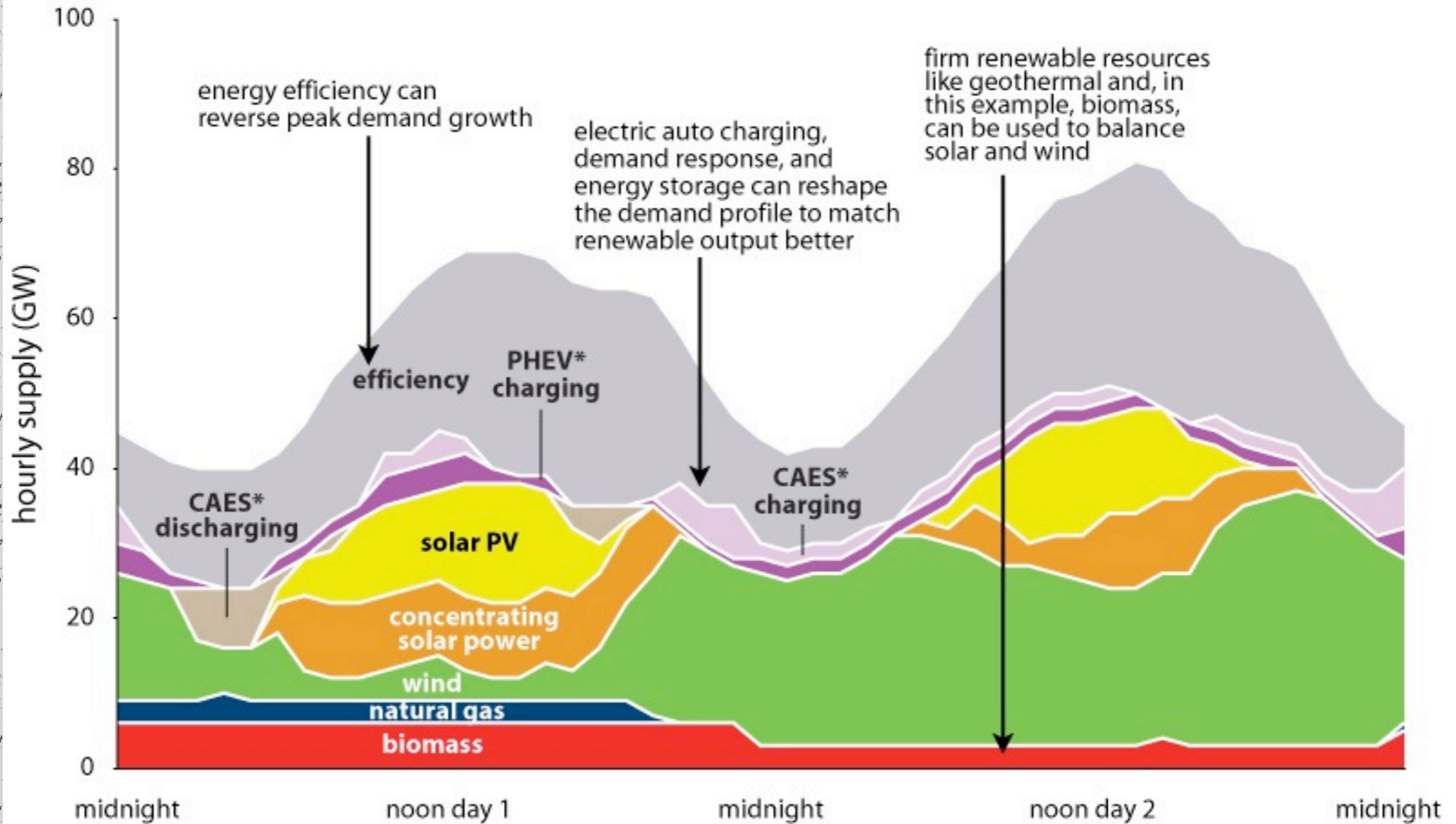


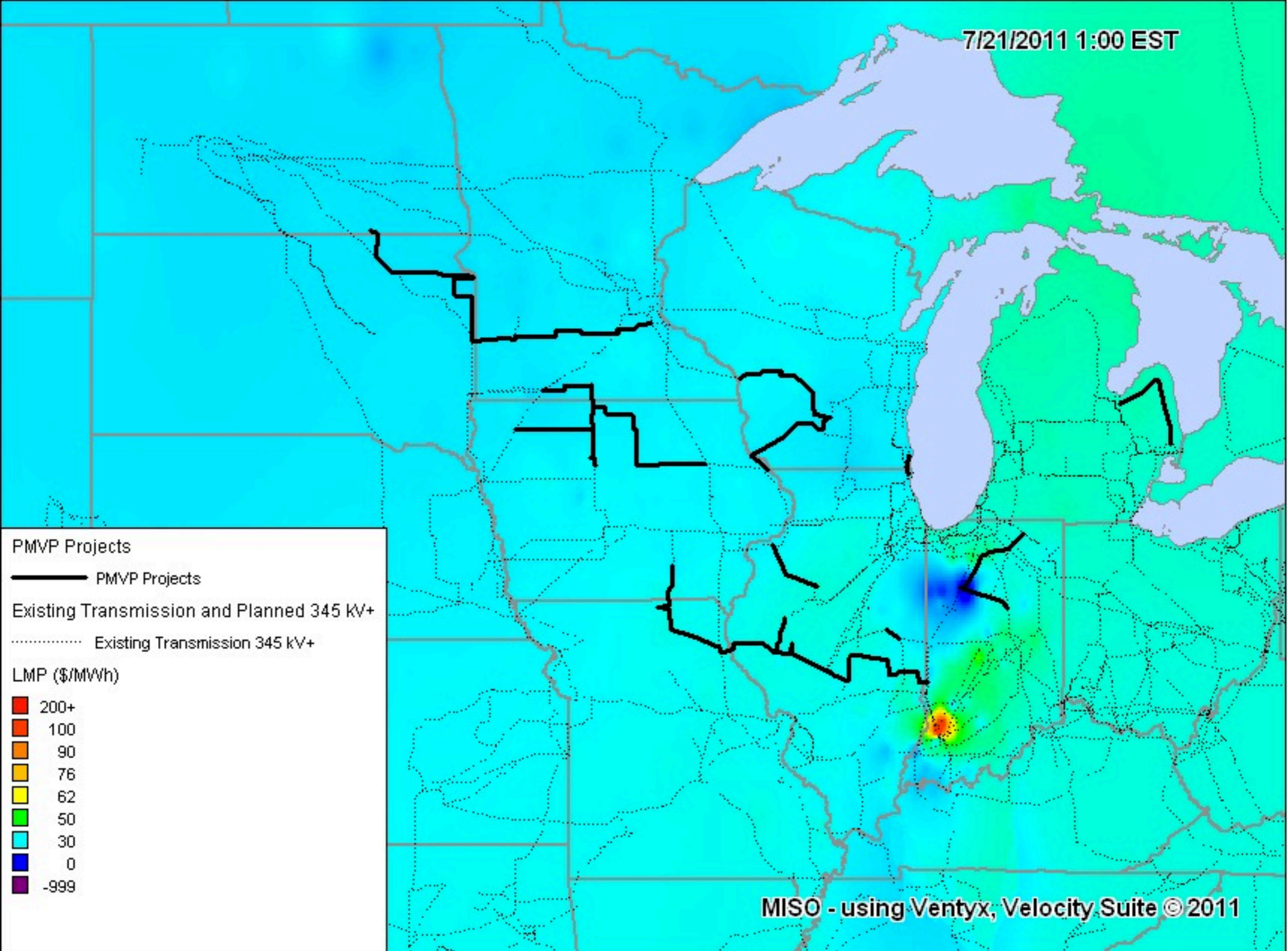
Hourly operability in a high-penetration renewables scenario



* PHEV is plug-in hybrid electric vehicle and CAES is compressed air energy storage

Rocky Mountain Institute © 2011. For more information see www.RMI.org/ReinventingFire.

