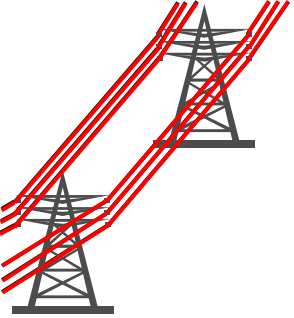

EE362G Smart Grids:
Austin Energy Smart Grids – Part 1

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Spring 2019

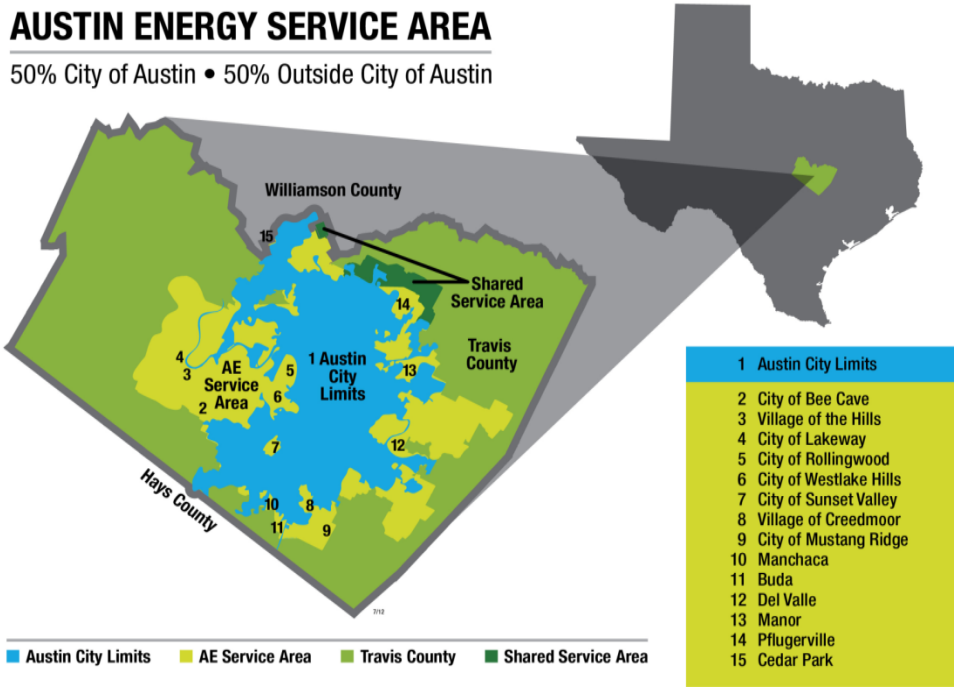
Presentation Outline

Note: “Grid Modernization” is the process of implementing “Smart Grid”

- About Austin Energy
- Grid Modernization and Safety
- What is Driving Grid Modernization
- What is Grid Modernization
- Austin Energy’s Power Delivery System
- What is Austin Energy’s Strategy
- What Austin Energy is Doing to Modernize the Grid
- Advanced Metering Infrastructure (AMI)
- History of AMI at Austin Energy
- Grid Automation

About Austin Energy

- 8th largest community-owned electric utility
- Reports to the City Manager who executes the policy and direction of the City Council
- 437 square miles of service area covering City of Austin and beyond
- Vertically-integrated in a deregulated whole-sale energy only market
- Annual budget $1.5B
- System peak load
    - 2755 MW (summer)
    - 2377 MW (winter)
- 480,000+ meters (65,000+ C&I)
- 1700+ Employees



Austin Energy's Mission, Vision, Focus

Mission:

To safely deliver clean, affordable, reliable energy and excellent customer service

Vision:

Drive customer value in energy services with innovative technology and environmental leadership

Customer Driven.
Community Focused.

How Does Grid Modernization Affect Safety?

Grid Modernization Impacts Safety By ...

Remote communication and control of T&D assets

Means reduced truck rolls

Reduced exposure

Grid Modernization Impacts Safety By ...

Making Network Vaults Safer for Employees to Work in

Grid Modernization Impacts Safety By ...

Remotely Inspecting our Infrastructure

What's Driving Grid Modernization?

The World is Changing

BLOCKBUSTER → NETFLIX

→ UBER lyft

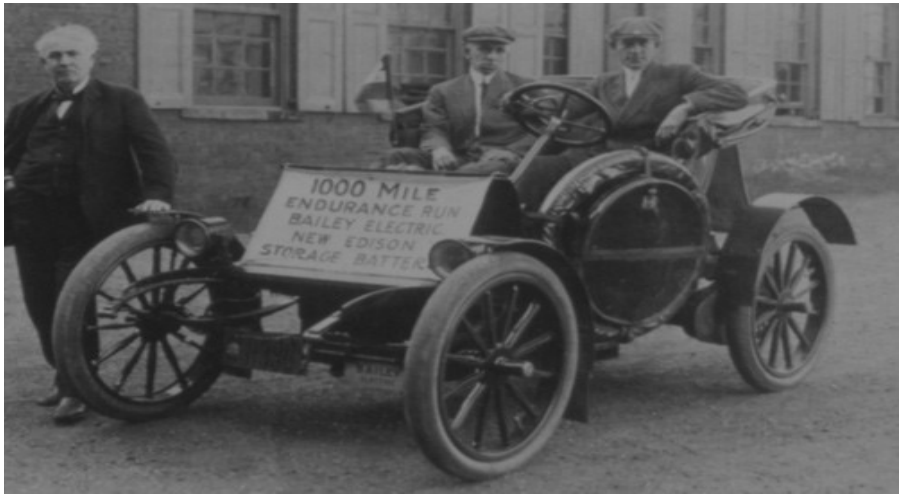
sears → amazon.com

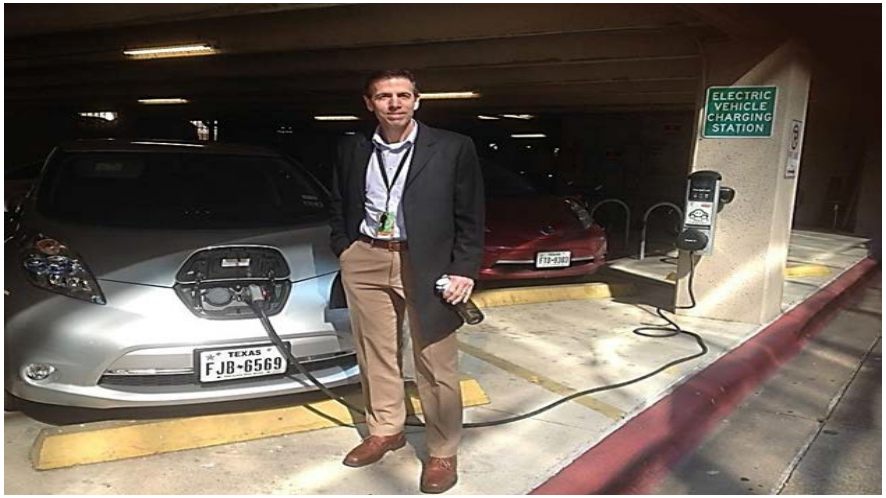
Back to the Future

38% of all vehicles are electric vehicles

… in 1917!

