

Real Time Emissions for Next Generation Energy Management

Relevance to Environmental Nuances of Time Variant Pricing

Dr. Carol Miller
March 31, 2015



building energy solutions
formerly WARM Training Center

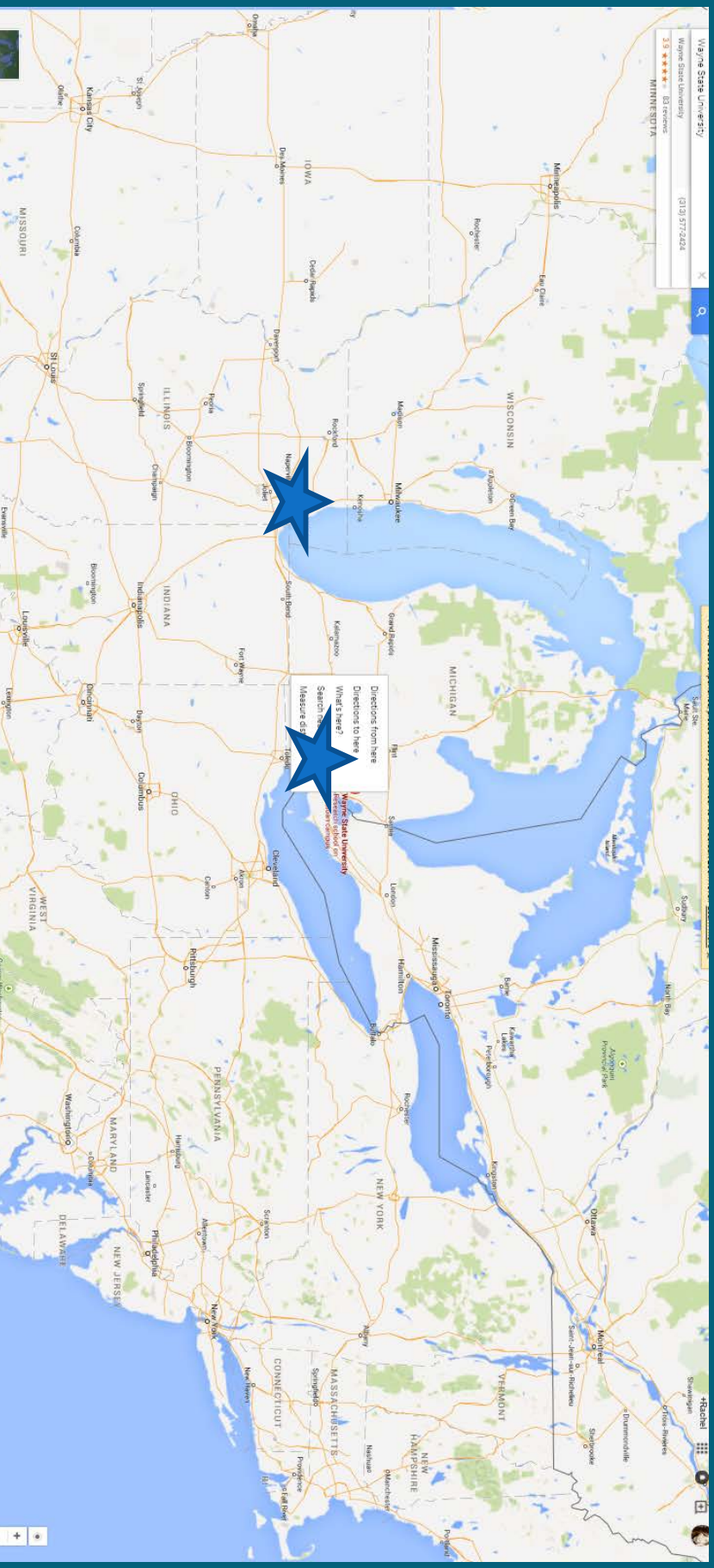
WAYNE STATE
UNIVERSITY



Great Lakes
Protection Fund

Brought to you by

- Wayne State University, Detroit
- EcoWorks, Detroit
- Great Lakes Protection Fund, Evanston

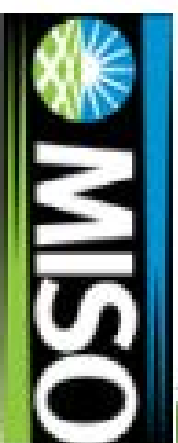


Genesis: Real-Time Energy Impact Monitors for Residential, Commercial, and Industrial Use

Partners



Great Lakes
Protection Fund



Consumers Energy

Count on Us



SIEMENS

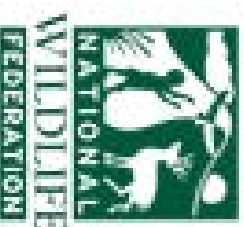


ILLUMINE



Pacific Northwest
NATIONAL LABORATORY

Presafly Operated by **Energy Star** 1995



www.comed.com
Customer Service / Power Outage
English
1-800-EDISON (1-800-334-7801)

Spanish
1-800-95-LUCES (1-800-955-6237)
Hearing/Speech Impaired
1-800-572-5789 (TTY)

Your Usage Profile
13 Month Usage (Total kWh)



Month	kWh
Jan-11	750
Feb-11	750
Mar-10	750
Apr-10	750
May-10	750
Jun-10	750
Jul-10	750
Aug-10	750
Sep-10	750
Oct-10	750
Nov-10	750
Dec-10	750
Jan-11	750
Feb-11	750

Page 1 of 2
Account Number 1234567890
Name JOHN SMITH
Service Location 1234 MAIN STREET, YORBTOWN
Phone Number 123-456-7890

