DTE Energy

DTE Energy: Application of Distributed Resources

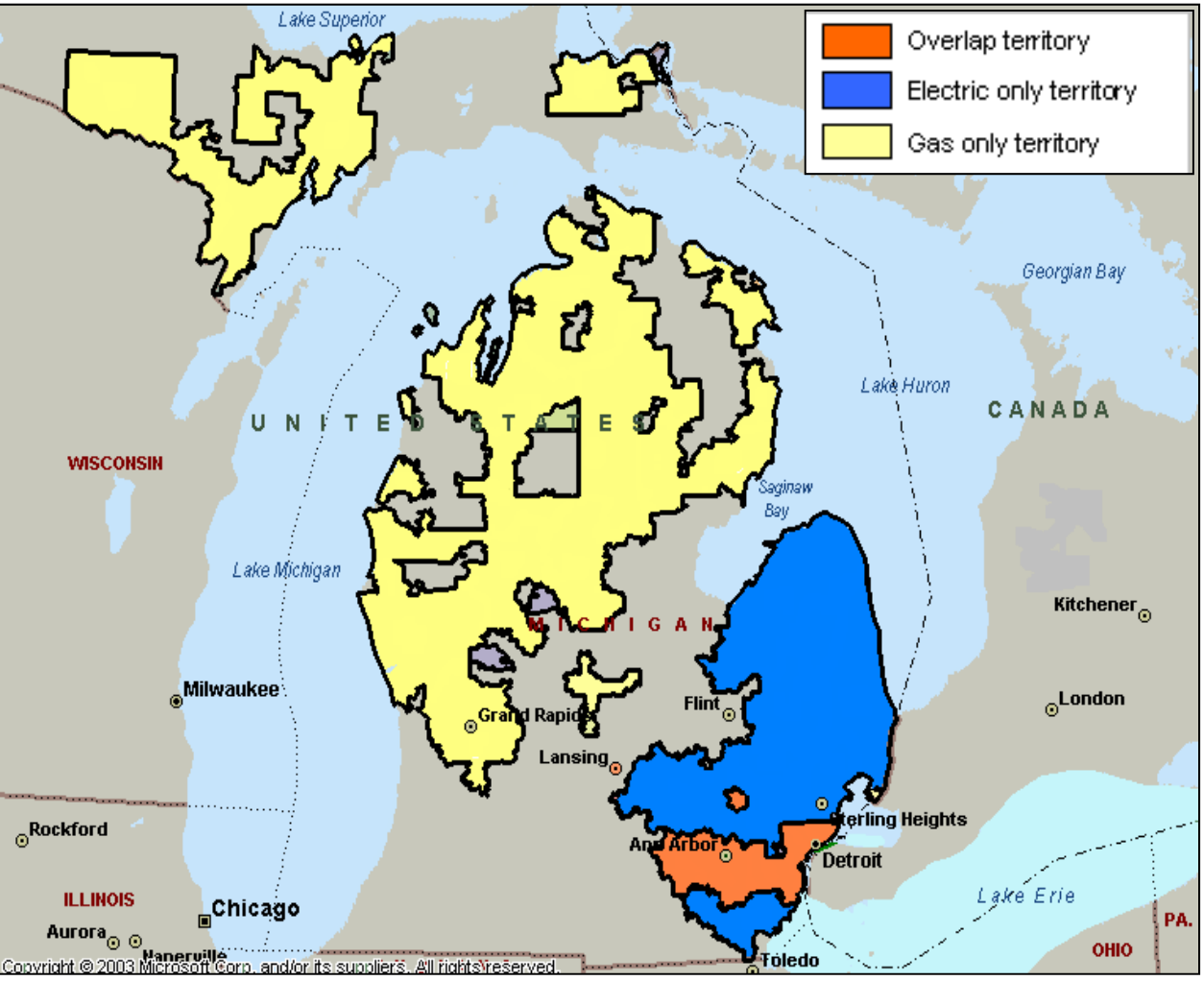
Hawk Asgeirsson
Manager – Power Systems Technologies
asgeirssonh@dteenergy.com

IEEE PES 2011 GM – Late Breaking News Session

Agenda

- DTE Energy Background
- Distributed Generation Applications at DTE Energy
- Energy Storage Applications
- PV and Energy Storage
- Community Energy Storage Project
- Secondary use of EV batteries

