prices, this dollar outflow was over $13 billion per year**

THIS IS A HUGE ECONOMIC DRAIN ON MINNESOTA'S STATE ECONOMY!

Economic Burden on Minnesota Homes and Businesses: State Taxes vs. Energy Costs (2010)



EFFECTS ON THE STATE ECONOMY

This ***additional*** **$6 billion** annual drain on Minnesota's economy is roughly equivalent to the lost payroll from **closing 120 major manufacturing plants**.

(assuming 1000 jobs @ $50,000 each, per plant)

Even the Wall Street Journal has written about the unprecedented transfer of wealth, calling it a "bonanza" and "windfall" for the handful of big energy producing states (i.e., AK, NM, ND, WY and TX) and countries (e.g., OPEC).

KEY POINT #2:

MINNESOTA'S FUTURE IS **NOT** IN FOSSIL FUELS

MINNESOTA'S RECOVERABLE RESERVES AS A SHARE OF U.S. RECOVERABLE RESERVES (Source: U.S. EIA)

- Coal: 0%
- Oil: 0 %
- Natural Gas: 0%

[also Uranium: 0%]

Why would Minnesota support policies that encourage greater consumption of these resources?

(At the state OR federal level !)

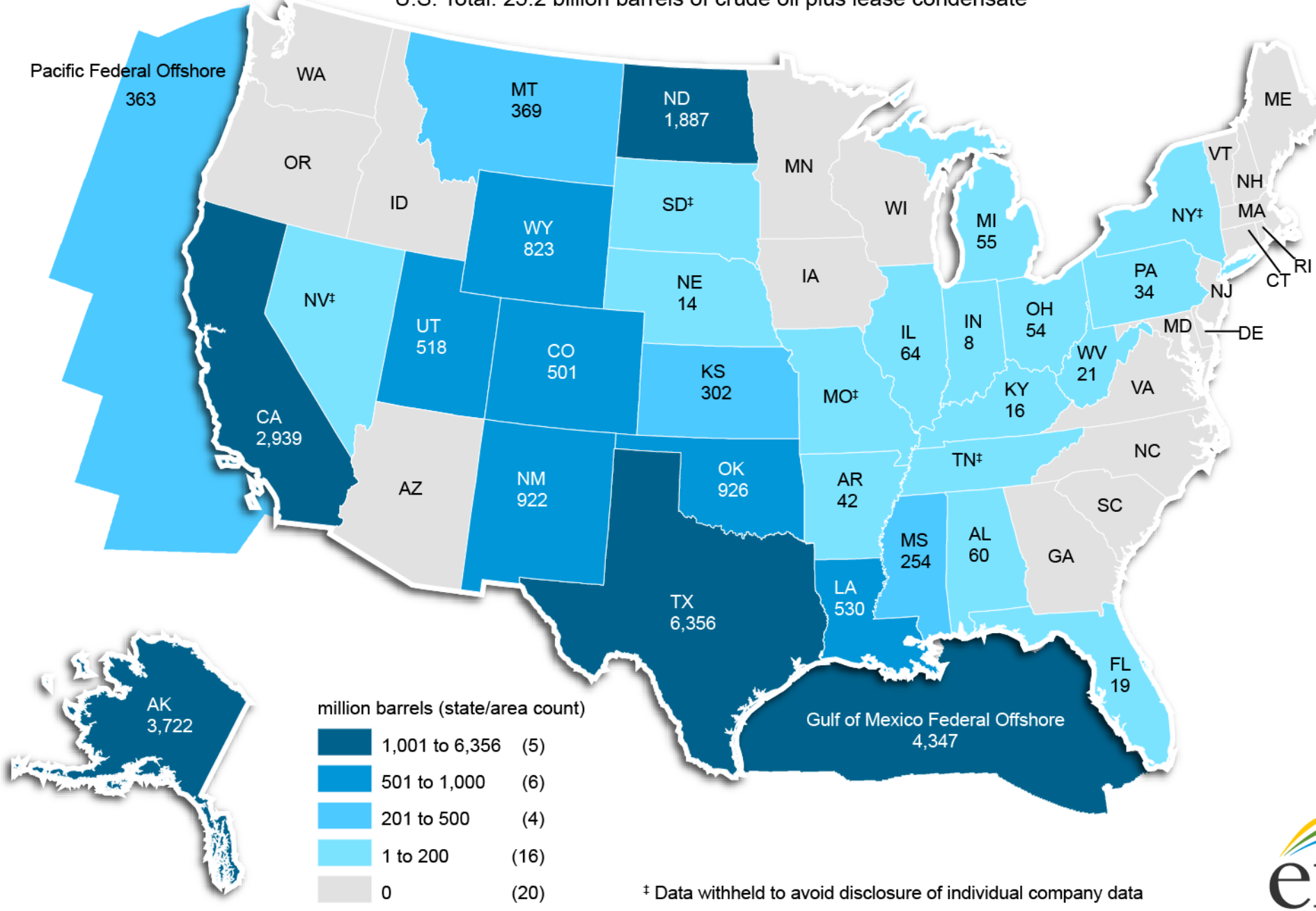
2011 Coal Production by Region

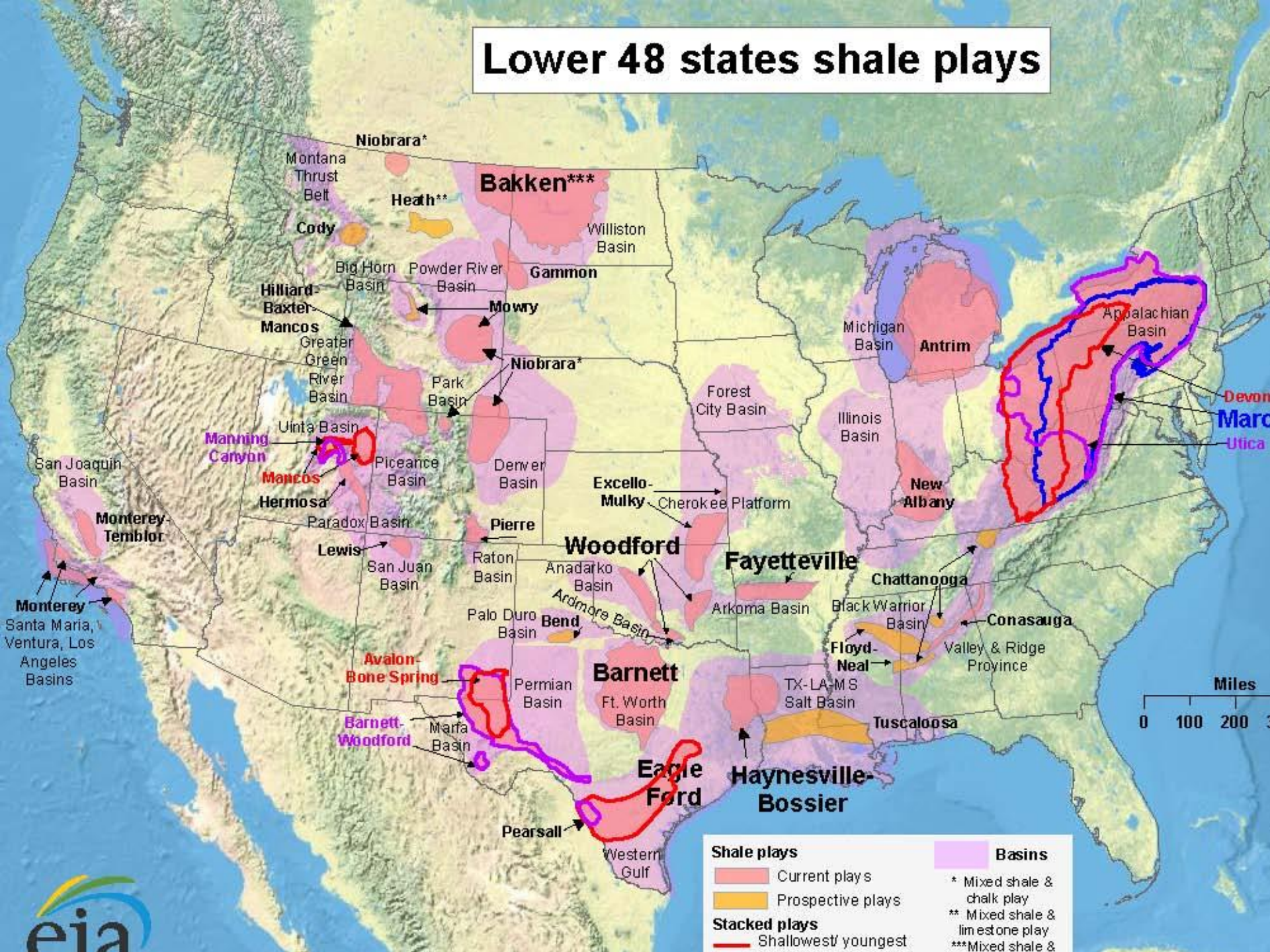
Million Short Tons
(percent change from 2010)

Source: U.S. Energy Information Administration, *Quarterly Coal Report,* October-December 2011 (April 2012), preliminary 2011 data. Production does not include refuse recovery.