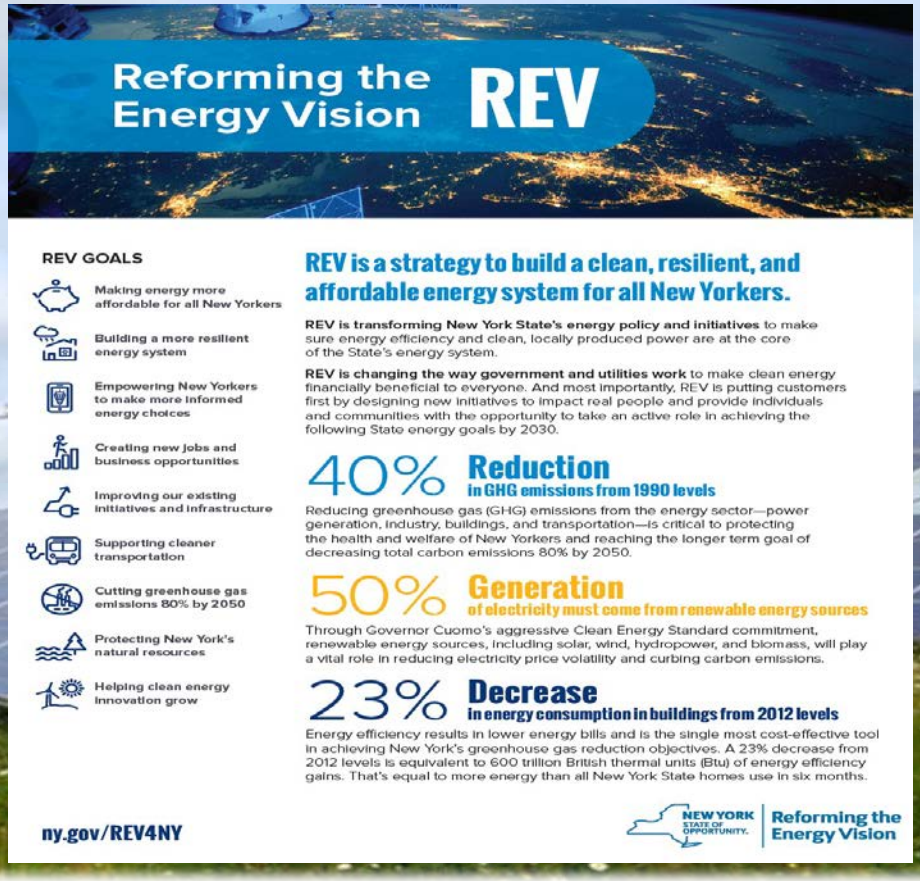
We will not stop until every car on the road is electric
- Elon Musk, CEO of Tesla Motors





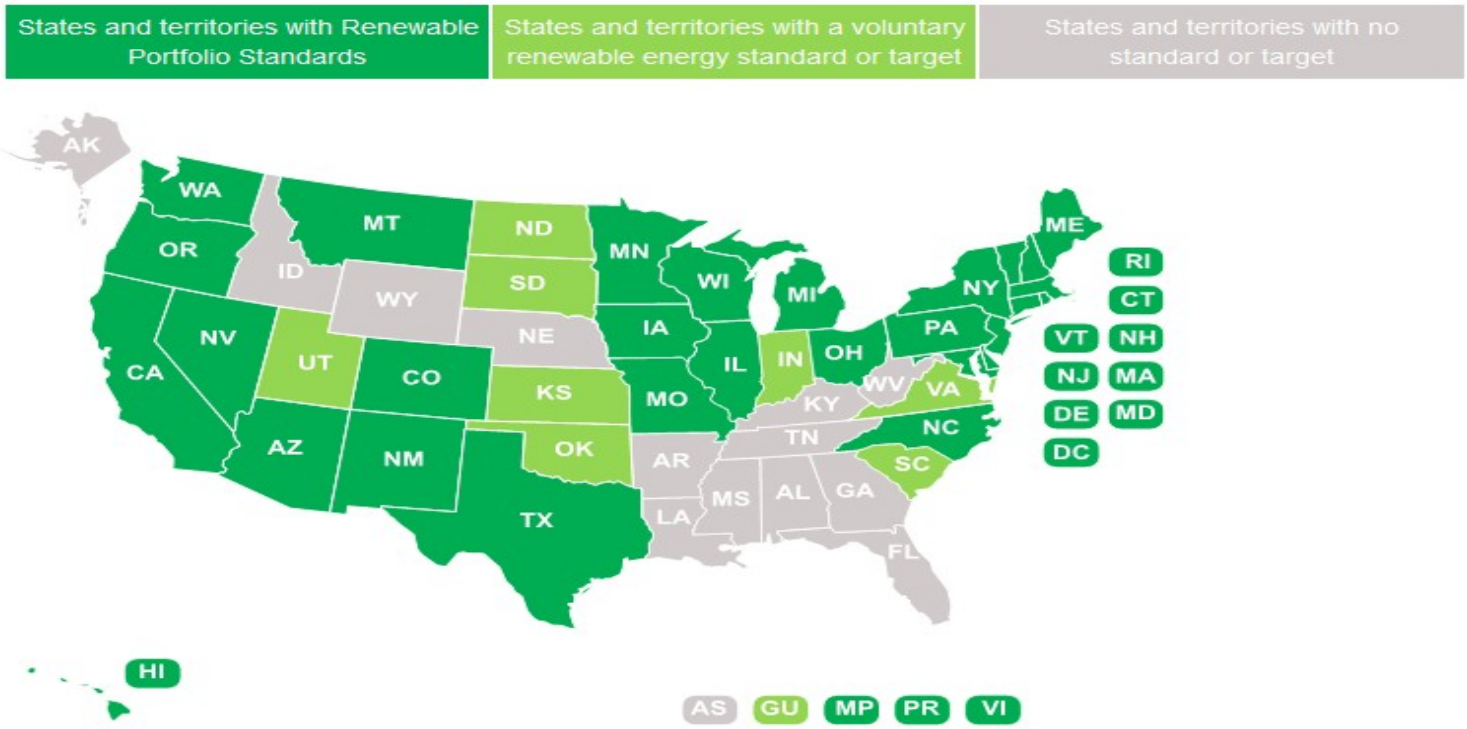
California and New York

California Governor Brown signs 50% renewable portfolio standard into law



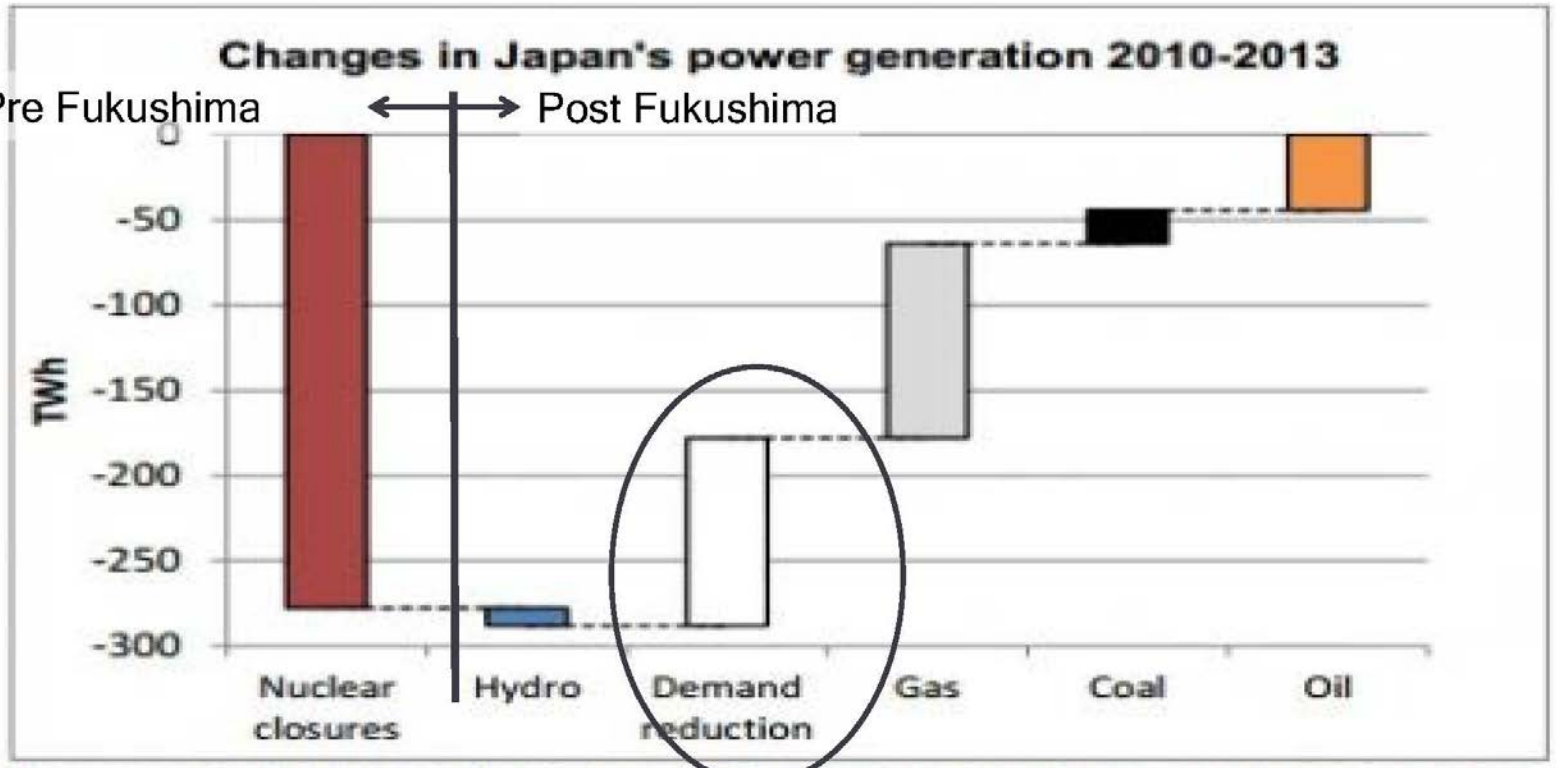
Current Renewable Portfolio Standards (RPS) US Map

