

GM PATHWAYS TO RE100

4 – Pillars Outlined



GENERAL MOTORS

HOW GM WILL ACHIEVE 100% RENEWABLE ENERGY



INCREASING
ENERGY
EFFICIENCY



SOURCING
RENEWABLES



ADDRESSING
INTERMITTENCY
THROUGH
BATTERY STORAGE
AND FUEL CELLS



INFLUENCING
POLICY TO
DRIVE SCALE



GENERAL MOTORS

ENERGY EFFICIENCY STEP 1

OVERVIEW OF GM'S ENERGY MANAGEMENT PROCESS & GLOBAL MANUFACTURING SYSTEM

Integrating Energy into your business plan will make it a sustainable part of your operations

What is needed to be successful?

- Top leadership support
- Resources (dedicated people and budget)
- Establish Energy as a pillar of business plan
- Utility Incentives

Tool kit for implementation

- Benchmarking*, Goals, and Scorecards
- Meter data, dashboards
- Continuous commissioning
- Budgeting and forecast
- Energy Savings Project Implementation Process
- Recognition

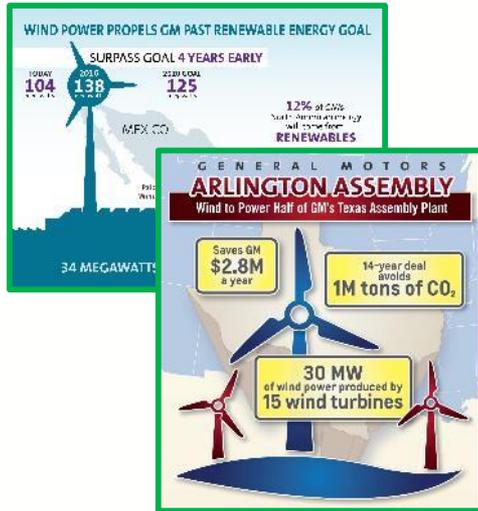


GM has been an Energy Star® partner for 20 years

PROCURING RENEWABLE ENERGY STEP 2

RENEWABLE ENERGY AS A STRATEGIC INVESTMENT

Offsite PPA



Green Tariffs



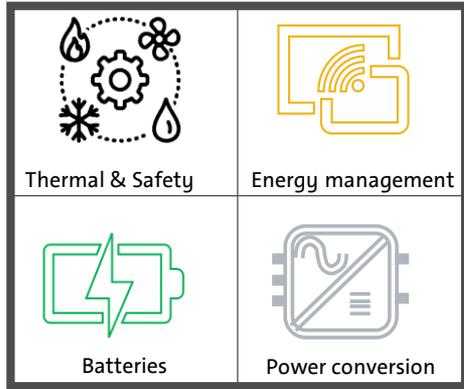
Onsite Investment



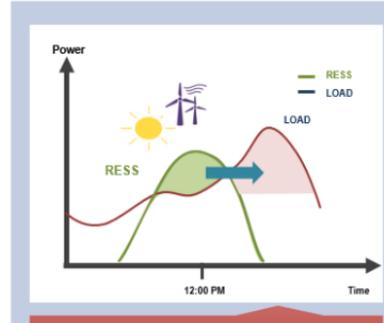
ENERGY STORAGE STEP 3

ENERGY STORAGE SYSTEMS (ESS) AND THEIR USE CASES

ESS Architecture

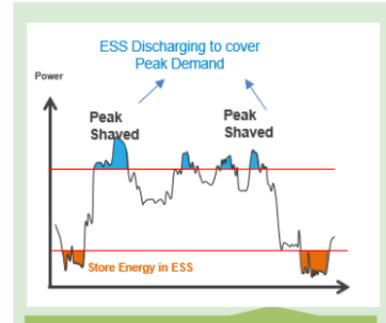


Example of Functions enabled by ESS on the electrical grid that benefit a range of customers