7/21/2011 1:00 EST



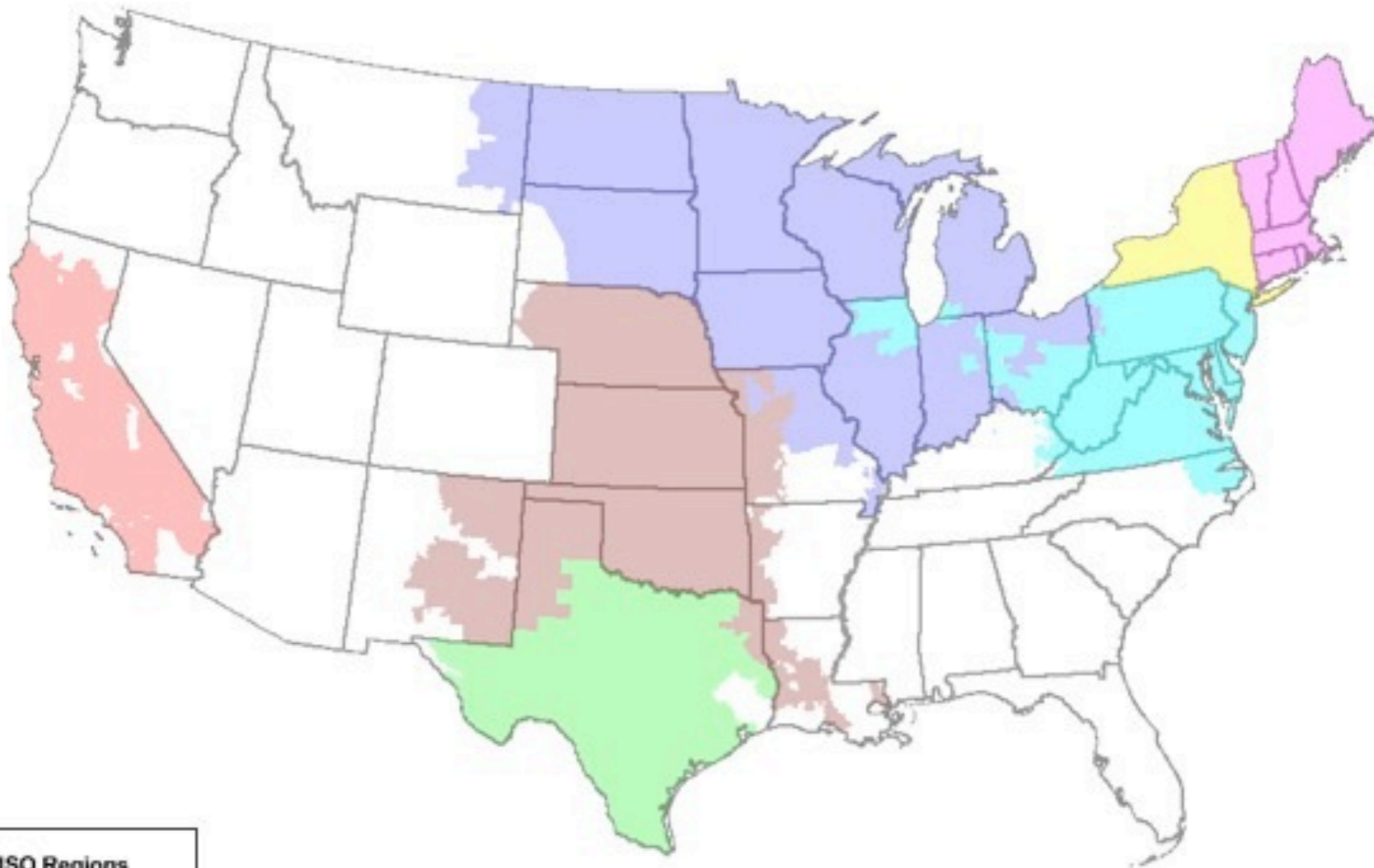
PMVP Projects
— PMVP Projects

Existing Transmission and Planned 345 kV+
..... Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
76
62
50
30
0
-999

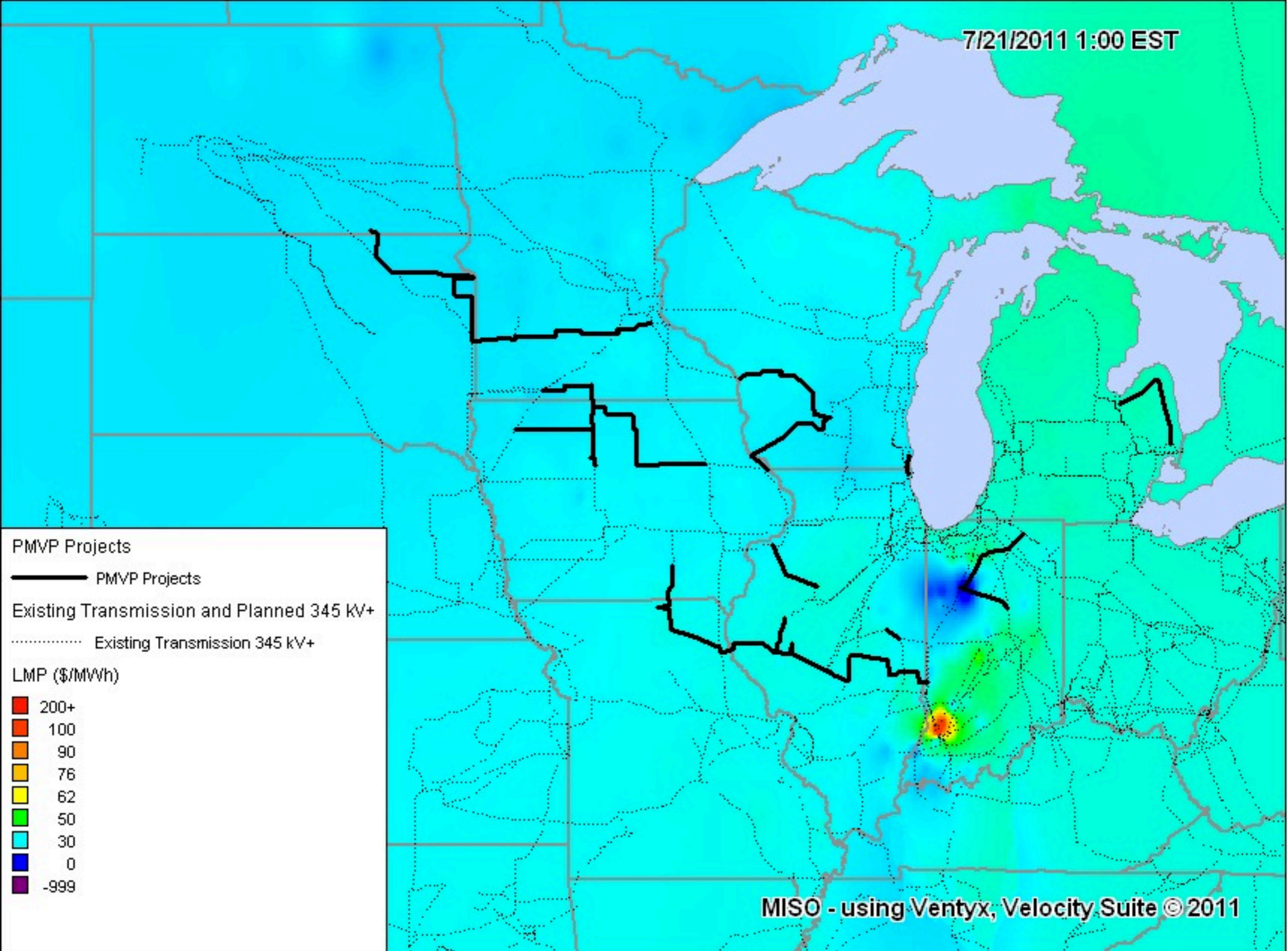
MISO - using Ventyx, Velocity Suite © 2011



RTO/ISO Regions

- California ISO
- ERCOT ISO
- Midwest ISO
- New England ISO
- New York ISO
- PJM ISO
- Southwest Power Pool

