DERMS Requirements and Considerations: A Utility Perspective

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DERMS Terminology and Requirements

The "Big Four" Requirements

- Simplify
- Aggregate
- Translate
- Optimize

The "Big Four" Requirements

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- Aggregate
- Translate

This alone is not a DERMS!

DERMS vs. DRMS vs. DMS

- DERMS
  - Distributed Energy Resource Management System
  - In a strict sense, it manages distributed energy resources (DER).
  - Energy Storage, Solar
- DRMS
  - Demand Response Management System
  - In a strict sense, it manages demand response loads.
  - Smart Thermostats, Water Heaters
- DMS
  - Distribution Management System
  - In a strict sense, governs the distribution system.
  - ADMS
  - Line Devices (Capacitor Banks, Voltage Regulators, Switches)

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These two can operate on their own or together but face optimization challenges without a network model.

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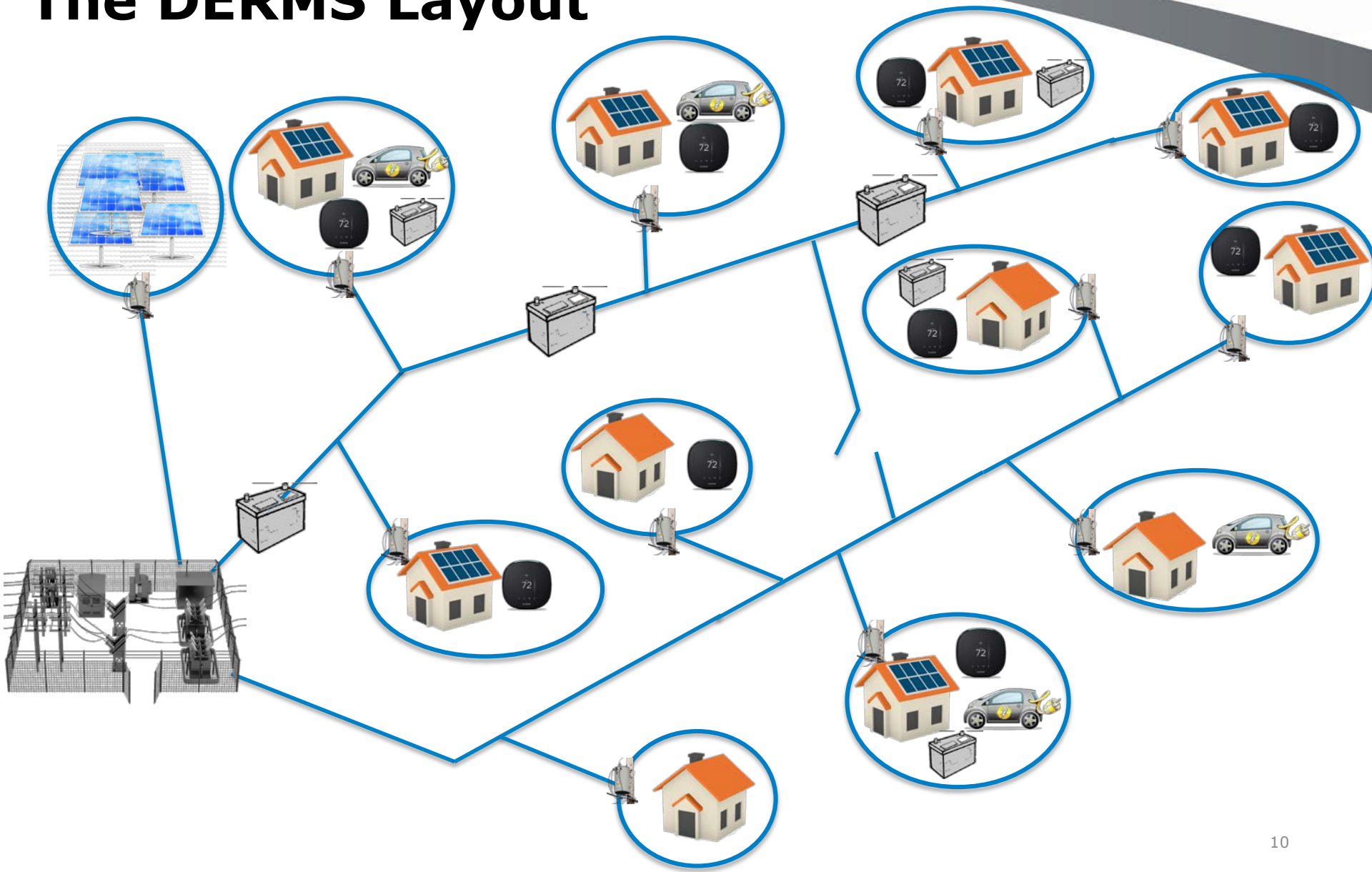
Without visibility of DER activity, gross load may be masked by presence of DER and DR devices.

Proposed "DERMS" Terminology

- Aggregator
  - Does what it says on the tin
  - Combines the interface of multiple devices
  - Read/Write capability
- dERMS ("little d" DERMS)
  - A subsystem of DERMS
  - Optimizes a type of device/location
  - Intelligence using the aggregator to operate
- DERMS ("big D" DERMS)
  - Holistic solution
  - "System of Systems" comprised of:
    - ADMS
    - Aggregators
    - Forecasting System
    - Communications Pathways/Infrastructure
    - DER devices
    - DR devices
    - Line Devices

DERMS Topology

The DERMS Layout



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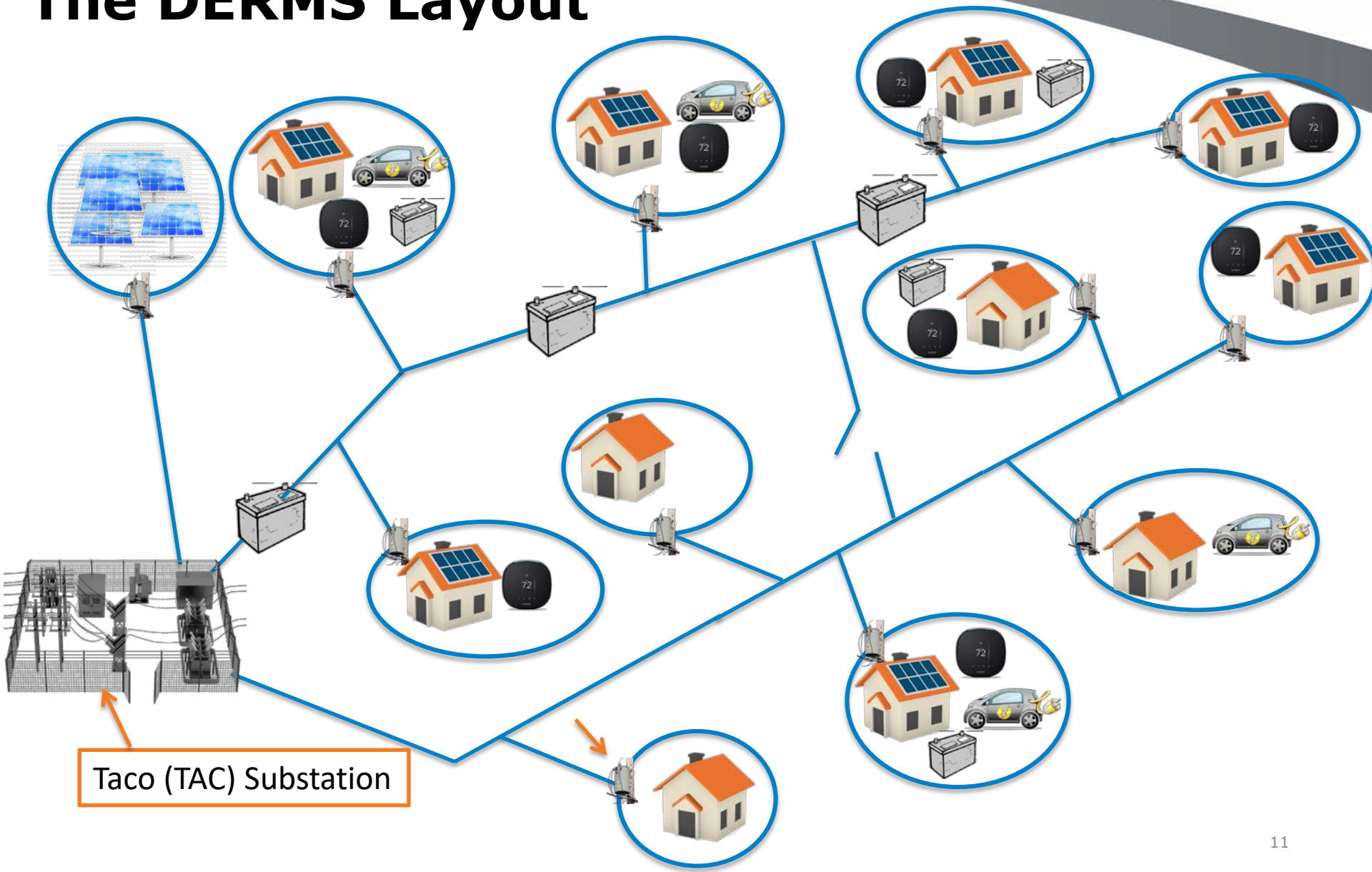