RPS is a regulation that requires the increase in production of energy from renewable energy sources.



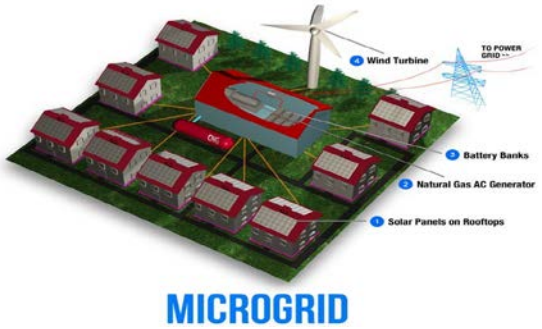
Do You Recognize This Picture?

Silver Lining of a Post Fukushima Grid



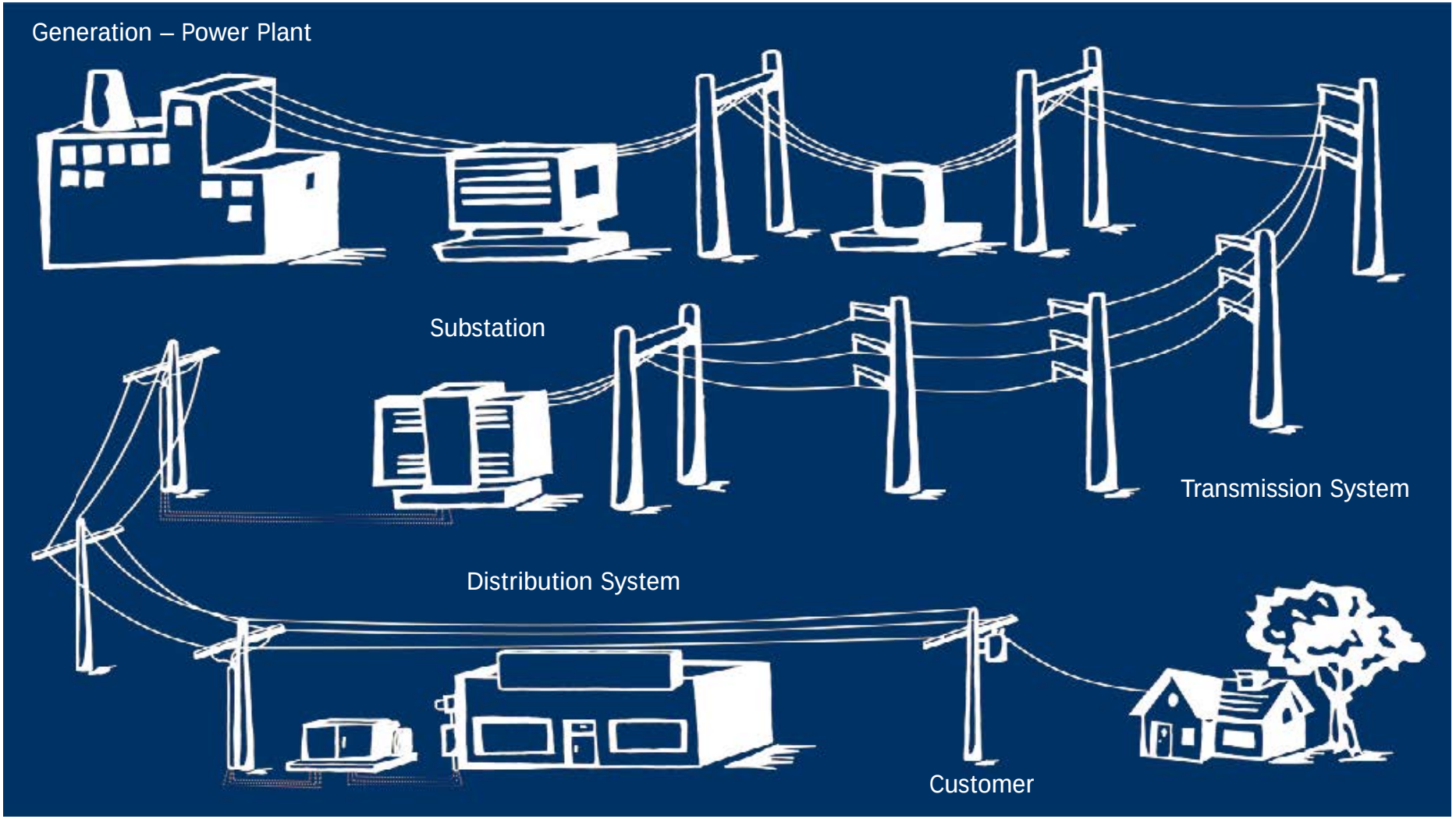
Source: calculated from Japan's official monthly power generation statistics[2].

What About Us?



What Exactly Is Grid Modernization?