7/21/2011 1:00 EST



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 2:00 EST

PMVP Projects

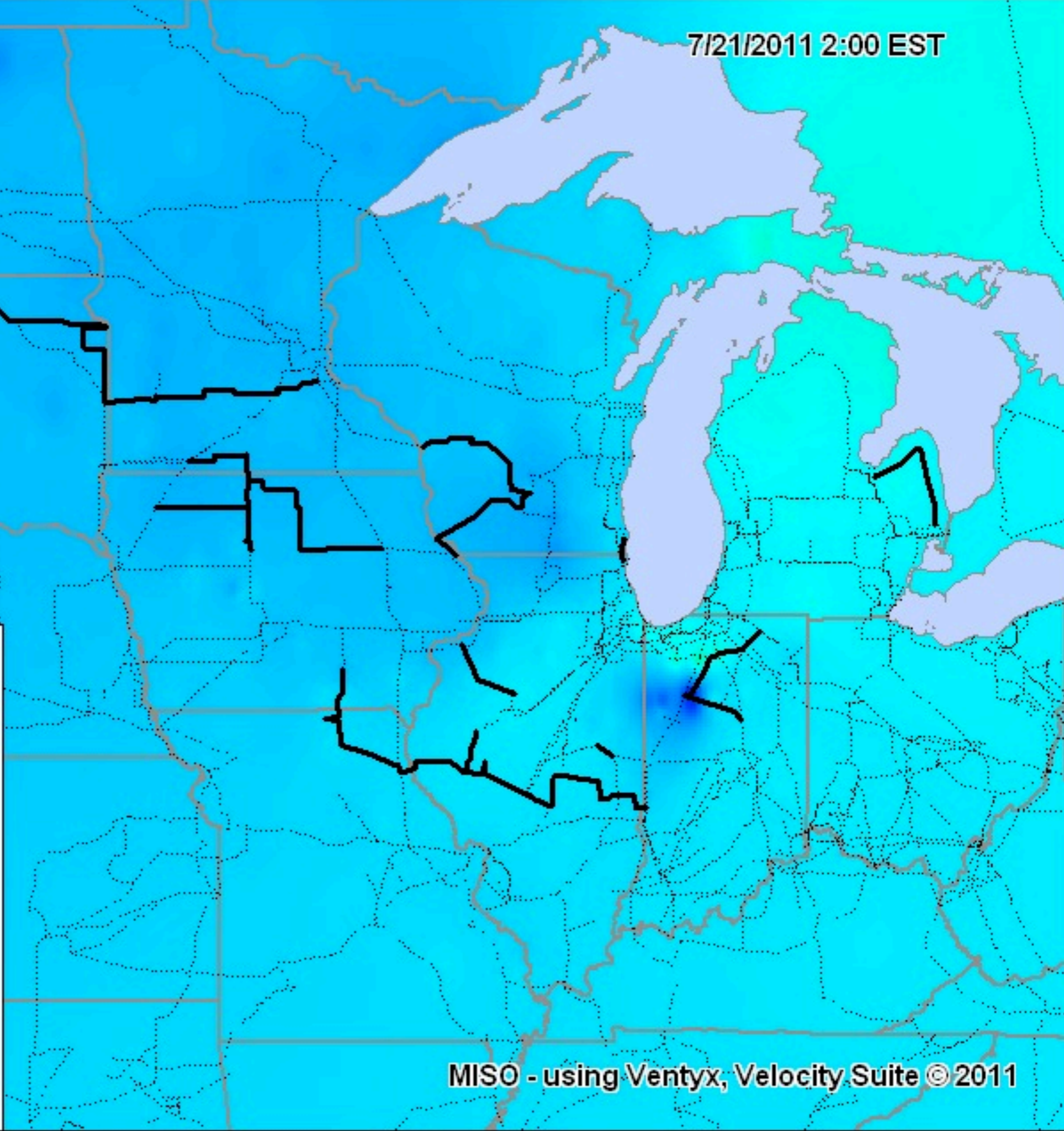
— PMVP Projects

Existing Transmission and Planned 345 kV+

..... Existing Transmission 345 kV+

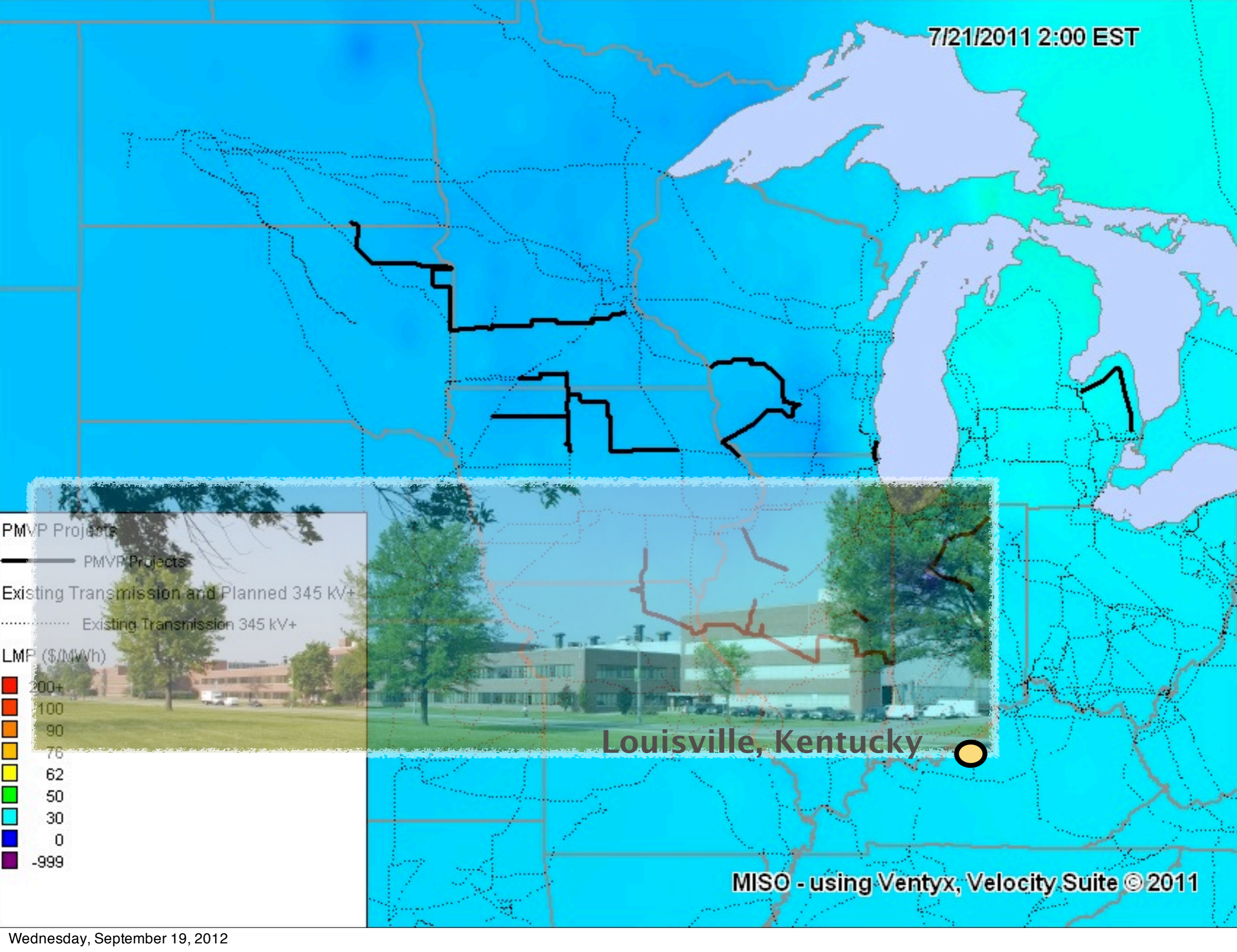
LMP (\$/MWh)

200+
100
90
76
62
50
30
0
-999



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 2:00 EST



PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

..... Existing Transmission 345 kV+

LMP (\$/MWh)