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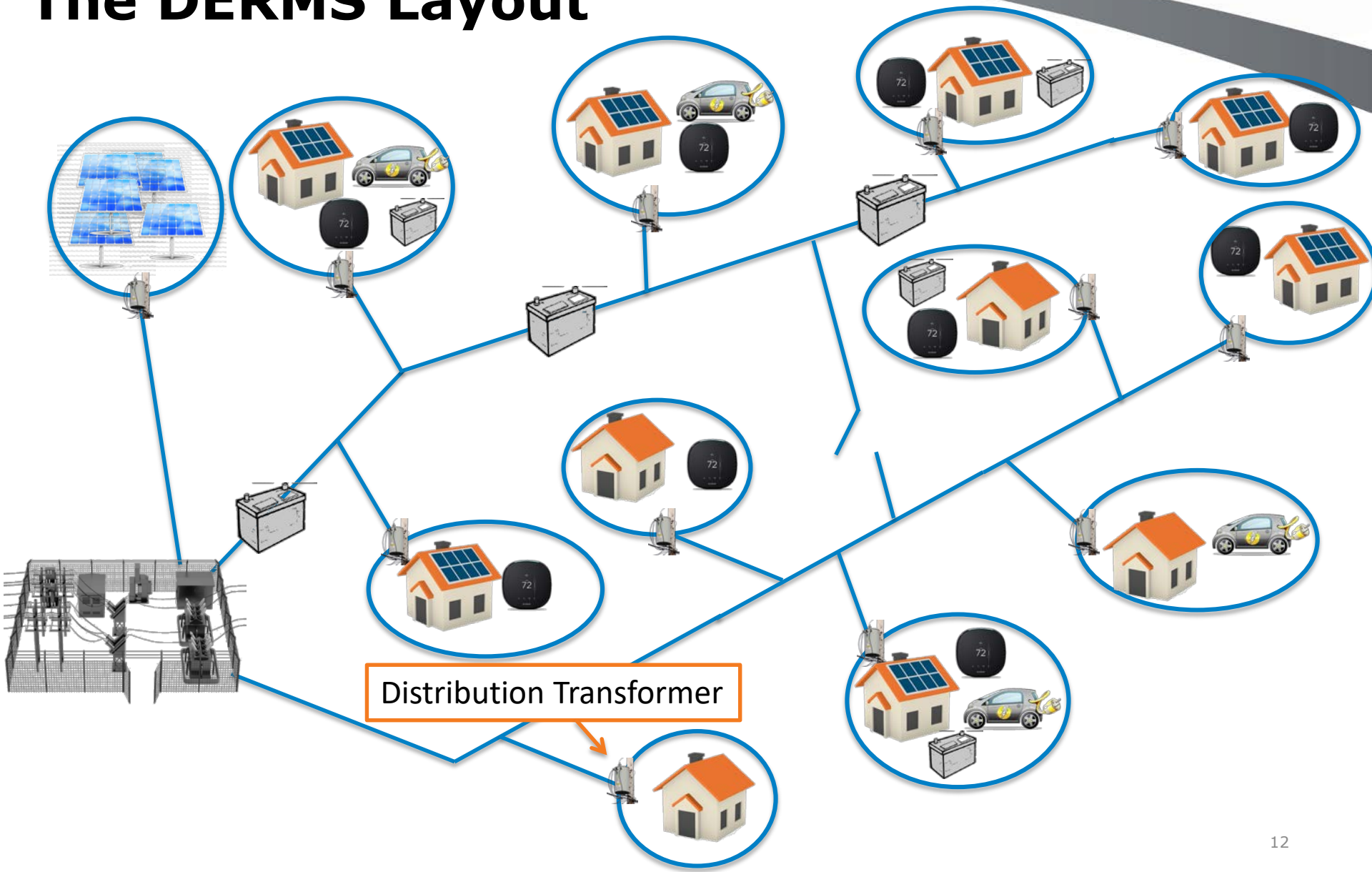

