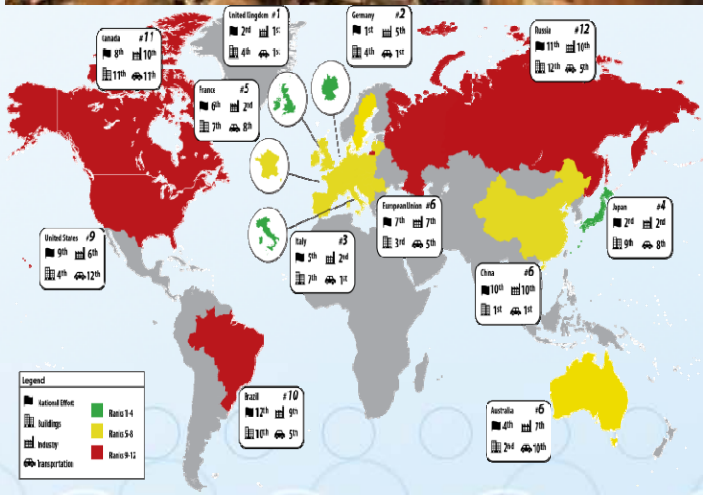
American Council for an Energy-Efficient Economy

Smart Approaches to Energy Efficiency: Learning from International Best Practices



Steven Nadel

American Council for an Energy-Efficient Economy (ACEEE)

February 2013

Summer Study

Summer Study: (1) A place where energy efficiency professionals gather to talk about energy efficiency from dawn to the wee hours while also enjoying sun, sand, wine and beer; (2) A place for out-of-the-box thinking and exploration of new ideas.

ACEEE
American Council for an Energy-Efficient Economy

ACEEE Summer Study

- Began in 1980; held in even years in California; 1000+ attendees in 2012

ECEEE Summer Study

- Held in odd years since 1993, generally on the French Riviera; 400+ attendees in 2011

ACEEE
American Council for an Energy-Efficient Economy

Summer Studies

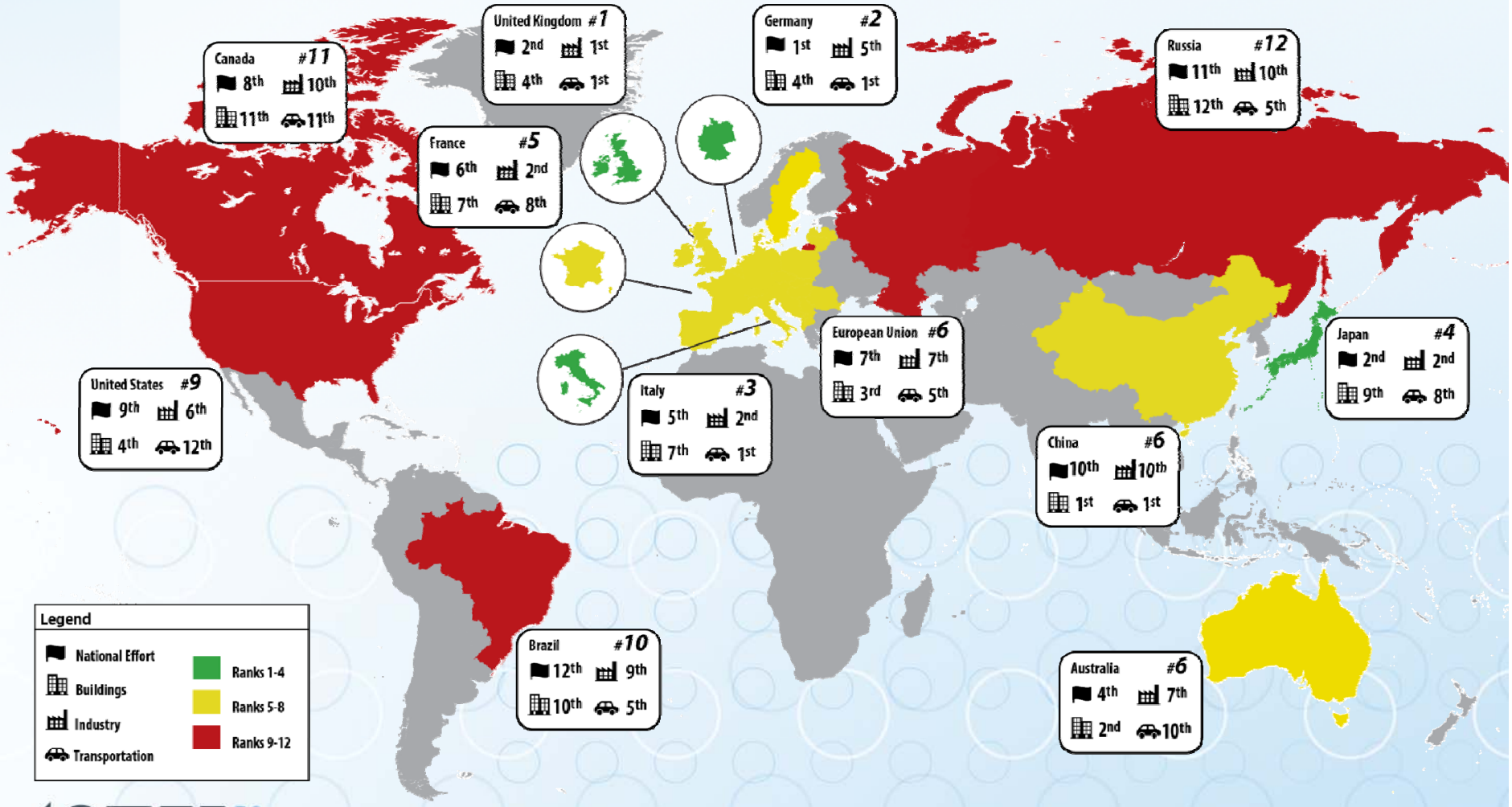
1. Latest in published research (e.g. 300+ refereed papers published in U.S.)
2. Many opportunities for informal interaction
   - Afternoon informal sessions
   - Nighttime social events
3. Plenaries on big picture topics