DTE Energy – Electric & Gas Regulated Businesses



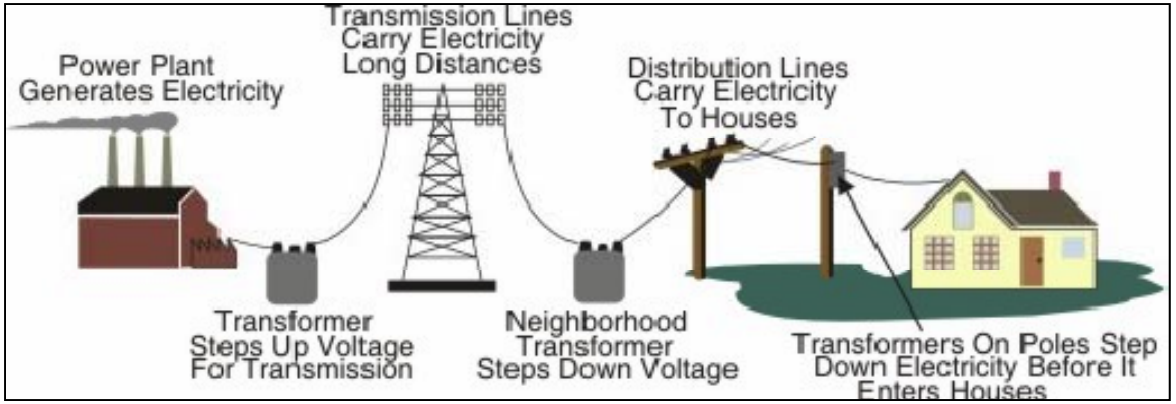
Detroit Edison

- Tenth largest US electric utility
- 7,600 square mile service
- 2.2 million customers
- $4.9 billion in revenue
- Gen Capacity: 11,080 MW
- Annual Sales: 50,000 GWH

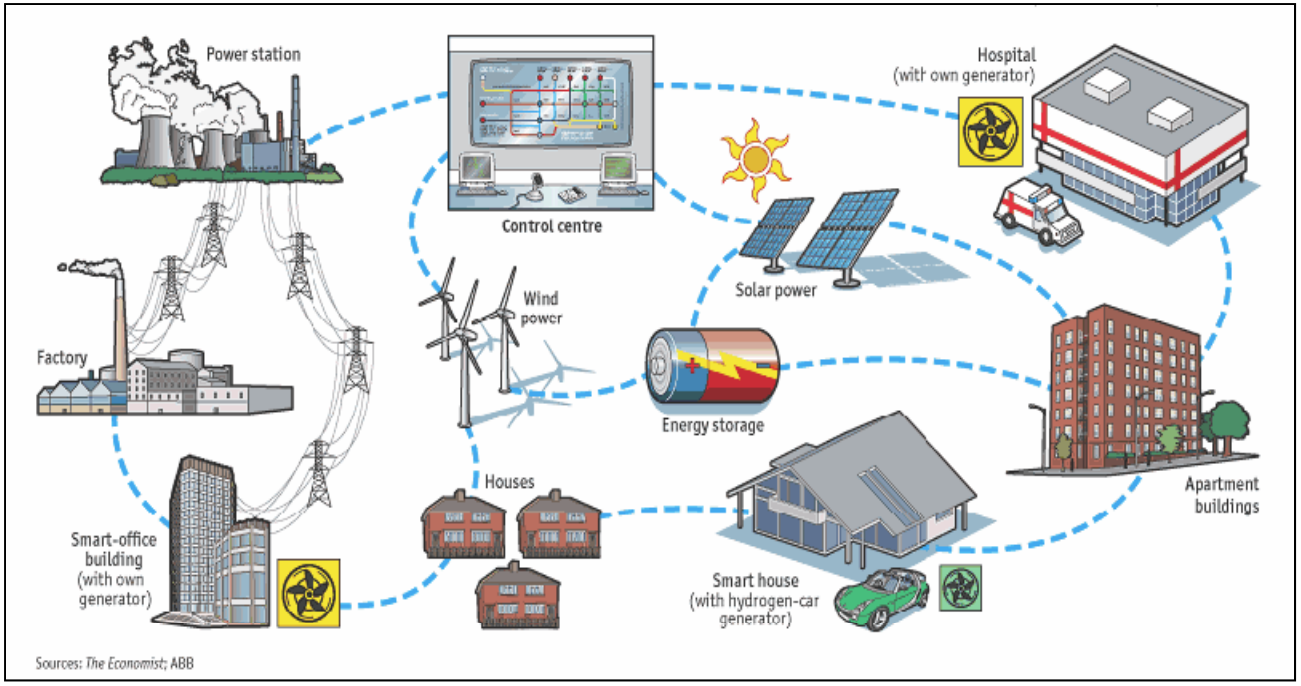
Michcon

- Eleventh largest US natural gas utility
- 14,700 square mile service territory throughout Michigan
- 1.3 million customers
- 679 bcf of gas sales
- $1.8 billion in revenue