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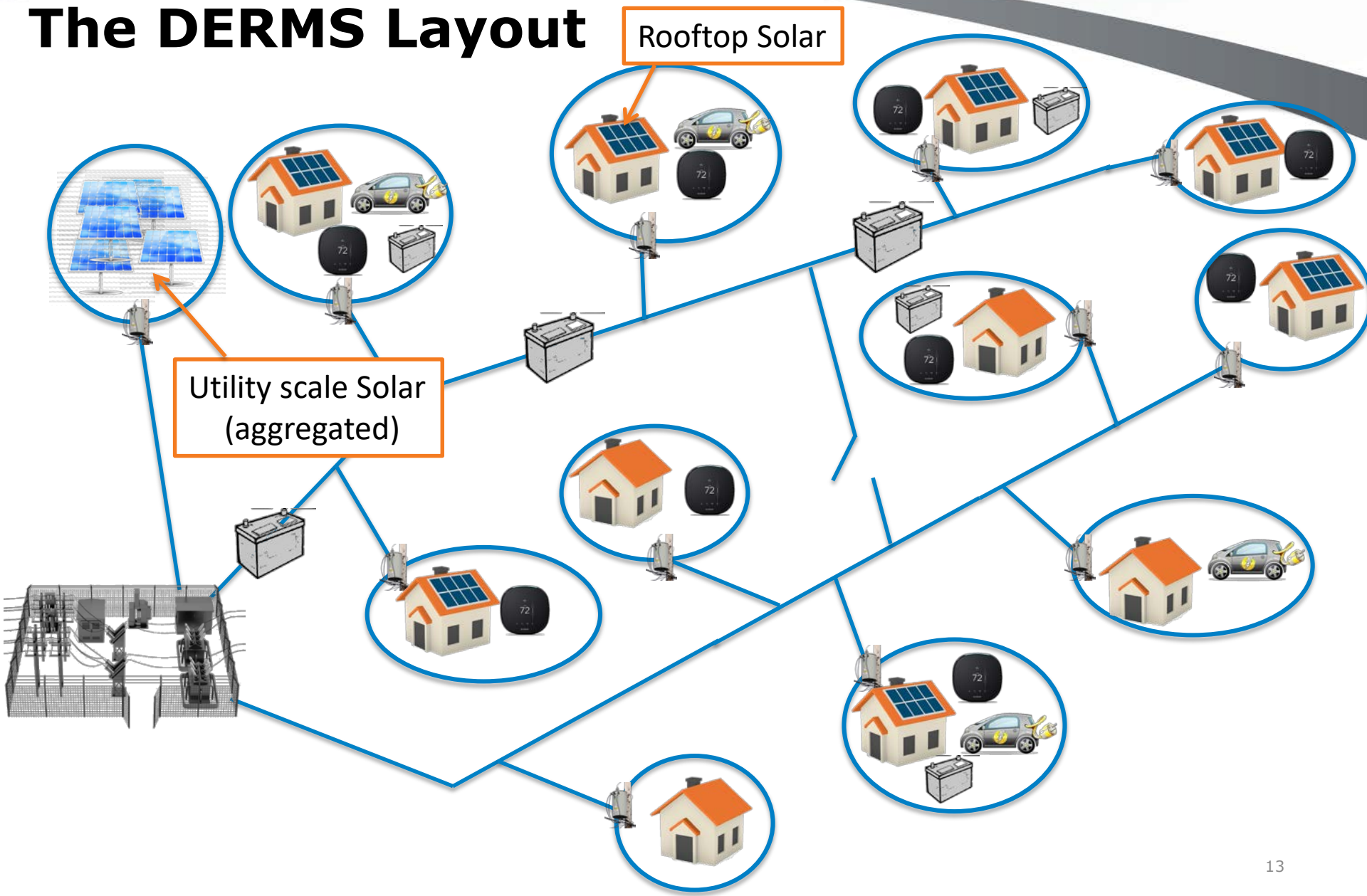

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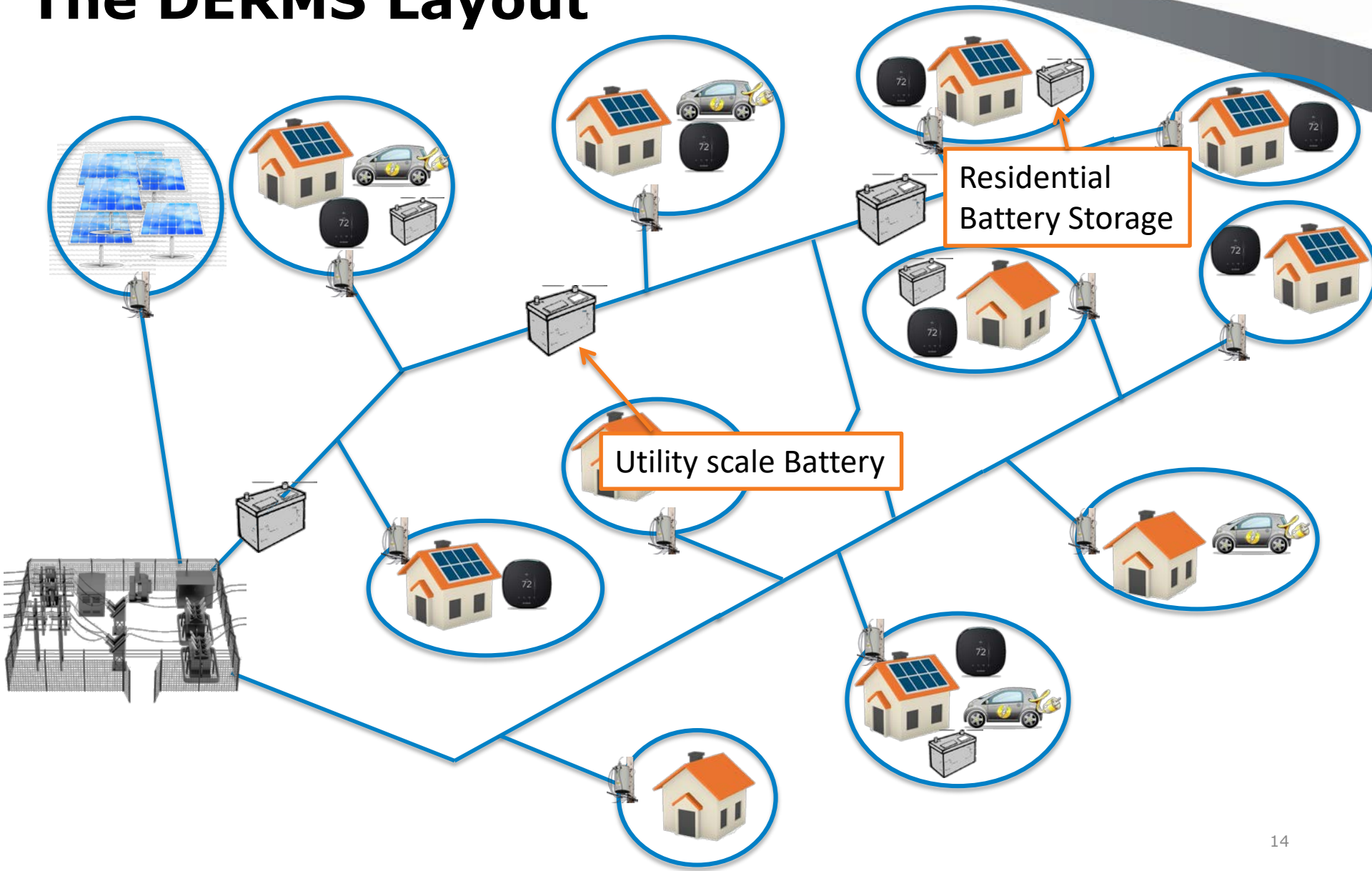