Figure 9. Oil proved reserves by state/area, 2010

U.S. Total: 25.2 billion barrels of crude oil plus lease condensate




Lower 48 states shale plays
Niobrara*
Montana Thrust Belt
Heath**
Bakken***
Cody
Williston Basin
Big Horn Basin
Powder River Basin
Gammon
Hilliard-Baxter-Mancos
Mowry
Greater Green River Basin
Niobrara*
Park Basin
Forest City Basin
Michigan Basin
Antrim
Appalachian Basin
Devon
Marc
Utica
Uinta Basin
Manning Canyon
Mancos
Hermosa
Piceance Basin
Denver Basin
Illinois Basin
New Albany
San Joaquin Basin
Monterey-Temblor
Paradox Basin
Pierre
Excello-Mulky
Cherokee Platform
Lewis
San Juan Basin
Raton Basin
Woodford
Anadarko Basin
Fayetteville
Chattanooga
Monterey
Santa Maria, Ventura, Los Angeles Basins
Palo Duro Basin
Bend
Ardmore Basin
Arkoma Basin
Black Warrior Basin
Conasauga
Floyd-Neal
Valley & Ridge Province
Avalon-Bone Spring
Permian Basin
Barnett
Ft. Worth Basin
TX-LA-MS Salt Basin
Barnett-Woodford
Marfa Basin
Tuscaloosa
Eagle Ford
Haynesville-Bossier
Pearsall
Western Gulf
Miles
0 100 200
Shale plays
Current plays
Prospective plays
Stacked plays
Shallowest/ youngest
Basins
* Mixed shale & chalk play
** Mixed shale & limestone play
***Mixed shale &
eia

As a matter of state policy, Minnesota should be trying to <u>maximize</u> the amount of energy efficiency it can accomplish…

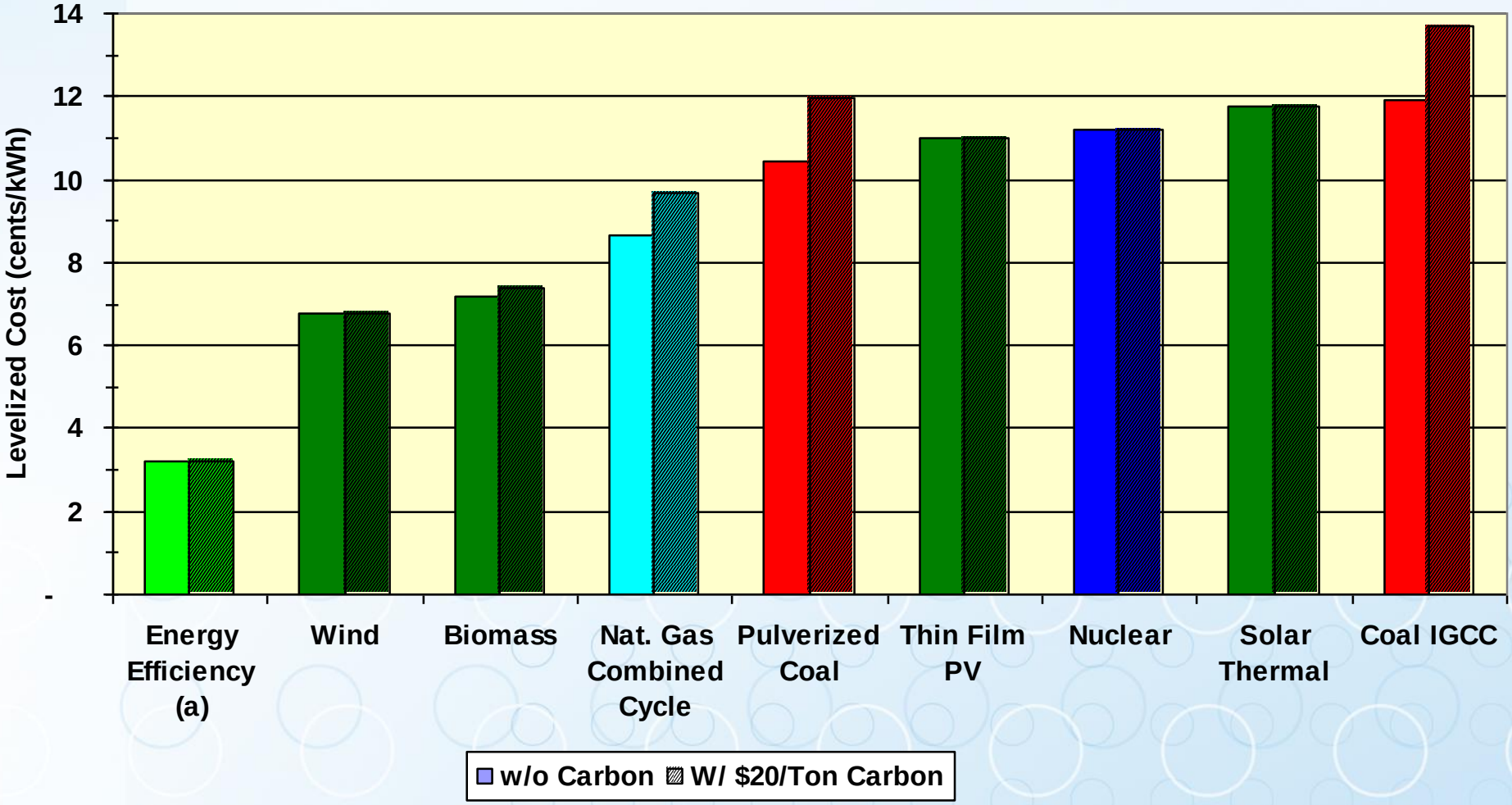
… and <u>minimize</u> the amount of additional fuel imports it needs

KEY POINT #3

It is much cheaper to save energy than it is to produce it.

[We can save electricity for about one-third the cost of producing it through a new power plant …. With no carbon (CO_2) emissions]

Cost of New Electricity Resources



Source: Lazard 2008 for NARUC (midpoint of range)

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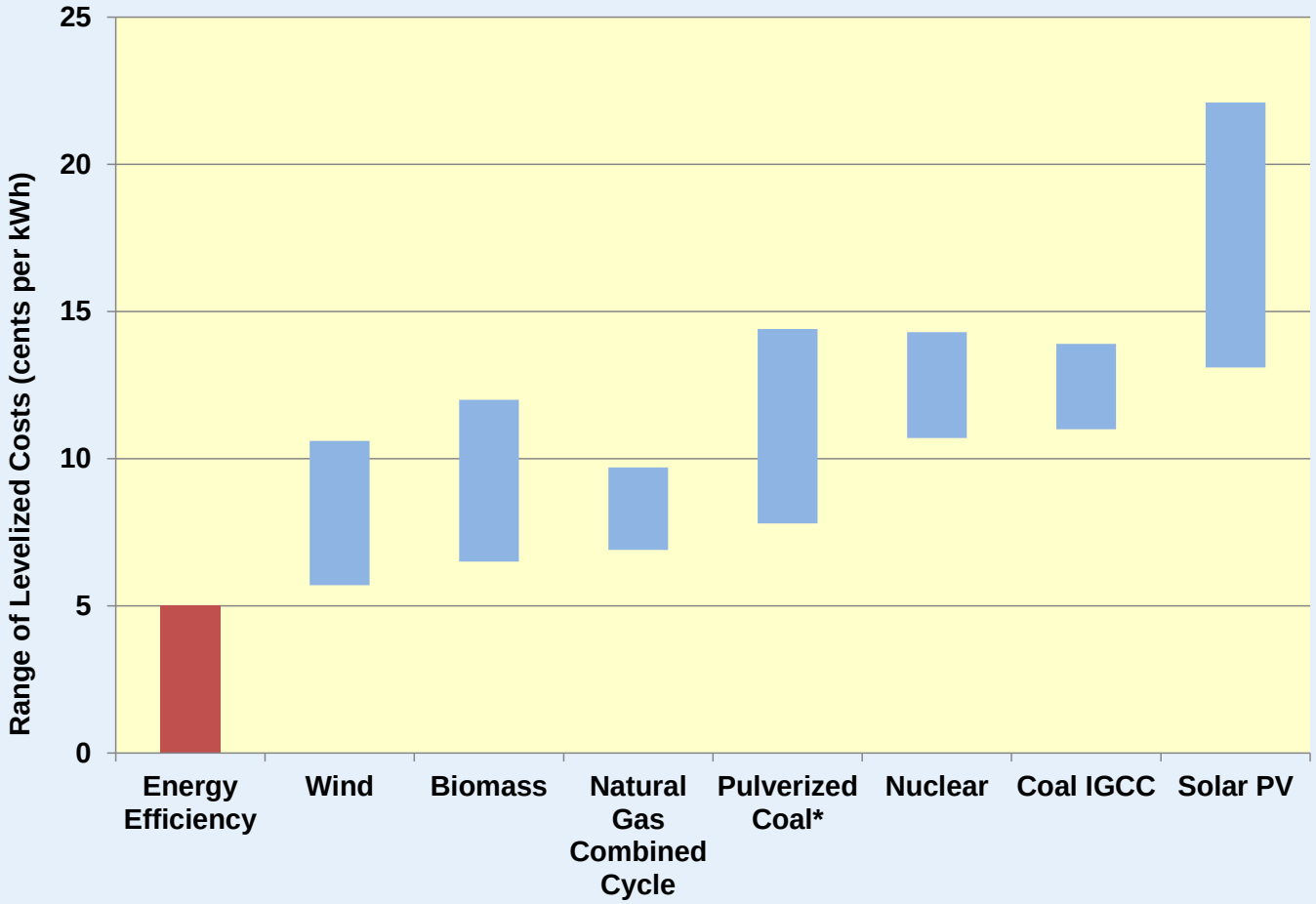
Cost of New Electricity Resources

[Source: Lazard 2011]



Minnesota's <u>electricity</u> policy, should be trying to <u>maximize</u> the amount of energy efficiency resources it can acquire,

… and <u>minimize</u> the amount of new power plants needed

(This is in fact now the declared policy of a number of leading states….)