Making the Most of a Summer Study

- Disconnect from the home office – it's only a few days.
- Attend informal sessions or even set one up.
- Connect with people – e.g. share a beer with the person who's presentation you really liked that day.
- Rest up when you get home.

ACEEE
American Council for an Energy-Efficient Economy

ACEEE International Scorecard

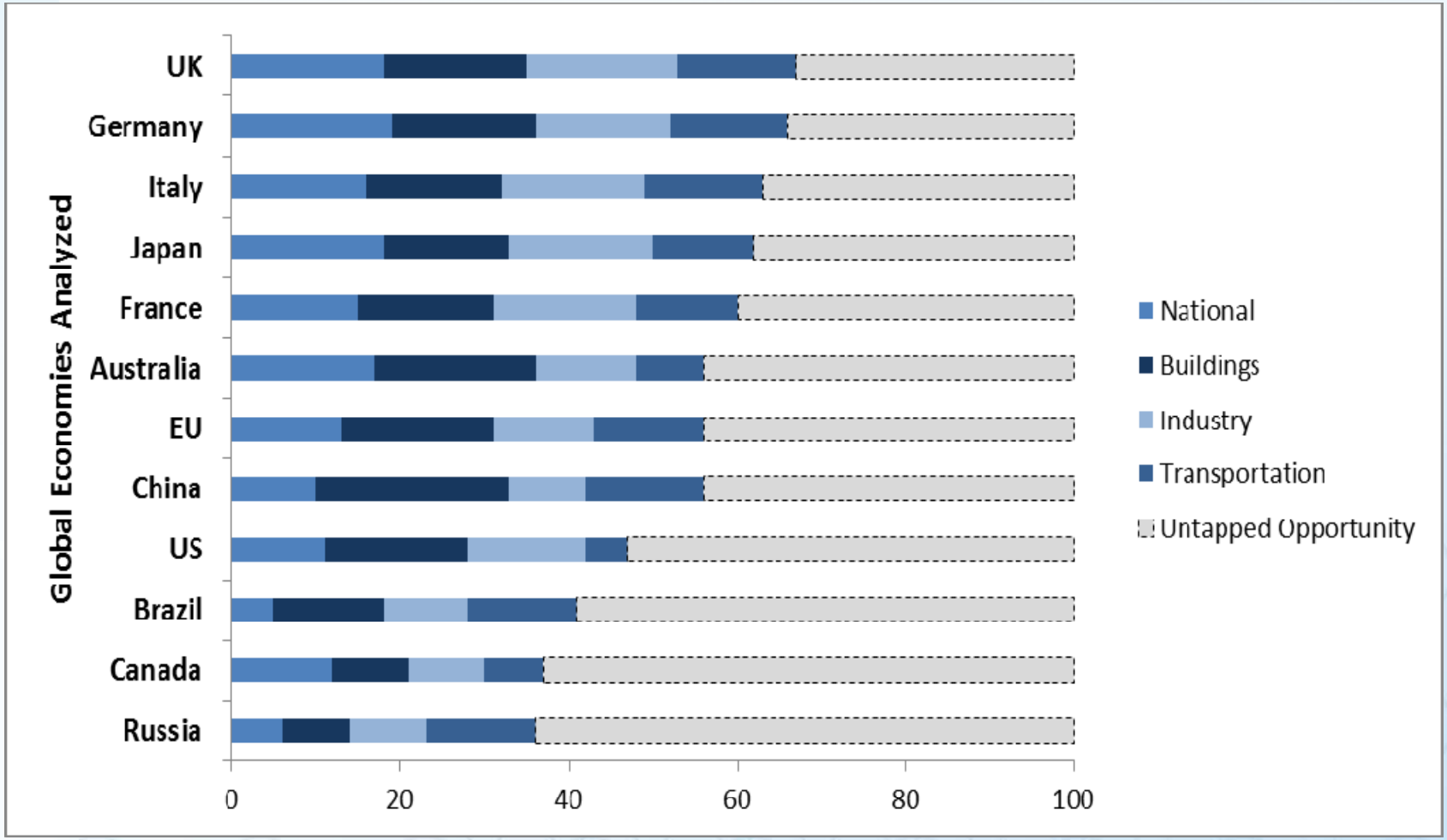


ACEEE
American Council for an Energy-Efficient Economy

Methodology: Limitations

- There is no perfect measure of energy efficiency economy-wide
  - 27 different measures provide a high-level snapshot
- Differences in countries impact the results (geographic size, population, climate, intensity of industry, etc.)
  - Attempted to mitigate this by normalizing results
- Consistent and comparable data is challenging
  - Used internationally recognized sources and country experts

The Results



ACEEE
American Council for an Energy-Efficient Economy

Major Themes

- Some big gaps between countries
- No country did great in every area
- Available data is a couple years old – new policies haven't yet been incorporated
- **Lots of room for improvement in all countries**

HIGH SCORE AWARDED FOR BEST IN SHOW IN EACH CATEGORY

Highest total score was 67

Average total score was 54

ACEEE
American Council for an Energy-Efficient Economy

National Efforts

Energy Productivity

	Gross Domestic Product to Energy Consumption ($/TOE)