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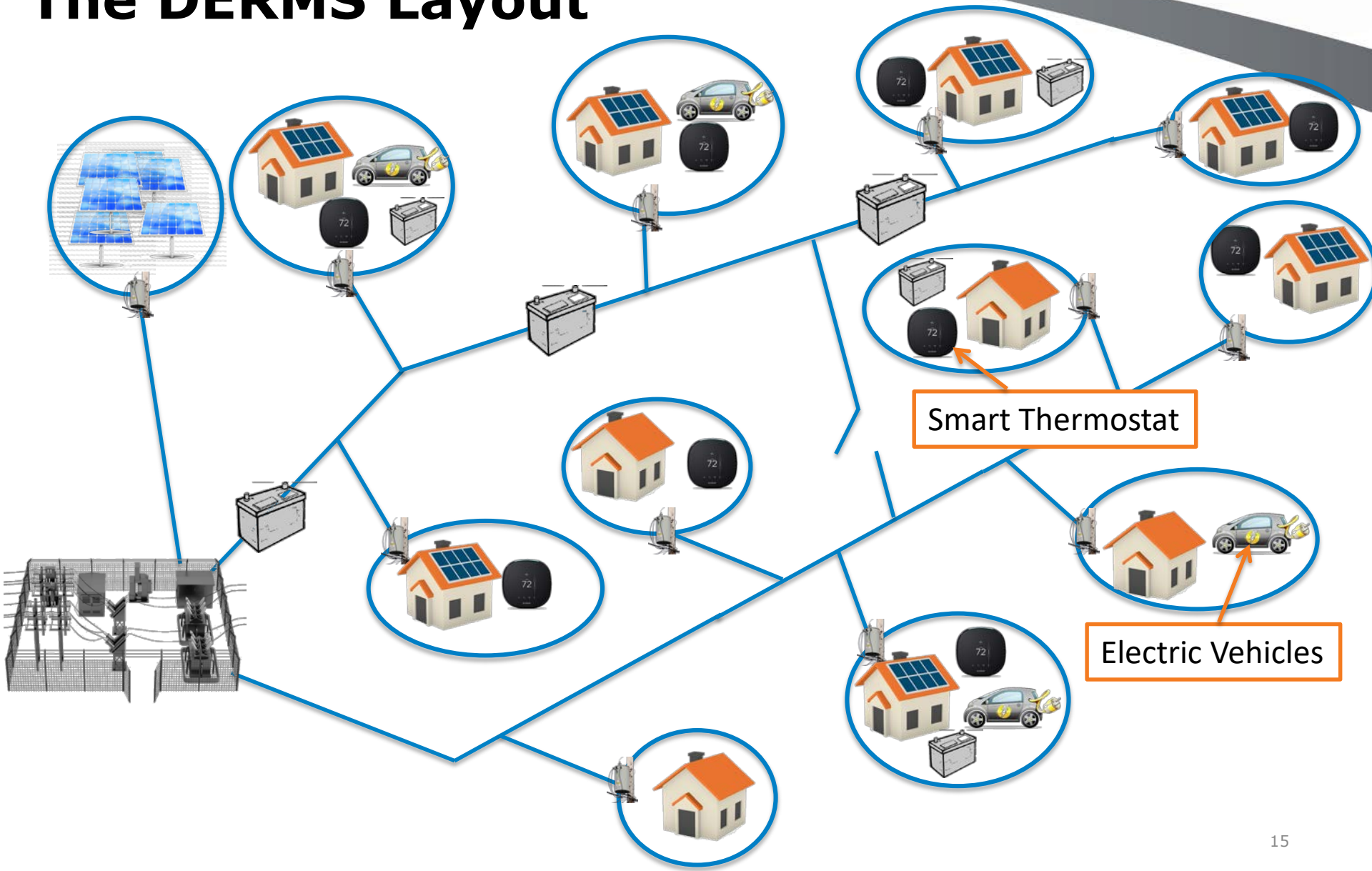

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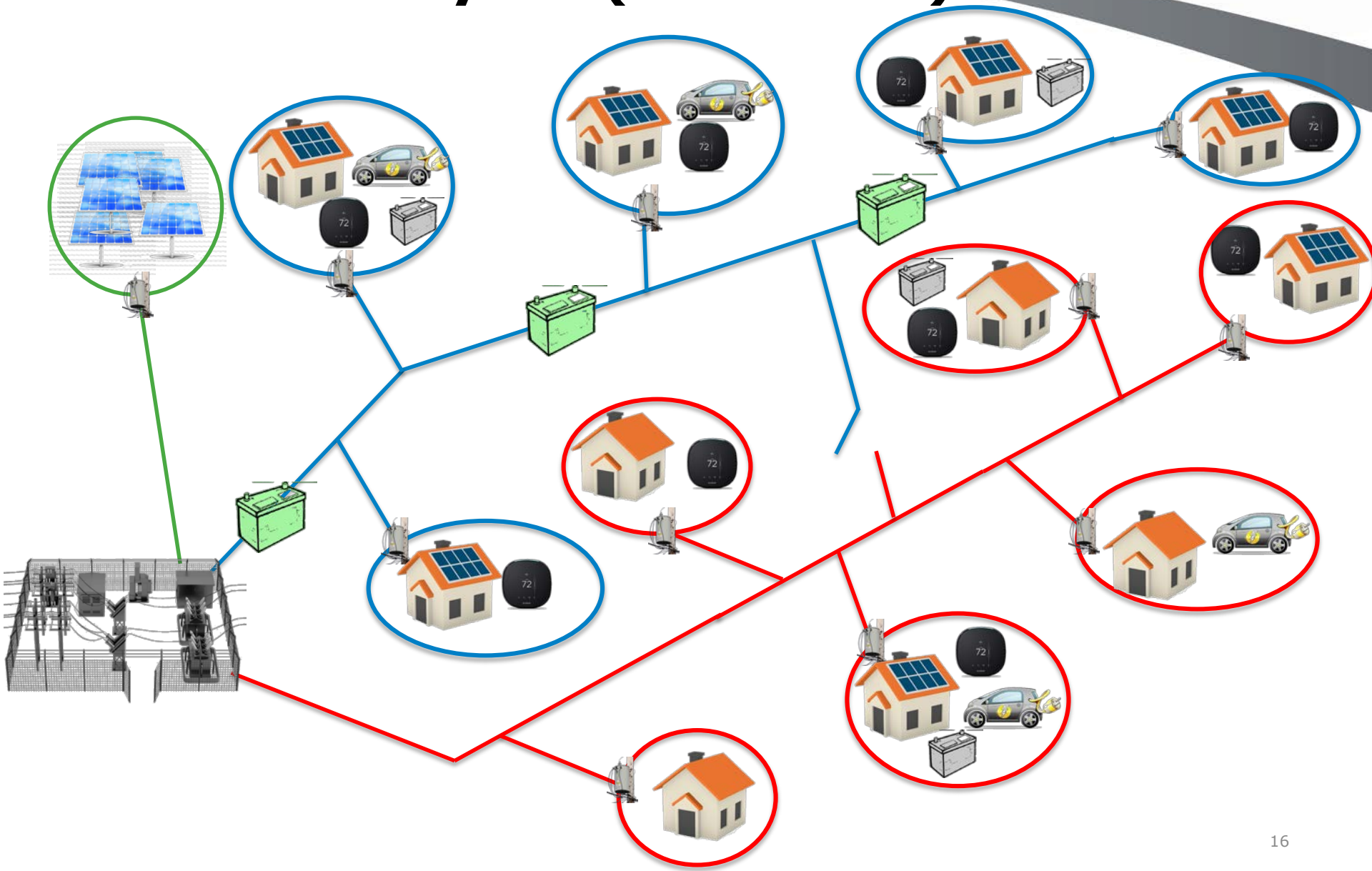