POLICY PRIORITY #1: UTILITY SECTOR ENERGY EFFICIENCY PROGRAMS

- Substantial **utility-funded** energy efficiency resource programs are the cornerstone of the policy efforts of every leading state on energy efficiency
  - States don't spend tax dollars on this…they are all broke
  - Utilities spend $billions every year (~ $8 billion in Minnesota). Just direct 3% or 4% to energy efficiency

Energy Efficiency as a utility system resource

RATIONALE FOR ENERGY EFFICIENCY AS A UTILITY SYSTEM RESOURCE

SIMPLY STATED:

- Utility systems need to have adequate supply resources to meet customer demand
- To keep the system in balance, you can add supply resources, reduce customer demand, or a combination of the two
- In virtually all cases today, it is much cheaper to reduce customer demand than to acquire new supply resources

  [True for electricity and natural gas]

ENERGY EFFICIENCY ON A "POWER PLANT" SCALE

- Some leading state examples
  - ❖Minnesota has saved over 2,300 MW since 1990
  - ❖The Pacific Northwest has saved over 5,000 MW since 1980
  - ❖California has saved over 1,500 MW in just the last 5 years
- Over a dozen states have EE programs on a scale large enough to displace power plants (i.e., save 1% of load or more each year)
  - AZ, CA, CT, IA, IL, MA, MI, MN, NY, OR, RI, VT, WA, WI

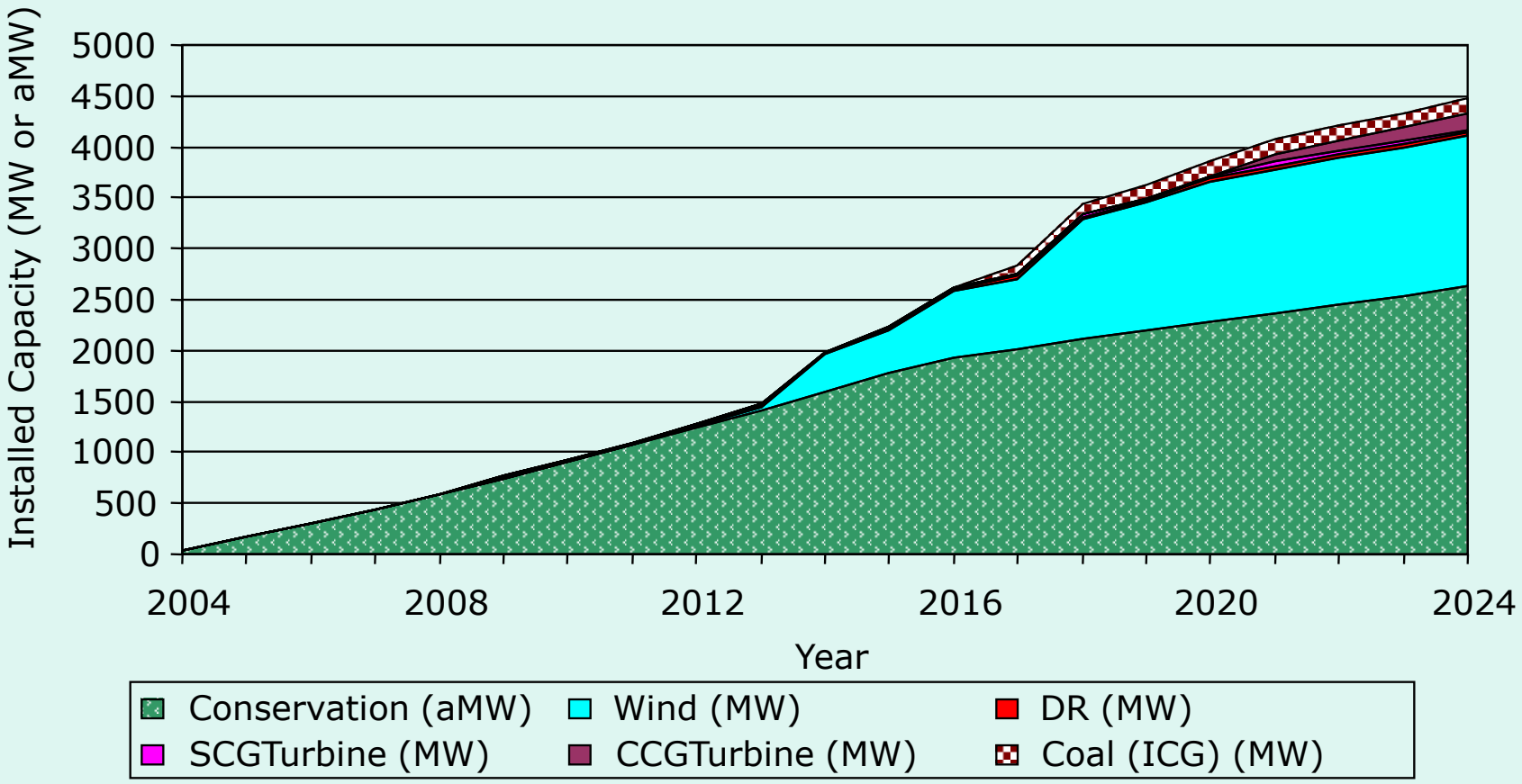
THE PACIFIC NORTHWEST (ID, MT, OR, WA)

- Best electric resource planning process in the U.S.
- 30 years of energy efficiency program experience
- The 2005 plan was to meet all new electricity resource needs through 2013, and two-thirds of new needs thru 2025, with energy efficiency

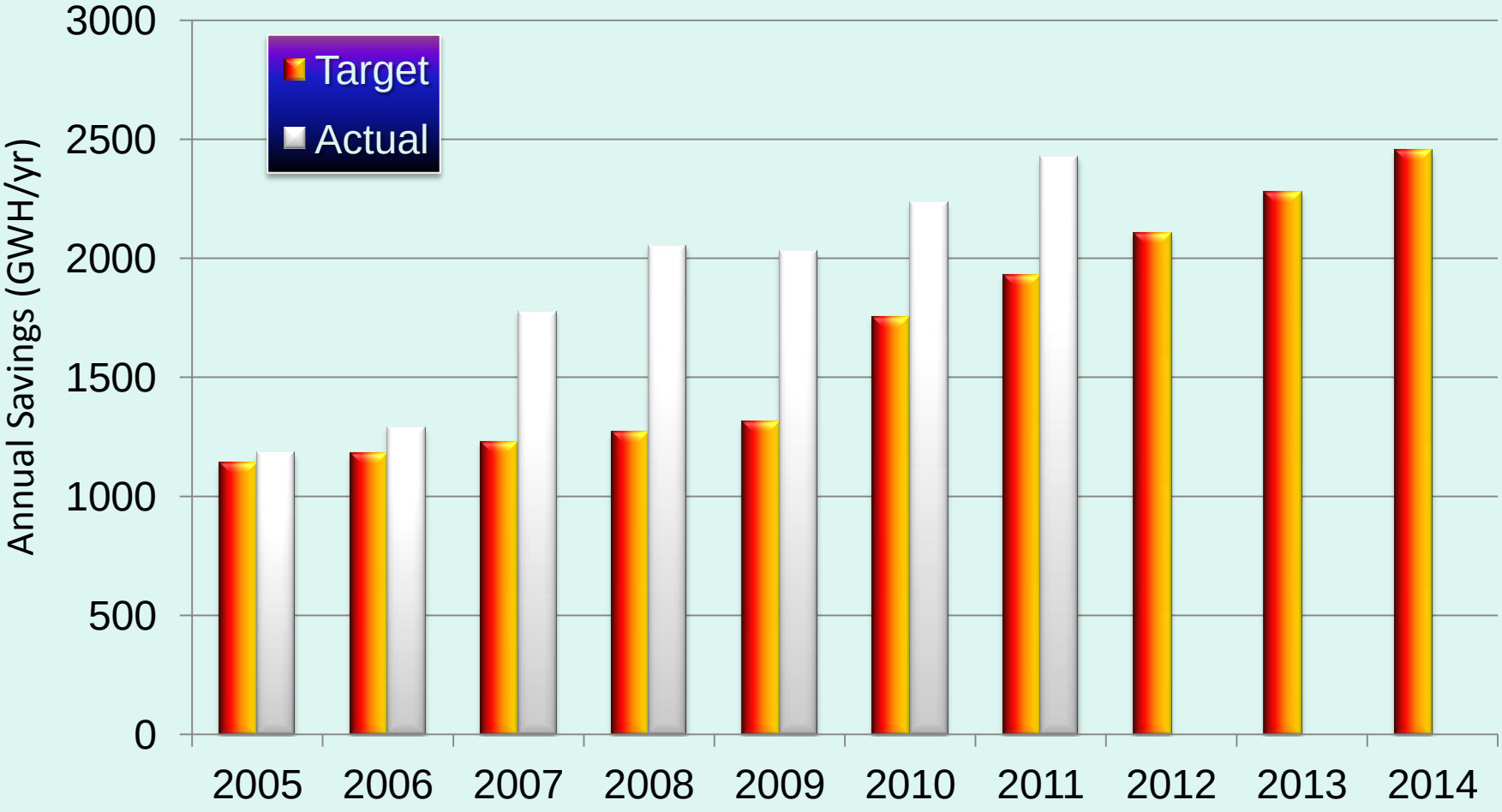
….And all at a levelized cost of 2.4 cents/kWh

