

ENERGY EFFICIENCY AS A UTILITY SYSTEM RESOURCE

Martin Kushler, Ph.D.

Director, Utilities Program

American Council for an Energy-Efficient Economy

Presentation to the Energy Efficiency Workgroup

Michigan 21st Century Energy Plan Process

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TOPICS

1. Definitions
2. Energy Efficiency as a Resource (leading examples)
3. National Overview of Utility Energy Efficiency Activity
4. How Does Michigan Compare?
5. Policies and Programs
6. A Benchmark Target for Michigan

Definitions

ENERGY CONSERVATION

Saving energy by doing with less or doing without (e.g., setting thermostats lower in winter and higher in summer; turning off lights; taking shorter showers; turning off air conditioners; etc.)

ENERGY EFFICIENCY

Measures which result in producing the same or better levels of amenities (e.g., light, space conditioning, motor drive power, etc.) using less energy. Measures are generally long-lasting and save energy across all time periods for which the end-use equipment is in operation.

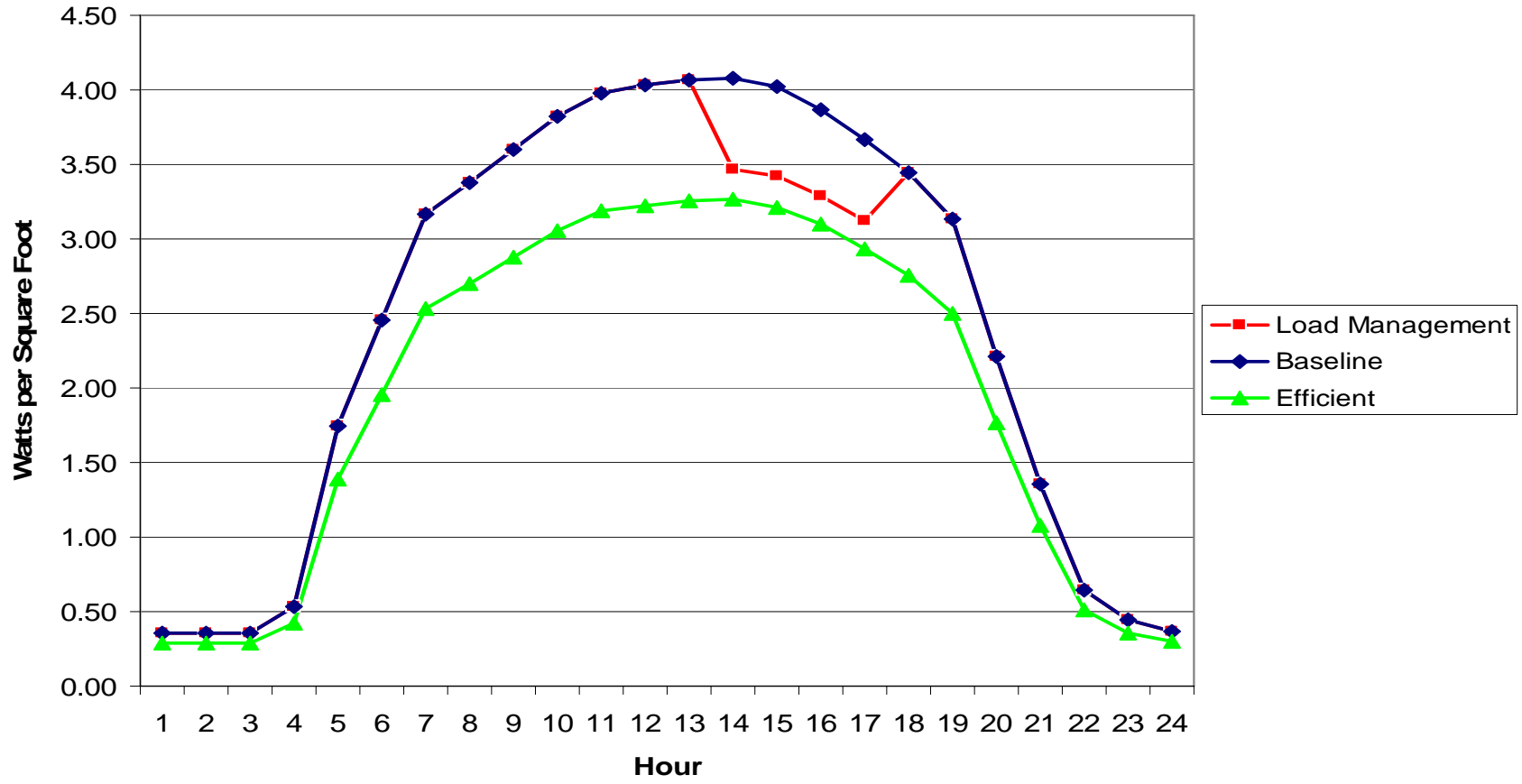
Definitions (continued)

LOAD MANAGEMENT (Including Demand Response)

Load management programs seek to lower peak demand during specific, limited time periods, by temporarily curtailing electricity usage or shifting usage to other time periods.

Energy Efficiency Compared to Load Management (4 hr curtailment)

Combined Commercial Cooling and Lighting Loadshape
Baseline, Load Management (STDR), and Energy Efficiency



COMPARISON OF BENEFITS

ENERGY EFFICIENCY

- can reduce system peak demand
- reduces total energy consumption
- reduces consumption of natural resources
- reduces air emissions
- can reduce energy imports
- effects are long-lasting

LOAD MANAGEMENT (& DEMAND RESPONSE)

- reduces system peak demand very well
- little or no effect on total energy use
(or possibly even increases usage)
- little or no effect (or possibly negative) on:
use of resources; air emissions; energy imports
- effects are temporary and short duration

One Problem

The electric industry prefers load management/DR and is mildly to openly averse to energy efficiency.

(See: Regulating Electric Distribution Utilities as if Energy Efficiency Mattered)

Primary reason:

Utilities and other electricity suppliers prefer Load Management/DR because it lowers peak demand during the highest cost time periods without really reducing their total sales or throughput of electricity.

Energy Efficiency may reduce peak demand, but it also reduces overall sales (thus adversely affecting short term profits).

For these reasons, energy efficiency requires public/regulatory policy to make it happen.

WHAT IS AN “ENERGY EFFICIENCY PROGRAM” ?