The Evolution of the Electric Utility System



One way power flow, limited renewable resources and simple interaction with load



Two way power flow, multiple distributed resources and stakeholders

Detroit Edison's Renewable Energy Plan includes two pilot solar programs

DTE Energy

SolarCurrents™

Residential & Small Commercial

- Approximately 5MW or 1,500 customers through REC contracts
- Customer funds and owns solar photovoltaic system < 20 kW
- Provides financial incentives to make solar more affordable

Commercial & Industrial

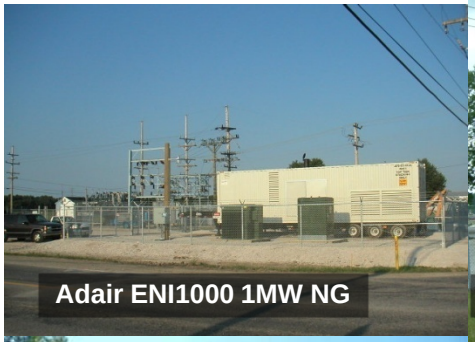
- Approximately 15MW of Detroit Edison owned solar assets
- Lease large rooftops , ground-mounted and/or on DTE facilities

Distributed Generation at DTE Energy

Technology Testing

Substation Applications

Temporary & Maintenance



Distribution Solutions

Circuit Applications

Emergency & Temporary

Premium Power

Customer Partnership

Virtual Power Plant Applications

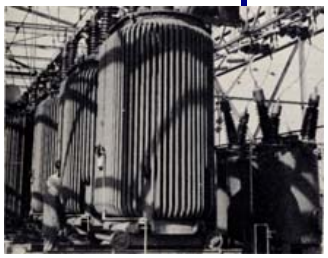
Grosse Ile – Natural Gas ENI 1000

Peak Shaving Application

Problem:

Transformer Or Circuit Overloading

Circuit Load

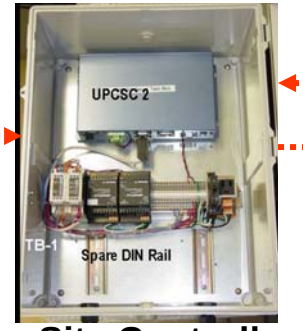


Transformer

Circuit Load Current

Solution:

Line Support Using Distributed Energy Resource(s)