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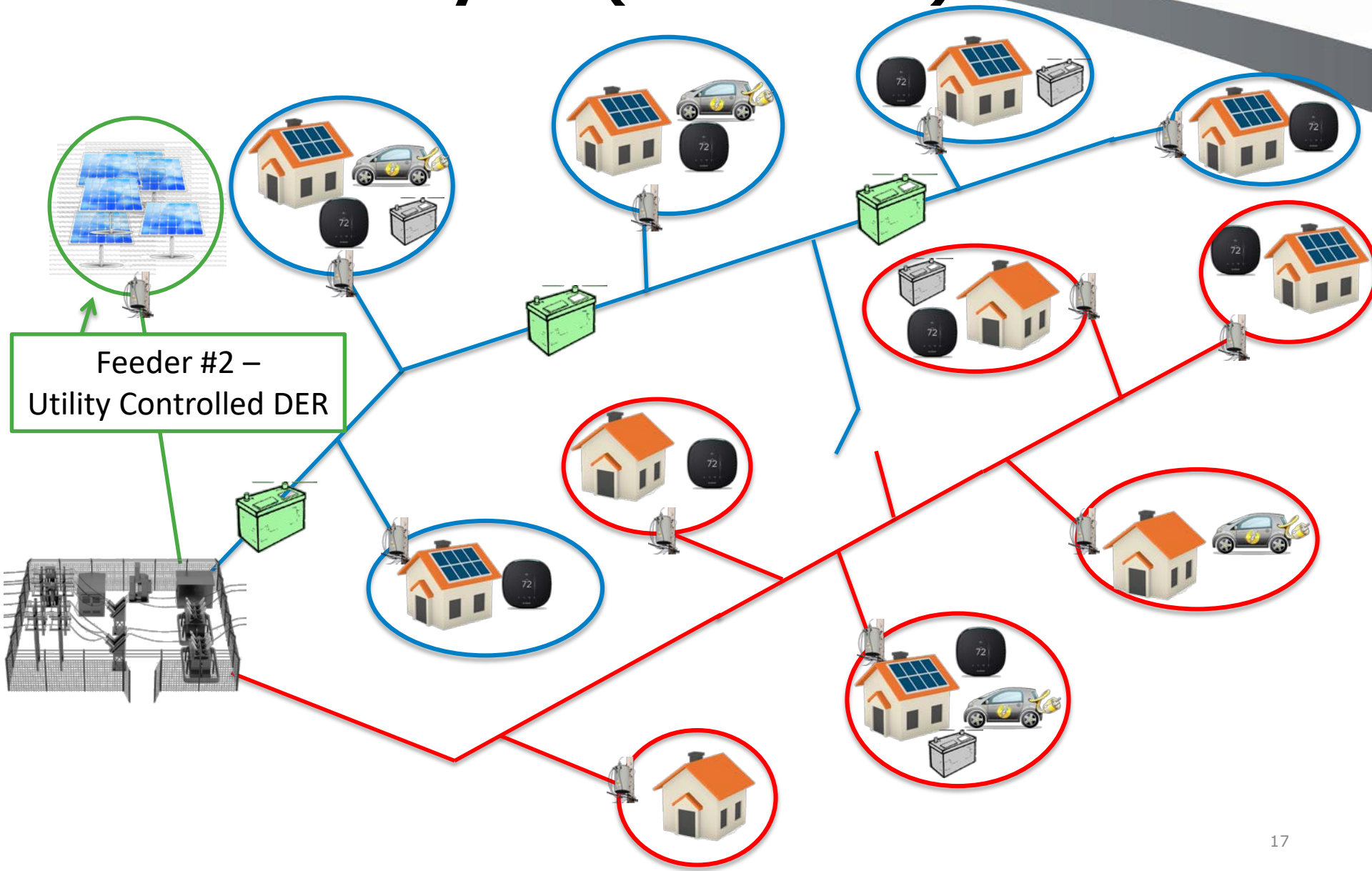

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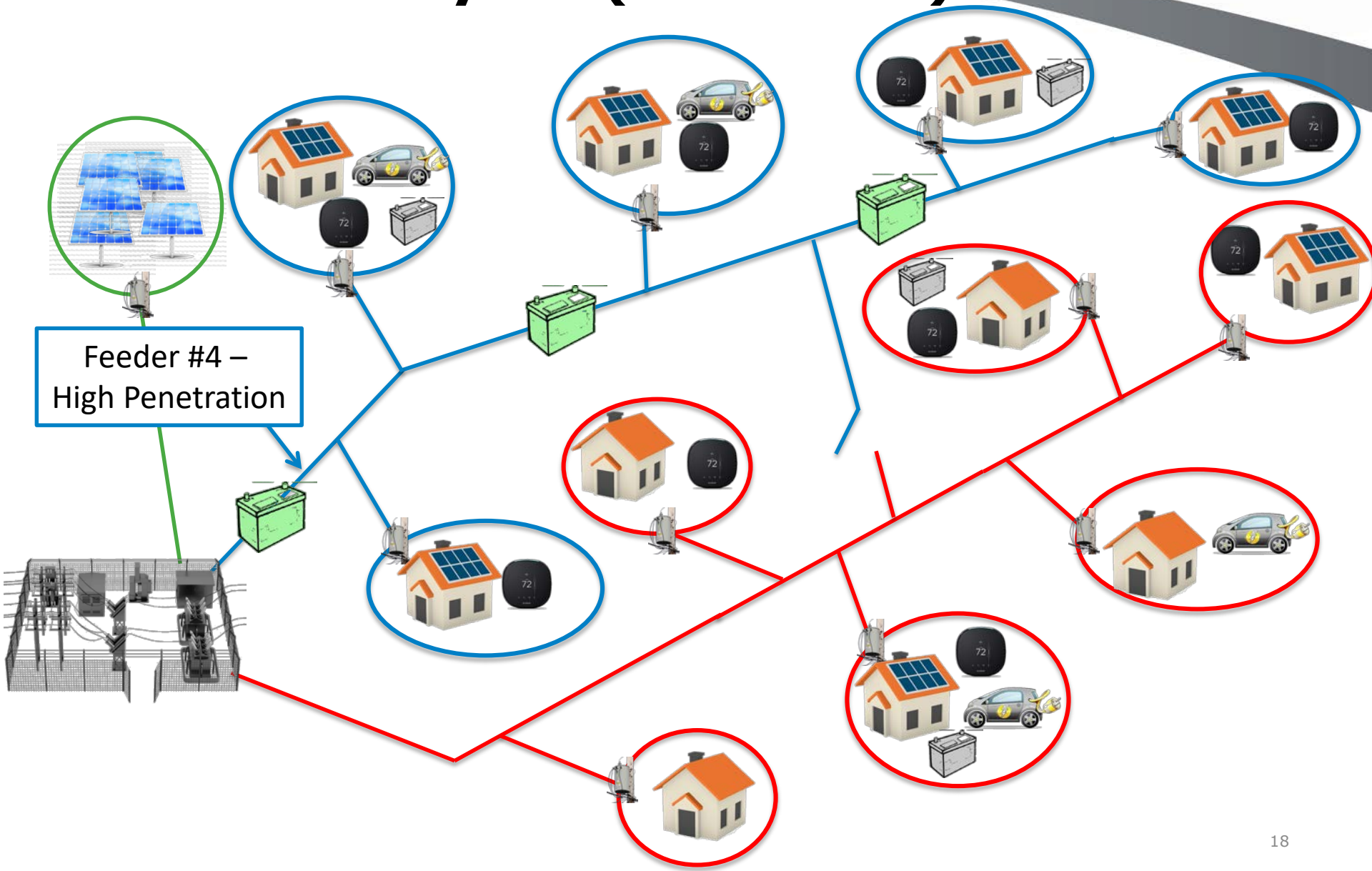

