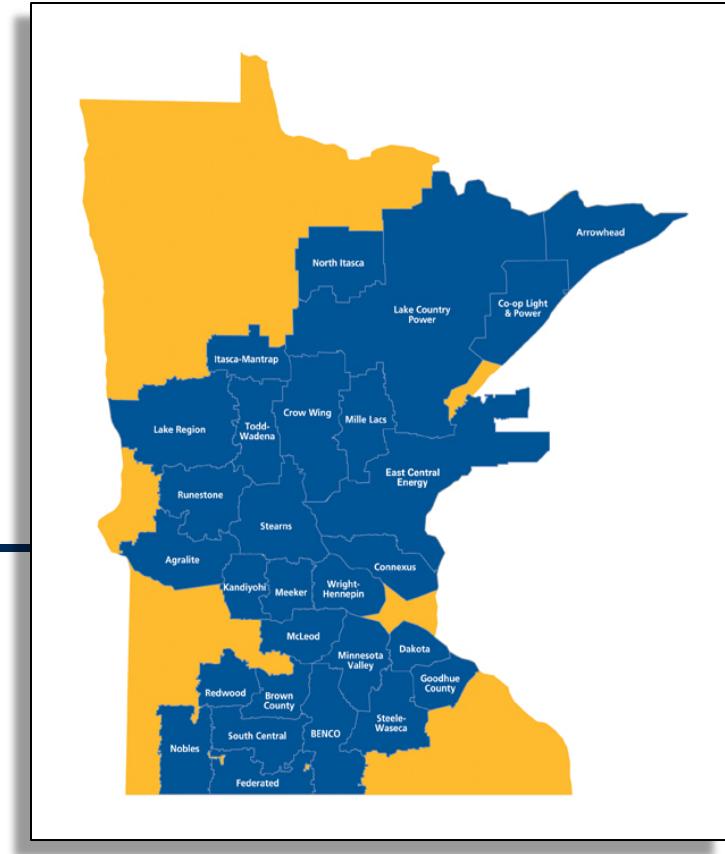


# Variable generation, variable load, what's a utility to do?

**Gary Connell**

Director, Demand Response  
and Member Services



# The challenge

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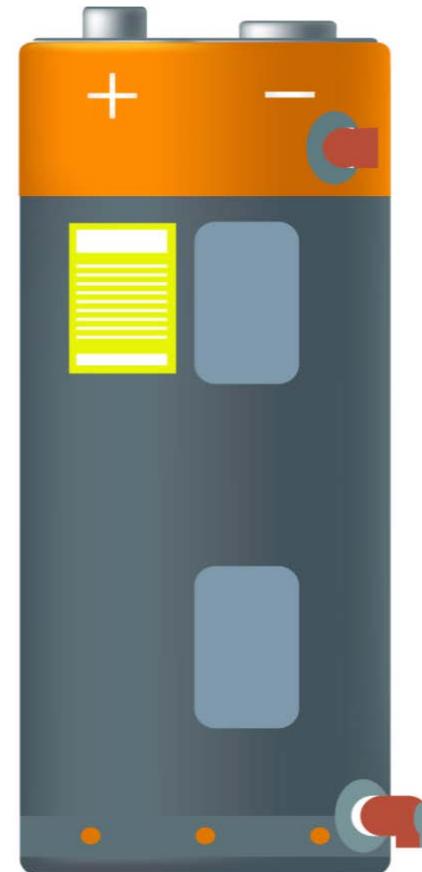


*The needs of the new grid  
requires a juggling act of sorts...*

# “Controlled” water heaters

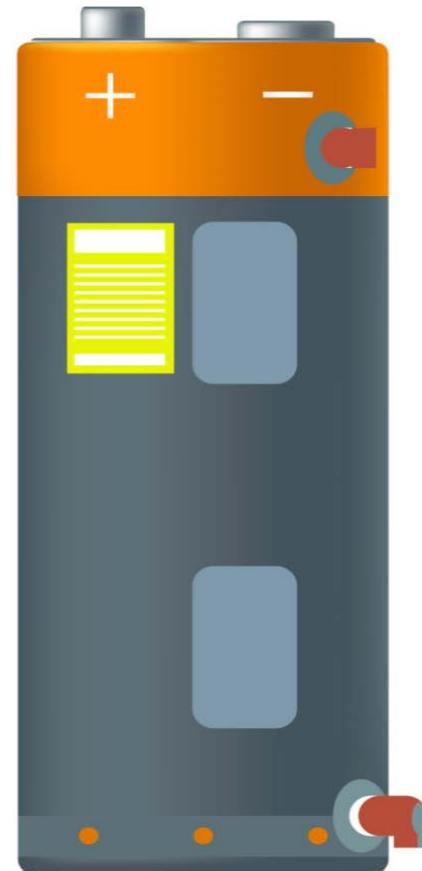
## A “battery in the basement”