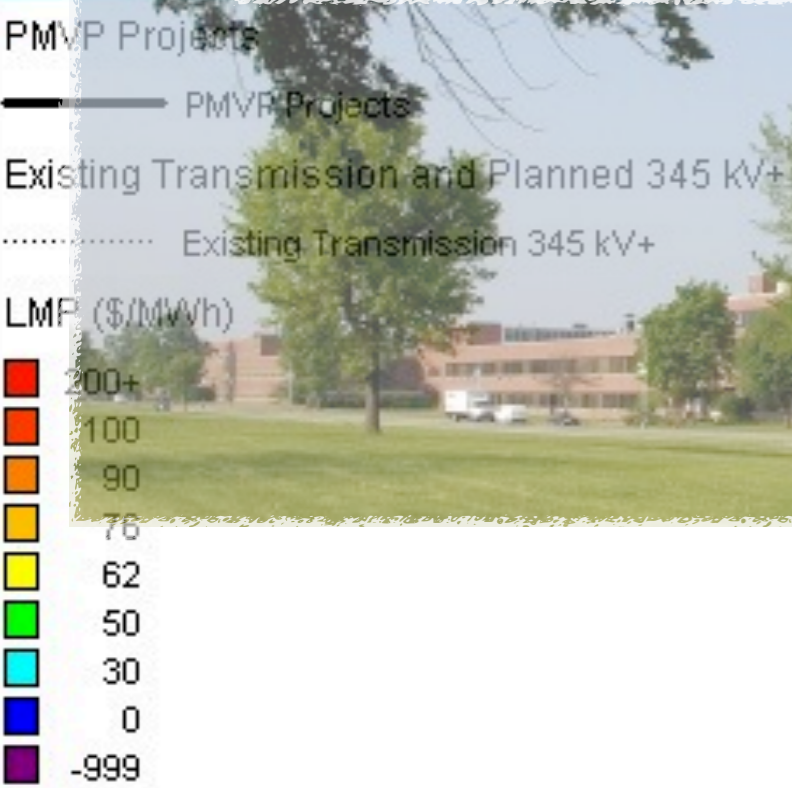
200+
100
90
76
62
50
30
0
-999

Louisville, Kentucky



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 2:00 EST



Louisville, Kentucky



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 2:00 EST



- PMVP Projects
- PMVP Project
- Existing Transmission and Planned 345 kV+
- Existing Transmission 345 kV+
- LMP (\$/MWh)
- 200+
- 100
- 90
- 76
- 62
- 50
- 30
- 0
- 999

Louisville, Kentucky



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 2:00 EST



PMVP Projects

— PMVP Projects

Existing Transmission and P

..... Existing Transmission

LMP (\$/MWh)

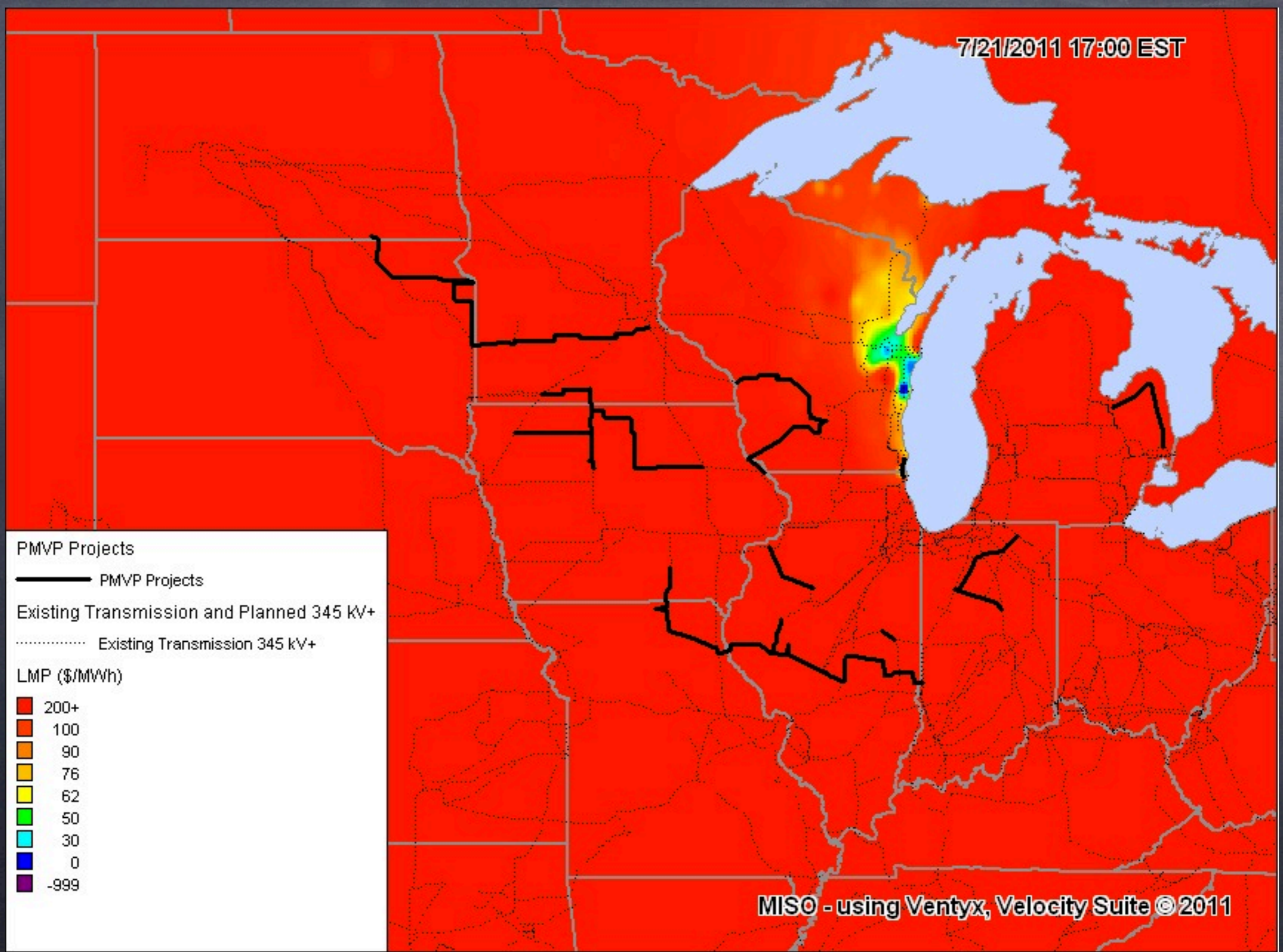
Red	200+
Orange	100
Light Orange	90
Yellow	76
Light Green	62
Green	50
Cyan	30
Blue	0
Purple	-999