An organized effort to try to encourage and facilitate customer implementation of energy efficiency improvements (residential and business)

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

[Note: providing brochures and web sites with “conservation tips” does NOT count!]

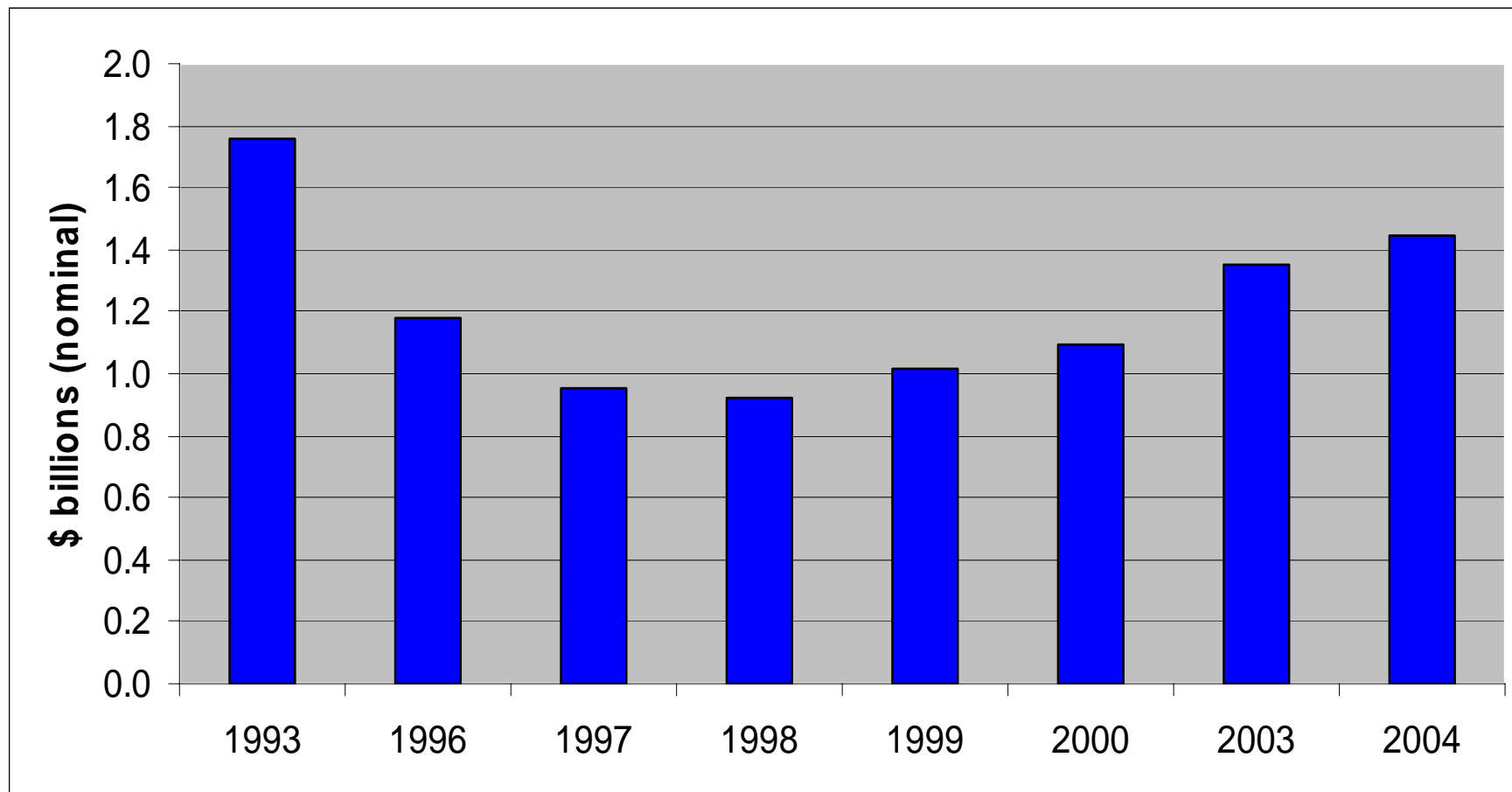
Key Points from this Presentation

1. Energy Efficiency is more than a ‘virtue’....
it’s a RESOURCE
2. Energy Efficiency costs less than new supply
3. Energy Efficiency requires policy and regulatory action
4. Proven examples are readily available