Japan	17,408
United Kingdom	17,020
Italy	16,336
France	15,974
Germany	14,651
European Union	14,048
Australia	11,901
Brazil	10,944
United States	9,974
Canada	8,122
China	4,136
Russia	3,500

Energy Savings Goal

	Mandatory Energy Savings Goals
France	Yes
Germany	Yes
Italy	Yes
Japan	Yes
Russia	Yes
United Kingdom	Yes
Canada	Yes
China	Yes
European Union	Yes
Australia	No
United States	No
Brazil	No

ACEEE
American Council for an Energy-Efficient Economy

National Efforts

Energy Efficiency Spending (Overall)

	USD per capita
Australia	209
Germany	156
Japan	61
European Union	56
China	35
United States	34
Russia	30
United Kingdom	23
Canada	22
Italy	8
France	7
Brazil	2

Energy Efficiency Spending (R&D)

	USD per capita
Australia	5.42
United States	4.50
United Kingdom	3.61
France	3.12
Canada	2.95
European Union	2.57
Japan	2.43
Italy	2.19
Germany	1.76
Russia	0.77
Brazil	0.00
China	NA

ACEEE
American Council for an Energy-Efficient Economy

Buildings

	Appliance and Equipment Standards
United States	43
Canada	34
China	26
Japan	21
Australia	17
European Union	14
France	14
Germany	14
Italy	14
United Kingdom	14
Brazil	13
Russia	1

Australia had the second highest score of any country in the Buildings Sector with 19 out of 28 points!

-China was 1st with 23 points

-China had:

(1) a greater number of appliance and equipment standards and;

(2) significantly lower energy use per square foot in commercial buildings.