Louisville, Kentucky



MISO - using Ventyx, Velocity Suite © 2011

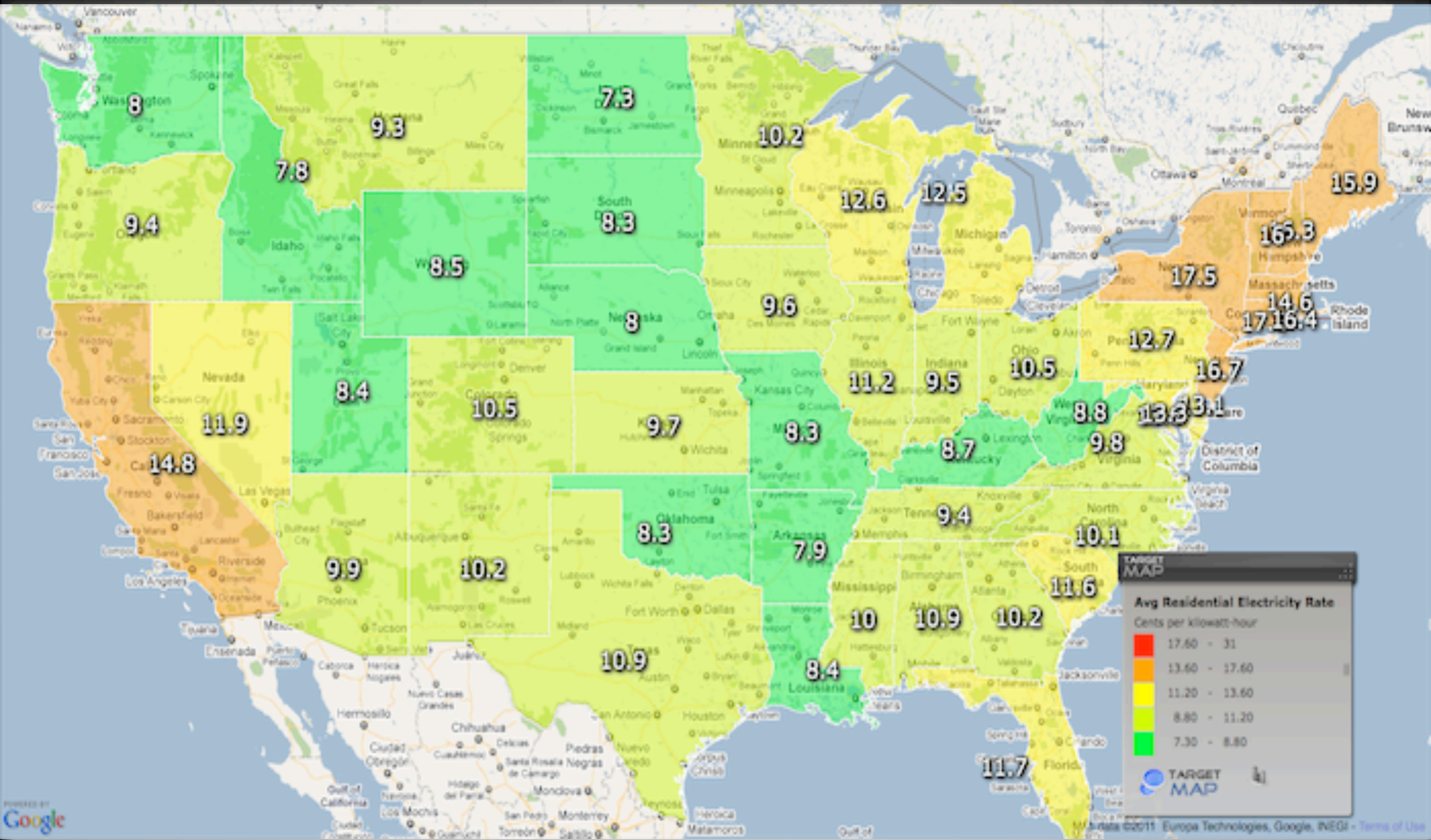
7/21/2011 17:00 EST



MISO - using Ventyx, Velocity Suite © 2011

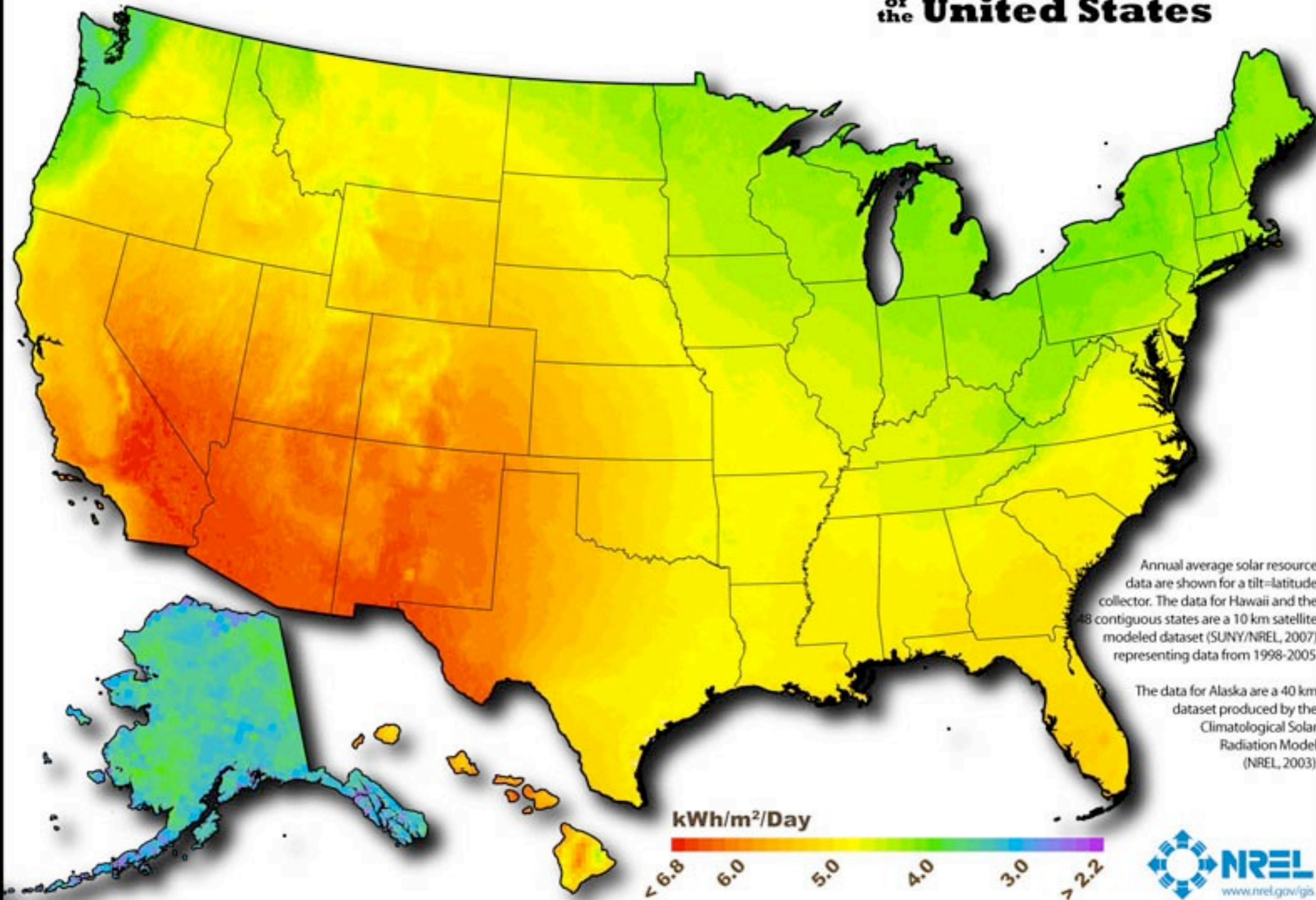






Average electricity rates

Photovoltaic Solar Resource of the United States



This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.

Author : Billy Roberts - October 20, 2008

Total Installed PV System Prices and Costs of Electricity (global avg.)

Total Installed PV System Prices and Costs of Electricity

(global avg.)

Year	System Price (\$/w)	LCOE Range (cents/ kwh)
2007	\$7.20	28 - 47
2008	\$7.00	27 - 45
2009	\$5.12	20 - 34
2010	\$4.55	18 - 30
2011	\$3.47	14 - 23
2012*	\$2.69	11 - 19
2013*	\$2.43	10 - 17
2014*	\$2.19	9 - 15
2015*	\$2.02	8 - 14
2016*	\$1.87	7 - 14
2017*	\$1.73	7 - 13
2018*	\$1.60	6 - 12
2019*	\$1.48	6 - 11
2020*	\$1.37	6 - 10
2021*	\$1.28	5 - 10

LCOE - Levelized Cost of Electricity

Source: Clean Edge, Inc. 2012 (*estimated)