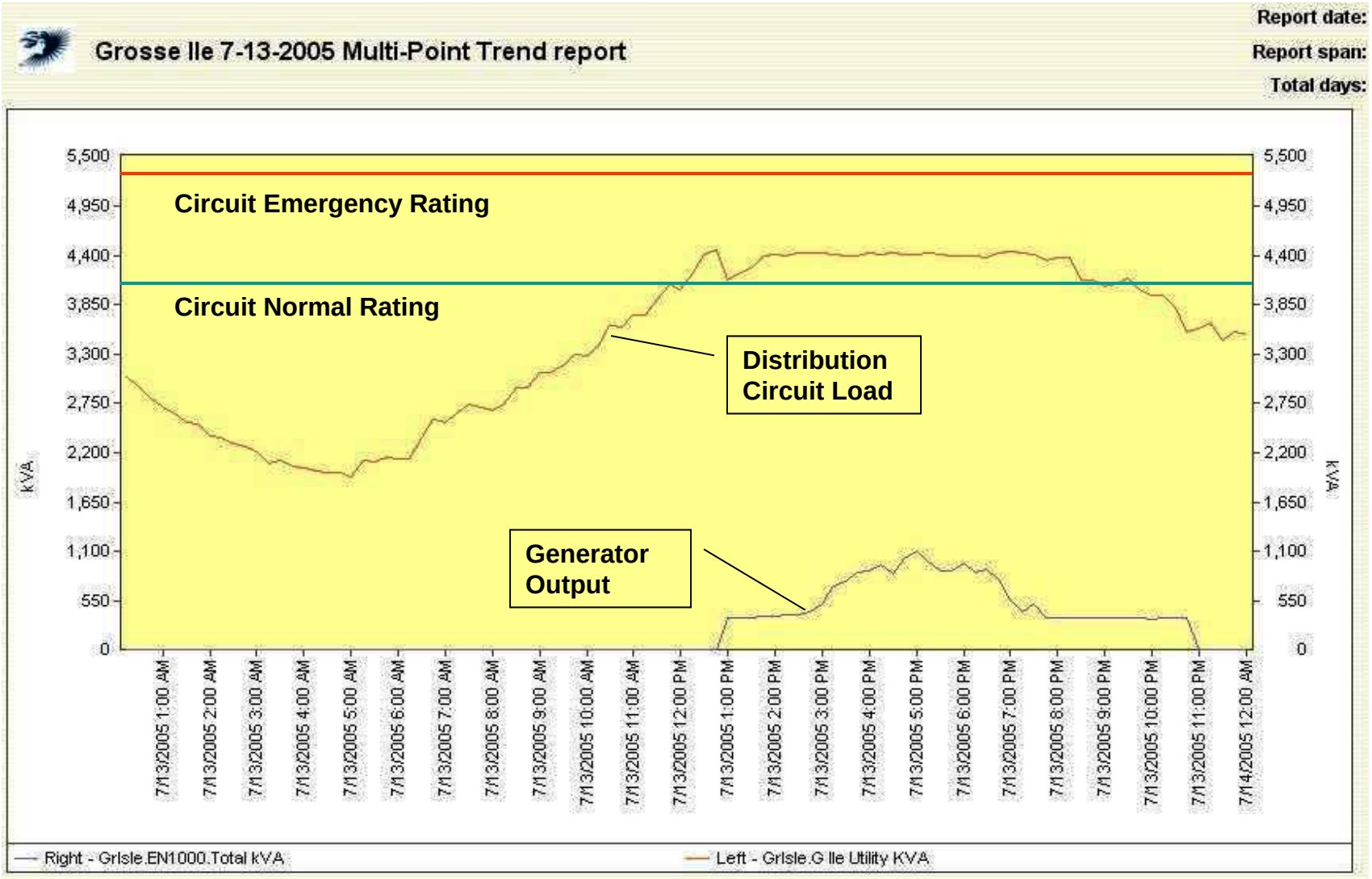
Site Controller

Generator Data

Control Data:
•Start/Stop
•Output Level

Distributed Energy Resource

Automatic Load Following



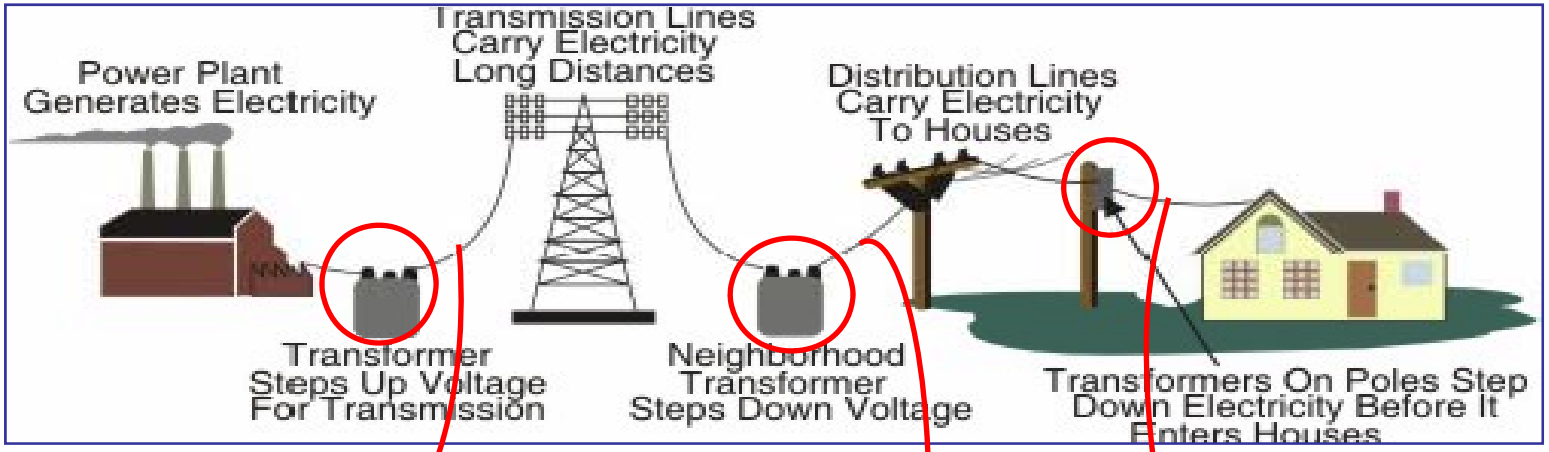
DG's keeping the lights on during heat wave