ACEEE
American Council for an Energy-Efficient Economy

Buildings

	Energy Use in Residential Buildings	
	(Btu/f2)	(kJ/m2)
Brazil	4.3	49
China	6.1	69
Australia	6.9	79
Japan	7.7	88
Italy	8.8	100
European Union	9.4	106
Canada	10.2	116
United States	10.5	119
United Kingdom	10.6	121
Germany	11.4	129
Russia	11.6	132
France	11.7	133

	Energy Use In Commercial Buildings	
	(Btu/f2)	(kJ/m2)
China	5.0	57
Germany	10.5	119
United Kingdom	11.2	127
European Union	13.4	152
France	15.6	177
Brazil	17.0	193
United States	19.3	220
Russia	19.9	226
Australia	23.6	268
Canada	25.7	292
Japan	27.0	307
Italy	31.3	356

ACEEE
American Council for an Energy-Efficient Economy

Industry

Percentage of Electricity Consumed by Industrial Sector that Is Generated by Combined Heat and Power

	Industrial Electricity Generated by CHP (%)
United Kingdom	27.0
European Union	18.7
United States	17.5
Italy	15.0
Russia	14.8
Germany	12.9
France	10.6
Brazil	10.0
China	10.0
Australia	5.7
Japan	4.0
Canada	0.1

Investment in Manufacturing Research and Development

	Percentage GDP Invested in Industrial R&D
Japan	2.3%
Germany	1.7%
United States	1.3%
France	1.1%
Brazil	1.1%
China	1.0%
European Union*	0.8%
United Kingdom	0.7%
Australia	0.5%
Canada	0.5%
Italy	0.5%
Russia	0.1%

ACEEE
American Council for an Energy-Efficient Economy

Transportation

Ranked 10th. Most room for improvement!

Average Fuel Economy of Onroad Passenger Vehicles

	Miles per gallon	Liters per 100 km
Italy	38.1	6.17
United Kingdom	37.5	6.27
France	34.7	6.78
European Union	33.0	7.13
Germany	31.4	8
Russia	29.0	8.11
China	27.0	8.6
Brazil	25.9	9.09
Japan	23.0	9.9
United States	23.0	10
Canada	22.2	10.6
Australia	21.2	11.1

Fuel Economy Standards

	Mandatory minimum fuel economy in miles per gallon (mpg)
European Union	>40 mpg
France	>40 mpg
Germany	>40 mpg
Italy	>40 mpg
Japan	>40 mpg
United Kingdom	>40 mpg
Canada	>30 mpg
China	>30 mpg
United States	>30 mpg
Russia	None
Brazil	None
Australia	None

Public Transit

- Government investment in public transit: Australia is tied for last (USD/person)
- Use of public transit is second lowest (percent of travel by public mode)

ACEEE
American Council for an Energy-Efficient Economy

Using EE to Defer T&D Investments

- In areas with distribution, transmission, substation and transformer overloading…
- Sometimes reducing the load thru targeted EE and/or DR will be less expensive than the upgrade
- Multiple U.S. utilities experimenting with this for more than a decade