Energy Efficiency as a Resource

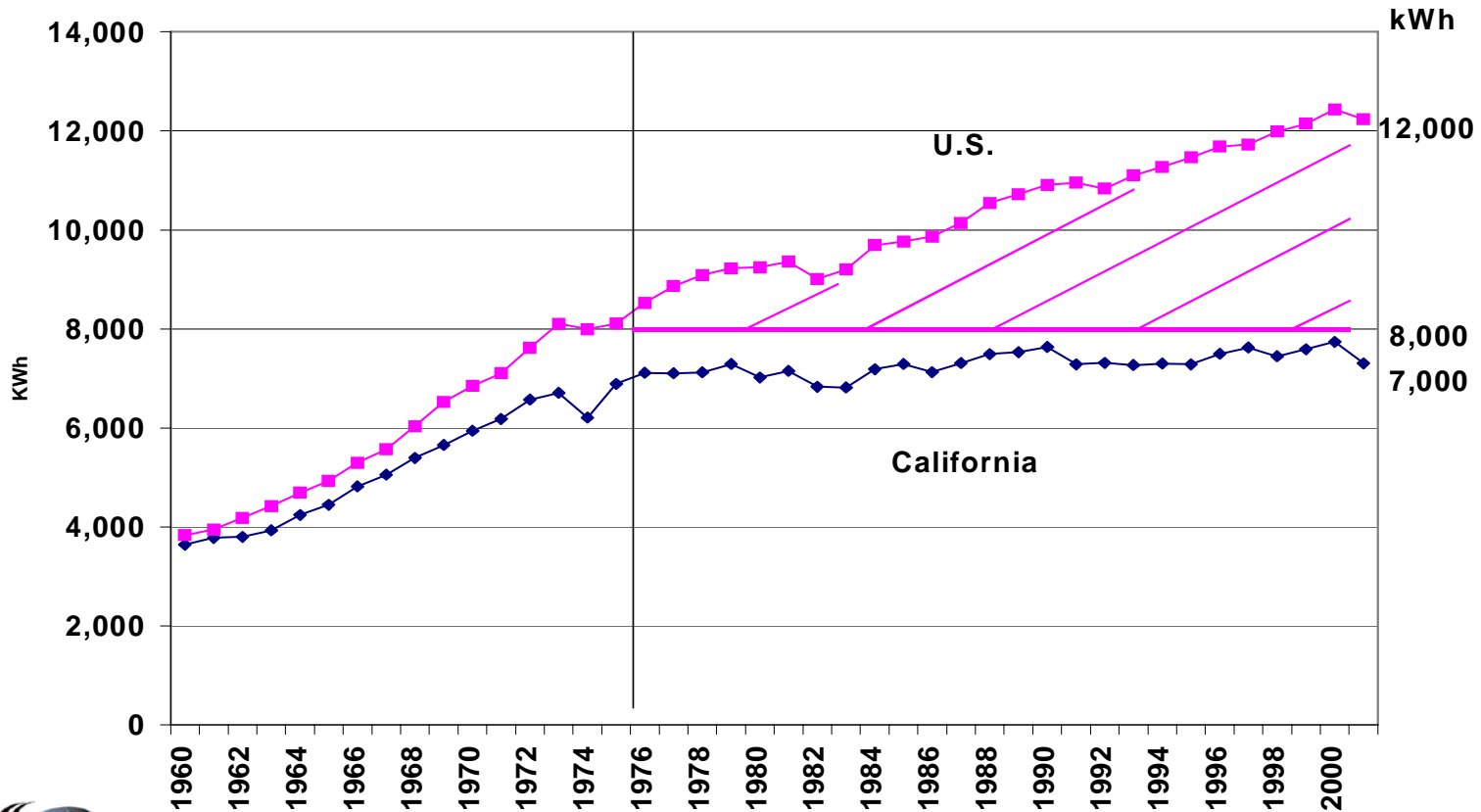
- Really began with Integrated Resource Planning (IRP) and Demand Side Management (DSM)
- DSM from 1985-1994: 29,000 MW @ \$.03/kWh
[see RAP report: *Efficient Reliability...* Cowart, 2001]
- A number of states have reported avoiding multiple power plants over time with energy efficiency
- Use of Energy Efficiency dropped significantly with the onset of “restructuring”, but has made a major comeback (see next slide)
- Several excellent examples out there.

Annual Spending on Utility Sector Energy Efficiency Programs 1993-2004 [nominal dollars]



CALIFORNIA: THE LEADING U.S. EXAMPLE OF ENERGY EFFICIENCY POLICIES & PROGRAMS

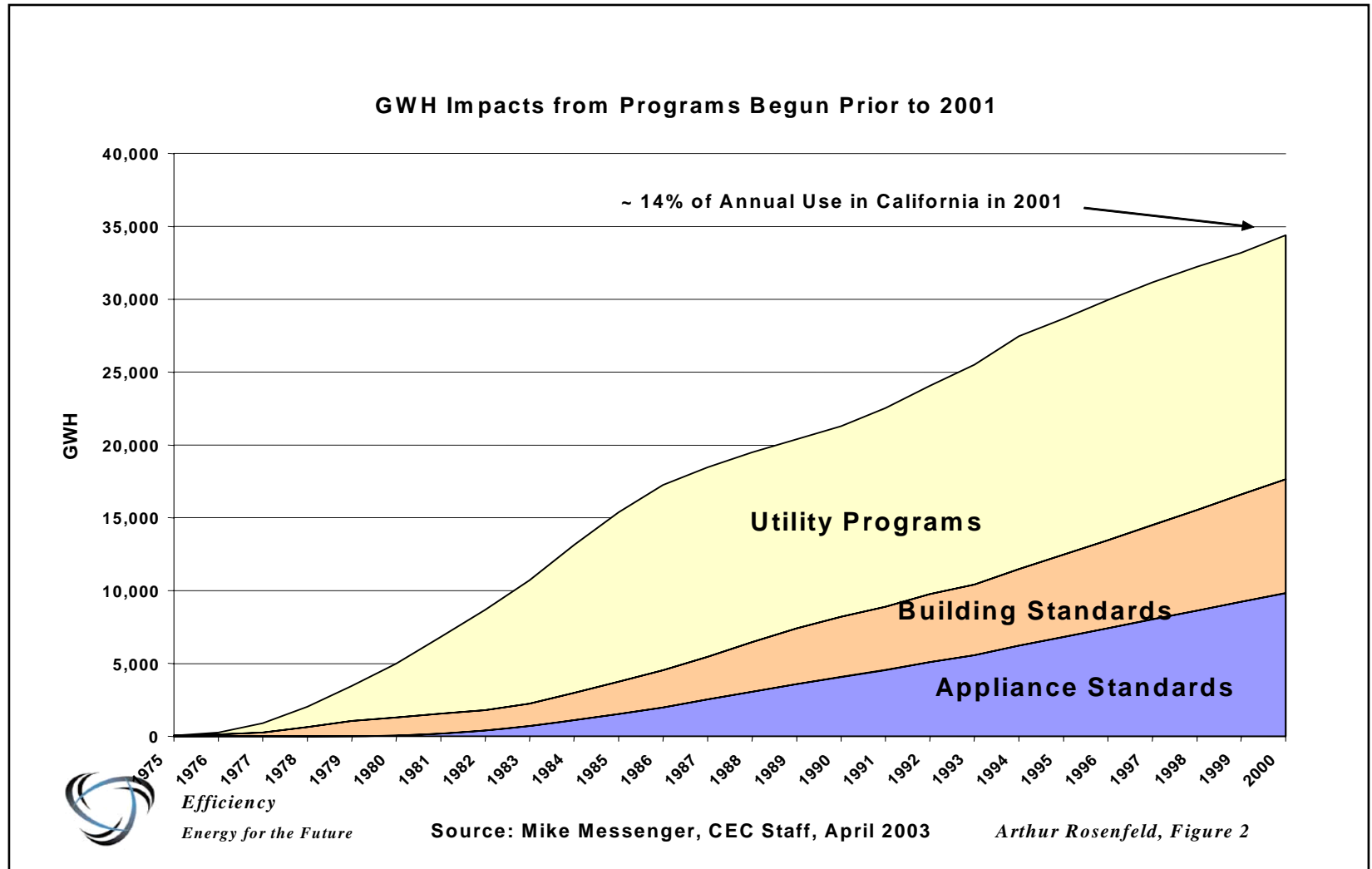
Total Electricity Use, per capita, 1960 - 2001



Efficiency
Energy for the Future

Arthur Rosenfeld, Figure 1

HERE'S HOW THEY DID IT



CALIFORNIA'S PROVEN RESULTS

Most Recent 5-Year Evaluation of their SBC Programs (2000-2004)

- \$1.4 billion spent on utility energy efficiency programs
- Annual savings: 1,100 to 1,900 GWh
225 to 450 MW
- Overall levelized cost: 2.9 cents/kWh

*Funding and Savings for Energy Efficiency Programs for Program
Years 2000 Through 2004, California Energy Commission,
July 2005*

MAXIMUM SHORT-TERM IMPACTS: THE AMAZING CALIFORNIA STORY

By almost any measure, the events surrounding the electricity system reliability crisis in California in the 2000/2001 time period were simply extraordinary.