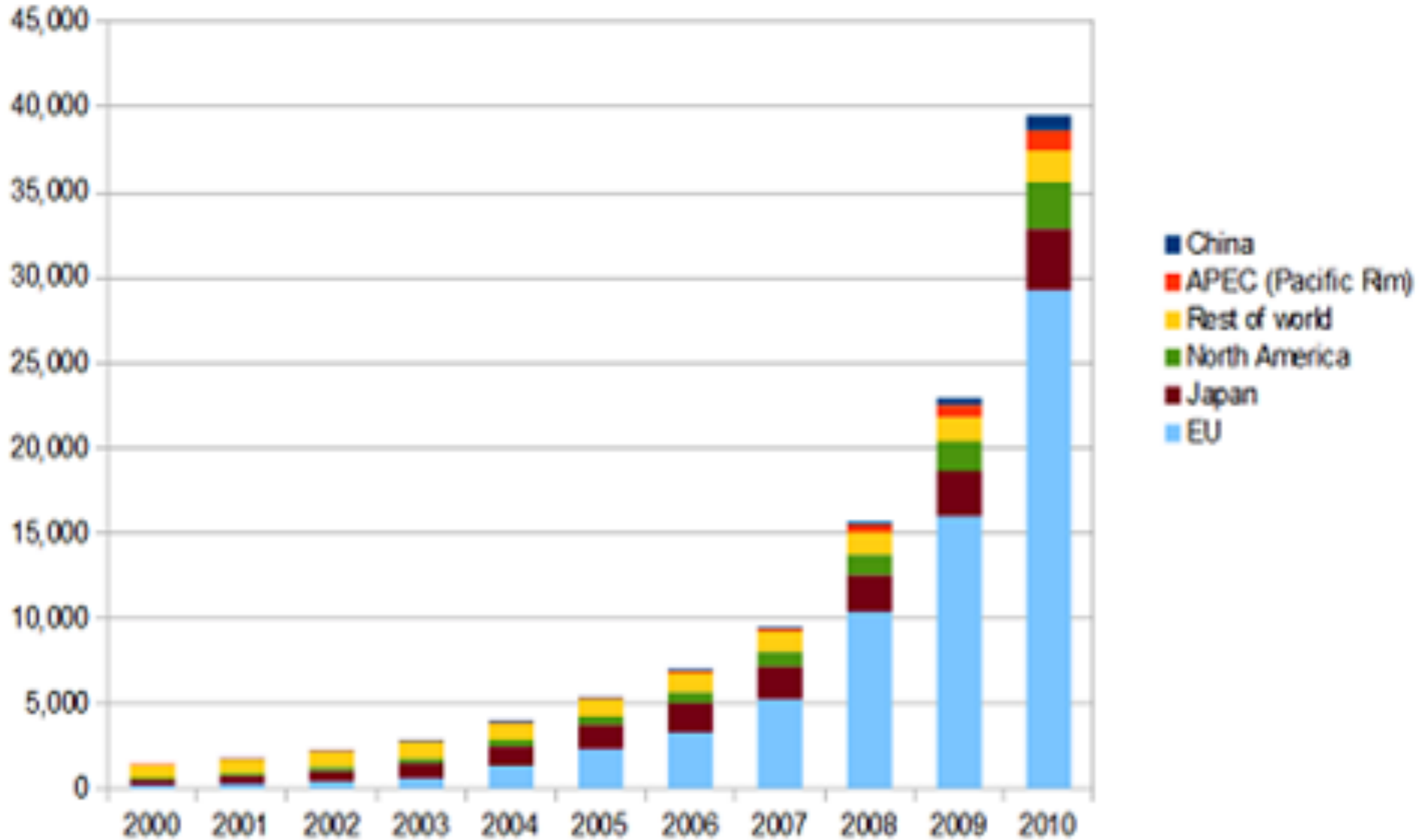
Global Clean Energy Market Size 2000-2011

Global Clean Energy Market Size 2000-2011

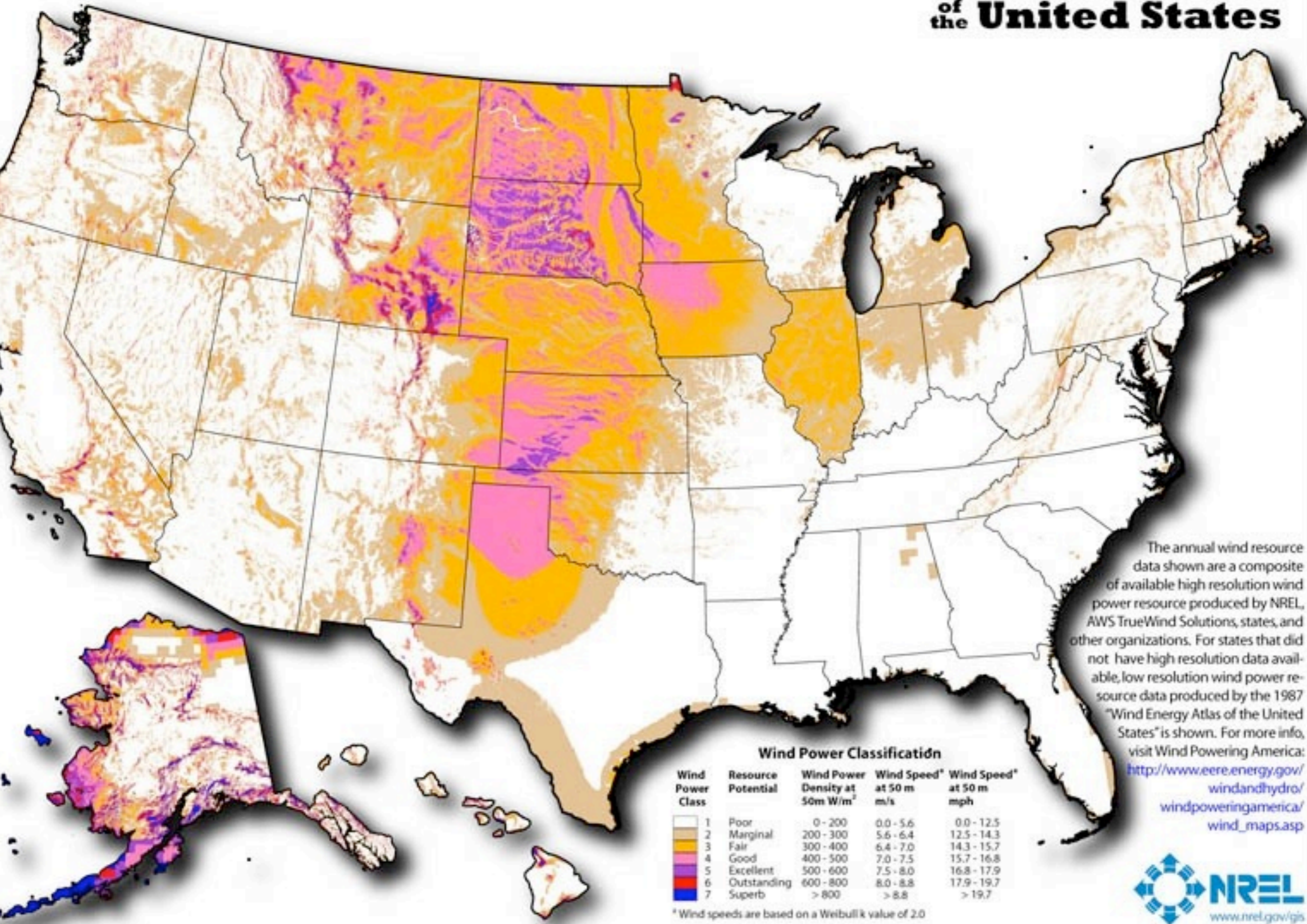
	Solar PV Global Market Sz. (in \$Billions)	Wind Power Global Market Sz. (in \$Billions)	Biofuels Global Market Sz. (in \$Billions)
2000	\$2.5	\$4.0	N/A
2001	\$4.6	\$3.0	N/A
2002	\$3.5	\$5.5	N/A
2003	\$4.7	\$7.5	N/A
2004	\$7.2	\$8.0	N/A
2005	\$11.2	\$11.8	\$15.7
2006	\$15.6	\$17.9	\$20.5
2007	\$20.3	\$30.1	\$25.4
2008	\$29.6	\$51.4	\$34.8
2009	\$36.1	\$63.5	\$44.9
2010	\$71.2	\$60.5	\$56.4
2011	\$91.6	\$71.5	\$83.0

Global Cumulative Installed PV Solar Capacity

Source: EPIA data



Wind Resource (50m) of the United States



The annual wind resource data shown are a composite of available high resolution wind power resource produced by NREL, AWS TrueWind Solutions, states, and other organizations. For states that did not have high resolution data available, low resolution wind power resource data produced by the 1987 "Wind Energy Atlas of the United States" is shown. For more info, visit Wind Powering America: http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp

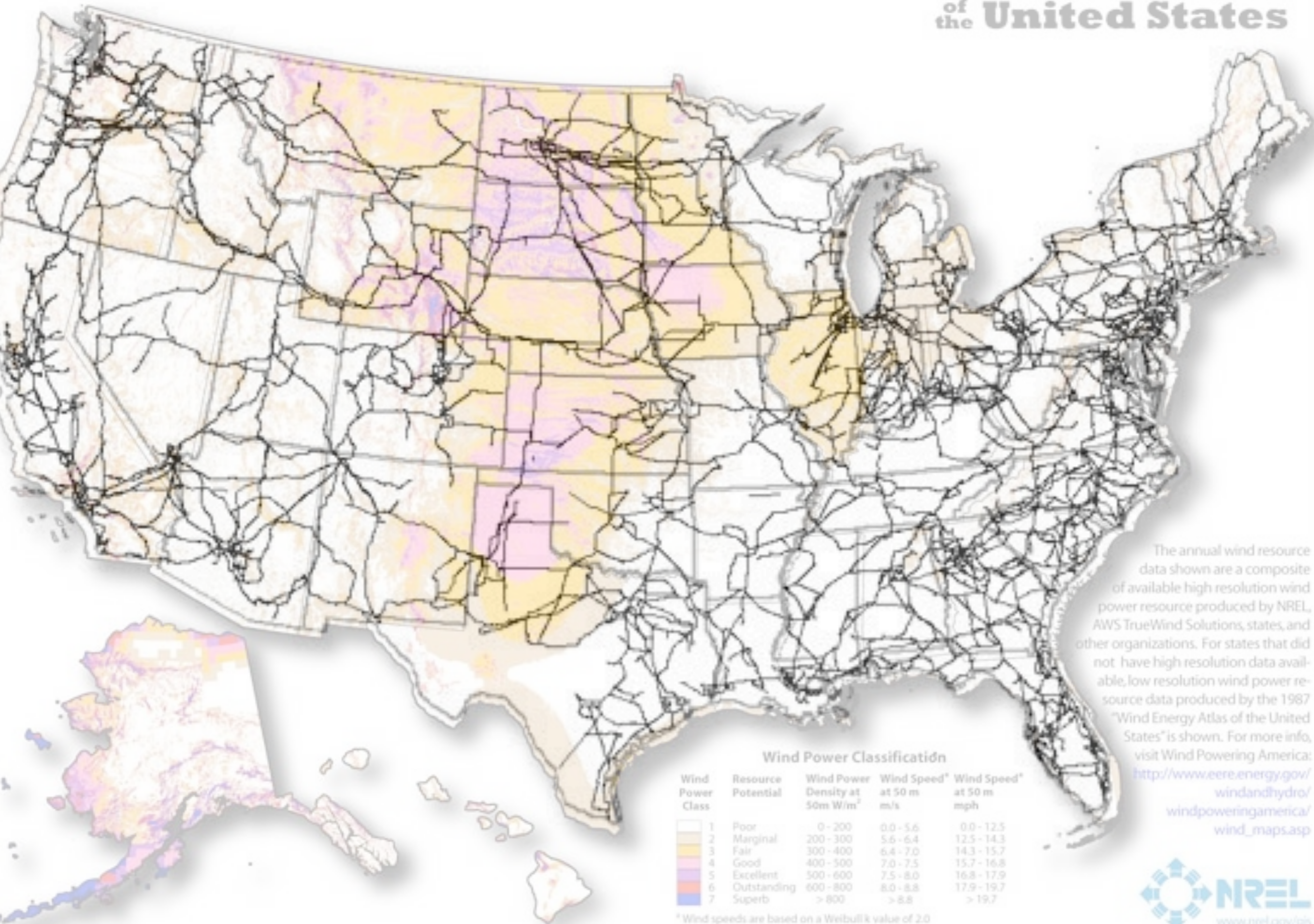
Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50m W/m ²	Wind Speed* at 50 m m/s	Wind Speed* at 50 m mph
1	Poor	0 - 200	0.0 - 5.6	0.0 - 12.5
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	> 800	> 8.8	> 19.7

* Wind speeds are based on a Weibull k value of 2.0



Wind Resource (50m) of the United States



The annual wind resource data shown are a composite of available high resolution wind power resource produced by NREL, AWS TrueWind Solutions, states, and other organizations. For states that did not have high resolution data available, low resolution wind power resource data produced by the 1987 "Wind Energy Atlas of the United States" is shown. For more info, visit Wind Powering America: http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp

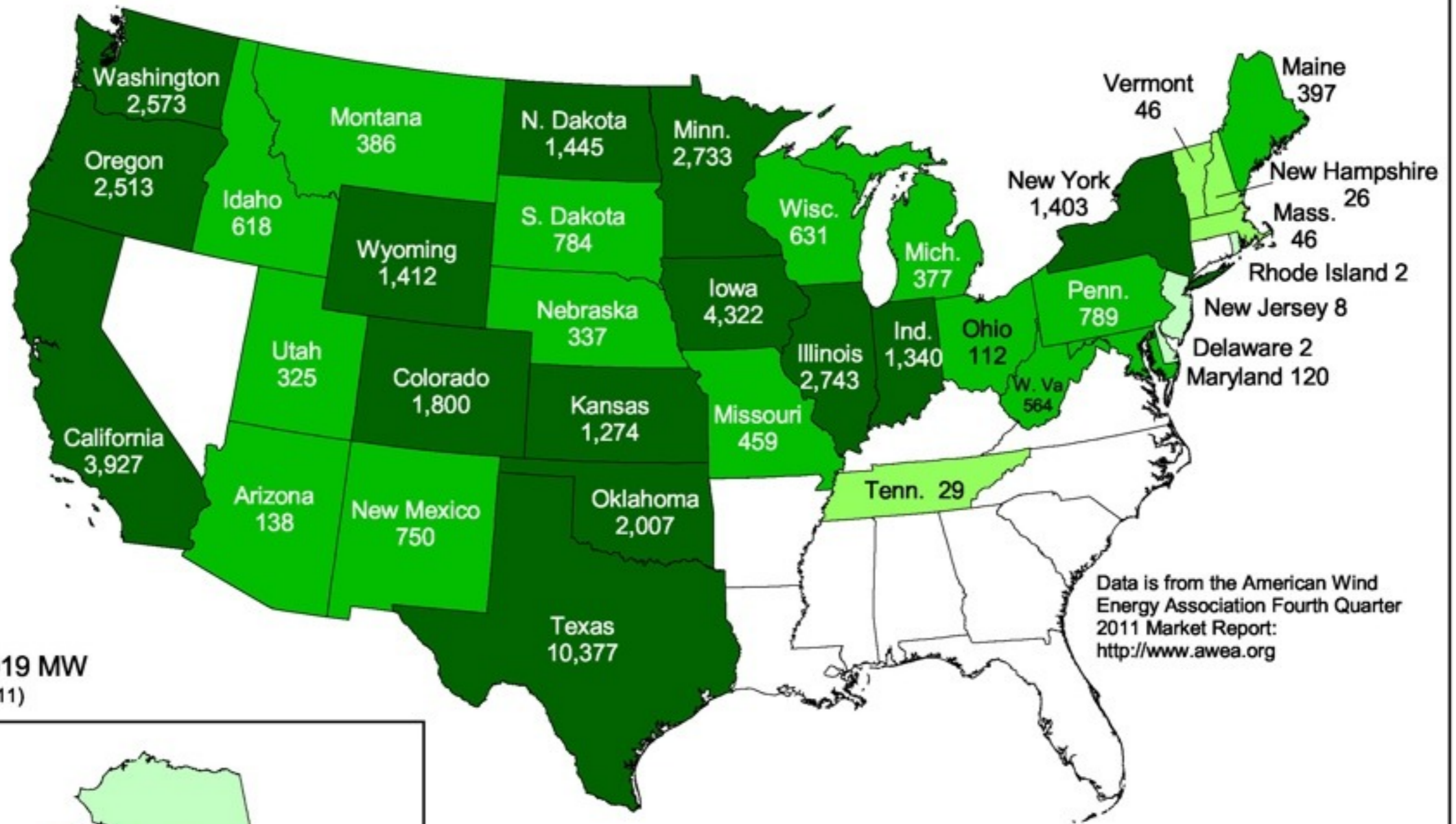
Wind Power Classification

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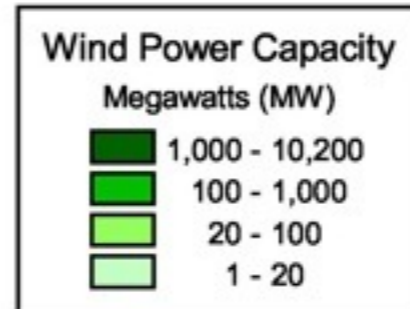