The Fifth Northwest Electric Power and Conservation Plan
Northwest Power and Conservation Council, May 2005.
[http://www.nwcouncil.org/energy/powerplan/plan/]

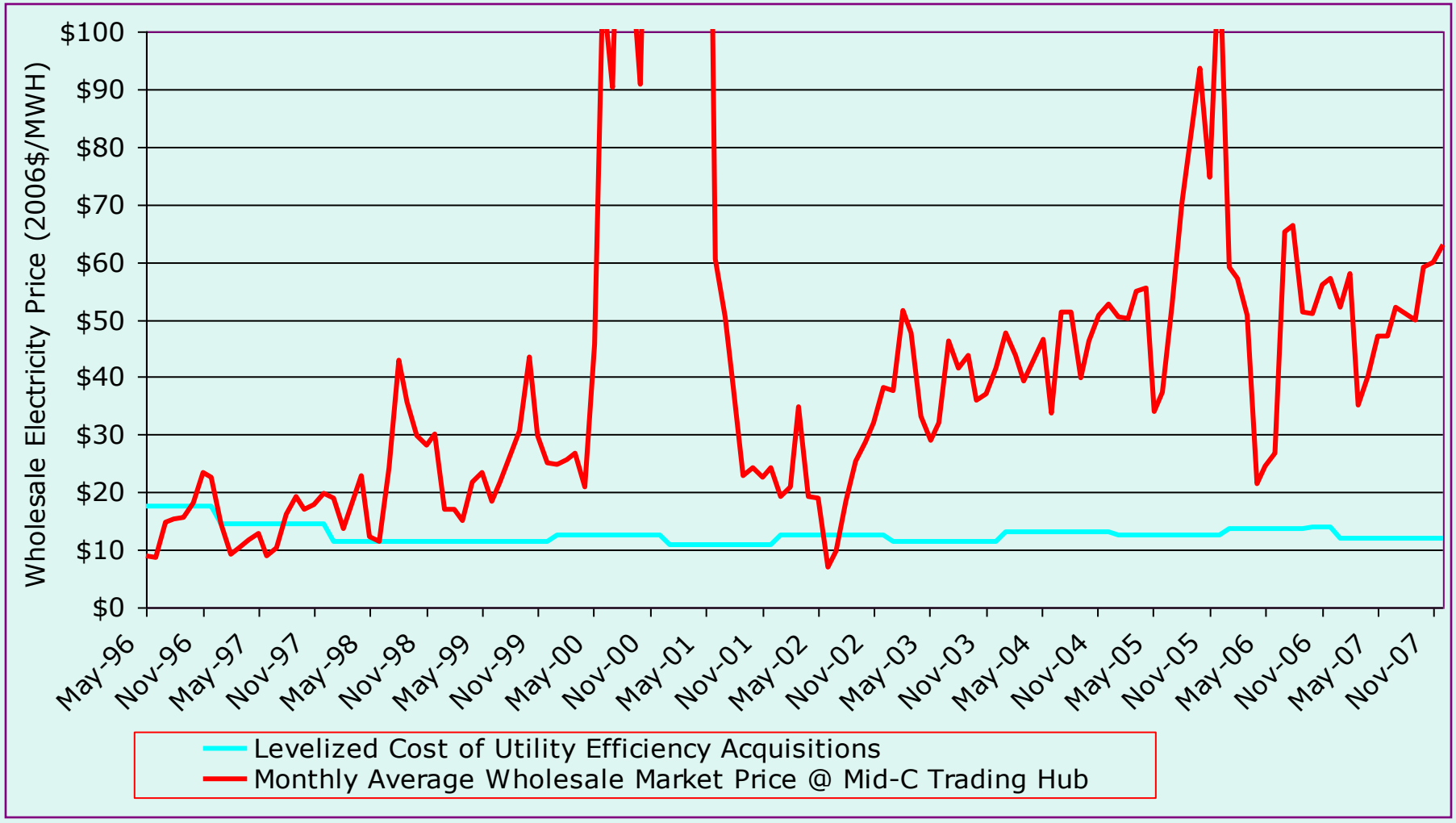
5th NW Plan Relied on Conservation and Renewable Resources to Meet All Load Growth Thru 2016



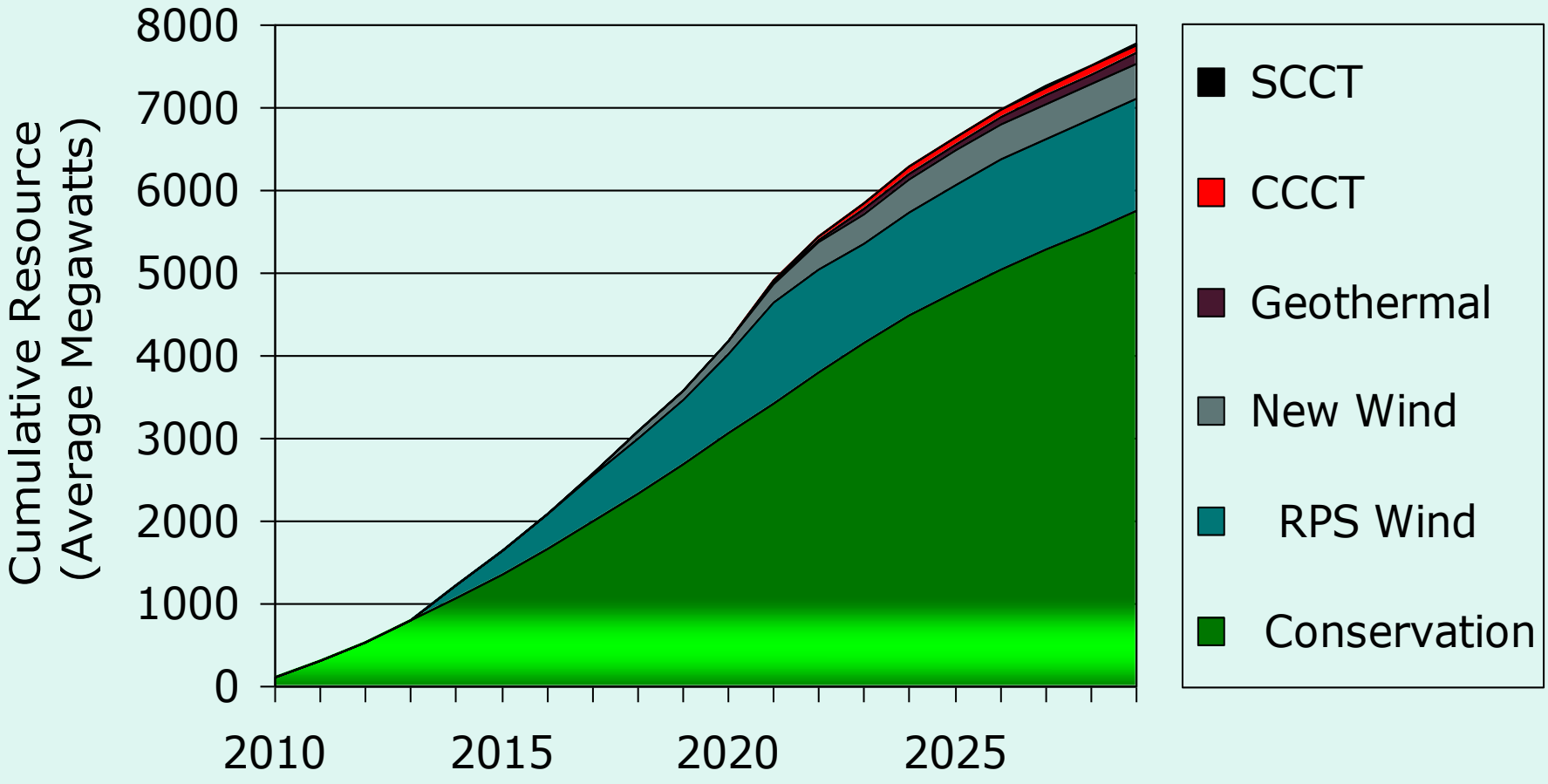
Accomplishments Have Exceeded Plan Targets Every Year



Utility Acquired Energy Efficiency Has Been A *BARGAIN!*



Pacific NW 6th Plan Resource Portfolio (2010)



The Pacific Northwest provides a great example of what is possible….

Minnesota can chart an energy course that is fundamentally based on energy efficiency and cost-effective local Minnesota renewable resources

Why is public policy needed for energy efficiency?