Billing Date July 8, 2011

Bill Summary

Previous Balance	\$100.00
Total Payment - Thank You	\$100.00
Amount Due on August 1, 2011	\$123.28

Meter Information

Read Date	Meter Number	Load Type	Reading Type	Previous Total kWh	Current Total kWh	Meter Reading	Difference	Multiplier	Usage
7/8	123456789	General Service	Total kWh	61565 Actual	62534 Actual	949	949	1	949

Service from 6/7/2011 to 7/8/2011 - 31 Days

Residential - Single

Electricity Supply Services

Electricity Supply Charge	949 kWh	X	0.07154	67.89
Transmission Services Charge	949 kWh	X	0.00787	7.28
Purchased Electricity Adjustment				4.75
Total				\$79.92

Delivery Services - ComEd

Customer Charge	14.28
Standard Metering Charge	2.86
Distribution Facilities Charge	18.50
IL Electricity Distribution Charge	1.20
Total	\$36.84

Taxes and Other

AC Cycle Open Credit	-5.00
Smart Meter Program	0.15
Environmental Cost Recovery Adj	0.14
Energy Efficiency Programs	1.52
Franchise Cost	0.59
State Tax	3.13
Municipal Tax	1.96
Total	\$2.49

Total Current Charges

(continued on next page)

View the Energy Comparison at \$ 8.00
Number of power suppliers: 10

Top 5 Energy Suppliers

- 1. Alliant Energy
- 2. Ameren
- 3. Exelon
- 4. E. I. du Pont de Nemours & Co.
- 5. FirstEnergy

View All Energy Suppliers



Power Price and kWh used statistics from efficient systems similar to yours

Where's the Transparency?

UNDERSTANDING YOUR ENERGY BILL

DUKE ENERGY RETAIL

HOW TO: UNDERSTANDING YOUR DUKE ENERGY BILL

Last Month Neighbor Comparison: You're less than your efficient neighbors.

YOU Efficient Neighbors

ALL NEIGHBORS

How You're Doing: GREAT (😊😊😊) Good (😊😊) More Than Average (😊)

WHO ARE YOUR NEIGHBORS?

- ALL NEIGHBORS**: Approximately 600,000 residential energy business that are similar to you by your usage (\$3.379 sq ft)
- EFFICIENT NEIGHBORS**: The most efficient 20 percent from the "All Neighbors" group

Environmentally Sensitive Electricity

ESE 101

ESE 102

Marginal Generator Responds to
Marginal Demand Changes

Marginal Generator = f (space, time)

Marginal Gen  Marginal Ems

ESE 103

LEEM

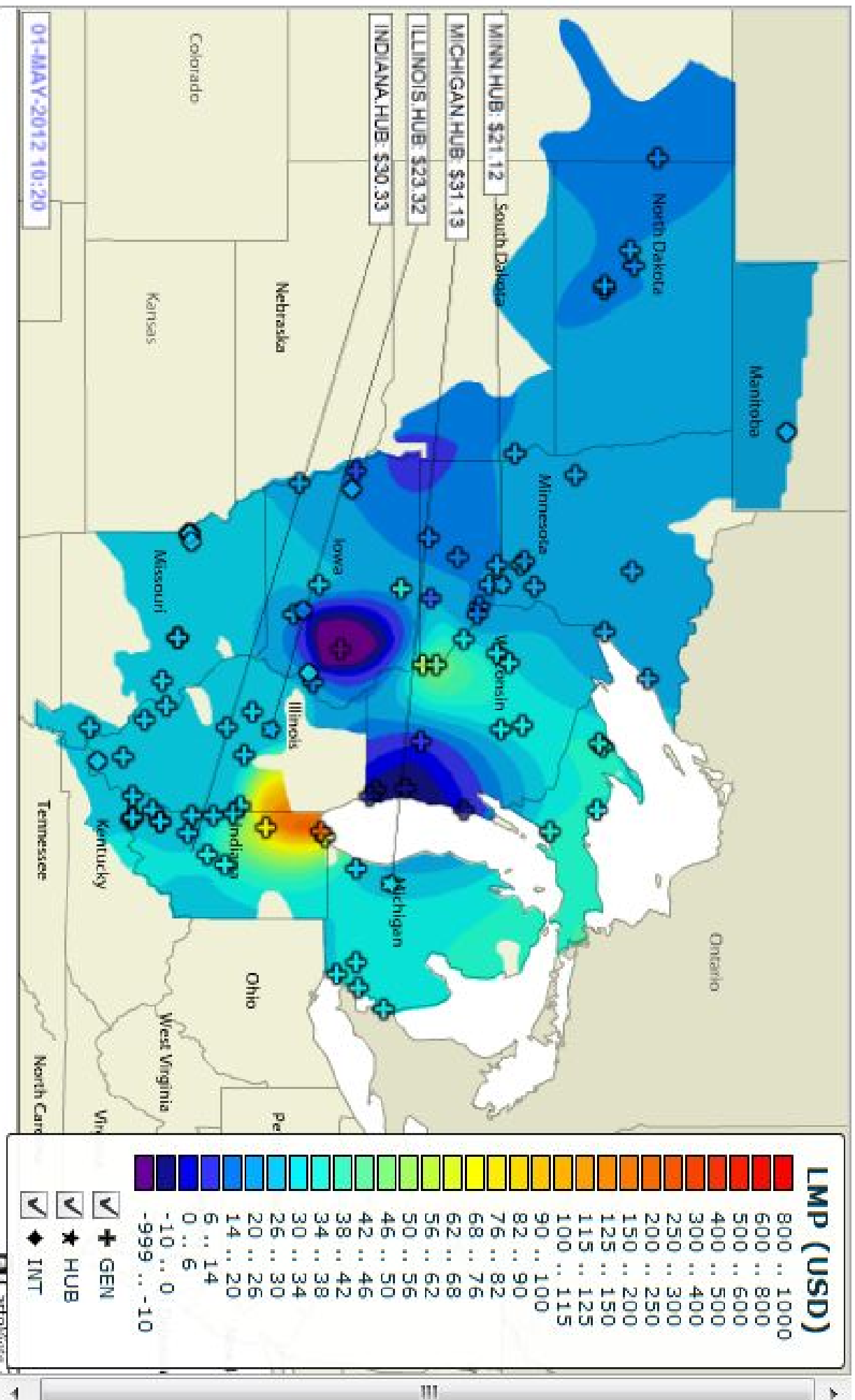


ESE 104

LMP = ρ (space, time)