- ▶ Industry seeking a battery to store renewable energy
- ▶ GRE has over 110,000 controlled water heaters
  - Low-cost water heating
  - A “Community storage” initiative
  - Storing a GWH each night, every night

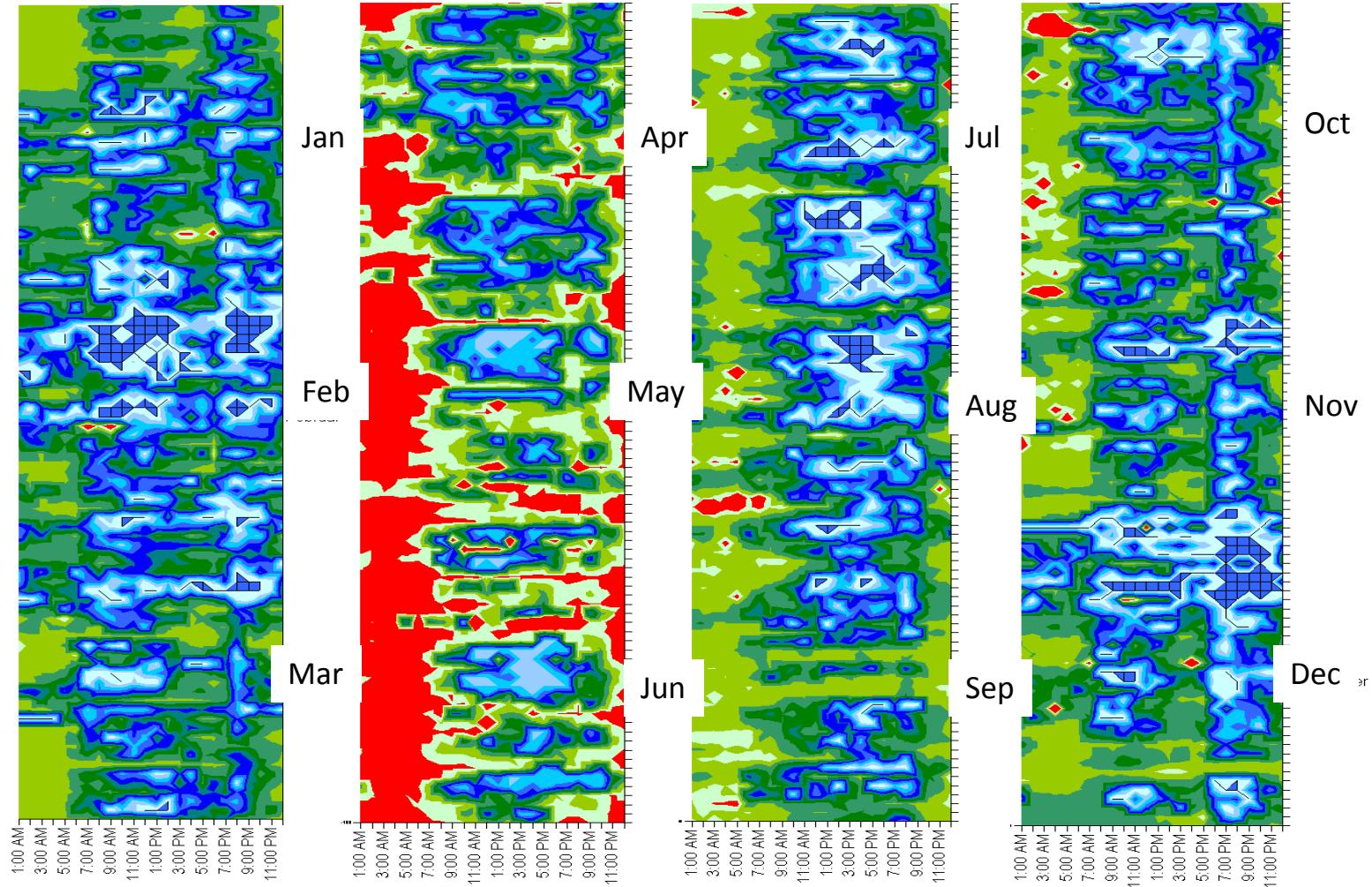


# “Smart” water heaters

- ▶ Grid-Interactive control technology
  - Dynamic demand response
  - Allows for better management of variable generation resources
  - Can provide ancillary services to wholesale markets



# Real Time Prices - MISO NSP.Buffr



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# “Community storage”

- ▶ Electric Co-ops and Natural Resources Defense Council Launch “Community Storage” Initiative and Unveil New Research from The Brattle Group
- ▶ Public Utilities Fortnightly
  - *Community Storage - Coming to a Home Near You*

## The Hidden Battery

### Opportunities in Electric Water Heating

#### PREPARED FOR



#### PREPARED BY

Ryan Hledik  
Judy Chang  
Roger Lueken

January 2016