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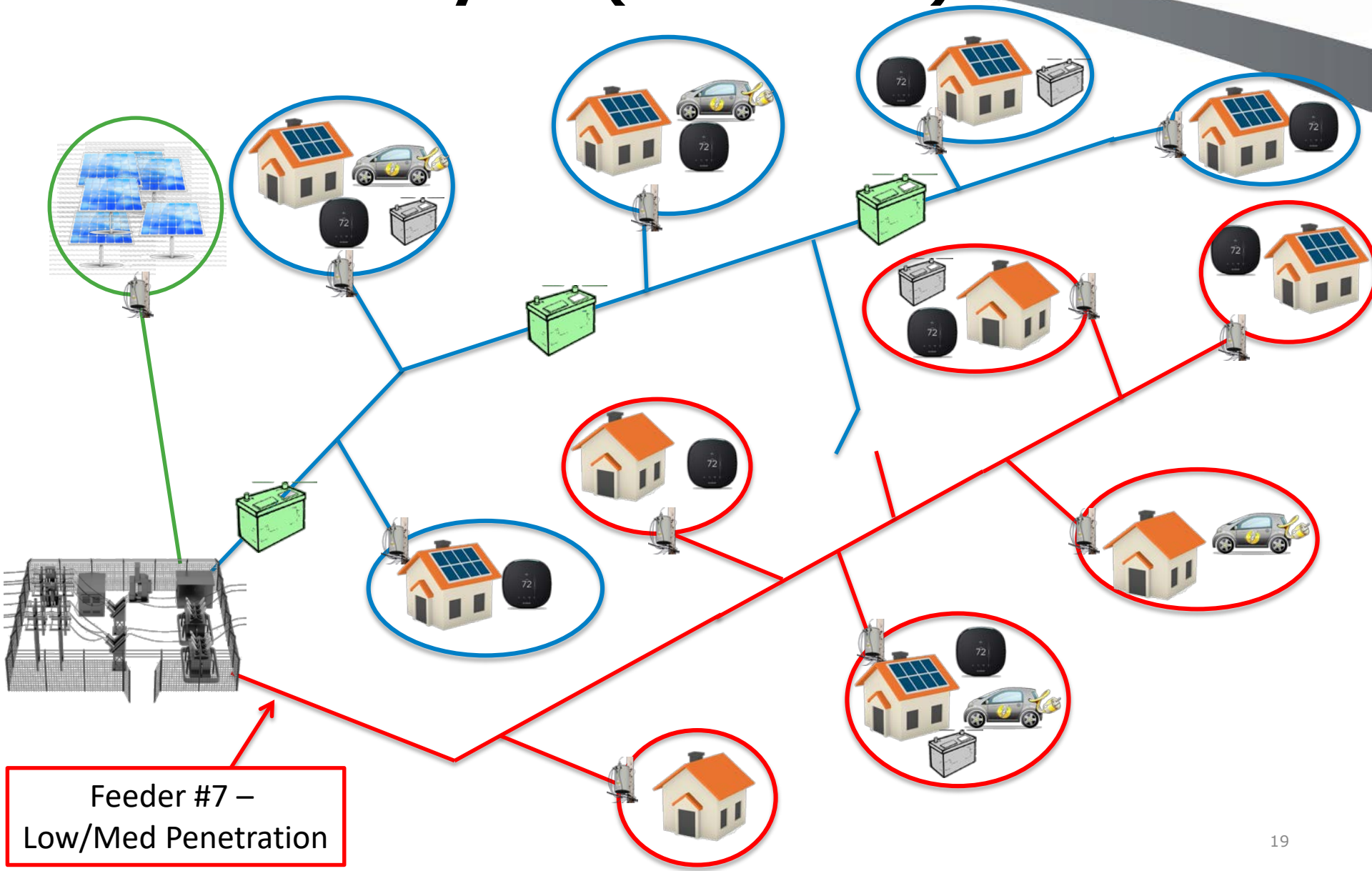

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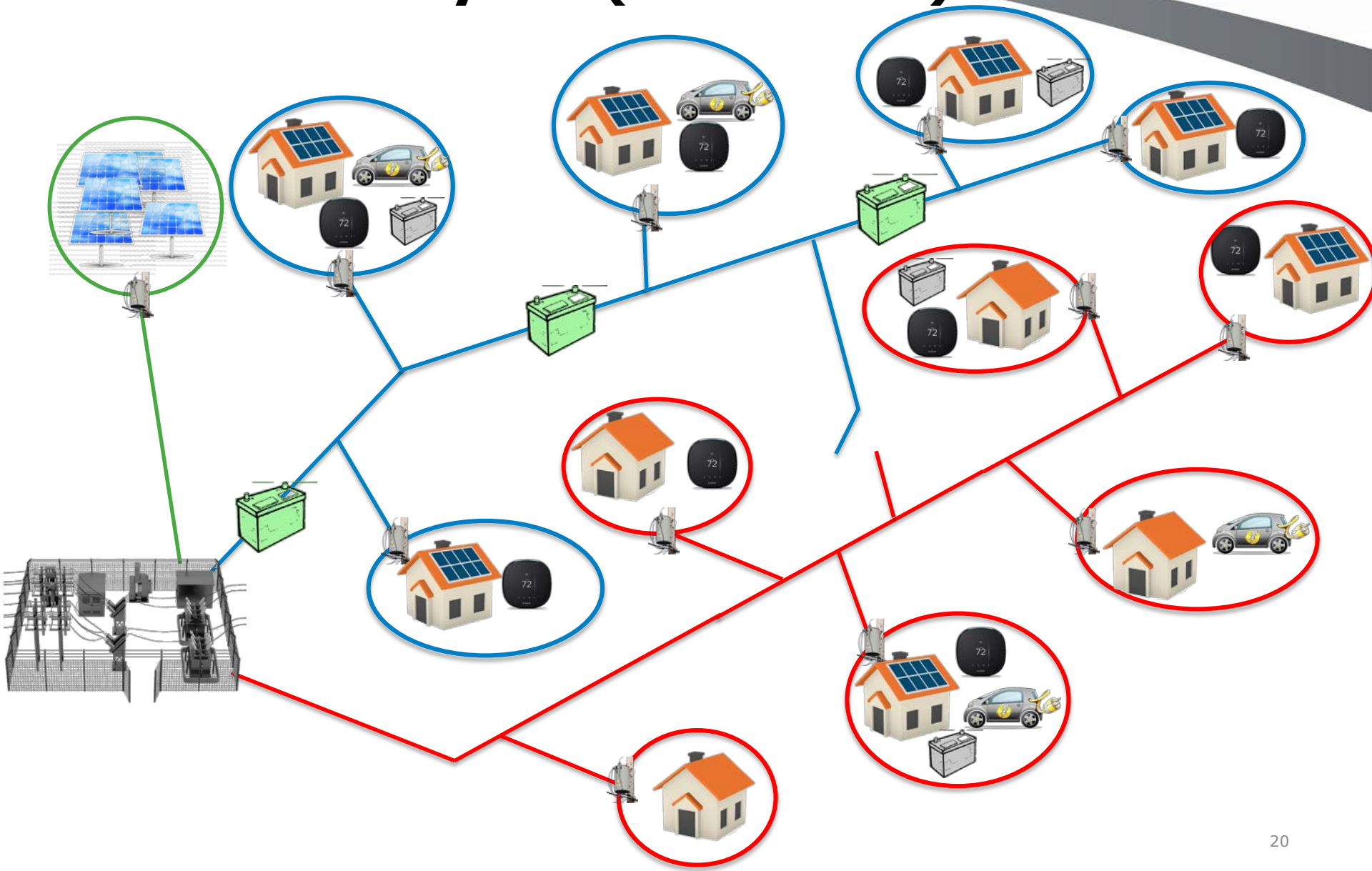
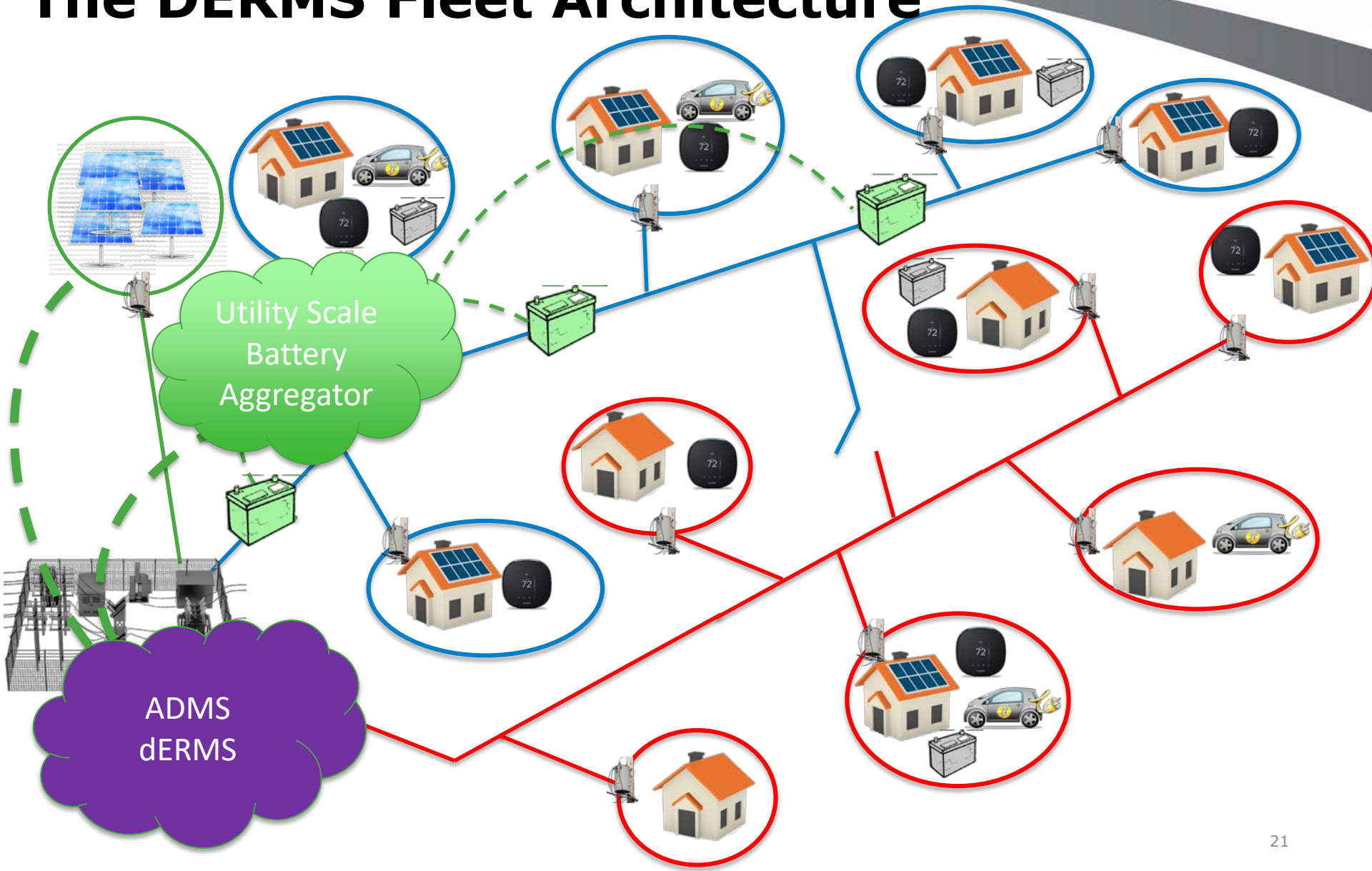