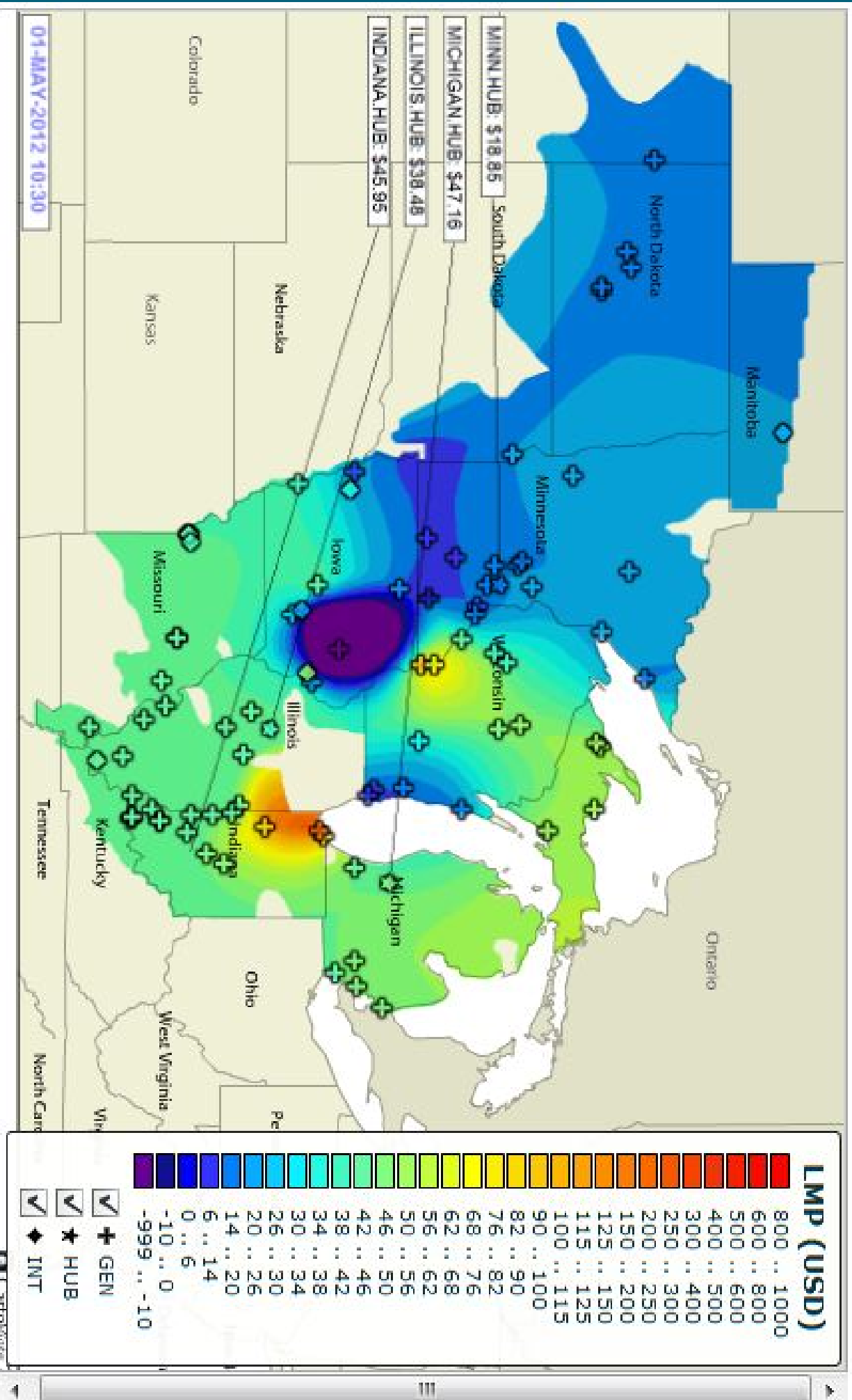
10:20 AM

Locational Marginal Prices



10:30 PM

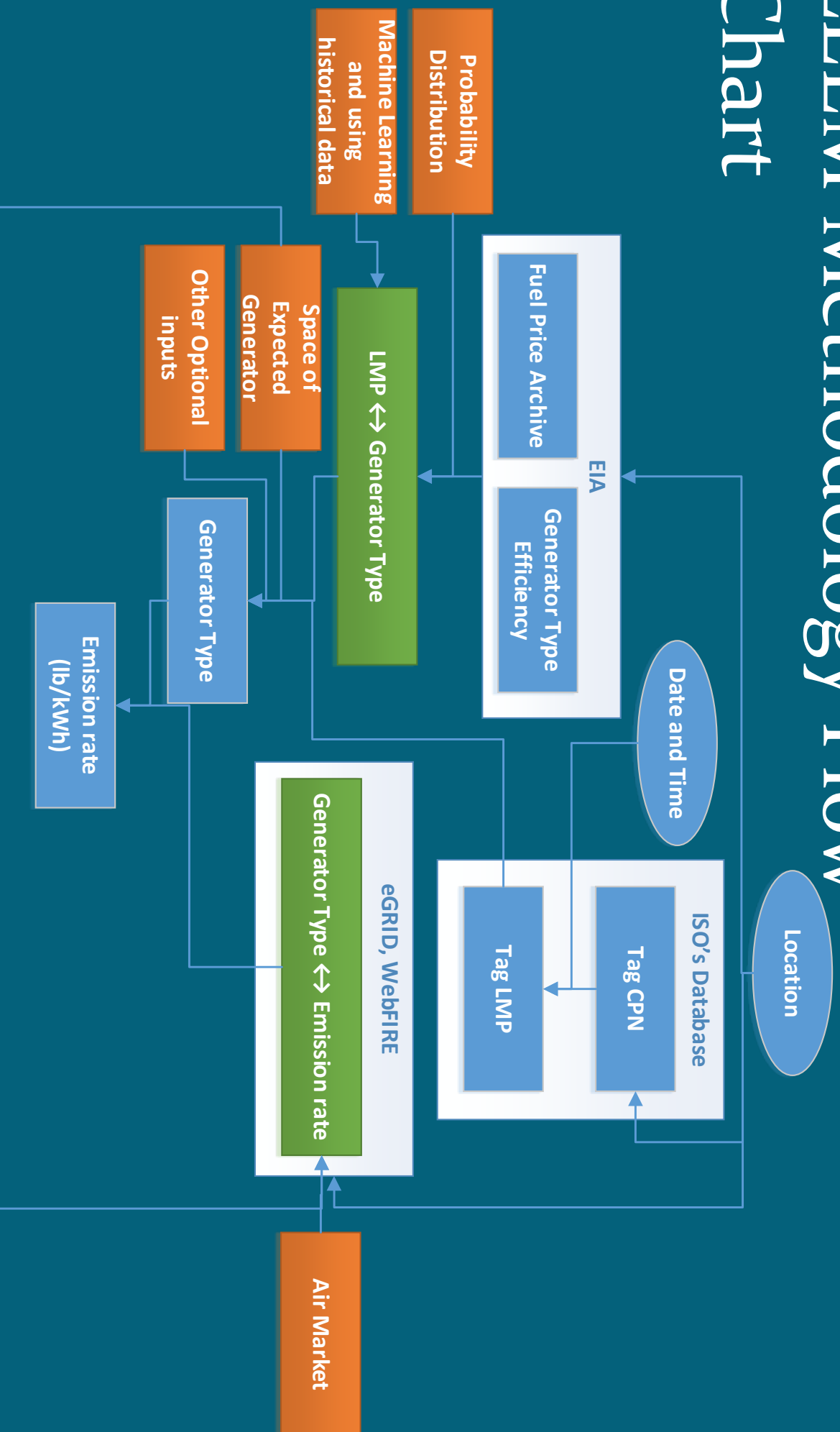
Locational Marginal Prices



ESE 105

The Algorithm

LEEM Methodology Flow Chart



ESE 106

The Business Model

A Tool for ESE...

141.217.48.221/App/Tpl/leem/index.html



LEEMCO

[Home](#)

[About Us](#)

[Solutions](#)

[Trial](#)

[Publications](#)

[FAQs](#)

[Contact Us](#)

LEEMCO

Timing of Electric Loads to Reduce Air