NEED FOR GOVT/REGULATORY PROGRAMS AND POLICIES

1) Most of the extra "benefits" of energy efficiency are external to the economic interests of utilities

   (i.e., reduced consumption of natural resources, reduced air emissions, reduced energy imports)

   or are long-term in nature (e.g., long-term avoided system costs)

2) Under traditional regulation, the short-term economic interests of utilities are adversely affected by customer energy efficiency

UNDERSTANDING UTILITY ECONOMICS REGARDING CUSTOMER ENERGY EFFICIENCY

TWO KEY FACTORS:

1) Under traditional regulation, once rates are set, if utility sales go up the utility's profits generally increase….

…. and if utility sales go down (e.g., through customer energy efficiency) the utility's profits decline.

Therefore, utilities have strong economic incentives to seek greater energy sales and avoid declines in sales

[This is sometimes referred to as: "***throughput addiction***.]

UTILITY ECONOMICS (CONTINUED)

2) Utilities earn a "rate of return" on their supply side investments (e.g., power plants, wires, meters),

but not on energy efficiency programs (those are typically just "expensed")

Not surprisingly….

the combination of those two factors results in what we have historically seen from utilities: proposals to build more power plants and sell more energy….(& passive or active opposition to strong energy efficiency requirements)

UTILITIES HAVE 3 KEY FINANCIAL CONCERNS REGARDING ENERGY EFFICIENCY PROGRAMS

[In order of importance]

- **Cost recovery** for the direct costs of a program
- **Addressing the disincentives** of "lost revenues" resulting from energy efficiency improvements that reduce customer energy use
- **Providing an opportunity for earnings** from energy efficiency program activity (to reflect the fact that they can generate earnings from supply-side investment)

3 Legs of the financial stool for utility energy efficiency programs

1. **Cost recovery (of expenditures on programs, incl. customer incentives and program costs)**

2. **Addressing "Through-put incentive" (more sales = more revenue)**

3. **Opportunity to earn on investments (comparable to supply-side)**

[Note: MN's financial stool is currently unbalanced]

REVENUE "DECOUPLING": ESSENTIAL FOR REACHING BROADER EE GOALS

- Originally a challenge, but "decoupling" is growing fast
- Not essential to achieving programs
- Not sufficient by itself to assure programs
- However, **addressing the utility disincentive from lost sales is <u>essential</u> to achieving true utility cooperation in broader energy efficiency objectives**

  (e.g., building codes, appliance standards, government public efficiency campaigns, ***climate goals***, etc.)

[Utilities can be motivated to some extent through direct performance incentives, but the effect only applies to targeted programs….not to broader objectives for customer energy efficiency.]

KEY POINT #4

ENERGY EFFICIENCY

is

Minnesota's best opportunity

For economic development

THE ECONOMIC "TRIPLE PLAY"

Energy Efficiency is the only resource that boosts the economy and provides jobs in 3 key ways:

1. Direct employment in delivering the EE
2. Local re-spending of saved energy dollars
3. Reduced energy costs for all ratepayers
   - Cheapest resource for the utility system
   - Downward pressure on market energy prices

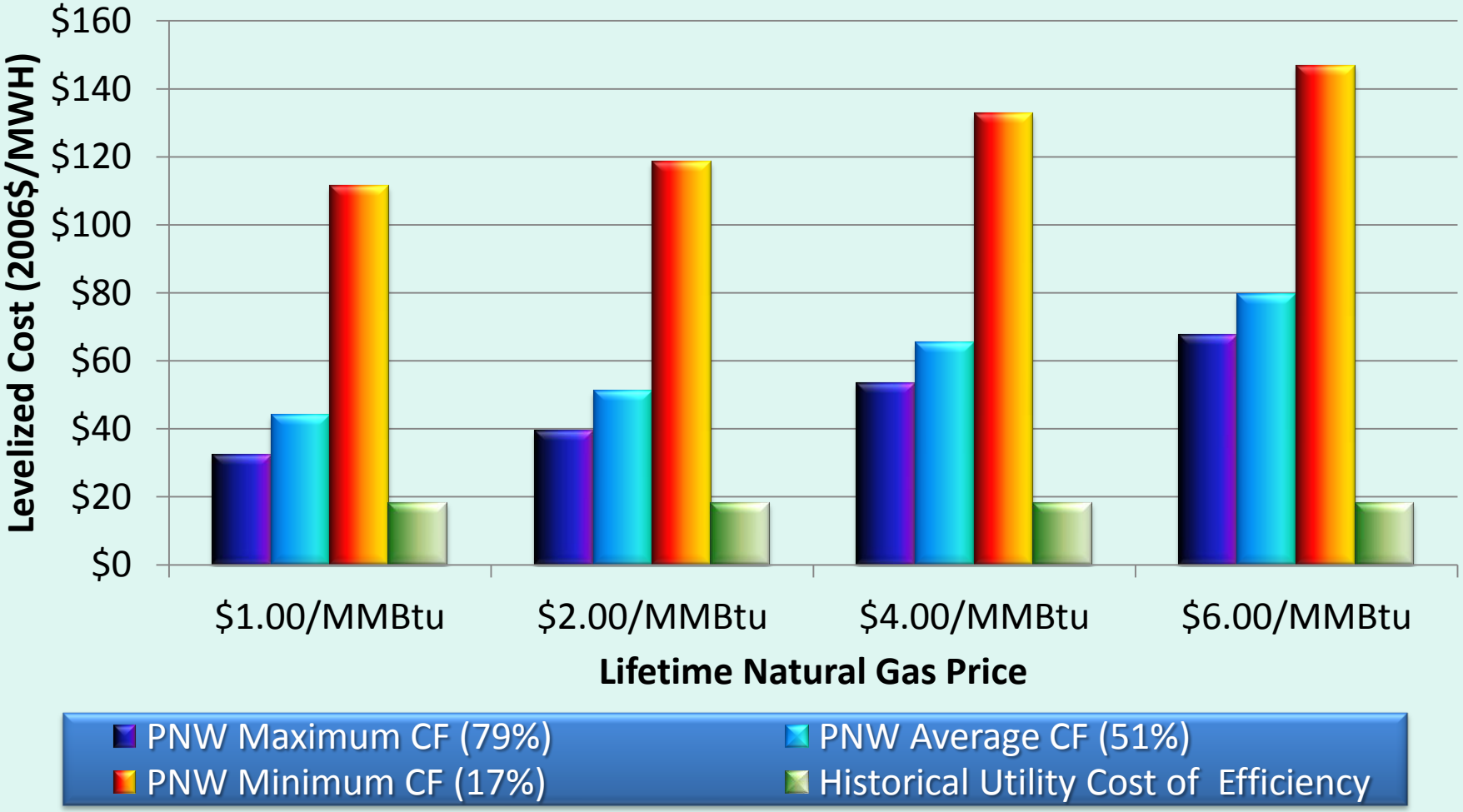
Some miscellaneous current 'hot topics'

DO THE CURRENT LOW NATURAL GAS PRICES MEAN THAT ENERGY EFFICIENCY IS NOT NEEDED?

1. No. Energy efficiency is still very cost-effective
   [electricity: see next slide; gas: see appendix]

2. Natural gas prices won't stay this low for very long
   [resource decisions need to be made on 10, 20 and 30 year time horizons]

Levelized Cost of Combined Cycle Combustion Turbine at Alternative Natural Gas Prices and Lifetime Capacity Factors Compared to Utility Cost of Conservation



WHAT ABOUT CLIMATE CHANGE?

1. Energy efficiency is by far the cheapest electricity resource option….even without adding CO2 costs
2. A modest $20/ton value for CO2 ***adds*** nearly 2 cents/kWh to the cost of electricity from coal, and nearly a penny/kWh to natural gas fired electricity (making EE even more cost-effective)
3. Energy efficiency is a “no regrets” policy because it’s other benefits are so substantial….even if no dollar cost is ever attached to CO2 emissions
4. There is general consensus that any serious plan to slow down climate change must have energy efficiency as the top priority policy.

WHAT ABOUT INDUSTRIAL CUSTOMERS?

1. The industrial customer sector is a major share of the total electric system load

   [~ a third of total MWh sales in MN]

2. The industrial sector holds the largest and cheapest energy efficiency opportunities for the utility system

   [typically 1 to 2 cents/kWh or less]

3. Any serious effort to lower total electric system costs for all customers must include capturing energy efficiency improvements in the industrial sector

   [If industrial customers "opt out", that is a major policy and program failure]

4. The keys are strong policies keeping industrials "in", and attractive programs to encourage participation

WHY INDUSTRIAL CUSTOMERS "ON THEIR OWN" DO NOT CAPTURE ALL COST-EFFECTIVE EE

The Problem

A typical large corporation will not invest in a project unless there is a very quick return…a historical "rule of thumb" has been about a two-year 'payback' [With the current tight economy, it is likely closer to 1-year now]

Assume a 2-yr. payback [device costs $2, saves $1 per year]

Typical industrial rate: 7.5 cents/kWh [$1/.075 = 13.33 kWh]

For the utility, a device that cost $2 and saved 13.33 kWh/yr., levelized over a 10-yr. life, would cost just 1.9 cents/kWh

That means that any EE with a cost over 1.9 cents per kWh will likely not get done by the customer, "on their own"

Here's how utility EE programs overcome that problem….