- Unprecedented electric system challenges
 - Over 70 days of electric system emergencies declared
 - Several incidents of deliberate rolling blackouts
- Unprecedented energy efficiency policy response
 - CA allocated over \$900 million to Energy Efficiency programs in 2001 (tripled existing levels)
 - Roughly equivalent to the entire rest of the nation combined

CONSERVATION AND EFFICIENCY WORKED

This was arguably one of the most dramatic and successful short-term public policy interventions in modern history

- 10 percent average cut in summer peak demand
- 6.7 percent reduction in total annual electricity use
- No incidences of rolling blackouts after the winter of 2000/2001
- Helped break the back of the electricity cartel

*Examining California's Energy Efficiency Policy
Response to the 2000/2001 Electricity Crisis*

(Kushler & Vine, ACEEE 2003)

CALIFORNIA NOW BREAKING NEW GROUND

- In 2003, CA established state policy of Energy Efficiency as their 1st priority resource in their “loading order” of utility resource acquisition.
- Have more than doubled their utility Energy Efficiency investment (SBC plus resource recovery in rates)
- CA utilities will spend \$2 billion on Energy Efficiency programs over 2006-2008 period.
- Expect to meet over half of forecasted load growth with Energy Efficiency

ANOTHER GREAT EXAMPLE: THE PACIFIC NORTHWEST (ID, MT, OR, WA)

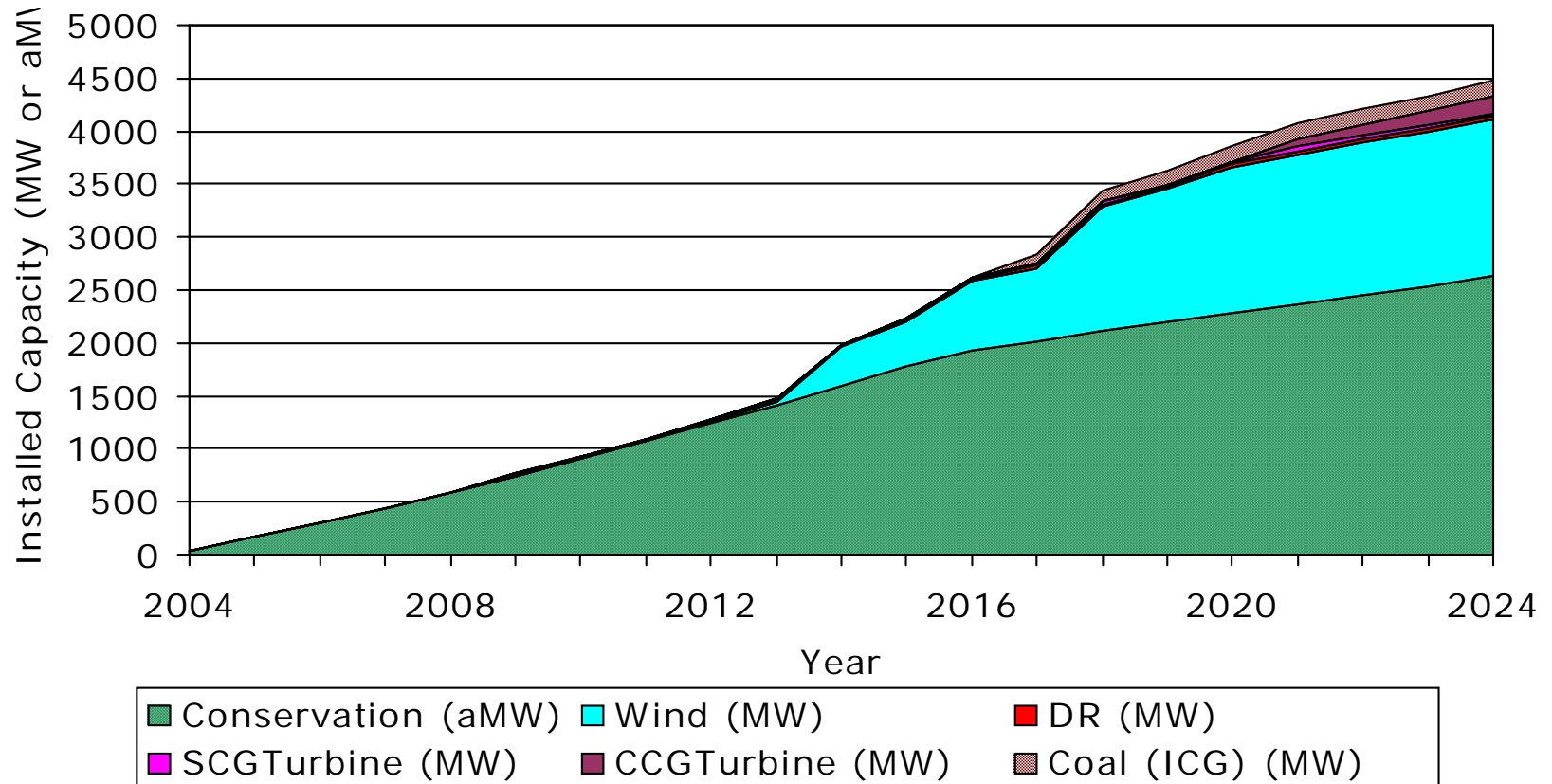
- Best electric resource planning process in the U.S.
- 20 years of energy efficiency program experience
- The Pacific NW expects energy efficiency to meet all forecasted needs for new electricity resources through 2012, and half of all new resource needs thru 2025
- Based on historical program evaluations results, they project an overall levelized cost of 2.4 cents/kWh

The Fifth Northwest Electric Power and Conservation Plan,
Northwest Power and Conservation Council, Portland,
Oregon, May 2005.