Emissions from Power Generation



The Business Model

Solutions

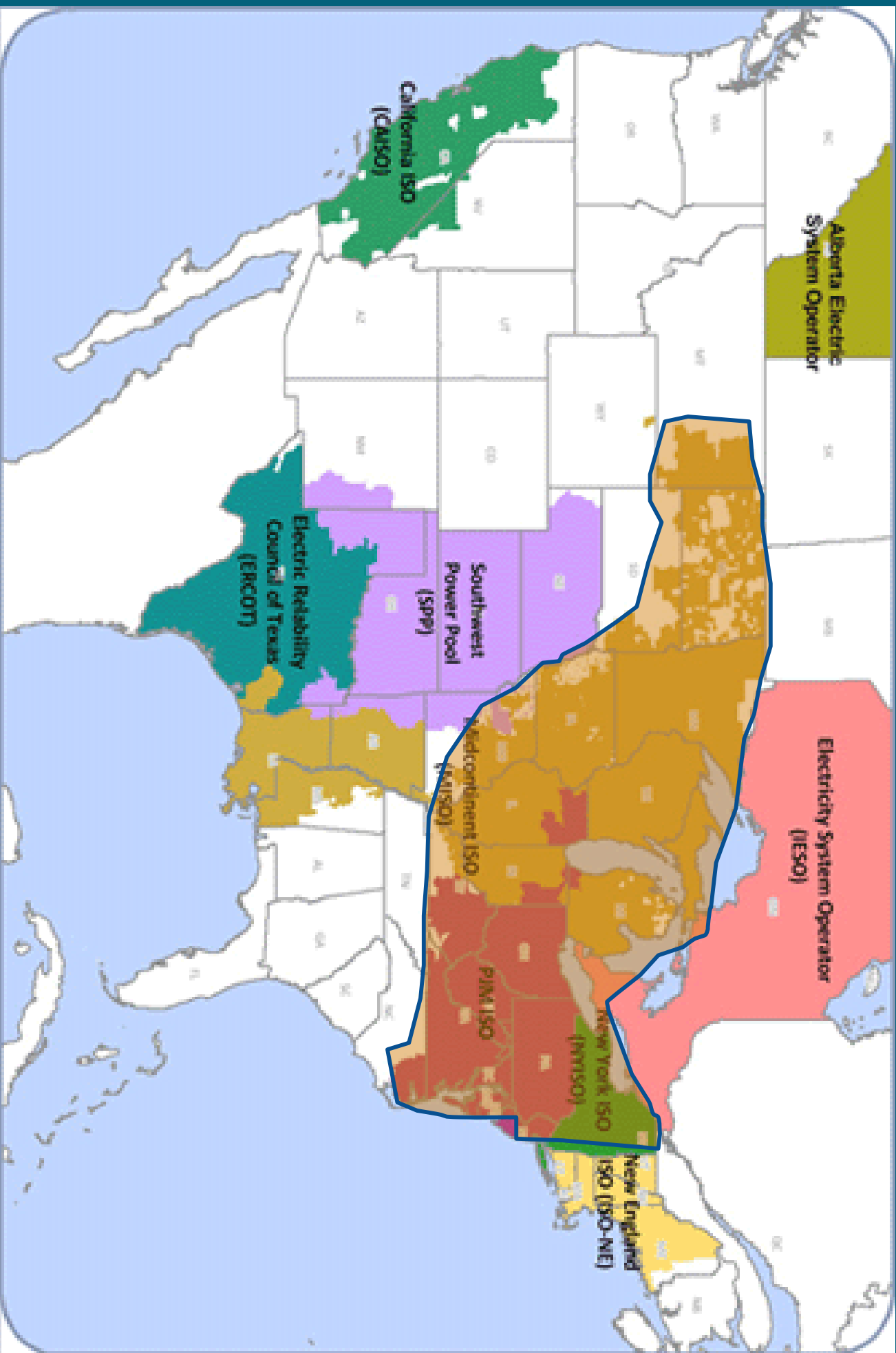
LEEMCO offers a good range of pre-assembled solution packages for our target clients. However, please note that we are very flexible with our solution packages, we will be happy to work with clients of diverse backgrounds to design customized packages that will meet your individual or corporate needs. Contact us today to find out more...