EXAMPLE OF HOW A UTILITY EE PROGRAM FOR INDUSTRIAL CUSTOMERS PRODUCES COST-EFFECTIVE EE THAT WOULD NOT OTHERWISE HAPPEN

- Assume an EE project with a four-year payback

  Cost: $4, annual savings: $1 (again, 13.33 kWh/yr.)

On its own, the customer would not do this project

<u>The Utility EE Program</u>

The utility provides a $2 incentive to the customer, to "buy down" the payback to 2 yrs, allowing the project to proceed

- The utility is essentially "buying" energy efficiency savings from the customer….in this case at a levelized cost of just 1.9 cents/kWh [$2 x CRF of .1294/13.33 kWh]
- This is about one-fourth the cost of electricity from building, fueling and operating a new power plant.
- The industrial customer benefits directly, the utility system (all ratepayers) benefit by avoiding higher-cost supply

A LEADING STATE EXAMPLE: INDUSTRIAL CUSTOMERS **SUPPORTING** PLAN FOR RECORD LEVELS OF UTILITY ENERGY EFFICIENCY

"These are very ambitious goals and we look forward to partnering with the electric and gas utilities to realize these goals and deliver energy efficiency solutions to our members statewide,"

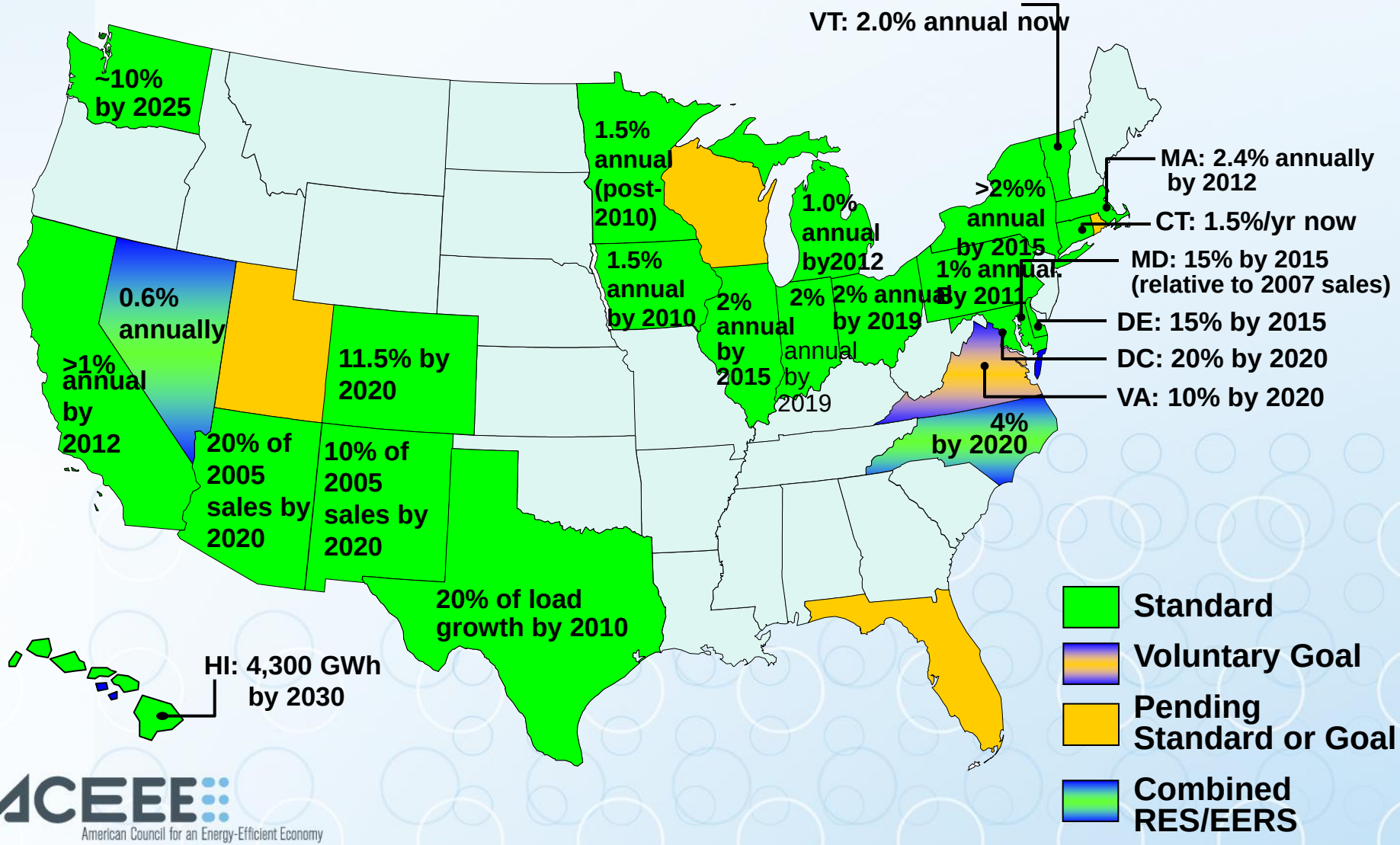
Robert Rio, SeniorVice President of Associated Industries of Massachusetts, who serves on the Energy Efficiency Advisory Council as its industrial energy users representative.

[In response to the announcement of Massachusetts' new plan for a $1.1 billion three-year program , to save 2.4% per year through energy efficiency]

So how does Minnesota compare to other states on utility-sector energy efficiency?

Energy Efficiency Resource Standards

24 States –as of 2011



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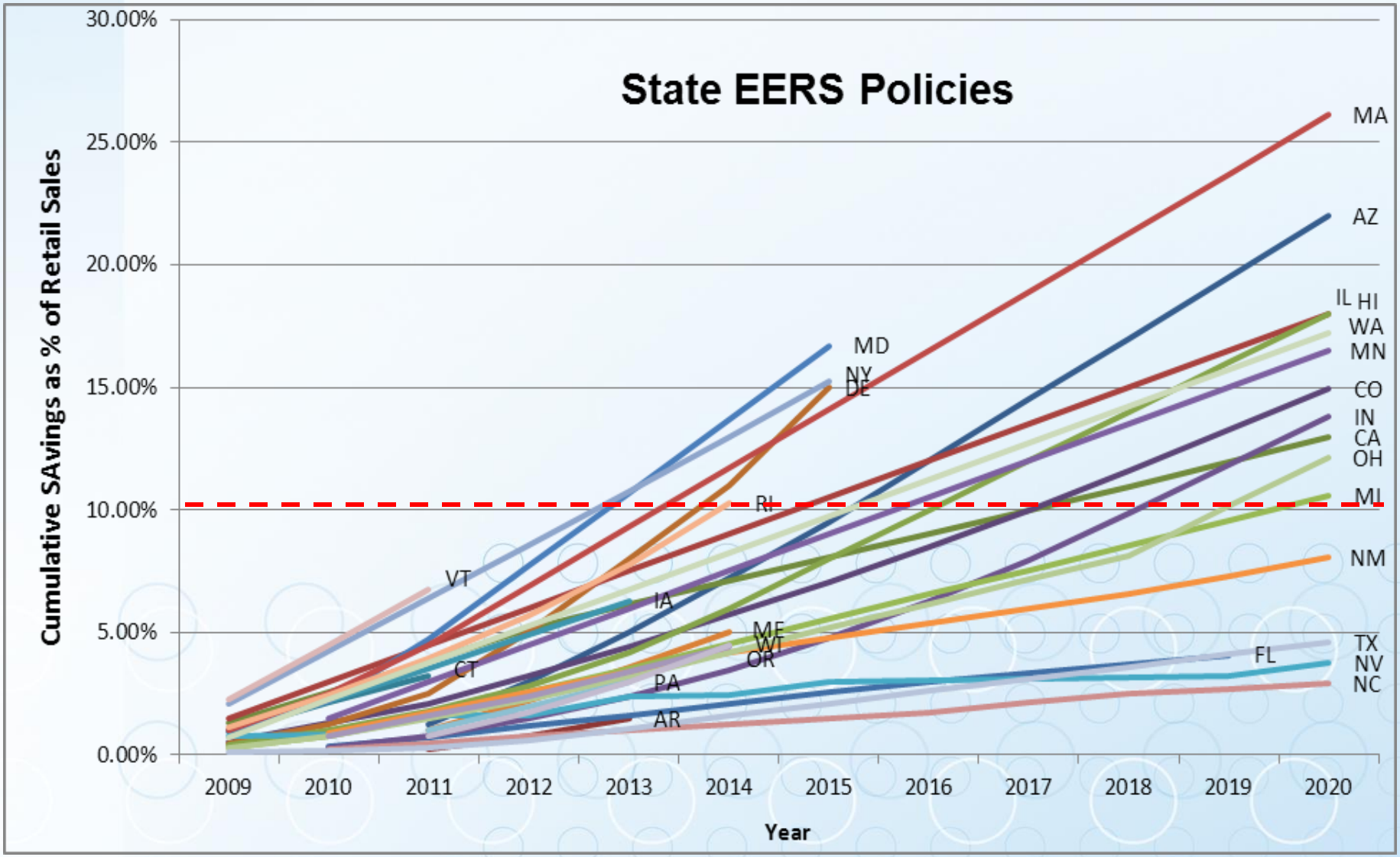