ACEEE
American Council for an Energy-Efficient Economy

Con Edison and T&D Planning

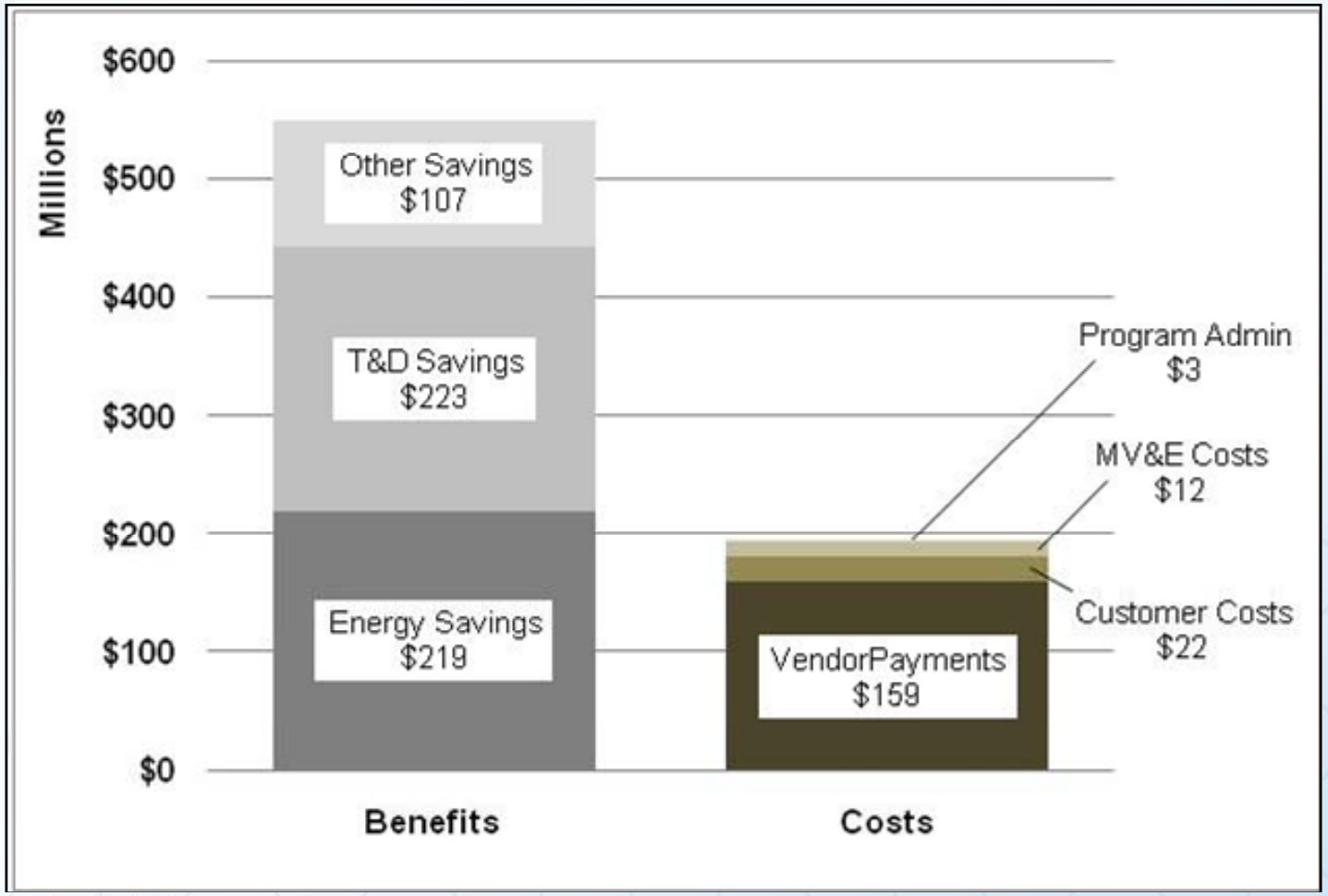
- Con Edison is the utility serving NYC
- Been using targeted EE to reduce T&D costs for more than a decade
- Incorporated system-wide EE programs into T&D planning
- Instituted targeted DSM in zones where load reductions can defer investments