Structure of the Grid



AE's Power Delivery System Today

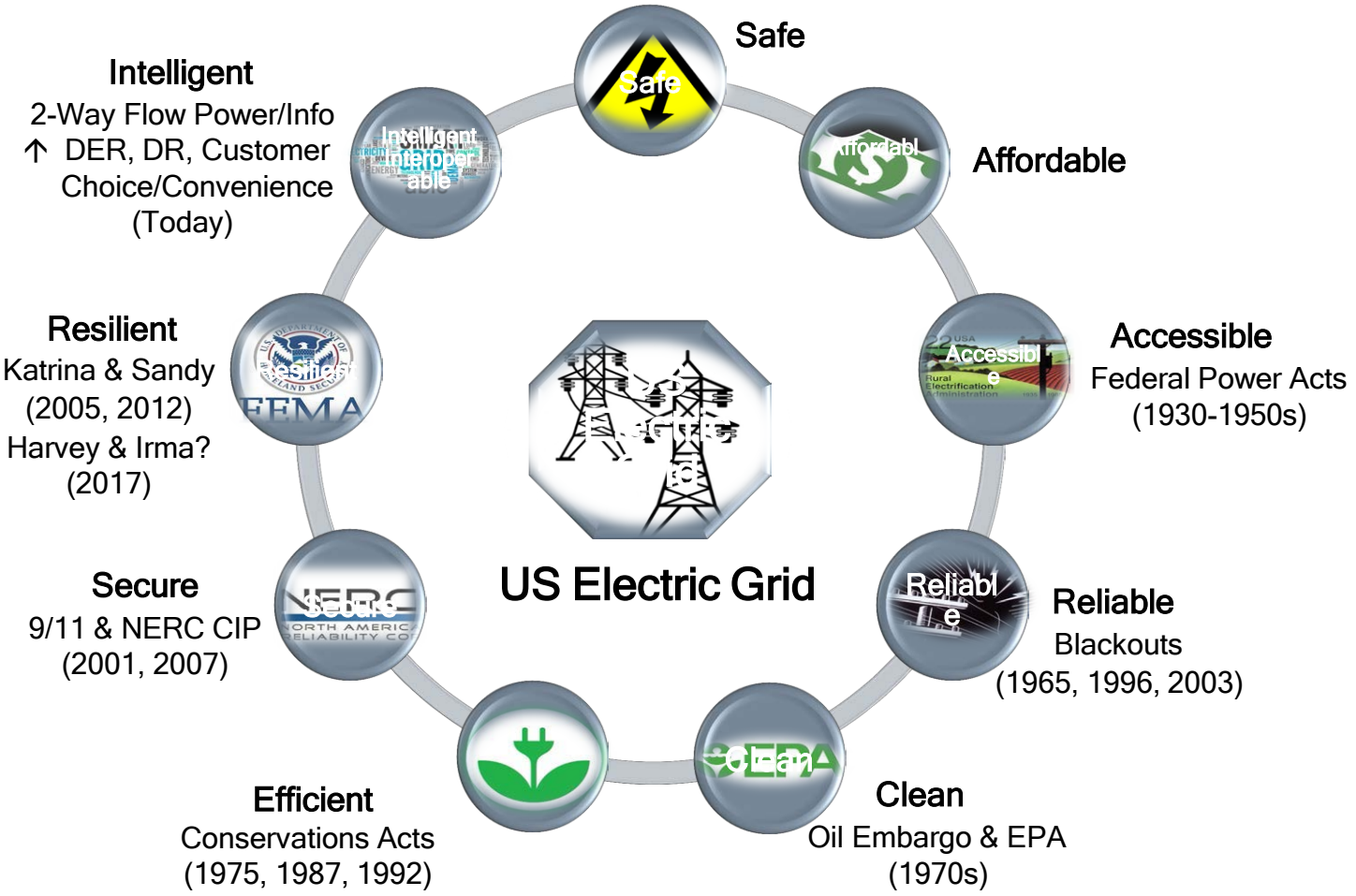
- ERCOT Market
  - ~ 72,000 MWs generation
    - 4,834 MWs Austin Energy owned and contracted generation

- 623 miles of Transmission Lines
- 75 Substations
- 4,938 miles Overhead Distribution Lines
- 6,652 miles Underground Distribution Lines
- 80,000 Distribution Transformers
- 180,000 Distribution Poles

- 2 Community Solar Farms
- 2 Energy Storage Systems (Shines Project)
- 30 MW Local Solar

- 480,000 Customers
- 10,000 Solar Generating Customers
  - 380,122 homes
  - 926,426 people
  - 596 schools, hospitals
  - 23 police, fire stations
  - 56,879 of businesses

Grid Modernization Evolution



Intelligent
2-Way Flow Power/Info
↑ DER, DR, Customer Choice/Convenience
(Today)

Resilient
Katrina & Sandy
(2005, 2012)
Harvey & Irma?
(2017)

Secure
9/11 & NERC CIP
(2001, 2007)

Efficient
Conservations Acts
(1975, 1987, 1992)

Clean
Oil Embargo & EPA
(1970s)

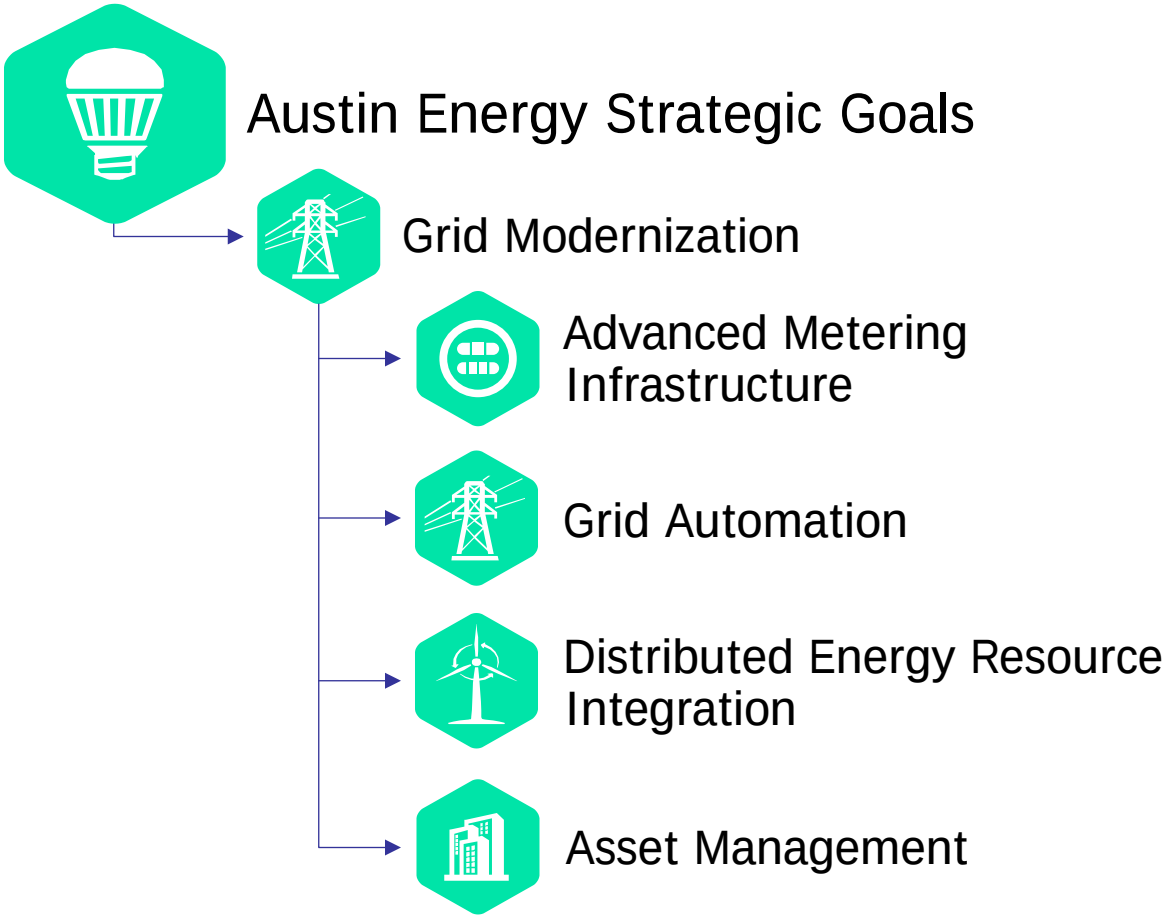
Reliable
Blackouts
(1965, 1996, 2003)

Accessible
Federal Power Acts
(1930-1950s)

AE Grid Modernization Strategic Goal

Goal: Innovative **two-way grid** utilizing customer and company infrastructure to deliver **superior reliability** and **customer experience** at the **lowest reasonable cost**.
Measure: Achieve top decile T & D reliability indices (SATLPI, SAIDI, SAIFI, CAIDI) and above average JD Power customer satisfaction index for residential and commercial customers
Current State: Top quartile reliability indices; Bottom quartile customer satisfaction index
Opportunities/Challenges: Resources (personnel/knowledge/funding), Analytics, Solution Selection