Eleven geographically dispersed states have committed to long-term targets to achieve over 10% cumulative annual savings by 2020

Cumulative Electricity Savings of State EERS Policies Extrapolated to 2020

State	Cumulative 2020 Target	State	Cumulative 2020 Target
Vermont*	27.00%	**Wisconsin***	13.50%
Maryland*	26.70%	**Maine***	13.40%
New York*	26.50%	**Connecticut***	13.14%
Massachusetts	26.10%	**California**	12.94%
Rhode Island*	25.26%	**Ohio**	12.13%
Arizona	22.00%	**Michigan**	10.55%
Illinois	18.00%	**Oregon***	10.40%
Hawaii*	18.00%	**Pennsylvania***	9.98%
Washington	17.24%	**New Mexico**	8.06%
Minnesota	16.50%	**Arkansas***	6.75%
Iowa*	16.10%	**Texas**	4.60%
Delaware	15.00%	**Florida**	4.06%
Colorado	14.93%	**Nevada**	3.76%
Indiana	13.81%	**North Carolina**	2.92%

*Savings beginning in 2009 extrapolated out to 2020 based on final year of annual savings required

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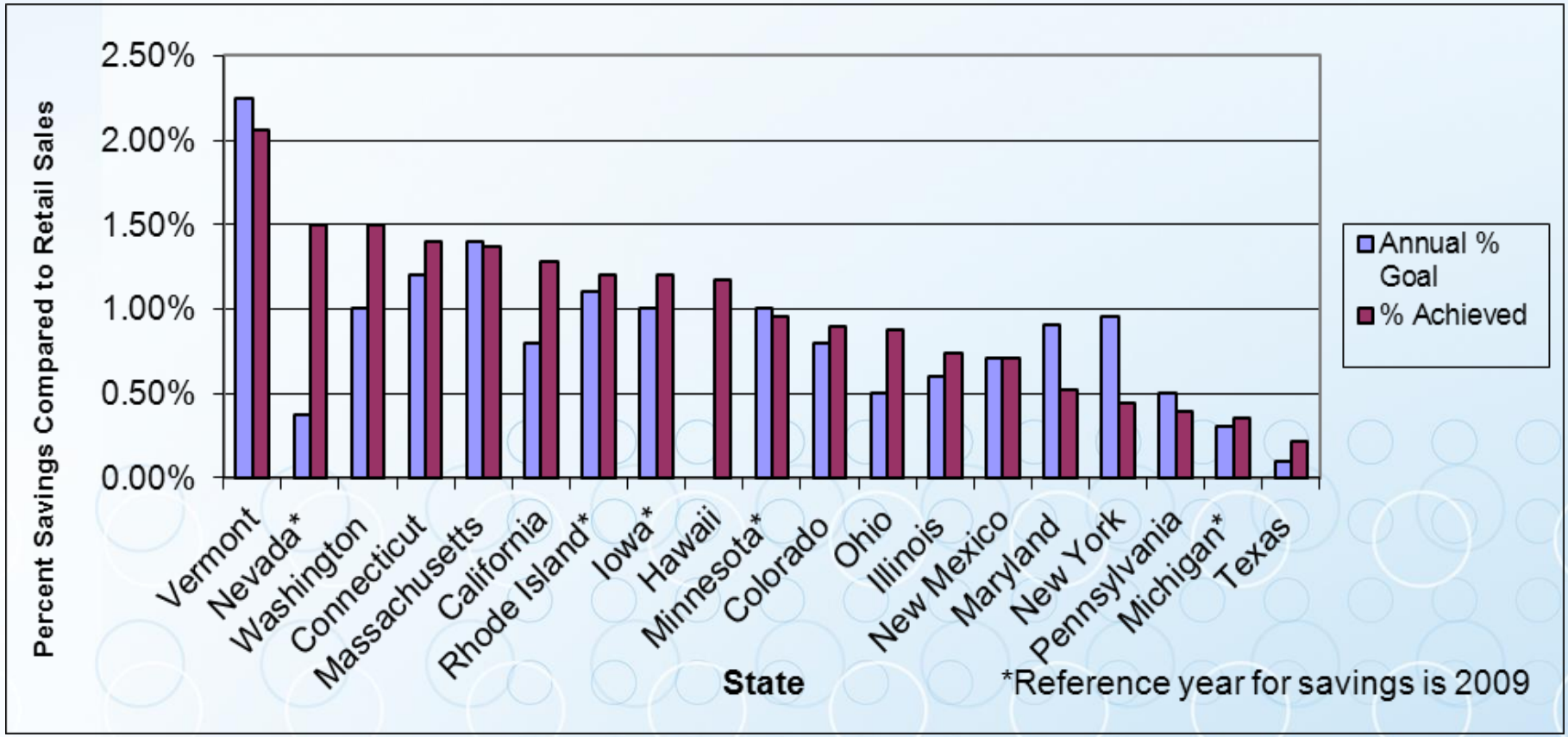
Note: Assumptions and methodology detailed in full report

Results of ACEEE EERS "Progress Report"



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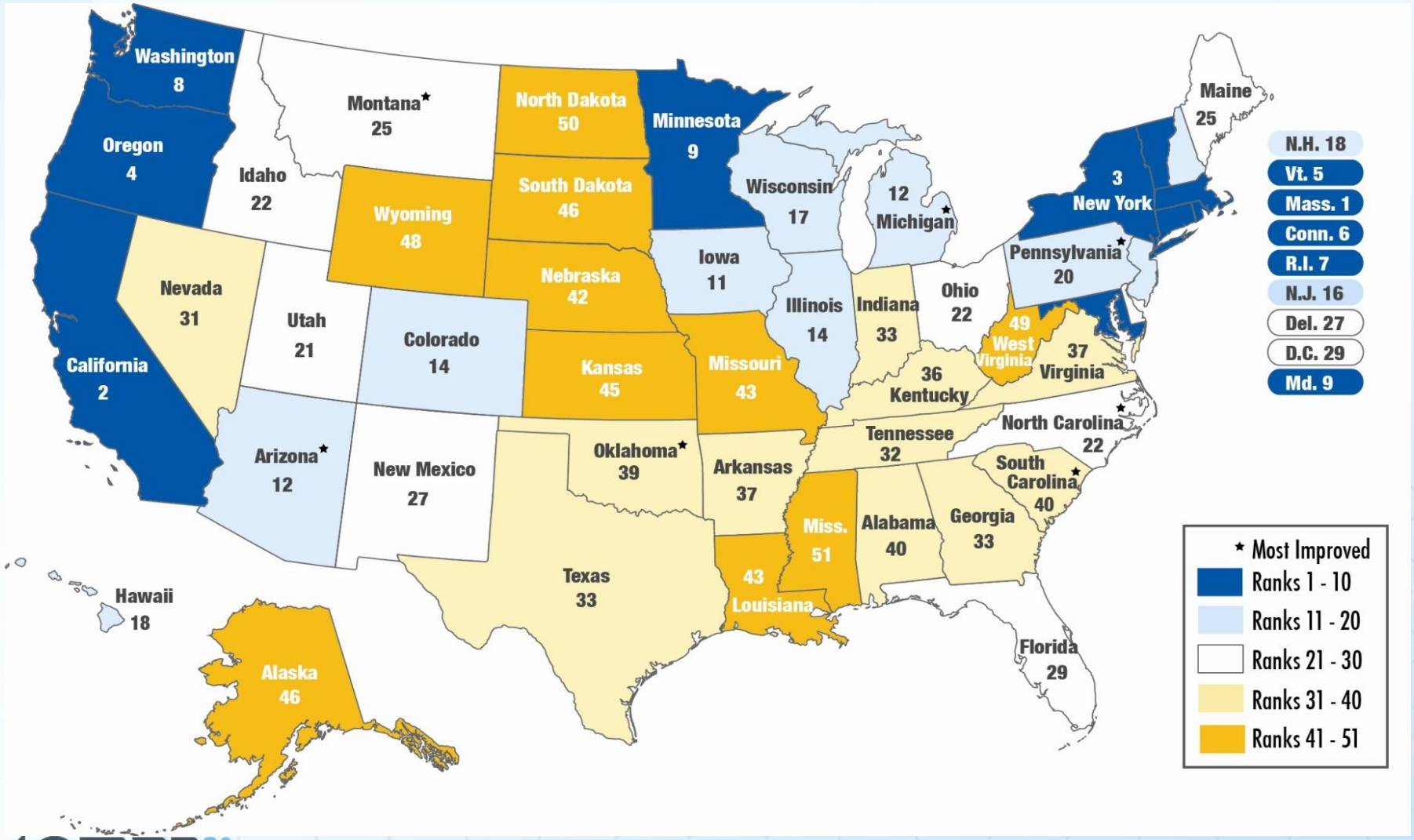
2012 ACEEE State EE Scorecard Rankings