2011 Year End Wind Power Capacity (MW)



Total: 46,919 MW
(As of 12/31/2011)

Data is from the American Wind Energy Association Fourth Quarter 2011 Market Report: <http://www.awea.org>



Total Installed Wind System Prices and Costs of Electricity (US)

Total Installed Wind System Prices and Costs of Electricity (US)

Year	LCOE Range (cents/ kwh)
2002-2003	\$.038 to \$.058
2009-2010	\$.058 to \$.075
2012-2013	\$.036 to \$.042

Source: NREL Wind Energy Report 2012



GRIDresponse
Intelligent Distributed
Energy Resources (I-DER)
Planning & Management

Generation Reduction (MW): **1.3662**
Total Dispatched (MW): **1.0056**

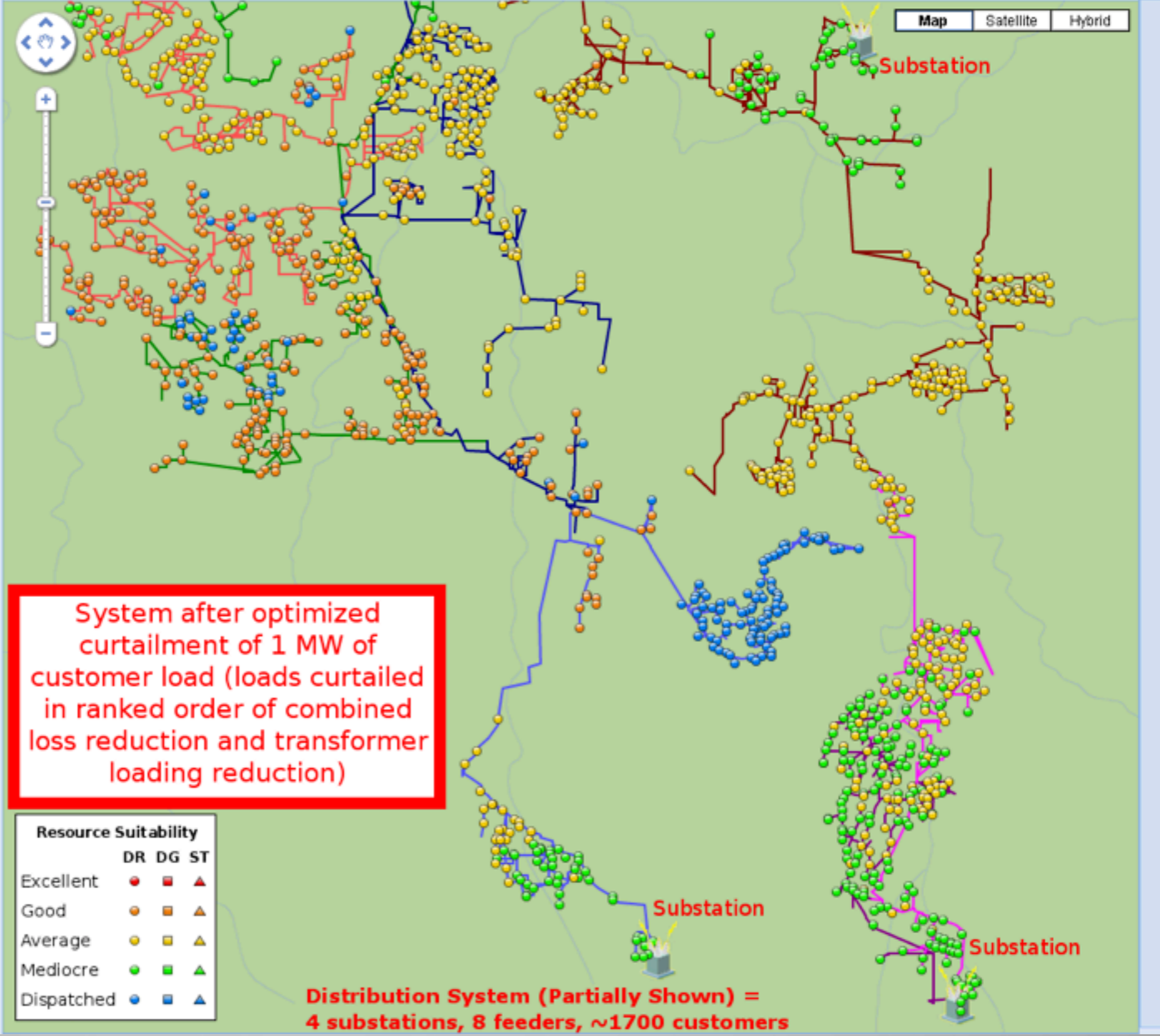
Demand Side Resources

DR-R DR-C DG Storage
Dispatch Recall Criterion
Automatic Manual Show All Clear Selections

System Generation (MW): 47.2840
Total Available to Dispatch (MW): 14.7373

Available to Dispatch per Resource Type (MW)
DR-R: 2.9973 DR-C: 2.9400 DG: 6.4000 Storage: 2.4000

Type	Rank	ID	Load kW	ICAP kW	Total MW	
<input type="checkbox"/>	DRC	8	TXB184393B	196.00	29.40	0.0294
<input type="checkbox"/>	DRC	10	TXB184385B	196.00	29.40	0.0586
<input type="checkbox"/>	DRR	12	TXB184814B	8.76	1.31	0.0601
<input type="checkbox"/>	DRR	14	TXB184446B	42.00	6.30	0.0684
<input type="checkbox"/>	DRR	15	TXB184460B	42.00	6.30	0.0727
<input type="checkbox"/>	DRR	16	TXB184450B	42.00	6.30	0.0790
<input type="checkbox"/>	DRR	17	TXB184448B	42.00	6.30	0.0853
<input type="checkbox"/>	DRR	18	TXB184732B	10.25	1.54	0.0869
<input type="checkbox"/>	DRR	19	TXB184447B	42.00	6.30	0.0932
<input type="checkbox"/>	DRR	20	TXB184459B	42.00	6.30	0.0995
<input type="checkbox"/>	DRR	21	TXB202722B	11.15	1.67	0.1011
<input type="checkbox"/>	DRC	22	TXB184401B	56.00	8.40	0.1095
<input type="checkbox"/>	DRR	24	TXB184441B	28.00	4.20	0.1137
<input type="checkbox"/>	DRR	25	TXB184456B	28.00	4.20	0.1179
<input type="checkbox"/>	DRR	26	TXB184454B	28.00	4.20	0.1221





Wednesday, September 19, 2012

Favorable Ratings: 2009, 2010, and 2011 Surveys

Concept	"Extremely" or "Very" Favorable		
	2009	2010	2011
Solar Energy	81%	79%	77%
Wind Energy	79%	75% ↓	71% ↓
Hybrid Vehicles	70%	64% ↓	61%
Electric Cars	62%	57% ↓	55%
Natural Gas Cars	N/A	N/A	51%
Clean Coal	52%	47% ↓	42% ↓
Nuclear Power	47%	42% ↓	40%
Biofuels	56%	47% ↓	39% ↓
Smart Meters	N/A	37%	38%
Smart Grid	47%	37% ↓	37%
Carbon Offsets/Credits	26%	24%	19% ↓
LEED Certification	16%	19%	18%
Cap and Trade	16%	15%	14%
Average Favorability	50%	45% ↓	43%

Arrows indicate a significant increase or decrease from the previous year, outside the +/- 3% margin of error for this survey.

(Source: Pike Research)