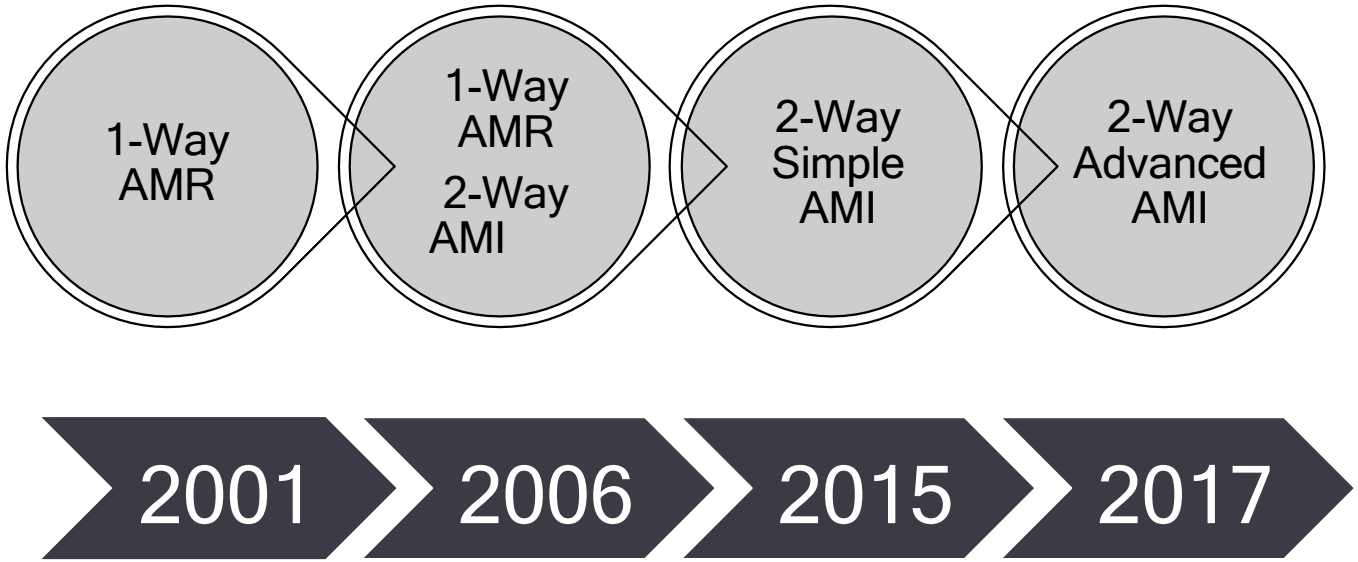
AE Grid Modernization Strategy



Advanced Metering Infrastructure (AMI)

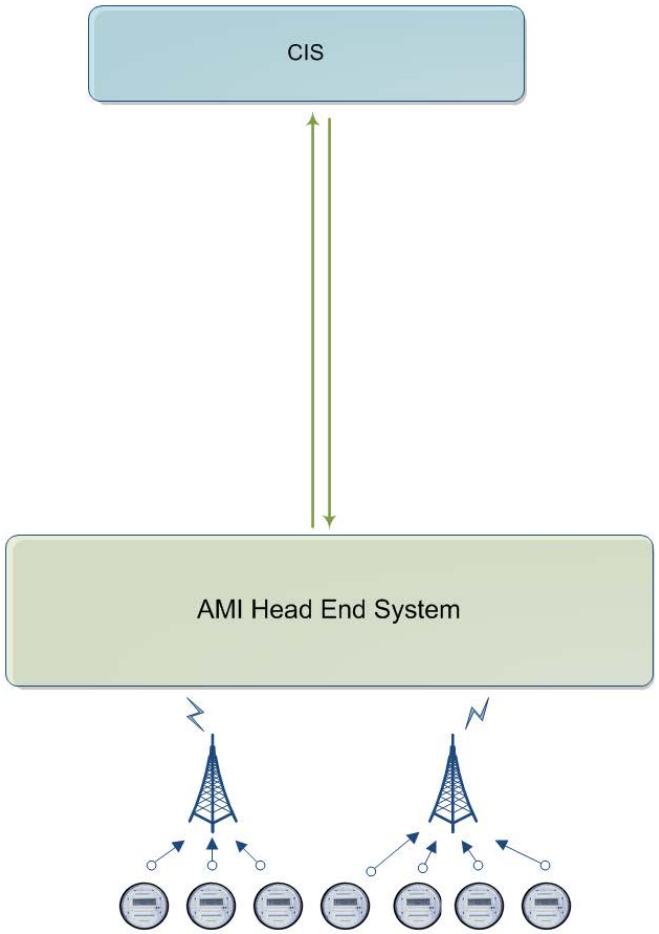
History of AMI at Austin Energy

AMR (Automatic Meter Reading) definition: an older technology (emerged in 80's and 90's) to collect basic meter reading data

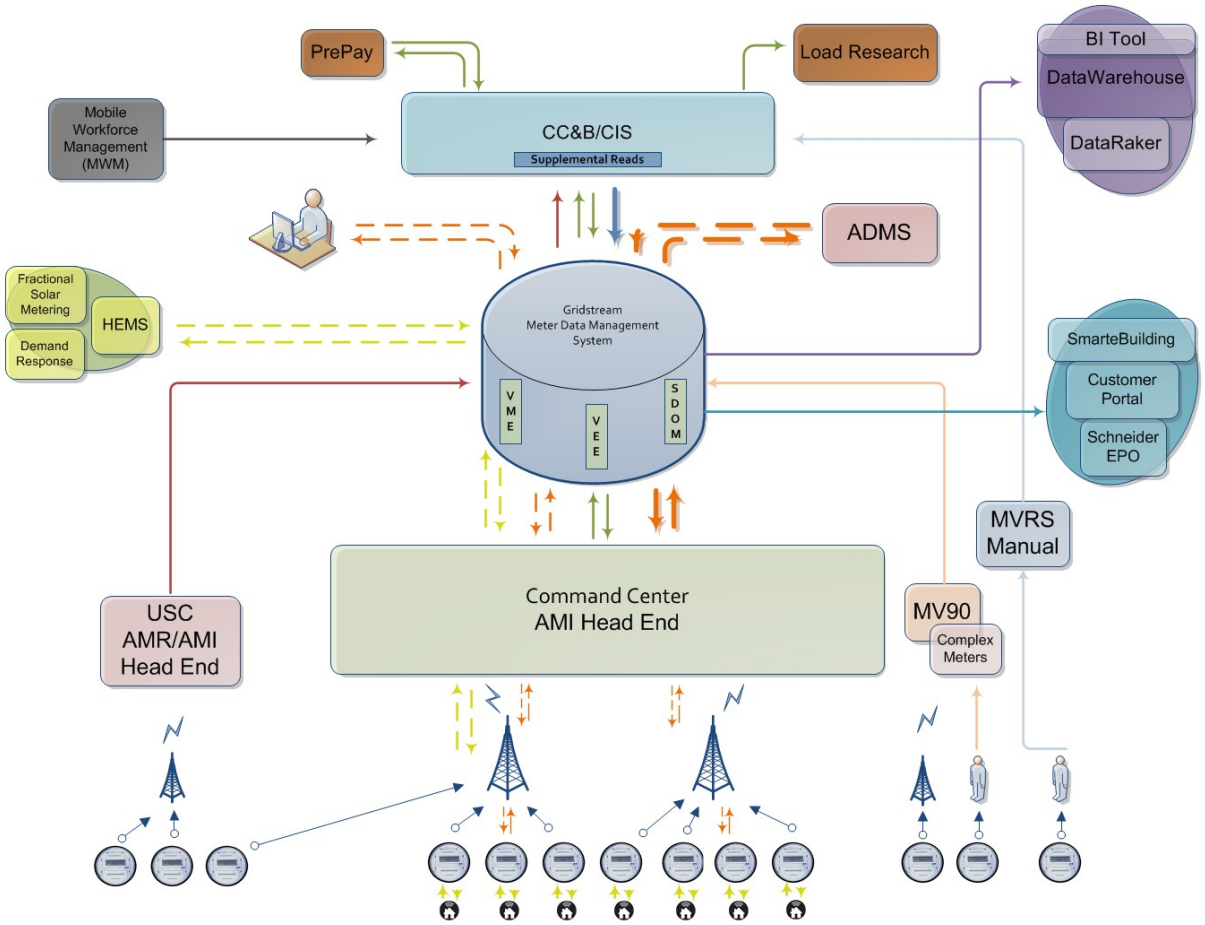


AMI in 2013

A **Head End System** is hardware and software that receives the stream of meter data brought back to the utility through the AMI. Head End Systems may perform a limited amount of data validation before either making the data available for other systems to request or pushing the data out to other systems.