	Emissions Managers	Energy Managers	Energy Traders
Marginal Emissions			
Marginal Locational Pricing			
Commercial Node Dynamics			
Marginal Generators			

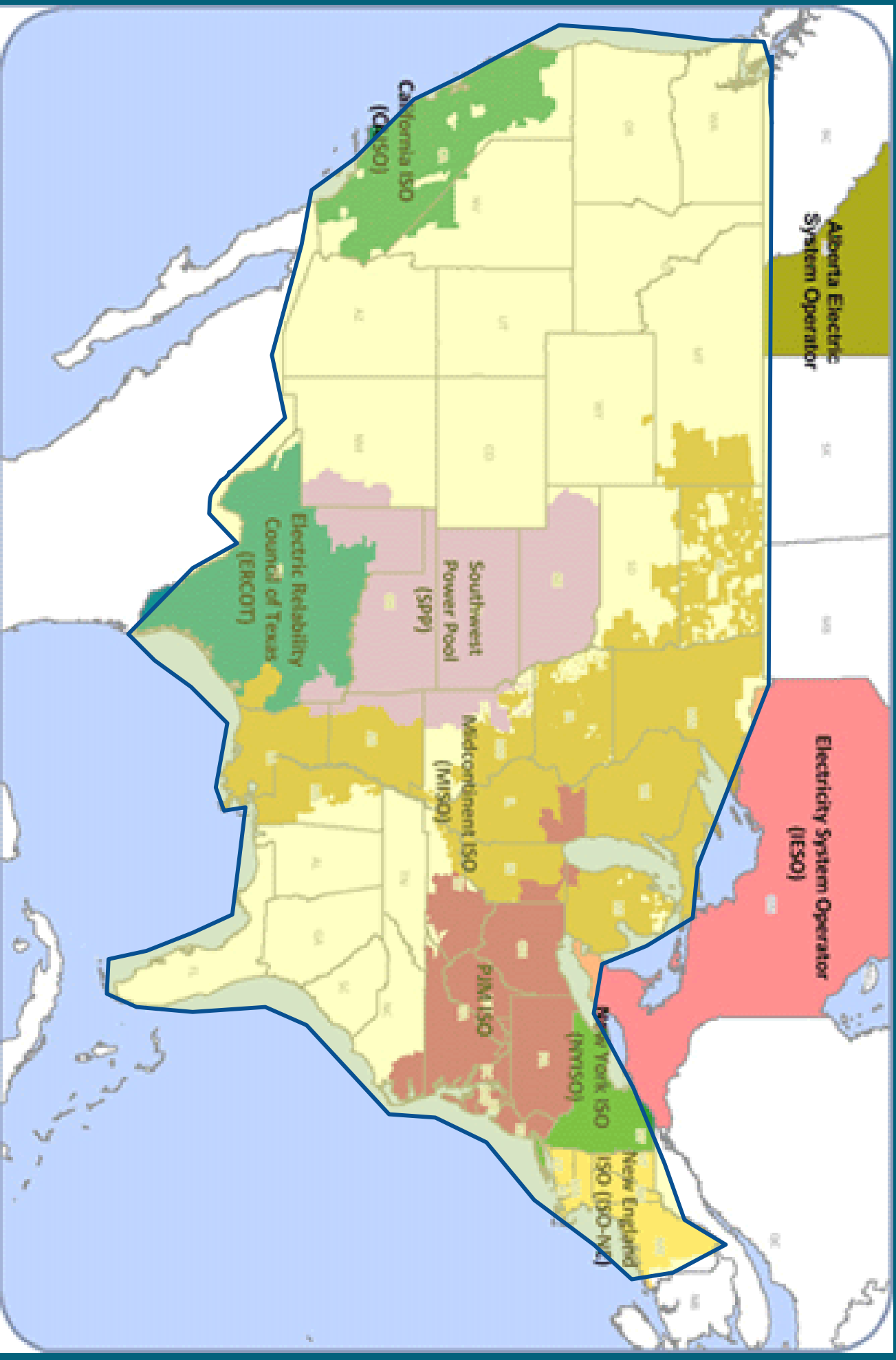
Marginal Emissions

Emissions Via Type Lookup Method	Long Name	Description
LEIARegion	EIA Region Code Lookup	The EIA/Egrid Subregion Used