The DERMS Fleet Architecture



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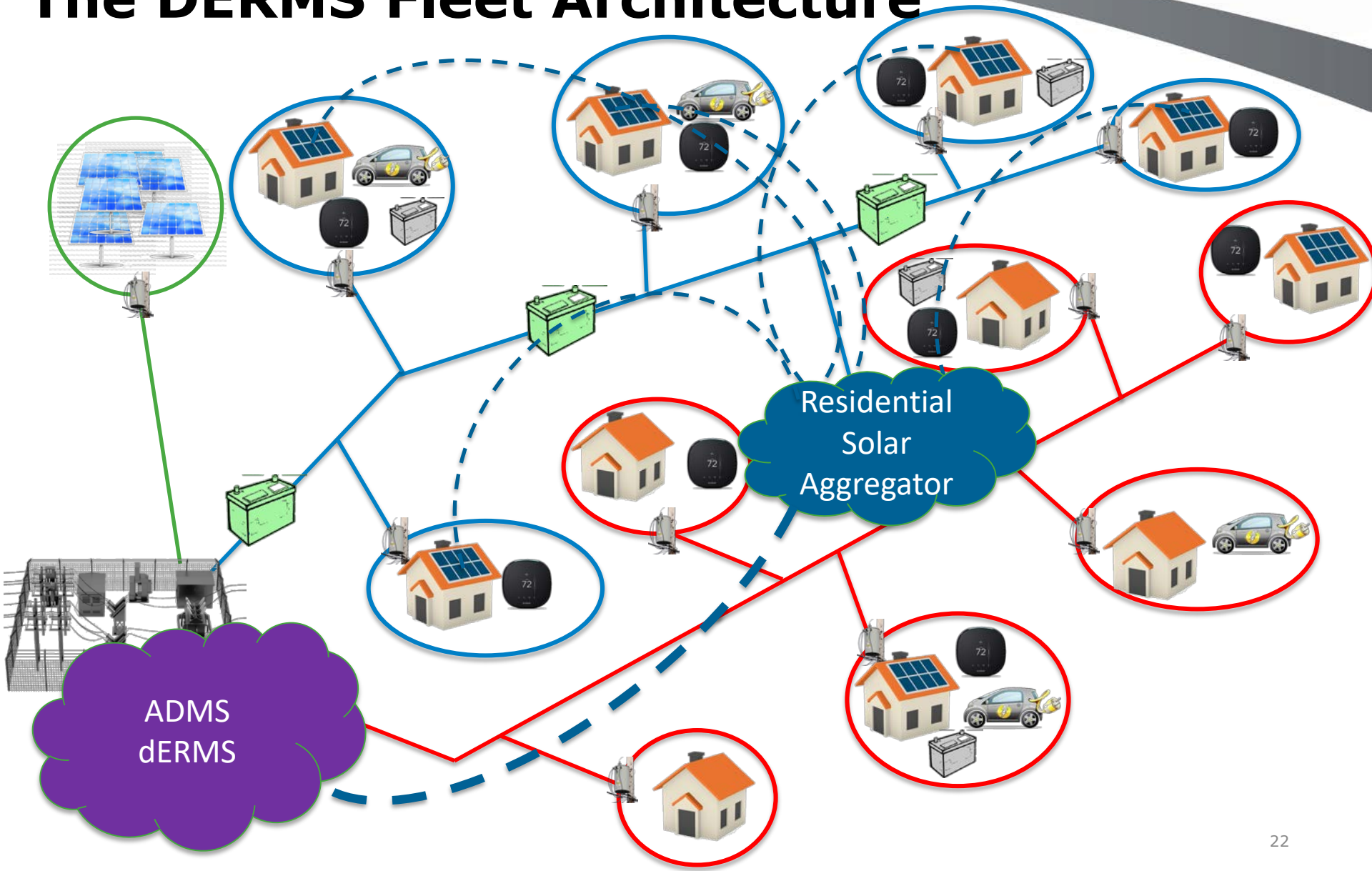