THE **Brattle** GROUP



**GREAT RIVER ENERGY**

# Solar projects



Total of 24 projects  
11 are community solar  
21kW to 276kW in size  
1.84MW total

*Just announced a 2.25MW  
project*



Matching community solar  
with community storage



Buy a 410 watt panel in the SUNNA project and get a free electric thermal storage water heater

- ▶ For the homeowner
  - \$170 panel cost
  - No sighting issues
  - No maintenance issues
  - No worries
- ▶ For the cooperative
  - One interconnection
  - Available to all members





Steele-Waseca Cooperative Electric offers sweet community solar and water heater bundle

## Steele-Waseca Electric Cooperative Announces New Community Solar Model with Off-Peak Water Heating

JANUARY 13, 2015

Small Co-op,  
Big Idea



### Why one electric co-op is offering their solar customers free water heaters

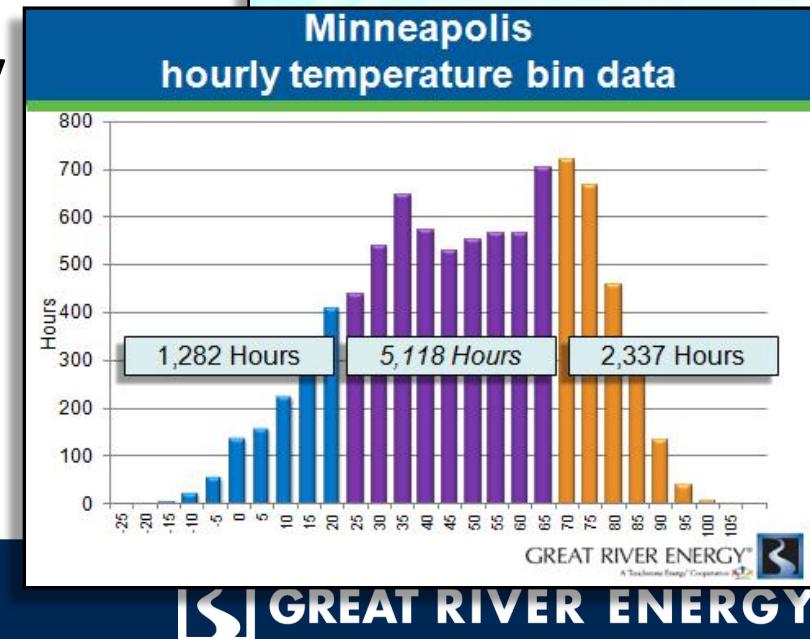
In Steele-Waseca's territory in Minnesota, community solar comes with a "catch."