AMI in 2018



AMI Data Flood

2013

Daily Reads = 1/day
Alarms/Events/Flags = 4

2018

Daily Reads = 1/day Interval
Reads = 96/Day
Alarms/Events/Flags = 137 - 600

Commercial & Residential Meter Upgrades

Commercial Meter Replacement Project

- 48,000 GE and Elster meters to be exchanged
- Planned completion FY 2019
- 30% complete
- Installation contractor

Residential Meter Replacement Project

- 245,000 residential meters to be exchanged
- Planned completion FY 2022
- 10% complete
- Revenue Measurement and Control

Leverage/Optimize Advanced Metering Infrastructure

Head End System Upgrade

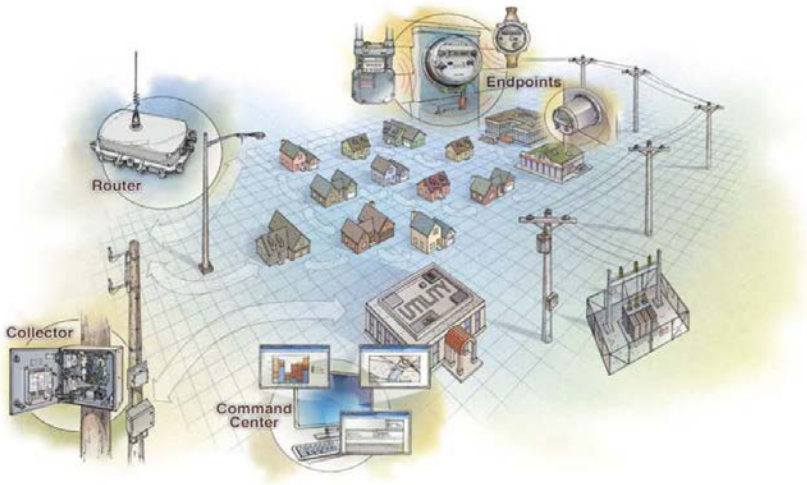
Remote Connect/Disconnect

ADMS Integrations

- Instantaneous voltage underway
- Automated outage/restoration events to MDMS>ADMS
- On Demand voltage requests from ADMS

Other Initiatives

- Thermostat and Home Energy Management System (HEMS) ZigBee integration proof of concept
- Proposed pilot of IP based metering communication protocol



Meter Data Management System Upgrade

Phase II Upgrade

- Upgrade to Version 4.0
- Planned completion Q1 FY 2020

Integration testing and reporting

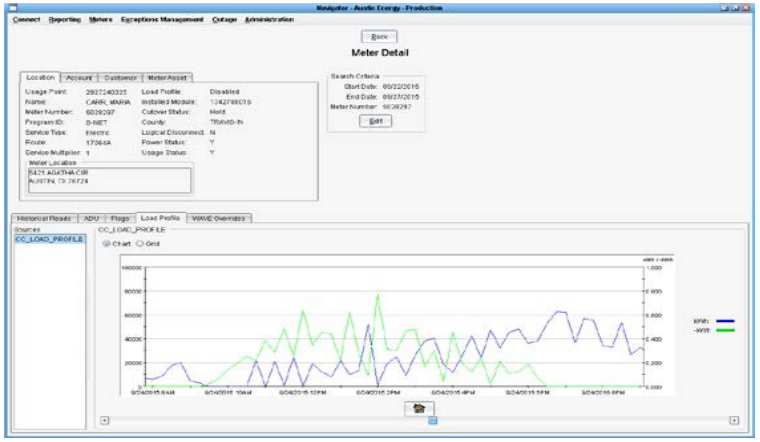
- All business unit needs (metering, rates, billing, field operations, CC&B vendor transition)

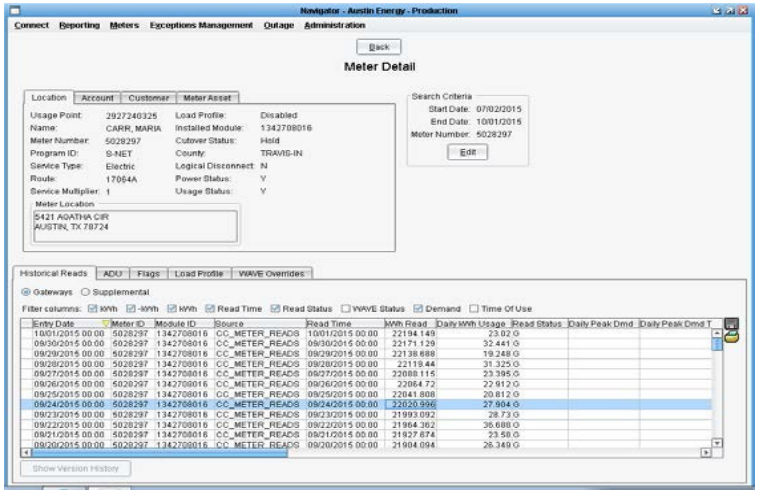
ADMS Integrations

- Automated outage/restoration events to ADMS
- On Demand Voltage requests from ADMS
- Monthly and Annual load profile data for all AMI reporting meters to support load flow estimates in ADMS