[<http://www.nwcouncil.org/energy/powerplan/plan/>]



NW Plan Relies on Conservation and Renewable Resources to Meet Load Growth



Other Examples of Energy Efficiency Program Cost-effectiveness

State	Benefit/Cost All programs	B/C Comm/Ind programs	B/C Residential programs	Cost of saved energy (\$/kWh)
California	2.0 – 2.4			0.03
Connecticut	NA	2.4 to 2.6	1.5 to 1.7	0.023
Maine	1.3 – 7.0			
Massachusetts	2.1	2.4 to 2.7	1.3 to 2.1	0.04
New Jersey				0.03
New York				0.044
Rhode Island	2.5	3.3	1.5	
Vermont	2.5	2.9	1.8	0.03
Wisconsin	3.0	2.0	4.3	
<i>Median</i>	2.1 to 2.5	2.5 to 2.6	1.6 to 1.7	0.03

STATES SETTING AGGRESSIVE ENERGY EFFICIENCY RESOURCE GOALS

- Texas law requires utilities to meet 10% of projected load growth thru energy efficiency. (This has proven so easy that they are considering increasing the target to 20% to 50%.)
- California utilities are now funding energy efficiency to meet over 50% of forecasted growth. (California utilities will spend \$2 billion on energy efficiency programs in next 3 yrs)
- The Pacific NW expects energy efficiency to meet all forecasted needs for new electricity resources through 2012, and half of all new resource needs thru 2025
- Vermont is considering targeting negative load growth as an goal, through aggressive energy efficiency programs.



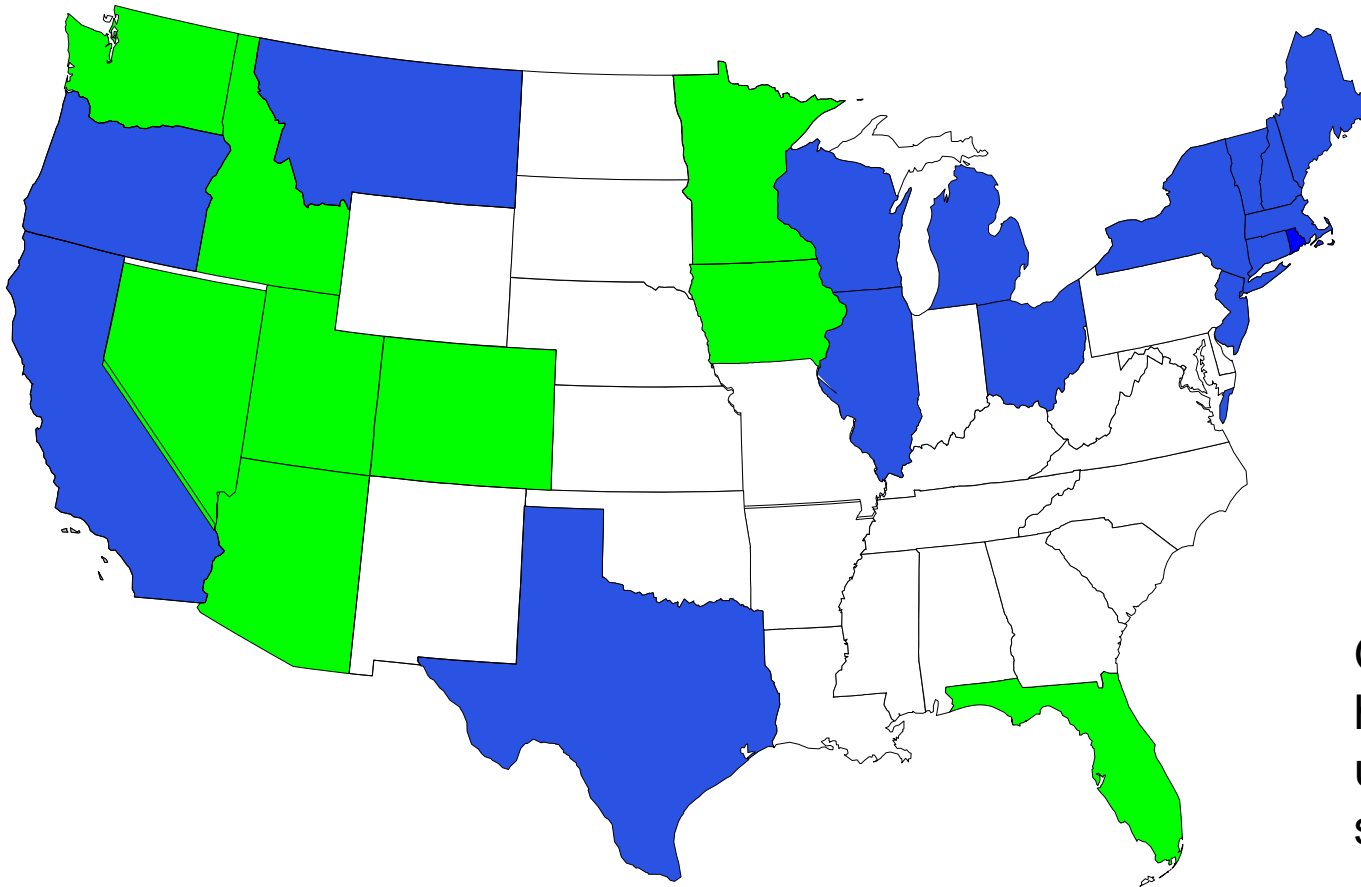
EVEN IN RESTRUCTURED STATES

“Resource Procurement” – newest emerging paradigm in restructured states*

- a. Retail markets for electricity have not developed (esp. for residential and small & medium commercial customers)
- b. Vast majority of customers are on “default” service
- c. Simply buying for them on the spot market is inefficient and risky
- d. Movement to put responsibility for a well-designed portfolio of resources for default service back on the utility (CA is the leading example...EE is priority resource...\$1 billion extra EE over 2006-2008.)

* In non-restructured states, traditional IRP and EE still apply.