ACEEE
American Council for an Energy-Efficient Economy

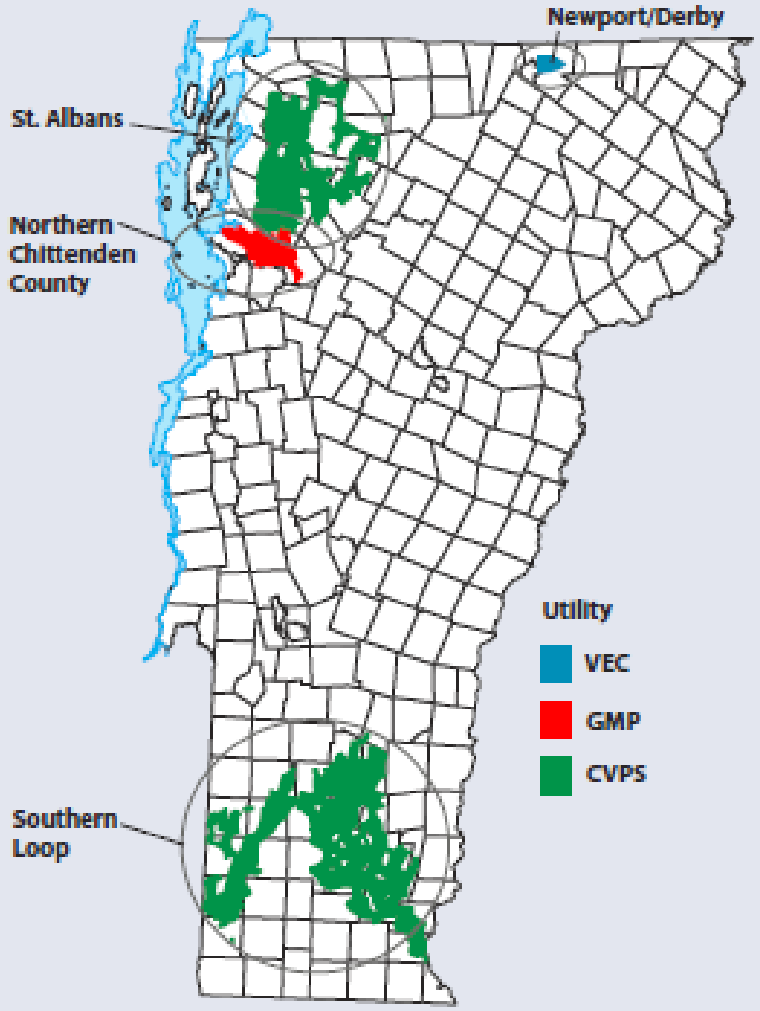
Benefit-Cost Ratio by Project

Phase	Load Area	Peak	Project Cost (M)	DSM (MW)	Con Edison TRC	Perpetual Deferral
1	Fordham	Day	10.0	6.5	5.3	n/a
	Astor	Day	145.0	14.3	2.9	n/a
	Brownsville	Day	7.1	18.7	2.1	2.6
2	Bensonhurst 2	Evening	7.0	15.4	2.1	2.7
	White Plains	Day	10.6	15.1	1.2	2.1
	Woodrow	Evening	29.0	4.4	0.7	n/a
	Fox Hills	Evening	0.5	8.8	2.0	2.1
	Willowbrook	Evening	0.5	5.5	0.6	n/a
3	Avenue A	Day	15.0	4.0	6.9	n/a
	Hellgate	Evening	5.5	6.6	0.8	n/a
	Harrison	Day	0.5	6.2	1.4	1.4
3 & 4	Wainwright	Evening	1.7	2.2	1.2	2.6
4	East 13th Street	Day	36.5	38.0	2.4	3.6
	Millwood West	Evening	1.2	1.1	1.3	3.3
Total	Residential	Evening		44	1.5	1.8
Total	Commercial	Day		103	2.4	3.1
Total	Program	All		147	2.2	2.8

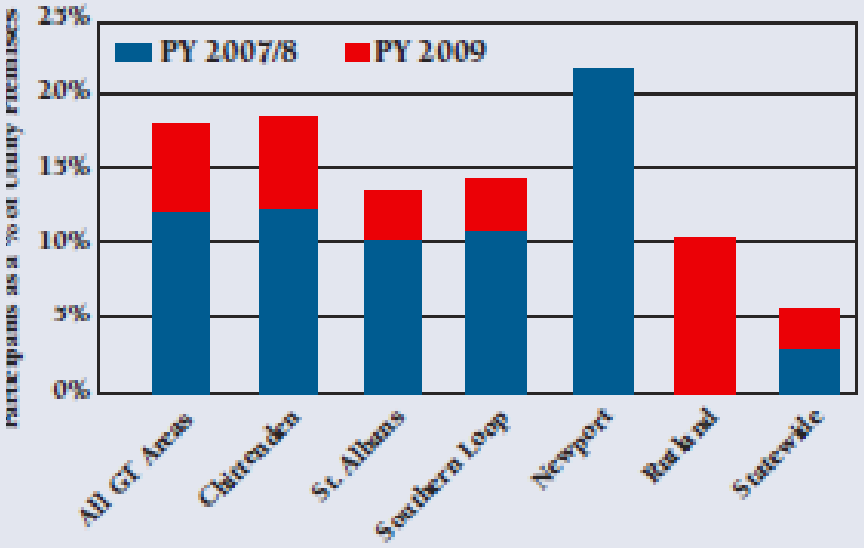
Benefits and Costs of Con Ed Targeted DSM