July 22 – 23, 2011
1.5 MW DG

July 23, 2011
2.0 MW DG

Electric Utility Energy Storage Applications

DTE Energy



Large Central Storage

100's of MW

Or

In conjunction with Wind Farm Firming

Substation or Circuit Level Storage

1 - 2 MW

Storage Close to Customer

25 kW/ 50 kWh

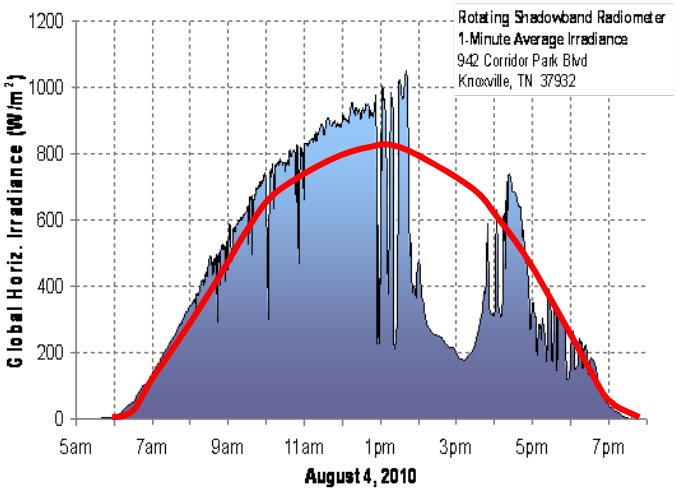
Ludington pumped storage facility stores renewable energy

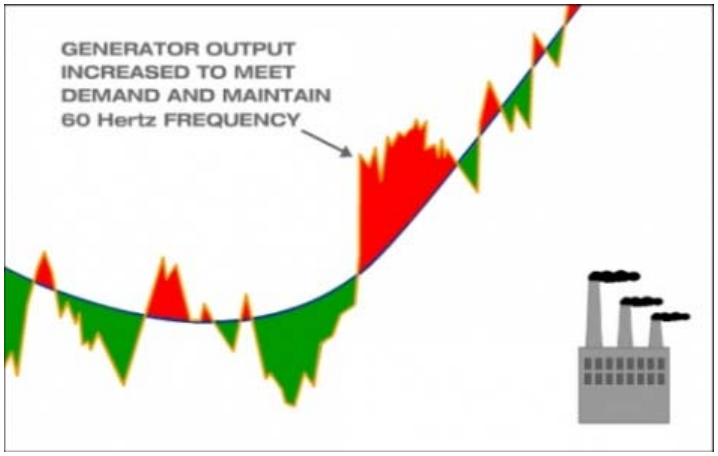
DTE Energy

- Began operation in 1973
- 27 billion gallon water reservoir
- Currently produces enough energy to power 1.4 million homes
- $800 million upgrade underway
- Will increase generating capacity from 1,872 MW to 2,172 MW
- Stores renewable energy produced at off-peak hours

Energy Storage Modes of Operation – Value Streams

- PV Output Leveling
- PV Output Shifting
- Frequency Regulation
- Circuit Peak Shaving
- Reactive Support
- Voltage support
- Islanding during outages





PV and energy storage integration
Ford Motor Co and Xtreme Power

DTE Energy

- 500 kW PV
- 750 kW/2 MWh storage
- Within auto assembly plant
- Load shifting based on system load curve
- PV Output Leveling
- PV Output Shifting
- Frequency Regulation
- Reactive Support
- Voltage support

PV and Battery Storage Integration

Location

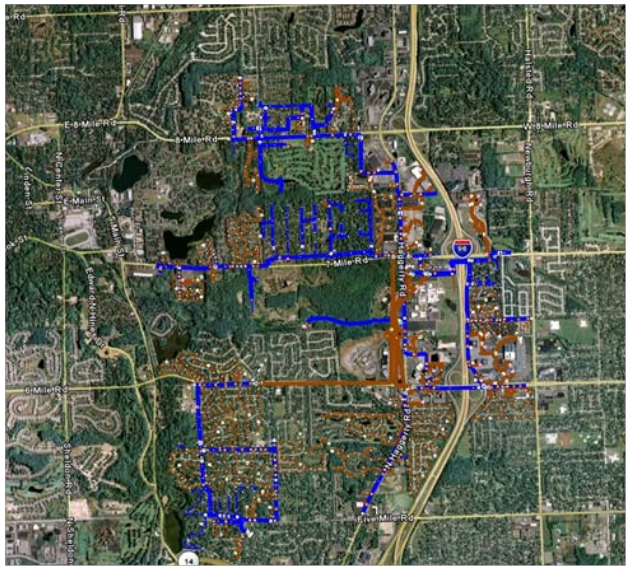
- Monroe County Community College
- 23 miles Southwest of Detroit