States with utility sector energy efficiency programs—public benefits or DSM



Blue states have public benefit funds that support EE

Green states have utility DSM under regulated structure

Structure and delivery of energy efficiency programs and services

- Utilities are still the primary providers of energy efficiency programs—including public benefits programs. But “non-utility” segment is growing.
- ACEEE research shows that numerous structures are possible for administration and delivery of services—no single “best model”

Leading Examples of non-utility public benefits programs

- Efficiency Vermont—the statewide “energy efficiency” utility
- Energy Trust of Oregon
- Focus on Energy [Wisconsin]
- New York Energy \$mart
- Efficiency Maine
- Others: OH and IL have small programs with state administration

FOR MORE INFORMATION

See state-by-state summaries in the appendices of:

Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies

[<http://www.aceee.org/pubs/u042.htm>]

- descriptive summaries of 21 states plus DC
- cites to orders, legislation and reports
- contact persons

So how does Michigan compare?

2004 Elec Utility Energy Efficiency Spending Per Capita

Rank	State	Spending/Capita
1	Vermont	\$22.54
2	Massachusetts	\$20.81
3	Oregon	\$17.51
4	Connecticut	\$16.60
5	Washington	\$14.28
6	Rhode Island	\$12.95
7	New Hampshire	\$11.64
8	Minnesota	\$10.95
9	New Jersey	\$10.68
10	California	\$10.60
11 (tie)	Iowa and Wisconsin	\$ 9.76
	U.S. Average	\$ 4.93
	Michigan	\$ 0.79

MICHIGAN WAS ONCE A LEADER IN UTILITY ENERGY EFFICIENCY PROGRAMS

- **In the early 1990's, Michigan was among the national leaders in utility efficiency programs.**
- **Our top utilities were spending 1 to 2% of revenues on energy efficiency**
- **Independent evaluations documented that the energy efficiency programs were very cost-effective (1.5 to 2.6 cents per kWh saved)...less than half the cost of new electric supply.**
- **The programs were very popular with the public**

Energy Efficiency Programs are Very Cost-Effective

COST OF CONSERVED ENERGY ACHIEVED^[1]

[from states with high quality evaluation data]

California	1.6 cents to 2.9 cents/kWh (U.S. \$)
Connecticut	2.3 cents/kWh
Massachusetts	3.2 cents/kWh
Minnesota	1.3 cents/kWh
Mich CPCo	2.6 cents/kWh
Mich DECo	1.5 cents/kWh
Vermont	2.6 cents/kWh

Typical current market cost, generation only: 5.0 cents/kWh

Fully loaded costs, incl. generation, transmission, distribution:
6.0 to 10.0 cents/kWh

^[1] Levelized cost of saving electricity, over the useful lifetimes of the measures installed.

Why energy efficiency is even more important today

- Energy efficiency is still the least-cost resource
- Growing risks associated with new power plant construction
 - Construction costs
 - Fuel price risks
 - Future environmental costs (esp. Mercury and CO₂)
- Yes, global warming is real. (and energy efficiency is a proven, cost-effective means to reduce emissions...being extensively modeled in New England's RGGI process)