LEEM GEOGRAPHIC COVERAGE 2.5

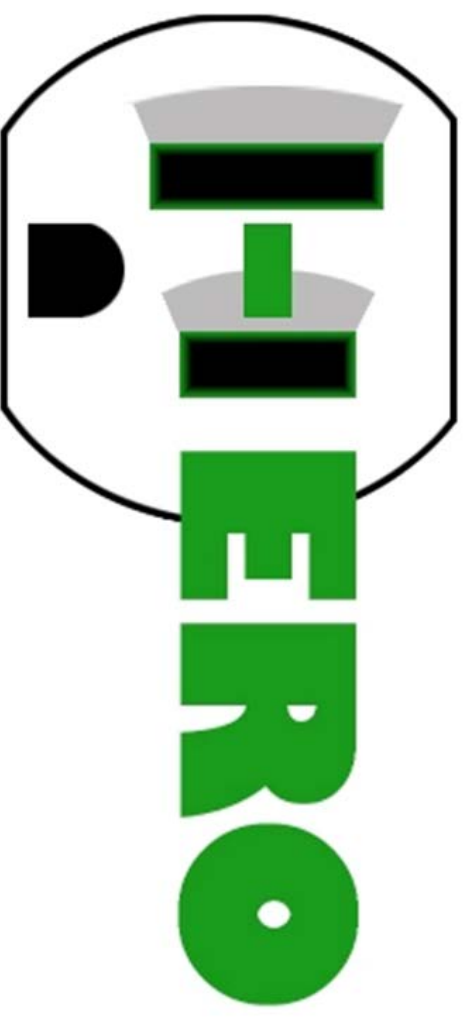


LEEM GEOGRAPHIC COVERAGE 3.0

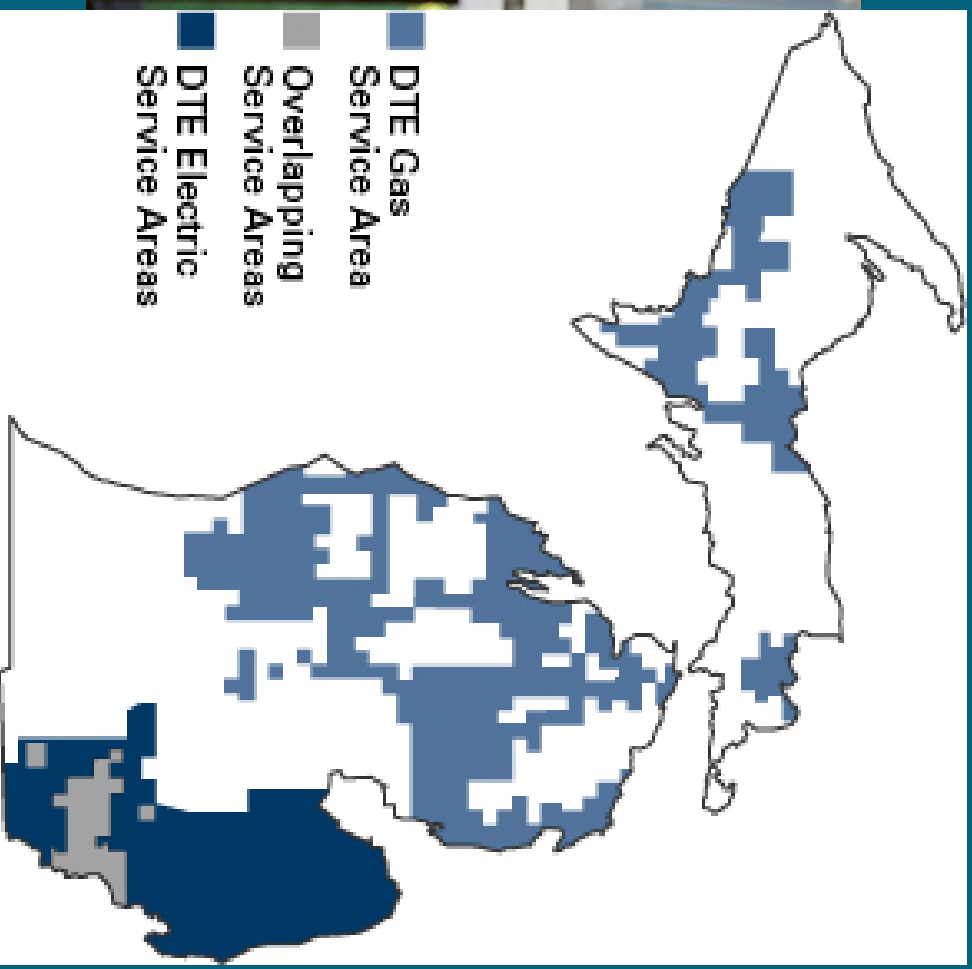


EMERGING APPLICATIONS/ PRODUCTS

SmartCharge



ESE Case Study







Search

Mail

Search

Save

Advanced

New

Get Mail

Delete



Reply

Reply to All

Forward

Spam



Close

Your HERO Index for today

From: "herowayne service" <herowayne.service@gmail.com>

To: "herowayne" <amharris@wayne.edu>

Reply To: "herowayne service" <herowayne.service@gmail.com>

Here is your marginal electricity emissions forecast for today:

Date: 01/09/15

Zip Code: 48208

	6 am	8 am	10 am	12 pm	2 pm	4 pm	6 pm	8 pm
Emissions								



The HERO Index provides an at-a-glance view of current and projected rates of air pollution from electricity generation. The color green indicates times when air emissions are low. Red indicates times when air emissions are high. Use the table above to select the greenest time to engage in energy intensive activities.