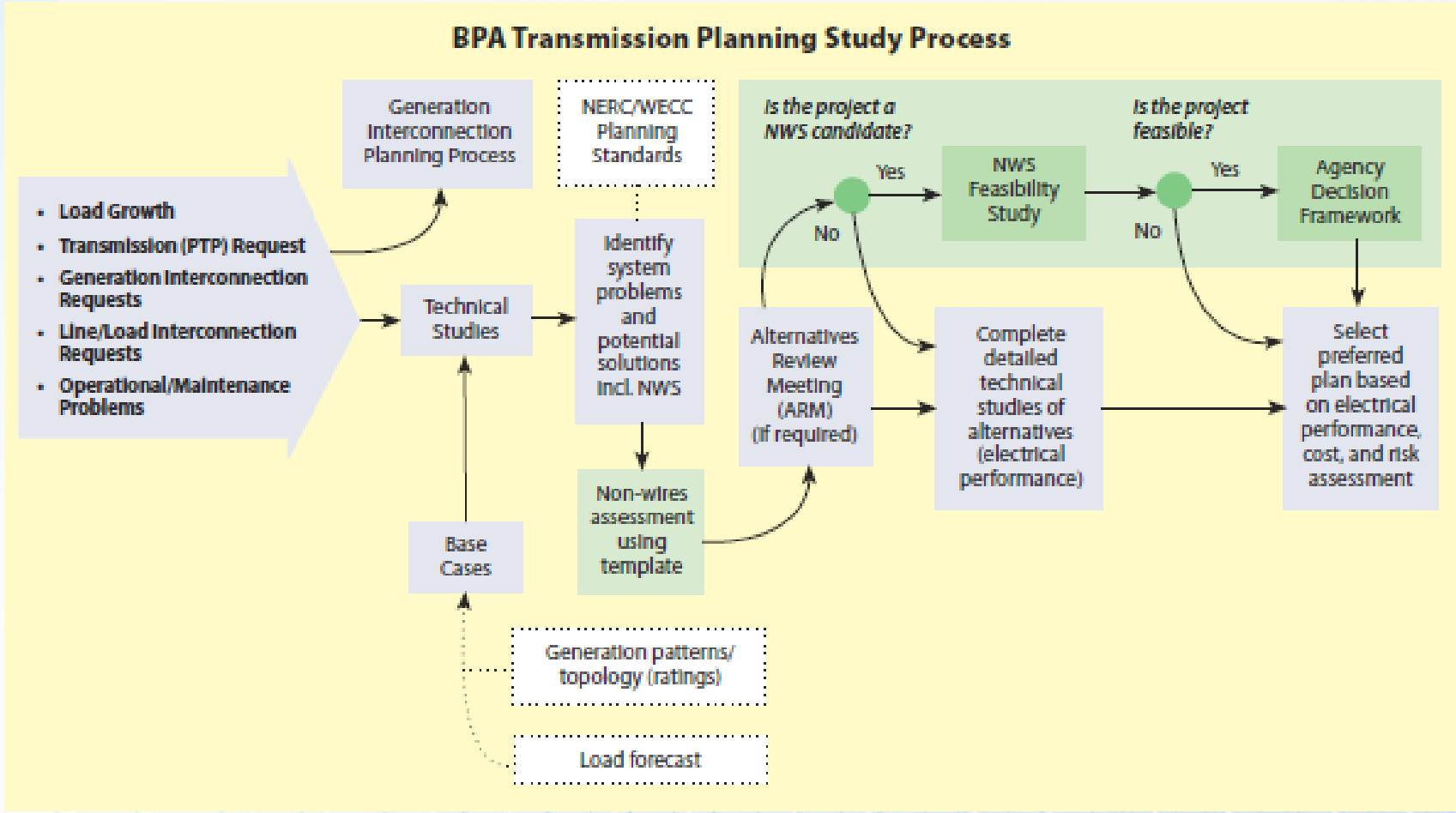
Efficiency Vermont Geo-Targeting Regions (2007-2008)