Totalized and Fractional Metering

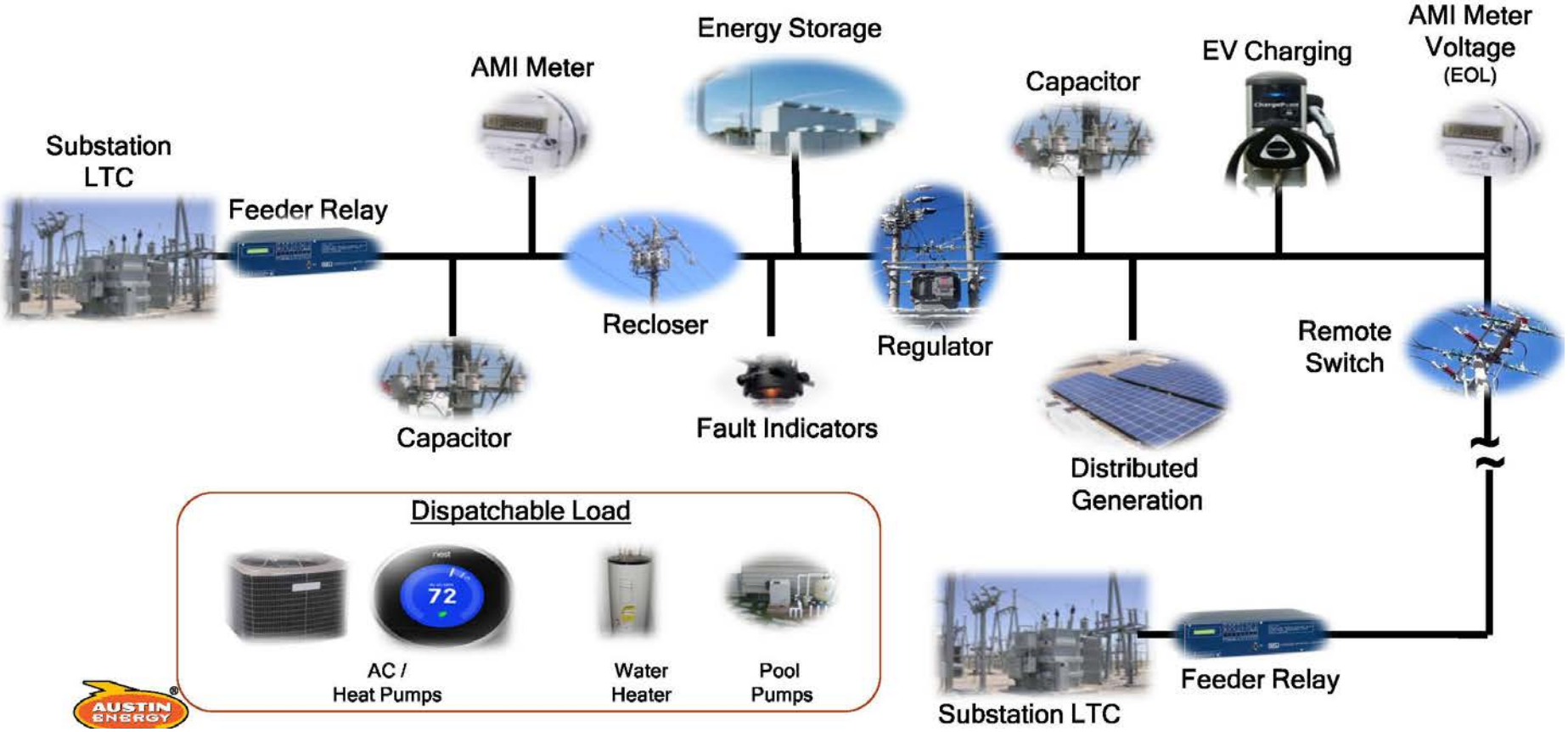
- Using MDMS Virtual Metering Engine





Grid Automation

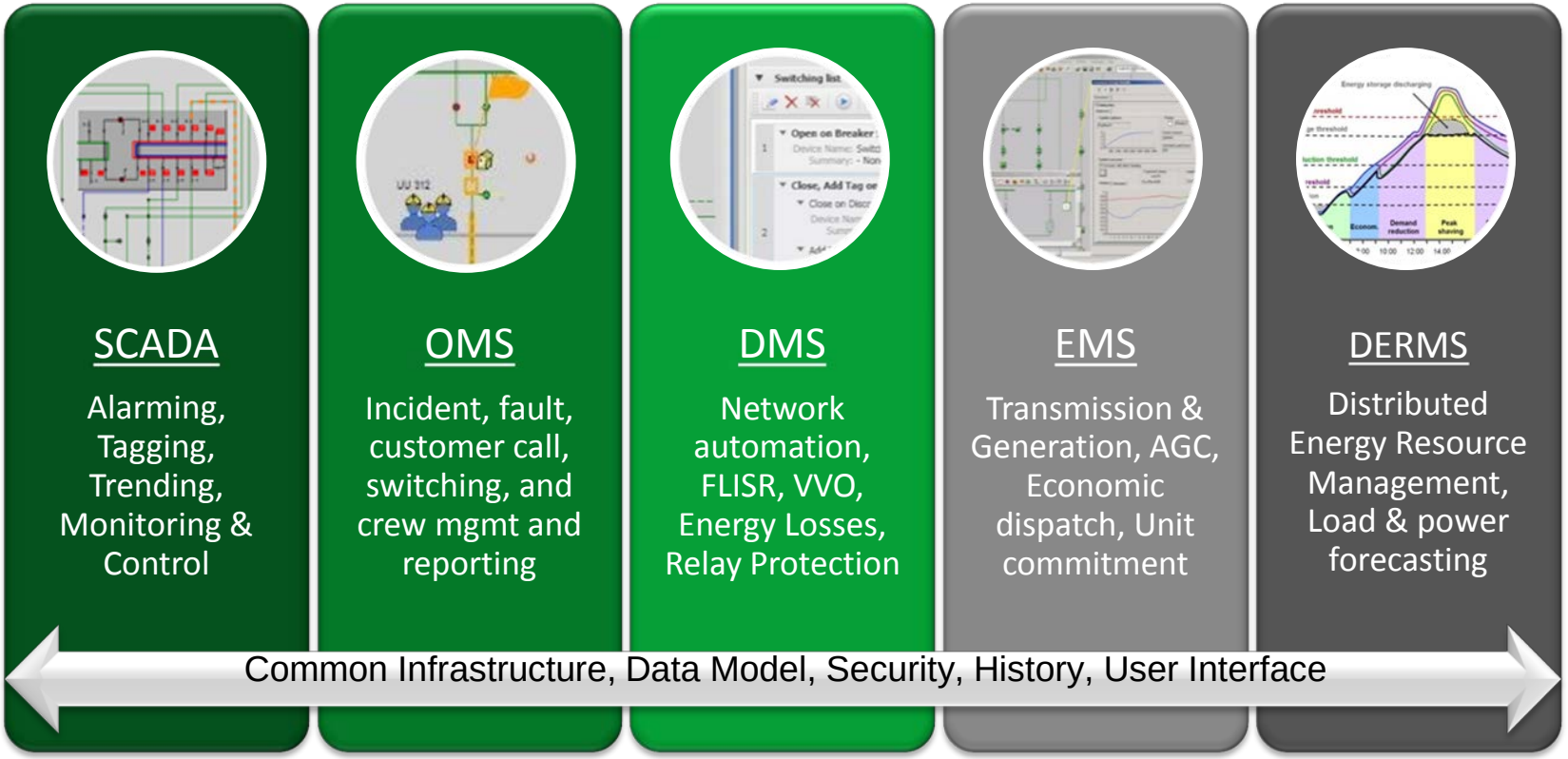
Grid Modernization – Today's Distribution System



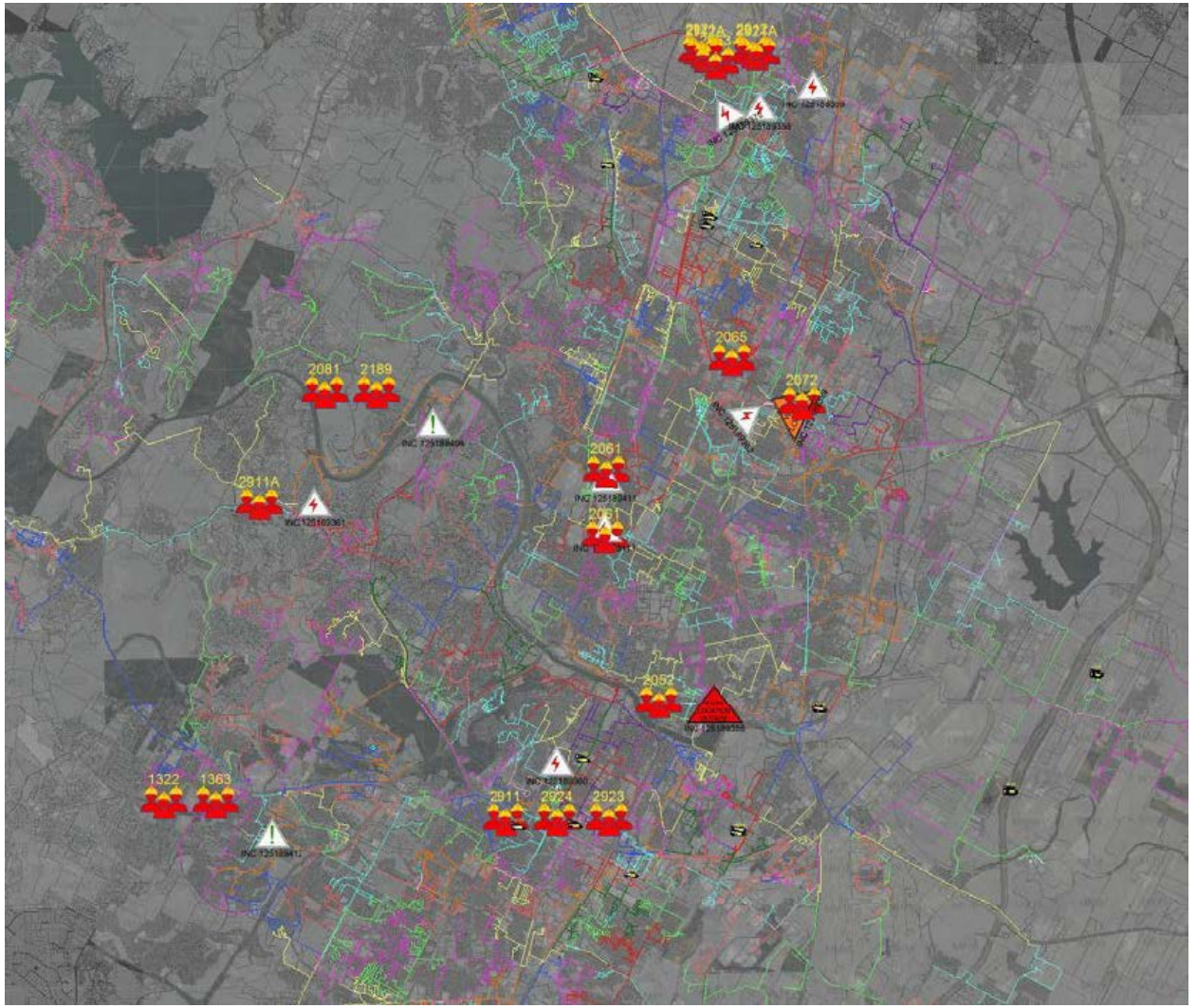
LTC: Load Tap Changer
EOL: End-of-line
Recloser: Automatic circuit recloser