[Click here to see details or search for other places.](#)

Would you like some suggestions of actions you can take during high or low index times? Click here. Make a difference everyday with HERO!

HERO forecast is brought to you by Wayne State University in partnership with the Great Lakes Protection Fund.

Location:

Chillicothe, OH

Zipcode: Chillicothe, OH

Current HERO Index:

Take Action



The HERO Index provides an at-a-glance view of current and projected rates of air pollution from electricity generation. The color green indicates times when air emissions are low. Red indicates times when air emissions are high. Use the table below to select the greenest time to engage in energy intensive activities.

Emissions	1:20	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm

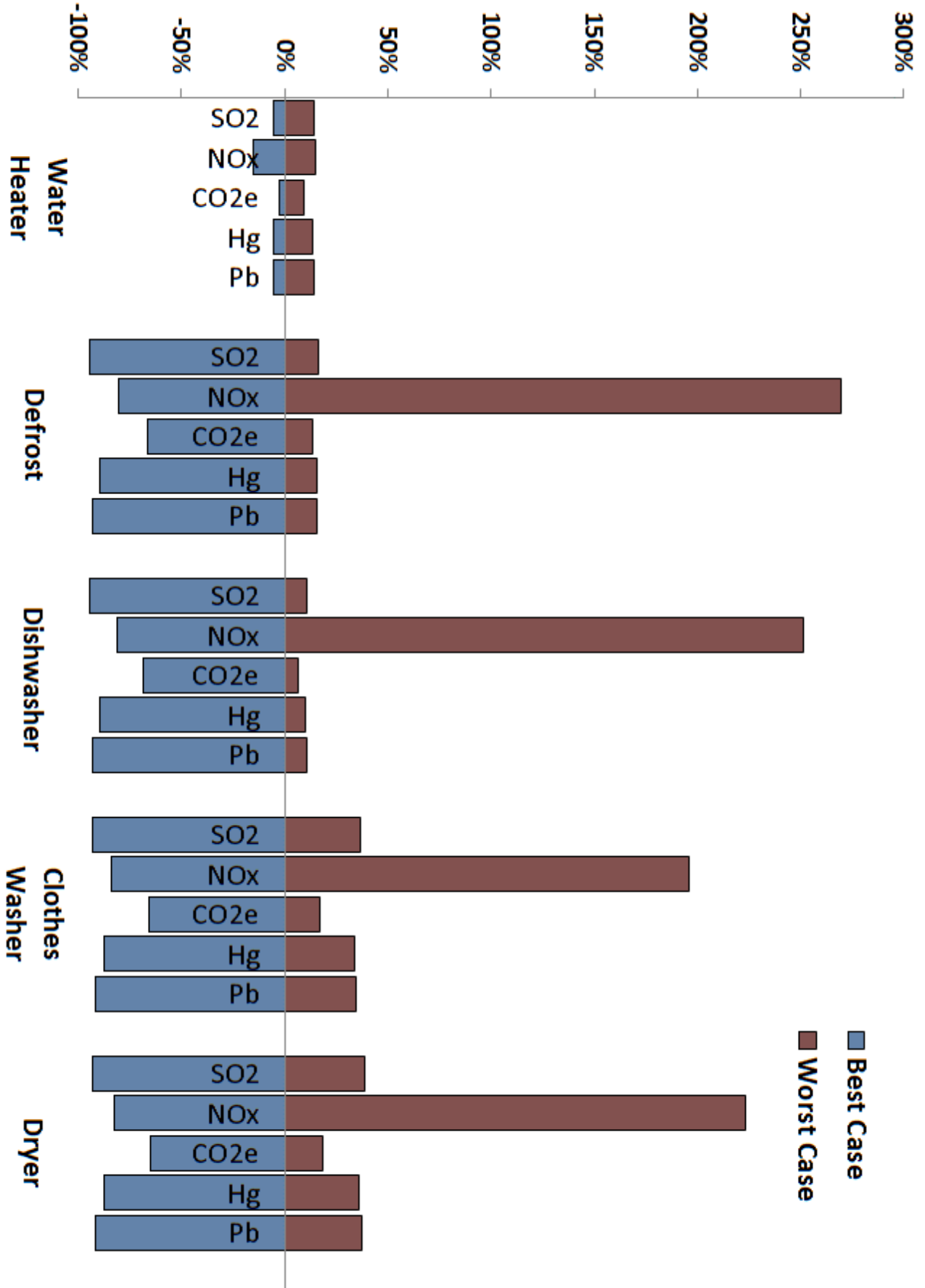
Low

Moderately Low

Moderate

Moderately High

High

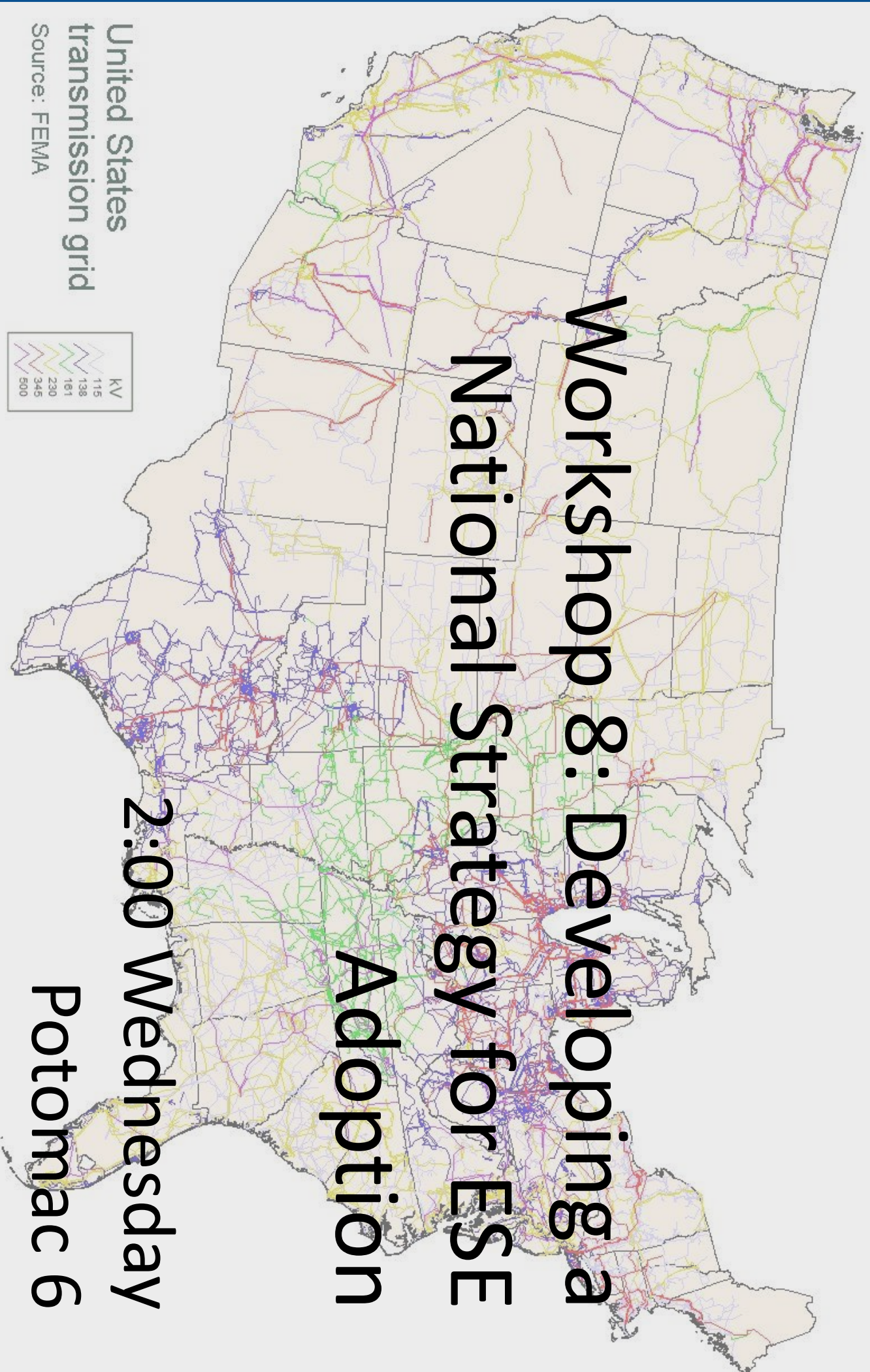




Target Pollutant	SO2	NO x	CO2e	Hg	Pb
SO2	30.0%	21.1%	21.0%	28.4%	29.6%
NOx	27.9%	35.1%	20.5%	26.2%	27.8%
CO2e	30.0%	21.1%	21.0%	28.4%	29.6%
Hg	30.0%	21.1%	21.0%	28.4%	29.6%
Pb	30.0%	21.1%	21.0%	28.4%	29.6%



Appliance	SO2	NO x	CO2e	Hg	Pb
Water Heater	0.13%	0.01%	0.07%	0.12%	0.13%
Defrost	2.3%	1.6%	1.6%	2.1%	2.2%
Dishwasher	2.3%	1.6%	1.6%	2.2%	2.2%
Clothes washer	2.2%	1.7%	1.6%	2.1%	2.2%
Clothes dryer	2.2%	1.7%	1.6%	2.1%	2.2%
Regional reductions in emissions					
(lbs/year)	429,000	110,000	87,240,000	2.21	4.53