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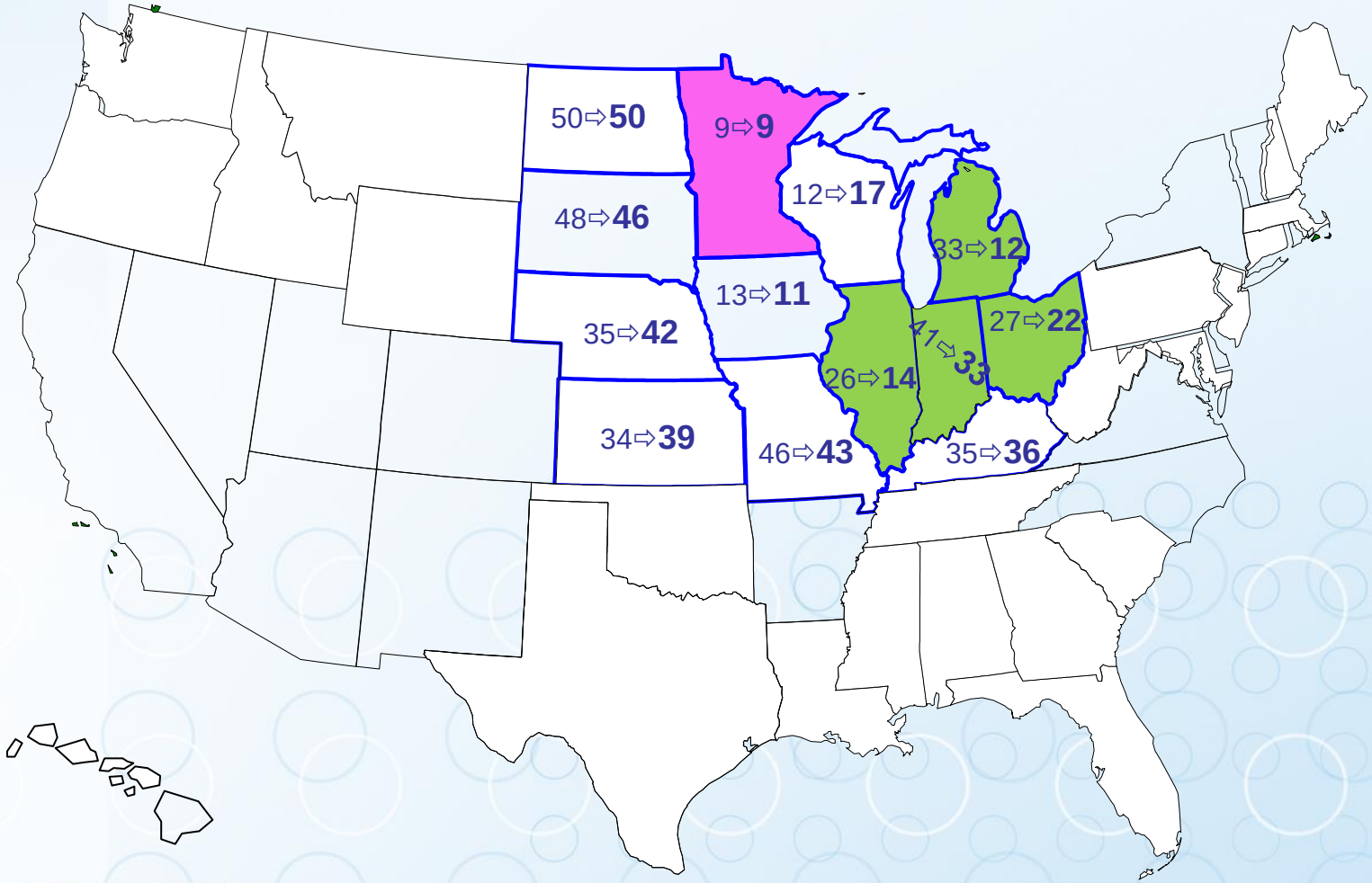
CHANGE IN ACEEE OVERALL EE SCORECARD RANKINGS MIDWEST STATES 2006 ⇨ 2012



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GRADING MINNESOTA… ON UTILITY-SECTOR ENERGY EFFICIENCY POLICIES AND PERFORMANCE

Overall grade: **B+/A-**

Areas for improvement to be truly "top tier":

- Find ways to push beyond 1.5%/year
- Balance the 3-legged stool (moderate incentives , add decoupling)
- Improve industrial customer buy-in to the EE strategy
- Find a way to capture CHP as a win-win for all
- Formally incorporate utility EE in state air quality objectives (ideally including GHG)
- Ensure good performance by all utilities
- Use hook-up fees and rate design to incentivize EE

CONCLUSIONS

- Minnesota has a very good record on utility energy efficiency
- There are substantial opportunities to do even better
- Minnesota's energy import dependence and energy dollar drain provide extra impetus to the state's interest in pursuing energy efficiency
- Considering 'climate' (GHG) goals only adds frosting to the cake

APPENDIX

WHAT IS AN "ENERGY EFFICIENCY PROGRAM" ?

*An **organized and comprehensive** effort to try to encourage customers (residential and business) to implement energy efficiency improvements*

Key elements

- Public information, education and persuasion
- Information, training, and incentives to "trade allies" (retailers, contractors, etc.)
- Economic incentives for customers (e.g., rebates)
- Quality control, monitoring, and evaluation

> Customers can often save 10-30% on utility bills

[ACEEE has done several national studies to identify exemplary utility energy efficiency programs]

ENERGY SAVINGS FROM RATEPAYER-FUNDED NATURAL GAS ENERGY EFFICIENCY PROGRAMS

- Historically, data for natural gas energy efficiency have not been as consistently reported as for electricity
- ACEEE's recent report provides data for individual states, for certain years where it is available
- Based on cost and savings data for 42 individual years across 12 states, one can calculate:
  - Average utility cost of saved gas: $2.88/Mcf
  - **Median cost: $2.70/Mcf**
  - Range: $0.57 to $7.42/Mcf
  - 78% of all state/year results were < $4.00/Mcf

SOME OTHER GOOD EXAMPLES OF NATURAL GAS ENERGY EFFICIENCY SAVINGS RESULTS

- An ACEEE national review in 2009 of 6 states with major natural gas EE programs found a ***median cost of conserved energy of $3.70/Mcf***, with a range of $2.70 to $5.50/Mcf

  http://www.aceee.org/research-report/u092

- A SWEEP review in 2006 of 9 leading utilities around the U.S. found a median savings of 0.5% of annual sales (with a range of 0.1% to 1.0%/year), and a ***median benefit-cost ratio of 2.4 to 1*** (with gas wholesale prices at ~ $6.00/Mcf)

  http://www.swenergy.org/publications/documents/Natural_Gas_DSM_Programs_A_National_Survey.pdf

- An ACEEE study in 2005 provided case studies of key programs at nine leading natural gas utilities, which reported saving gas at a ***median cost of $2.50/Mcf***, with a range of $1.50 to $4.10/Mcf

  http://www.aceee.org/research-report/u051

TWO BASIC MECHANISMS FOR ADDRESSING LOST REVENUES

- **Decoupling** – Essentially, "truing up" for actual sales above or below forecast

  NOTE: INCREASING THE FIXED CHARGE COMPONENT OF THE BILL IS **NOT** "DECOUPLING" !!!

- **Direct lost revenue compensation**

  DIRECT LOST REVENUE RECOVERY HAS SEVERAL DISADVANTAGES, AND HAS FALLEN OUT OF FAVOR

  - Vulnerable to 'gaming'
  - Leads to very contentious reconciliation hearings
  - Doesn't do anything to address the utility disincentive regarding broader energy efficiency policies (e.g., codes and standards),
  - Nor does it diminish the general utility interest in pursuing load-building

RATIONALE FOR 'TRUE' DECOUPLING

- Utilities have rates established based on approved costs and an authorized rate of return, spread over a forecasted level of sales
- If EE programs cause sales to decline below forecasted levels, such that authorized fixed costs are not recovered, there is a 'moral argument' for allowing those costs to be collected (in exchange for the utility providing energy efficiency programs)
- However, if sales are still above the forecasted level, there is no actual deficit in recovering authorized costs, and no moral argument for collecting 'lost revenues'
- True symmetrical 'decoupling' recognizes those factors and simply 'trues up' actual sales to forecasted sales + or –

[in contrast, direct lost revenue recovery can lead to, in essence, 'double dipping', if sales are still above forecast]

HOW **LOCAL COMMUNITIES** BENEFIT FROM UTILITY SECTOR ENERGY EFFICIENCY PROGRAMS

- **Direct local employment** (installers, electricians, skilled trades, service occupations and retail)
- **Direct savings on utility bills for customers participating** in the energy efficiency programs (10-30% savings is possible)
- Indirect benefit from **reduced dollar drain from the community** (i.e., re-spending of the $ savings by customers)
- **Reduced air emissions** from fossil fuel combustion (& urban areas tend to have the most serious air quality problems …NOx, ozone, smog, mercury, particulates)

ECONOMIC RESULTS FROM WISCONSIN

EFFECTS OF 10 YEARS OF ENERGY EFFICIENCY PROGRAMS:

- 25,000 net additional job-years
  (91,000 over life of measures)
- $1.1 billion additional net labor income
  ($5.7 billion over life of measures)
- $1.9 billion net business activity increase
  ($12 billion over life of measures)
- 40 to 60 net additional job-years per million $ of EE program spending
  [~1/3 are direct ("green jobs"), the rest are induced by re-spending of saved utility bill $; reducing energy imports; improved in-state business competitiveness, and indirect effects on the "supply chain" for energy efficiency products.]