Advanced Distribution Management System (ADMS) Platform

ADMS is a ***comprehensive network management solution*** with monitoring, analysis, control, optimization, planning and training tools sharing a common infrastructure, data model, and user experience

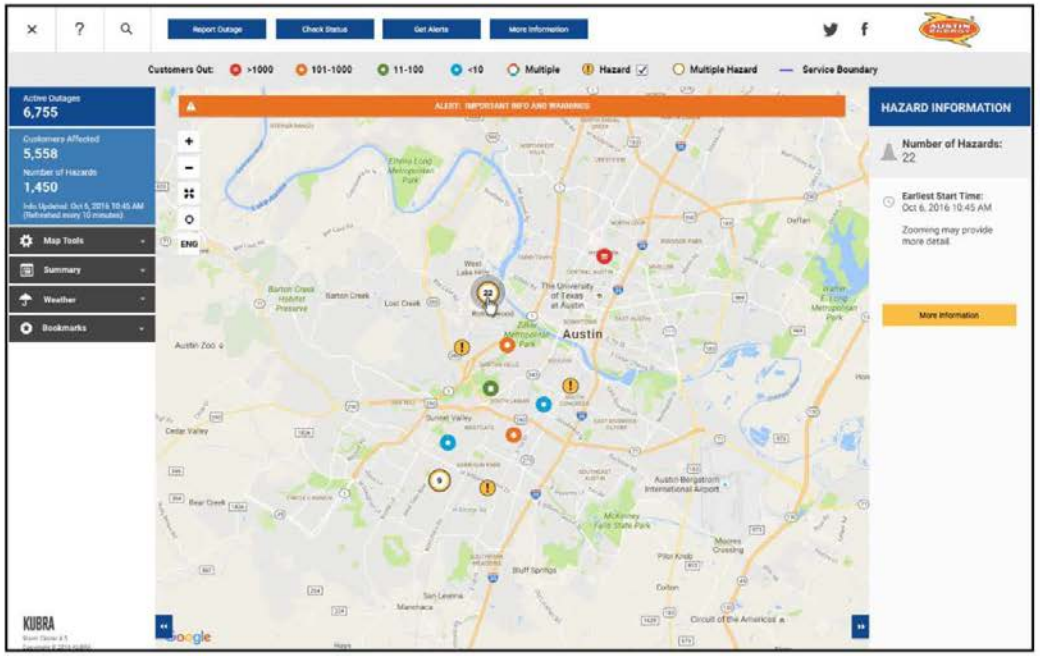


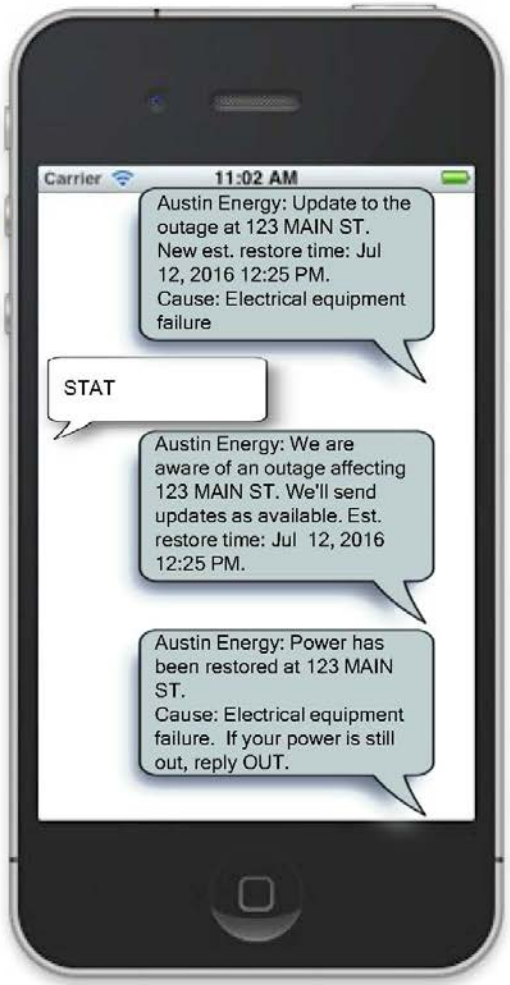
Grid Automation- ADMS



Grid Automation Roadmap

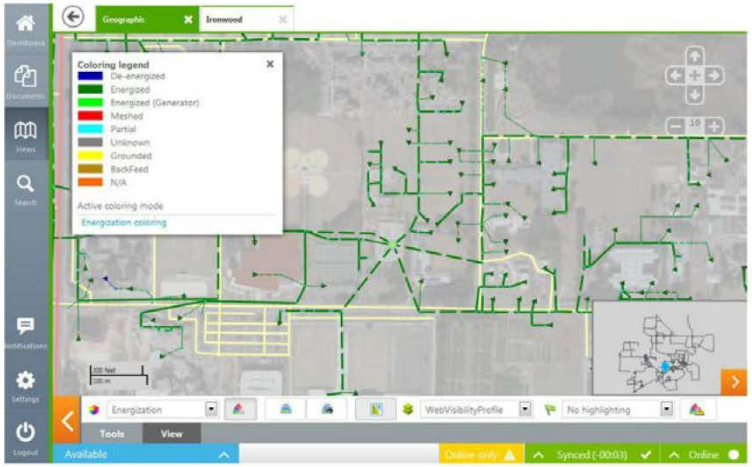
Customer Outage Communication





Mobile Workforce Accessibility

Taking the ADMS, OMS, and Work Order Management to the Field



Homework – Due March 7

1. What is the difference between Smart Grid and Grid Modernization? Hint: Use the Department of Energy's websites material to describe the difference.
2. What are the drivers for Austin Energy's Grid Modernization?
3. What is an ADMS?
4. What are the most important characteristics of Smart Grid?
5. Considering the increase in the AMI data flow from 2013 to 2018 at Austin Energy, calculate the percent increase in the needed communication bandwidth. Assume 4 bytes for reading number and 1 bit for Alarm/Event/Flag.
6. Do you have any suggestions for Austin Energy for Smart Grid implementation?