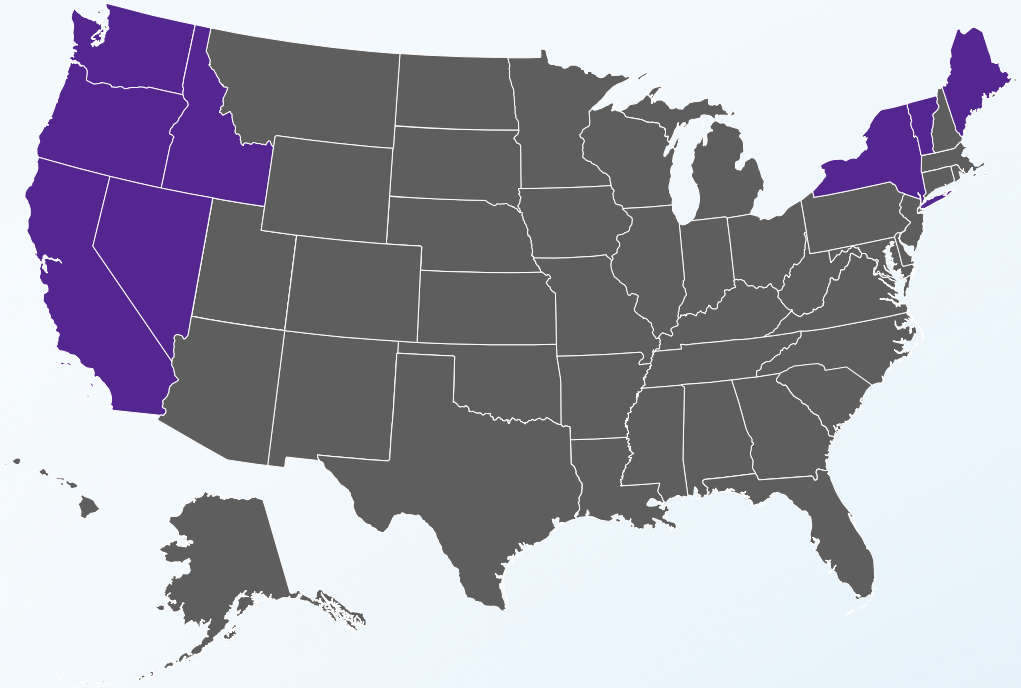


Vermont Geo-Targeting Commercial and Industrial Participation Rates



ACEEE
American Council for an Energy-Efficient Economy


BPA Transmission Planning Study Process
Generation Interconnection Planning Process
NERC/WECC Planning Standards
Is the project a NWS candidate?
Is the project feasible?
Yes
NWS Feasibility Study
Yes
Agency Decision Framework
No
No
Load Growth
Transmission (PTP) Request
Generation Interconnection Requests
Line/Load Interconnection Requests
Operational/Maintenance Problems
Technical Studies
Identify system problems and potential solutions incl. NWS
Alternatives Review Meeting (ARM) (if required)
Complete detailed technical studies of alternatives (electrical performance)
Select preferred plan based on electrical performance, cost, and risk assessment
Non-wires assessment using template
Base Cases
Generation patterns/ topology (ratings)
Load forecast



California	**Pacific Gas & Electric - Delta Project**
Oregon	**Portland General Electric - Downtown Portland Pilot**
Oregon, Washington, Idaho	**Bonneville Power Administration**
Vermont	**Green Mountain Power - Mad River Valley *AND* Efficiency Vermont Geo-Targeting Regions**
New York	**Consolidated Edison**
Maine	**Central Maine Power**
Nevada	**NV Energy**

ACEEE
American Council for an Energy-Efficient Economy

RAP Energy solutions for a changing world

US Experience with Efficiency As a Transmission and Distribution System Resource

Authors
Chris Neme, Energy Futures Group
Rich Sedano, Regulatory Assistance Project

*www.**rap**online.org/document/download/id/4765*

February 2012

ACEEE American Council for an Energy-Efficient Economy

Lessons Learned

- Geographically-targeted efficiency can defer T&D investments
- Efficiency can be a cost-effective T&D resource
- Unexpected events can affect the benefits of efficiency
- Sufficient lead time is critical
- Distribution is easier than transmission
- Cross-discipline communications are critical
- Efficiency should be integrated with other distributed resources

Recommendations

- Required least-cost T&D planning
- Require consideration of integrated solutions
- Institutionalize a long-term planning horizon
- “Level the playing field” in payment for wires and non-wires alternatives
- Collect more data on efficiency’s impact
- Start with pilot projects
- Leverage “smart grid” investments

ACEEE
American Council for an Energy-Efficient Economy

Conclusions

- Summer study is a place to learn, discuss, think out-of-the box and have fun
- Countries can learn from each other -- all can do better
- Energy efficiency can be an important component of T&D planning

ACEEE
American Council for an Energy-Efficient Economy