EVEN EPRI IS GETTING INTO THE ACT

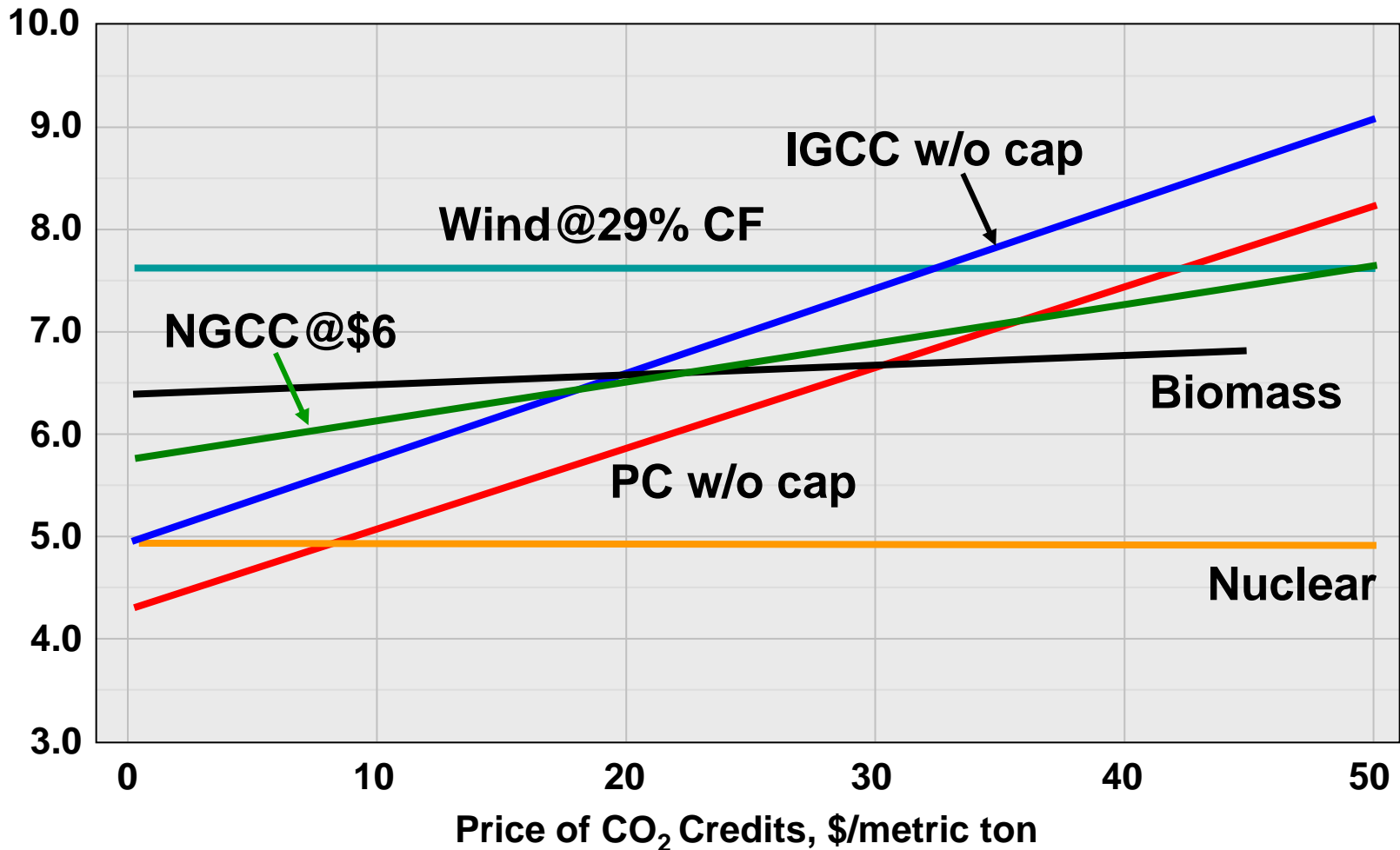
Efficiency and Demand Response

NARUC
Washington, DC
February 14, 2006

Steve Specker
President & CEO
EPRI

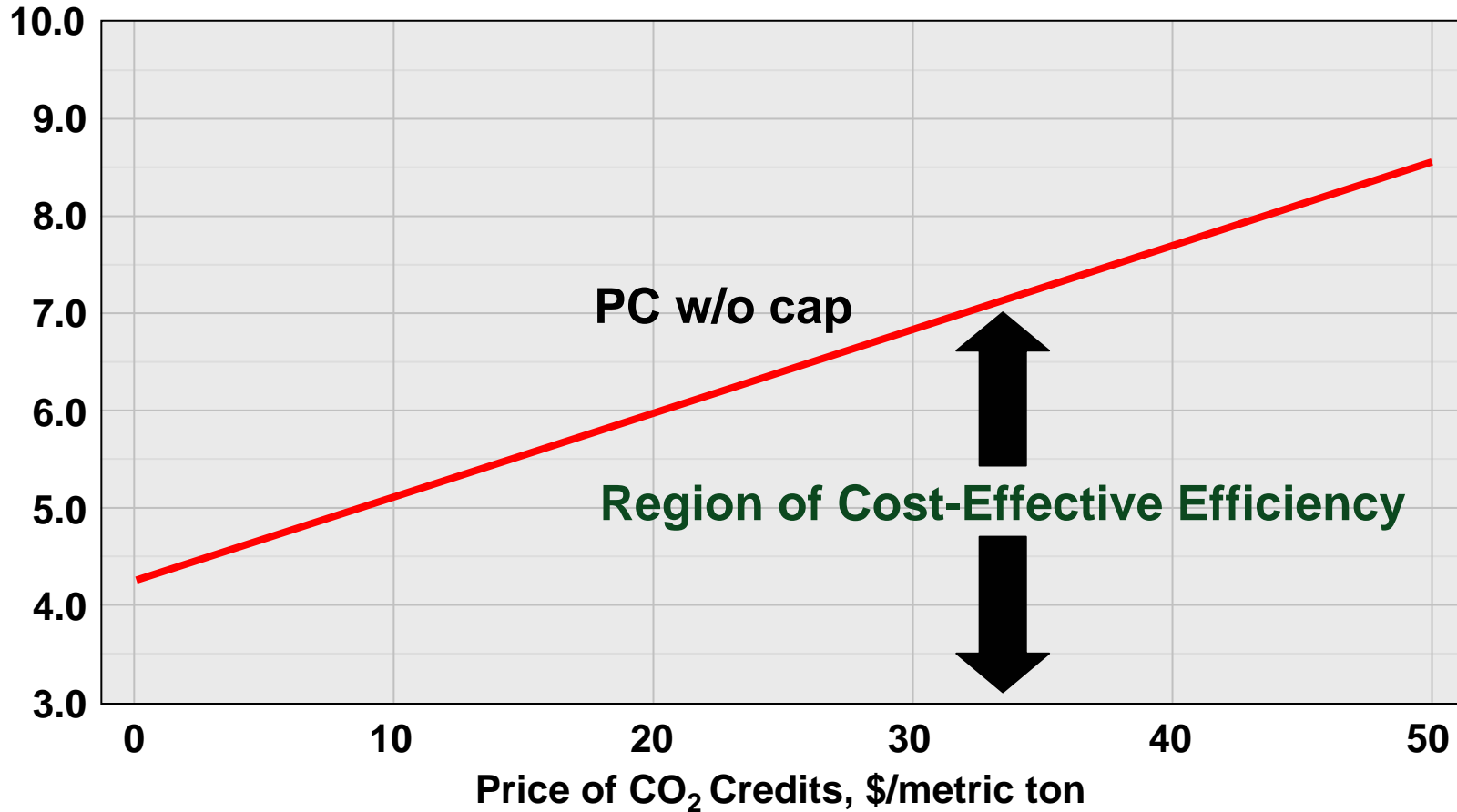
Comparative Costs of “CO₂-Free” Generation

Levelized Cost of Electricity, cents/KWh



Cost Effective Efficiency

Levelized Cost of Electricity, cents/KWh



Key Points (EPRI)

- Energy efficiency (EE) and demand response (DR) can be cost-effective alternatives to adding new capacity
- Programmatic approaches to EE and DR have been successful, but have only “scratched-the-surface” of what’s possible
- Huge opportunity to utilize technology, innovation, and markets to drive EE, DR, and overall electricity utilization

Why energy efficiency is even more important today

- Energy efficiency can provide T&D system reliability benefits—reduce overall and targeted loads to reduce system stress—reduce scale or delay need for expansions and upgrades
- Energy efficiency can provide broader economic benefits—create jobs and help reduce overall energy prices

[Economic benefits especially important in a state that **imports 100% of the coal and uranium fuel, 96% of the petroleum, and 3/4ths of the natural gas we use.**]

Energy Efficiency Produces a Wide Variety of Benefits

- Transmission and distribution level savings
- Reduced environmental emissions
- Local economic benefits
- Helps hold down the market cost of energy

A good reference: *Efficient Reliability: The Critical Role of Demand-Side Resources in Power Systems and Markets*

by Richard Cowart, Regulatory Assistance Project,
Vermont, June 2001

<http://www.raonline.org/Pubs/General/EffReli.pdf>

Energy Efficiency and Reliability

Using Targeted Energy Efficiency Programs to Reduce Peak Electrical Demand and Address Electric System Reliability Problems Nadel, et.al. ACEEE, 2000

That report profiles six key energy efficiency technologies

- Res. A/C equipment (new & retrofit)
- Res. A/C tune-up & repair
- C&I HVAC equipment
- Commercial building retro-commissioning
- C&I lighting retrofit
- C&I lighting advanced design

and concludes that they have the potential to save 64,000 MW over 10 years (~40% of projected growth in U.S. peak demand)

Energy Efficiency and Reliability (Continued)

Energy Efficiency and Electric System Reliability: A Look at Reliability-Focused Energy Efficiency Programs Used to Help Address the Electricity Crisis of 2001 Kushler, Vine and York, ACEEE, 2002.