System

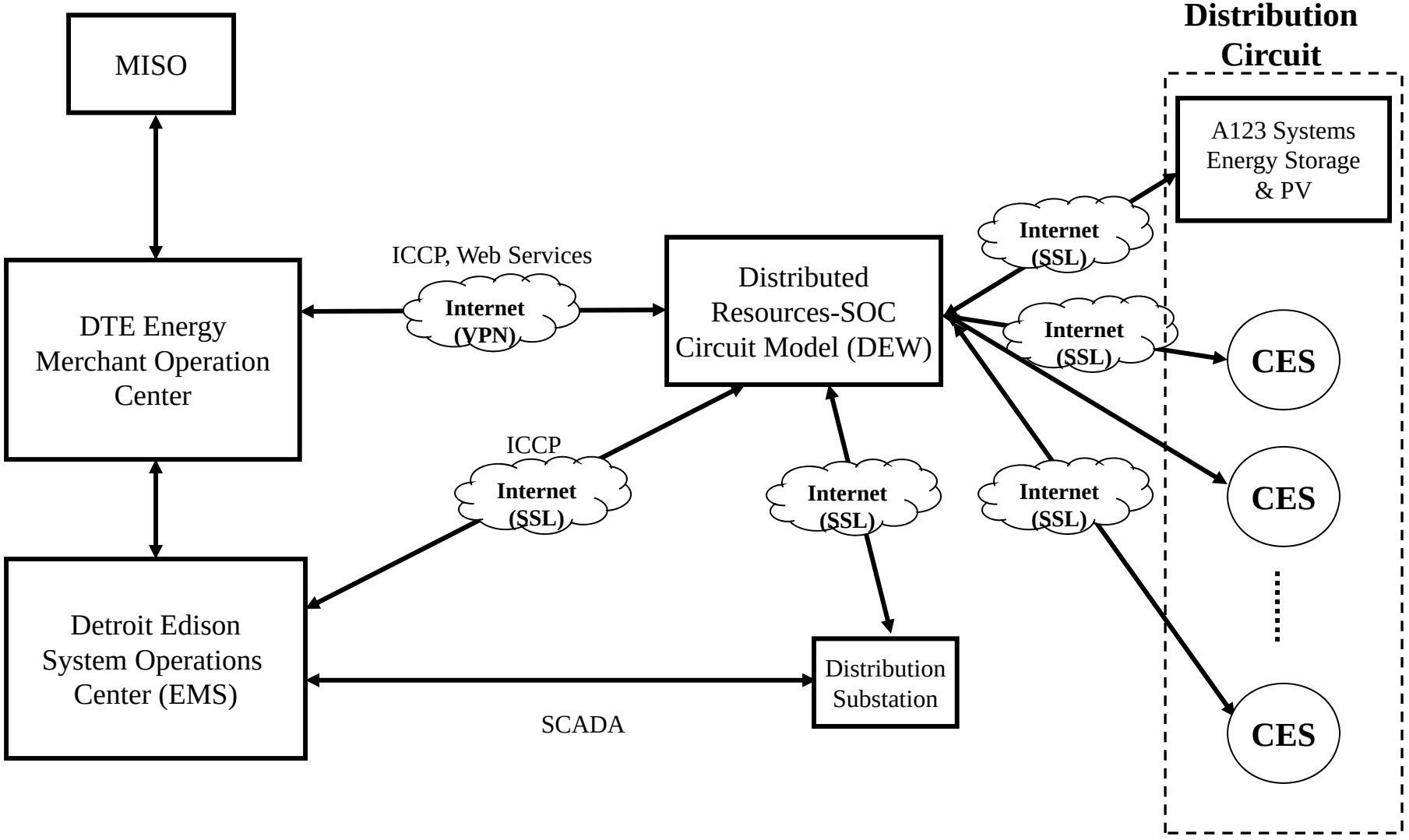
- 500kW PV
- 500kW – 30min (250kWh) Storage
- Dynamic 4-Quadrant PCS / Grid Interface
- Installation / Operation Sept 2011
- 20 Community Energy Storage Systems – Distributed
- Two will be used EV batteries