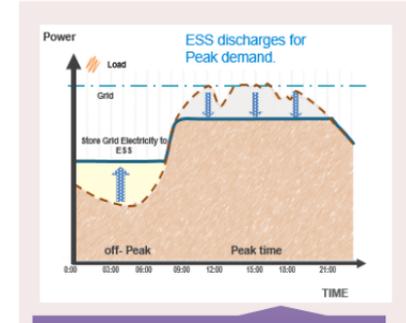
Load Shifting

Improves renewable generation efficiency



Peak Shaving

Decreases customer demand and reduces bills



Demand Response

Defers infrastructure upgrades requirements

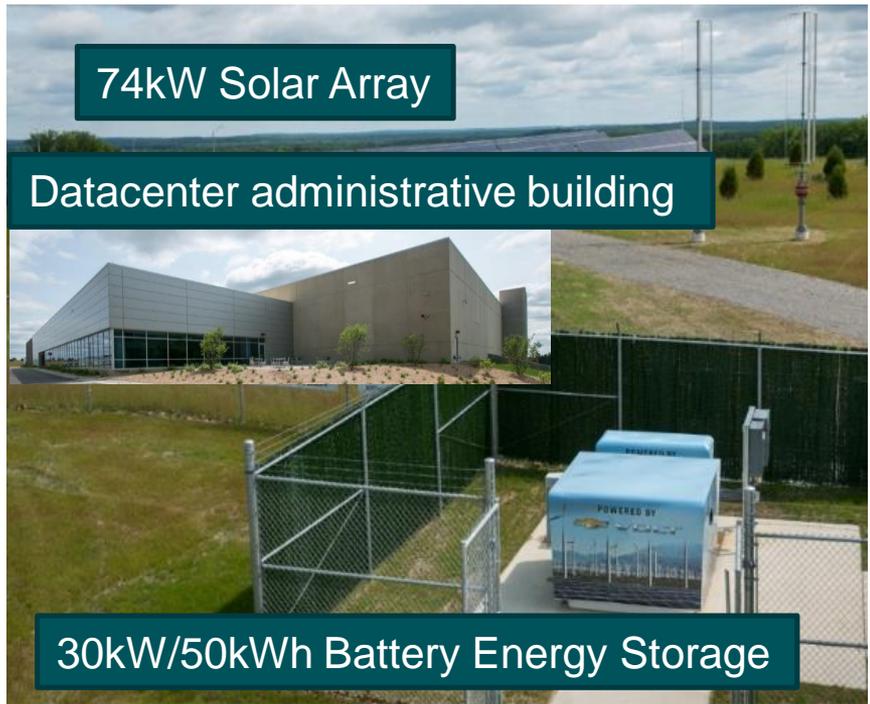
Leveraging:

- 1st use battery modules
- 2nd life battery modules

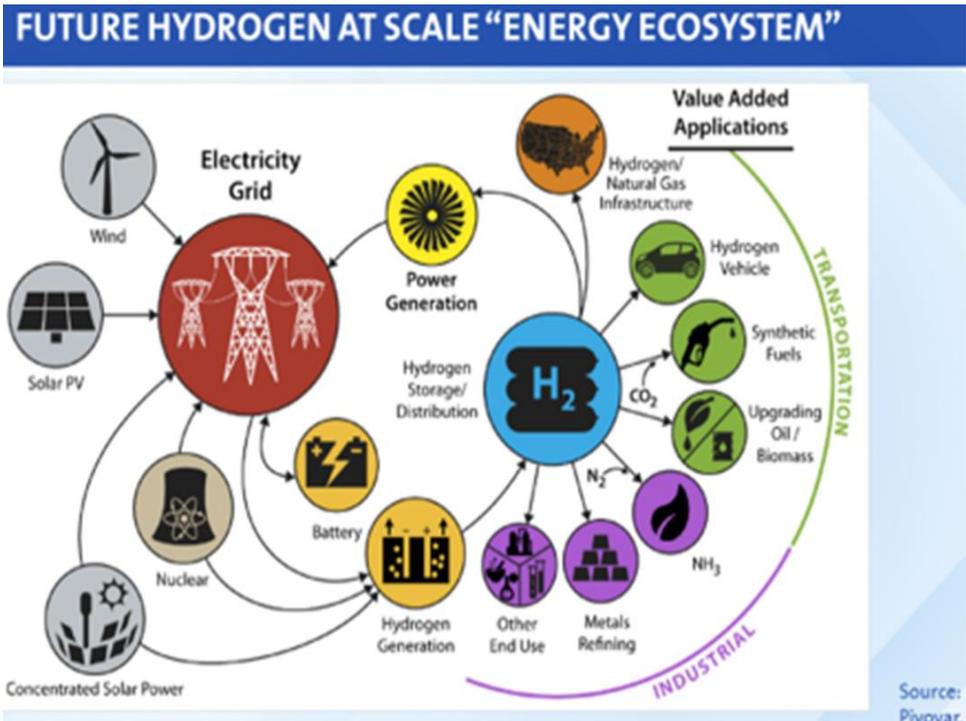
Residential, C&I, Utilities

ENERGY STORAGE AT A STRATEGIC OPPORTUNITY

Battery Storage



Fuel Cells



Source: Pivovar.

POLICY AND SCALE

STEP 4

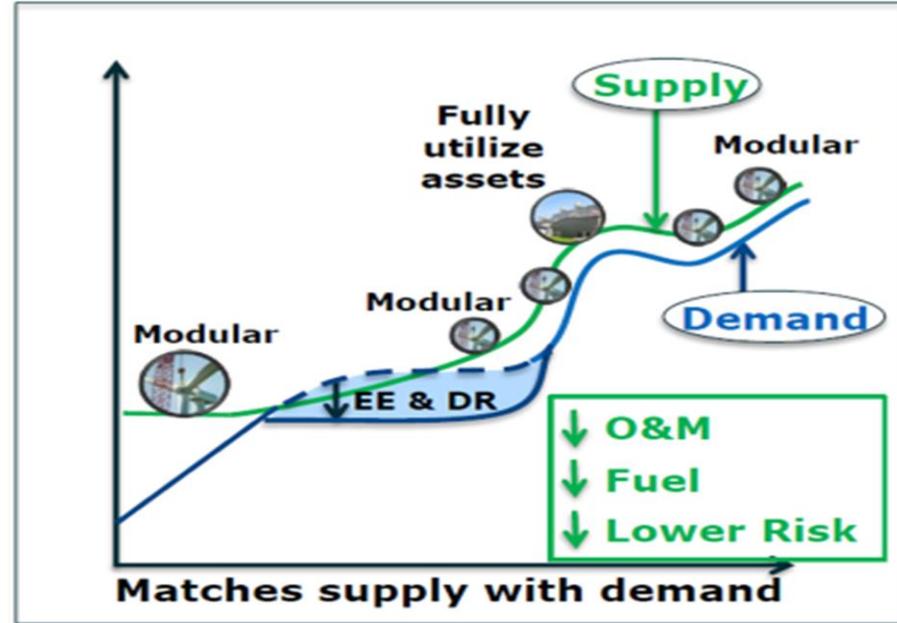
UTILITY MINDSHIFT

Clean & Lean Utilities and GM Powerhouse (CUC)/WWTP "Procurement"

Old Utility Model



Clean And Lean



Utility Business Models, Regulatory Innovation, Grid Integration, Transportation Electrification

ELECTRIC UTILITY – PRIMER | SMART GRID PROGRAMS

State utility regulator goals are broad, complex ...And has political influences.

Financial

Provide affordable electricity to all customers, with advent of renewables, increasing costs.

Operational

Ensure reliability, security as distributed and intermittent resources come online.

Environmental

Integrate renewable energy, energy efficiency, distributed generation (residential solar).



EVs, and their flexibility to charge at different times and act as a distributed resource, have potential to unlock value while offering Operational & Environmental benefits.

- Passive
- Time of use rates
 - Efficient charging
 - Upgrade deferrals
 - Reduce/Avoid peak

Financial

Operational

Environmental

- Active
- Demand-response
 - Reverse DR (renewables)
 - Act as energy storage
 - Distributed resource
 - Upgrade deferral