United States
transmission grid
Source: FEMA



Workshop 8: Developing a National Strategy for ESE Adoption

2:00 Wednesday
Potomac 6

Further Information?

YouTube links:

LEEM: <http://www.youtube.com/watch?v=6DdAE1XGbpbs>

HERO: <http://www.youtube.com/watch?v=BfLTY8sFiQ8>

www.herowayne.com

Carol Miller, Ph.D. cmiller@eng.wayne.edu

Allison Harris, Ph.D. arharris@ecoworksdetroit.org

Time Variant Pricing

- Emissions/Cost not Directly Aligned (time/space)
- Provide Emissions Intel with Real Time Cost Intel
- III(d) and the policy implications of this data

LEEM: Connecting Energy Consumption to Real-time Emissions Impacts - [Join us to learn more about LEEM](#)

WEBINAR ----- APRIL 17, 1 PM ET

- **Gene Rodrigues**, Vice President of **ICF International**
- **Tom Catania**, Former VP Government Relations at **Whirlpool Corporation**
- **Nathaniel Brown**, Regional Manager, **Siemens Energy**
- **Anne Dougherty**, Founding Advisor of **ILLUME**

https://attendeegotowebinar.com/register/1494



LEEM: Connecting electricity consumption to real-time emissions impacts

Fri, Apr 17, 2015 1:00 PM - 3:00 PM EDT

Show in My Time Zone

Join us for a webinar to learn about LEEM – The New Big-Data Platform that Provides Users, Managers and Utilities with Real-Time and Location-Specific Electricity-Related Emissions Estimates

*Required field

First Name*

Last Name*

Email Address*

Phone Number



EDF and NYU Law –

The ESE team says *Thank You!*