Community Energy Storage (CES)

- CES is a small distributed energy storage unit connected to the secondary of transformer serving a few houses or small commercial load
- Offers value similar to substation batteries when aggregated
- Buffers customer renewable generation
- Local voltage and var management
- Offers backup power to customers
- Can optimize battery life by deploying different control algorithms
- Makes PEV charging a less critical issue
- Can use new or used PEV batteries

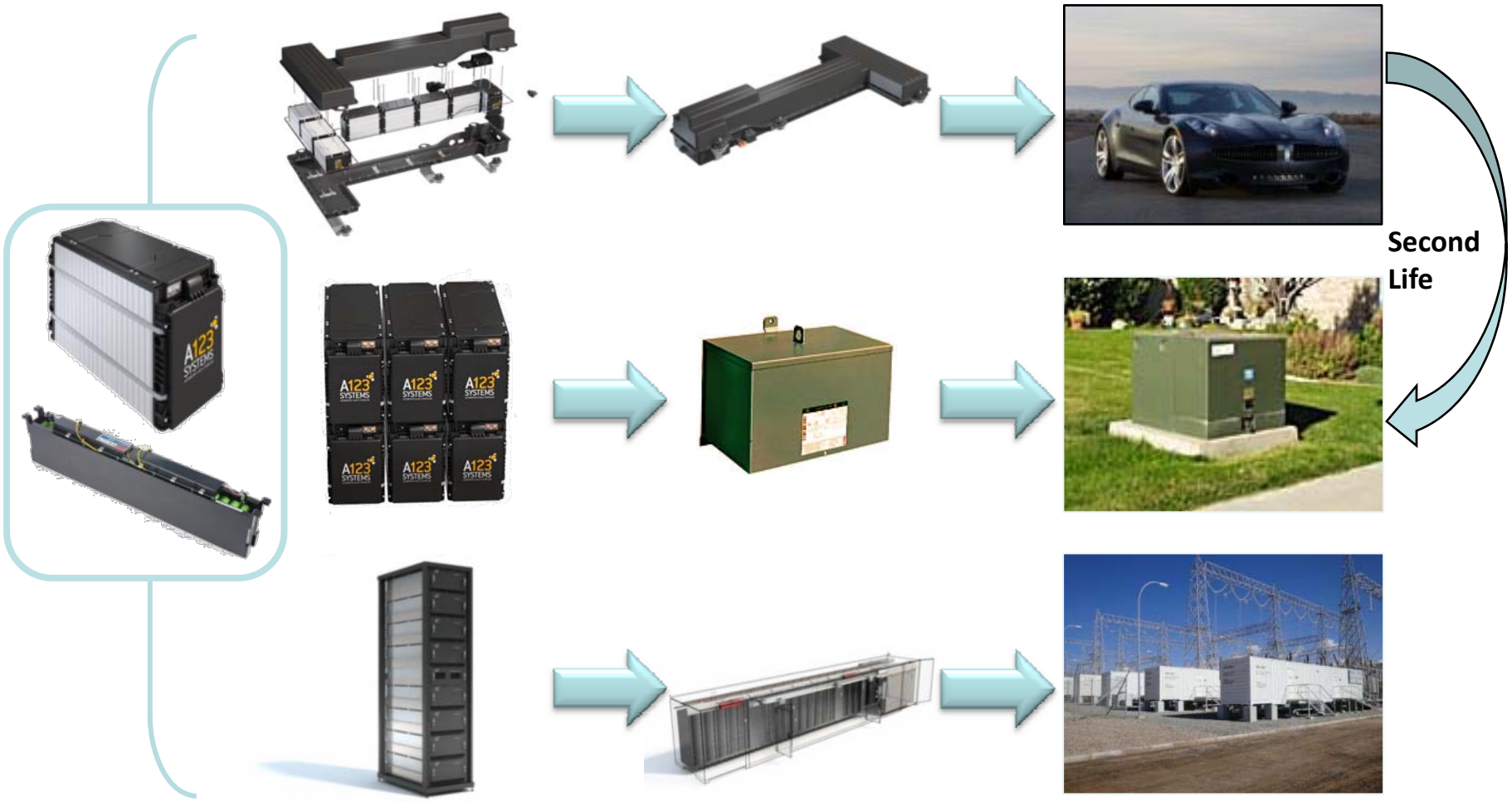


CES Communication Architecture

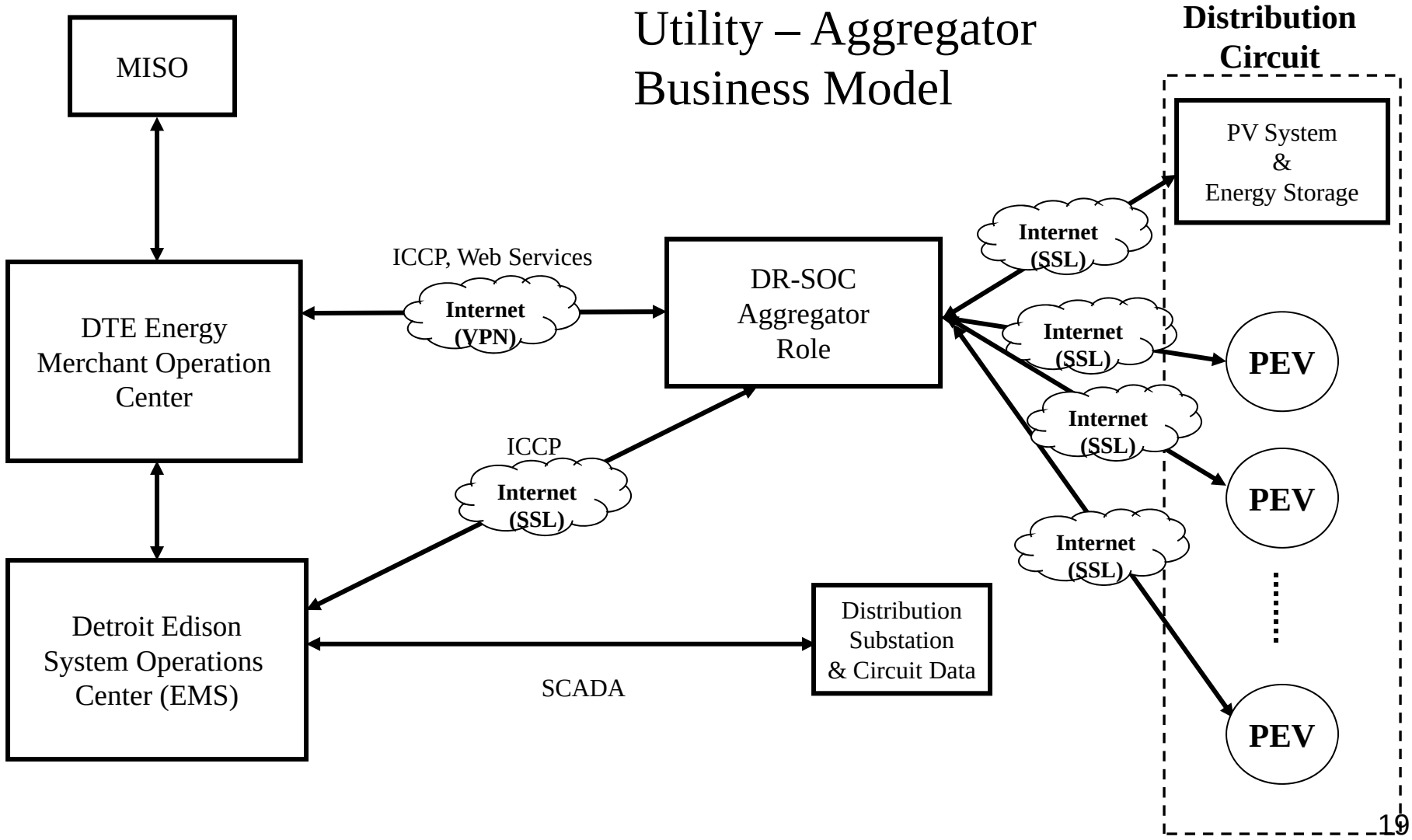


Modular architecture for rapid battery prototyping and deployment

DTE Energy



Aggregation Communication Architecture for Distributed Resources



Secondary use of EV batteries

- Used EV batteries applications
  - Utility applications
  - Residential applications
  - Commercial applications
  - Large MW size warehouse
- What is the value of used EV battery systems vs new

Conclusion

- DTE Energy has a long history of deploying distributed generation
- Energy storage has multiple value streams
- Plug-in vehicle Li-ion batteries show promise for grid applications