By [Robert Walton](#) | February 10, 2015



# Air Source Heat Pumps

- ▶ A hybrid heating system
- ▶ Heats when temp is above 20F
- ▶ Efficiencies of 200% or greater
- ▶ Uses energy in off-peak months
- ▶ Complements wind energy



# Future Grid

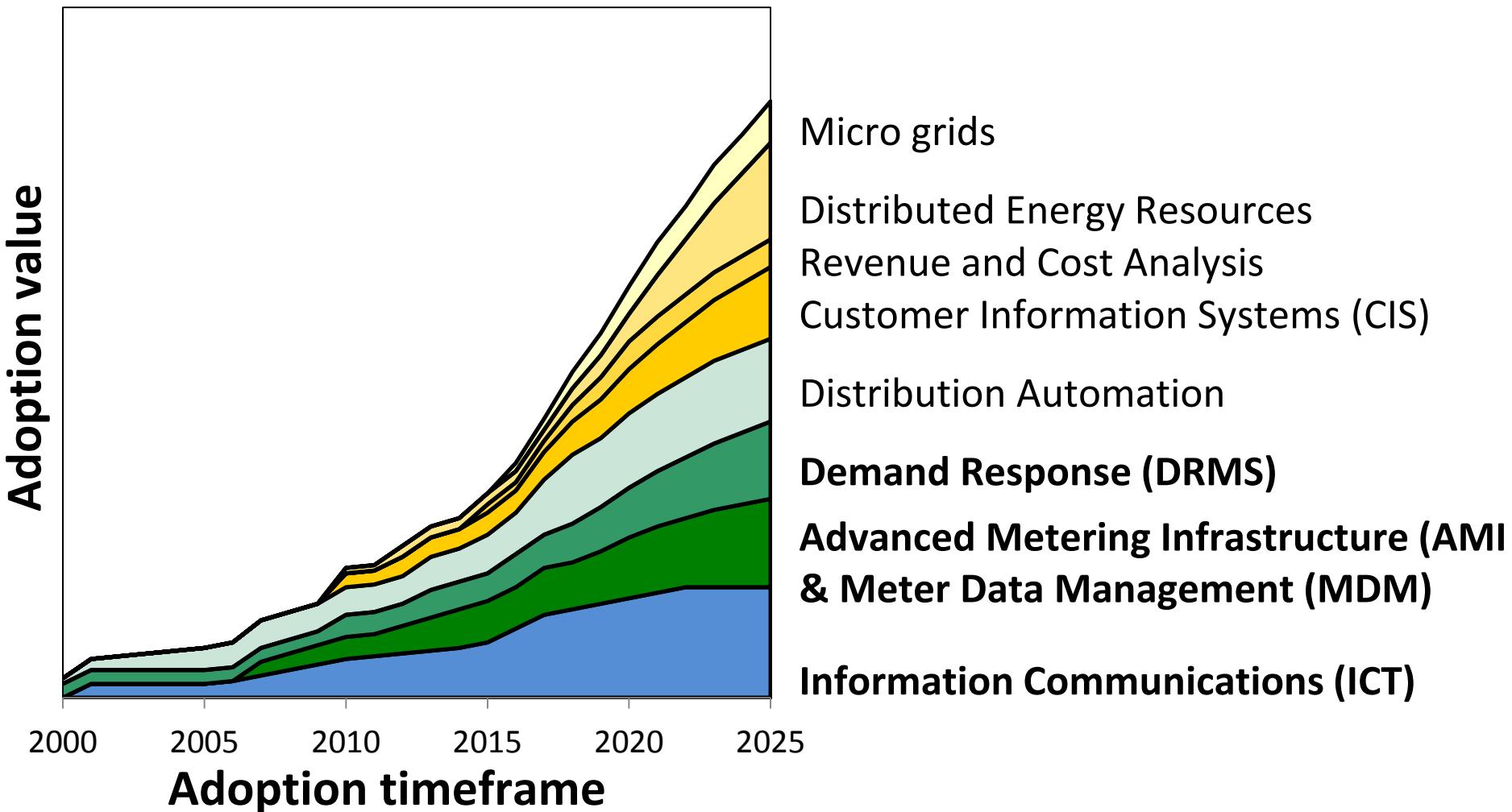
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*The seamless integration of the electric grid, a communications network, and software and hardware that monitors, controls, and manages the creation, distribution, storage and consumption of electricity.*