<http://aceee.org/pubs/u021full.pdf>

- 22 “case studies” of successful examples of “reliability- focused energy efficiency programs” operated in 2001 from around the U.S.
- A review of other EE policy responses (executive, legislative, regulatory) that were implemented in various states in response to the electric system problems

Natural Gas Program Spending, Savings and Cost-Effectiveness

	Min	Max	Mean	Median	Total
Annual program spending: all programs* (n = 32) (\$ million)	\$0.079	\$36	\$3.7	\$0.954	\$131
Annualized 1st year savings: all programs* (million therms)	0.025	10	1.3	0.568	44.8
•Savings: residential programs (n = 20)	0.025	7.0	0.824	0.267	16.5
•Savings: C/I programs (n = 10)	0.025	10	2.4	1.3	23.9
Cost-effectiveness					
•Cost of conserved energy: 1 st year \$/therm (n = 8)	1.53	6.70	3.63	2.59	
•Cost of conserved energy: lifetime \$/therm (n = 7)	0.07	0.80	0.38	0.28	
•Benefit/cost ratio (n = 9)	1.08	5.05	1.98	1.42	

*All programs data include two portfolios of multiple programs

Key Point: Energy Efficiency Requires Policy and Regulatory Action

- Utilities will not voluntarily provide serious energy efficiency programs
- The “market” does not provide a viable substitute for utility sector energy efficiency programs

So, let's assume that Michigan wants to start capturing its significant energy efficiency potential...

UTILITY SECTOR POLICY APPROACHES

(The cornerstone of an overall state approach)

1. Establish binding **savings targets** for utilities/states
(e.g., an “**energy efficiency portfolio standard**”)
2. Provide funding for energy efficiency through state **system benefit funds**
3. Require funding for energy efficiency through electric and gas **utility rate cases**

[Funding approaches and programs can be tailored to meet the unique needs of each state. Some states are using a combination of approaches]

WHAT IS THE SIZE OF THE ENERGY EFFICIENCY RESOURCE?

- In 2004 ACEEE completed a “meta-analysis” of energy efficiency potential studies from around the U.S.¹
 - Median cost-effective “achievable” potential for energy efficiency was 24% of total forecasted electricity use
 - Median achievable potential equivalent to 1.2% of total electricity consumption per year
- [Note: leading states are saving 0.8% to 1.0% of total sales in current programs already]

¹ [*The Technical, Economic, and Achievable Potential for Energy Efficiency in the United States: A Meta-Analysis of Recent Studies*, Nadel, Shipley & Elliott, ACEEE, 2004.]

Some Example Energy Efficiency Potential Studies

				Potential (%)		
Region	Year	Fuel	Years	Tech	Econ	Achvbl
CA	2003	Elec	10	18%	13%	10%
MA	2001	Elec	5		24%	
NY	2003	Elec	20	36%	27%	
OR	2003	Elec	10	31%		
Puget	2003	Elec	20	35%	19%	11%
Southwest	2002	Elec	17			33%
VT	2003	Elec	10			31%
U.S.	2000	Elec	20			24%
Median		Elec		33%	21.5%	24%

Help is Available

Proven Programs for Electric Efficiency

America's Best: Profiles of America's Leading Energy Efficiency Programs

York & Kushler, ACEEE, 2003

<http://www.aceee.org/pubs/u032.htm>

Energy Efficiency and Electric System Reliability: A Look at Reliability-Focused Energy Efficiency Programs Used to Help Address the Electricity Crisis of 2001

Kushler, Vine and York, ACEEE, 2002.

<http://aceee.org/pubs/u021full.pdf>

A BENCHMARK TARGET FOR MICHIGAN

[Based on 20 states with restructuring related funding for energy efficiency and low-income programs.]

Energy Efficiency

- Range: 0.03 to 3.3 mills/kWh
- Median: 1.0 mills/kWh
- \$ Range: \$1.5 million to \$228 million/yr.

>>If Michigan spent at median:

1.0 mills/kWh =

\$100 million/yr. for electric energy efficiency

BENCHMARK TARGETS (CONT.)

Low Income:

_Range: 0.1 to 1.2 mills/kWh

- Median: 0.6 mills/kWh
- \$ Range: \$0.8 million to \$100 million

>> If Michigan spent at median:

0.6 mills/kWh = \$60 million/yr.

Total Energy Efficiency plus Low-Income Programs:

CURRENT MICHIGAN LI/EE FUND: ~ \$45 million/yr.

TOTAL NEEDED TO BE AT MEDIAN: \$160 million/yr.

[\$100 MILLION EE, \$60 MILLION LI]

ENERGY EFFICIENCY RESOURCE FUNDING IS NOT A "TAX" !

Rather, this would be having the utilities re-direct 1% or 2% of the \$7 billion in annual revenues in our electric system..

That 1% or 2% would be spent on energy efficiency resources instead of fossil fuel supply resources.

Because energy efficiency costs less than half as much, this would **reduce** the total cost of meeting Michigan's energy needs. [A dollar spent on energy efficiency saves 2 to 3 dollars on energy supply costs.]

ENERGY EFFICIENCY IS VERY POPULAR WITH THE PUBLIC

Surveys repeatedly show very strong public support for energy efficiency.

Plus, amazingly strong attitudes against importing more energy from outside the state. (MI, 1996)

% of the public that favors or strongly favors:

83% Energy Efficiency

72% Renewable Energy

30% Building a coal or natural gas power plant

21% Building a new nuclear power plant

**19% Buying more power from other states or
Canada**

CONCLUSIONS

- Energy Efficiency is a proven cost-effective resource.
- Energy Efficiency can save electricity at half the cost of constructing, fueling, operating and delivering electricity from a new power plant.
- Significant local economic and environmental benefits are a bonus.
- Michigan has fallen way behind leading states in energy efficiency.
- Policy/regulatory action will be required to make utility-sector energy efficiency happen. (Fortunately, excellent models are available.)