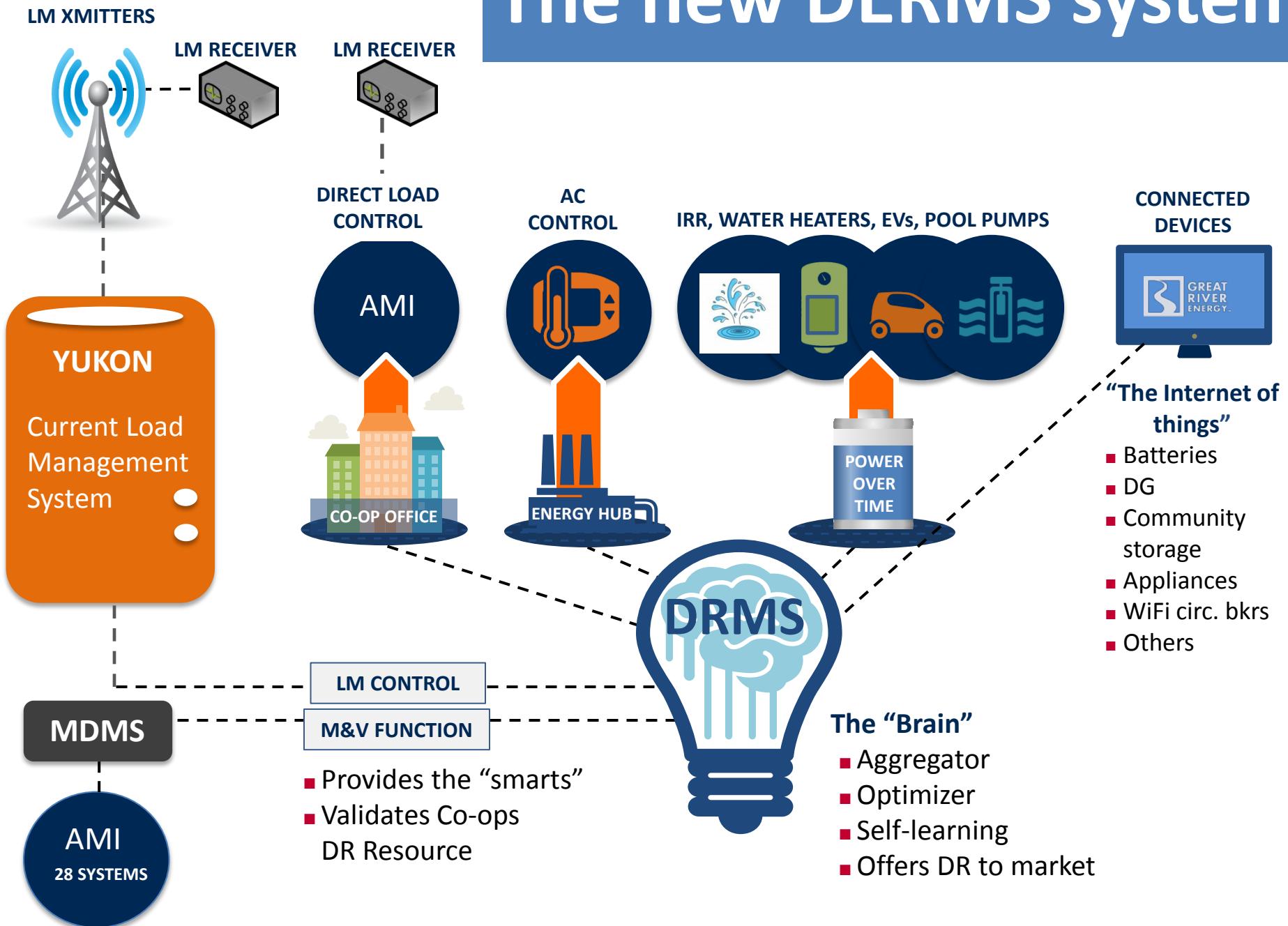
*It will be interactive, it will be self-healing, and it will communicate with every device.*



# Technology roadmap



# The new DERMS system



# In summary

*Consider three end-use trends...*

- Electric end-use appliances are more widely available and offer a path toward a lower carbon future
- In designing policies, important to consider how the grid operates today and the grid's longer-term trends
- There is an increase need to find solutions to integrate variable generation into the grid –
  - This can be greatly assisted with end-use electric appliances – including the often forgotten water heater