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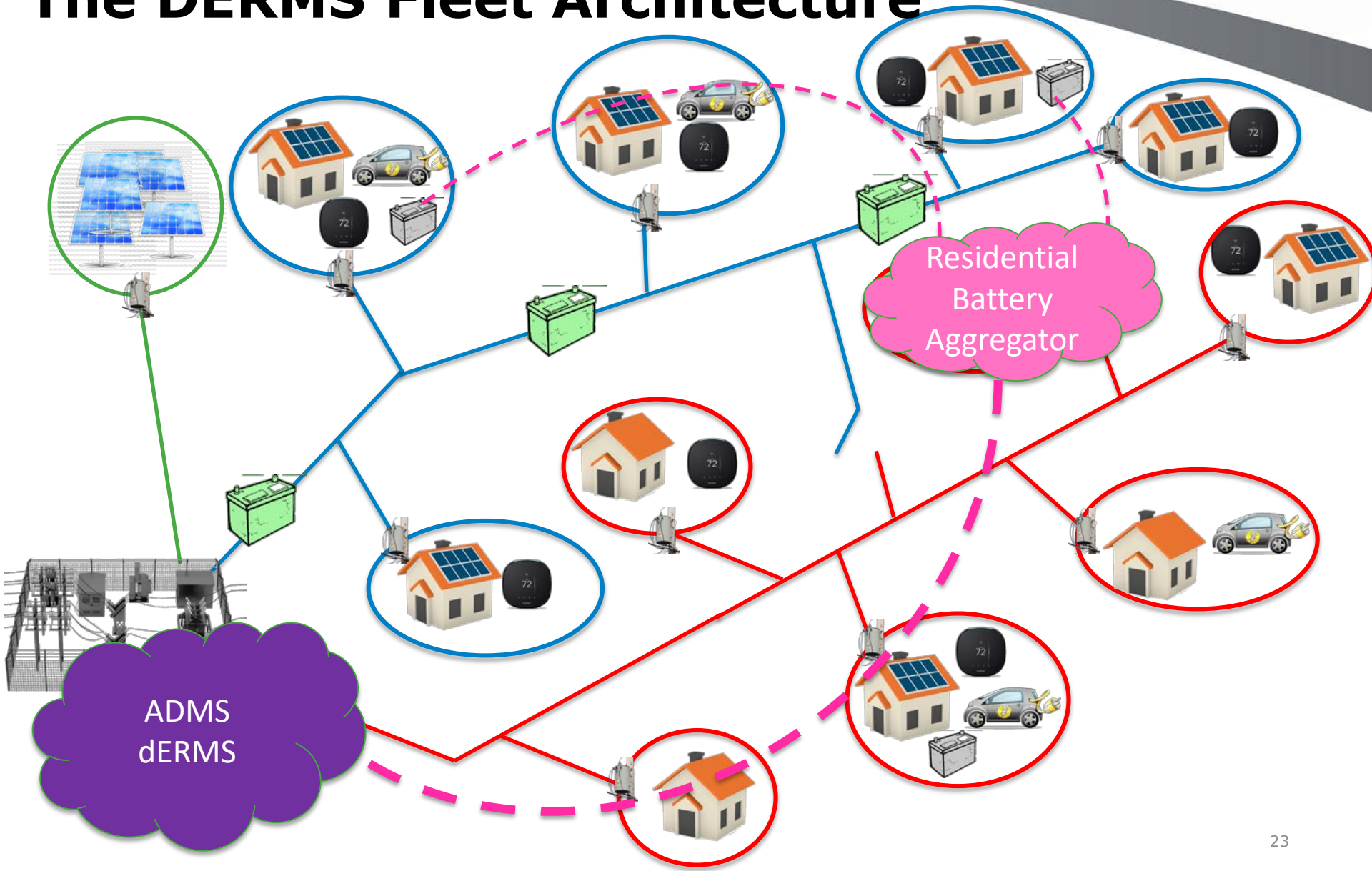

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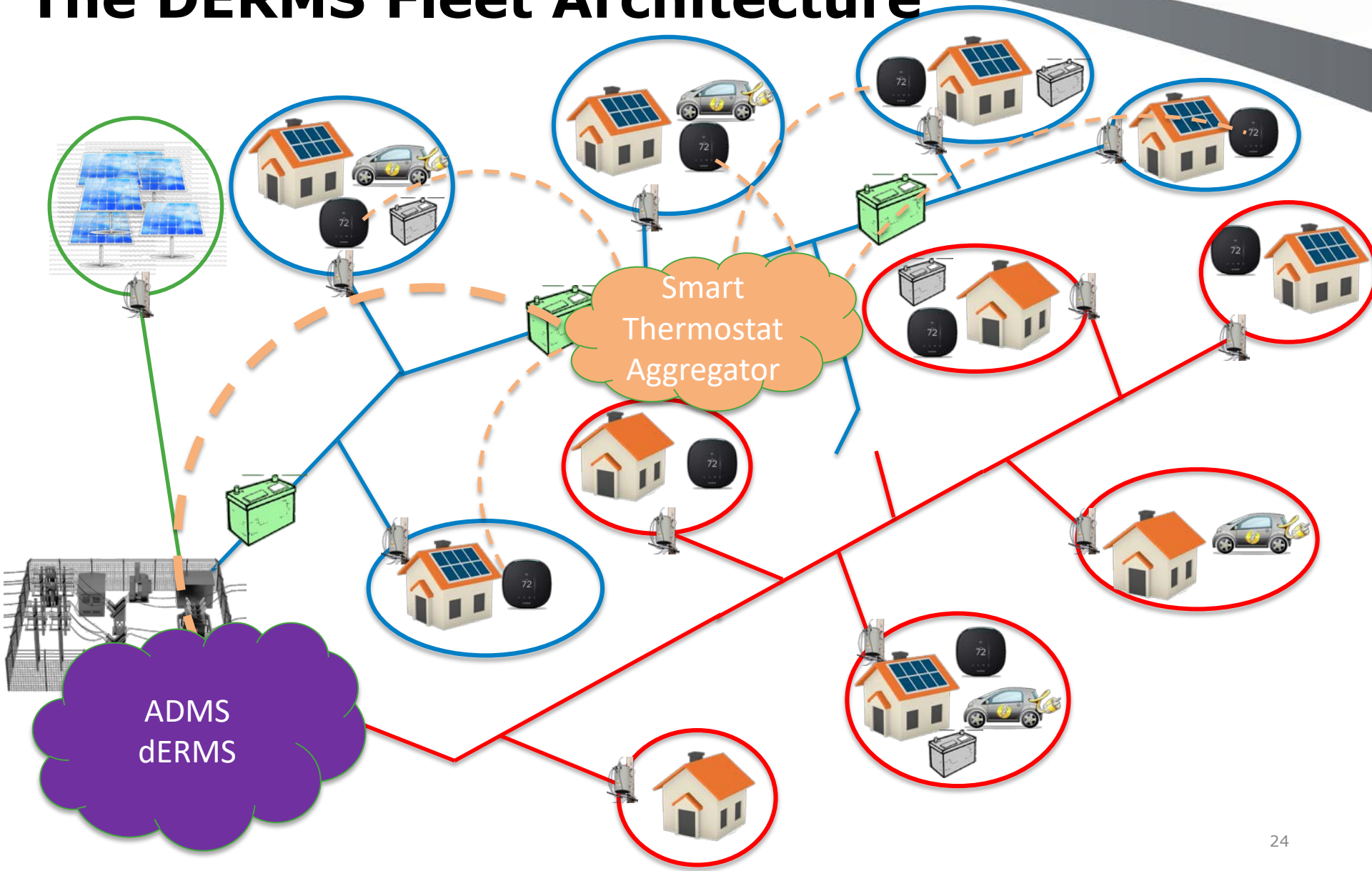

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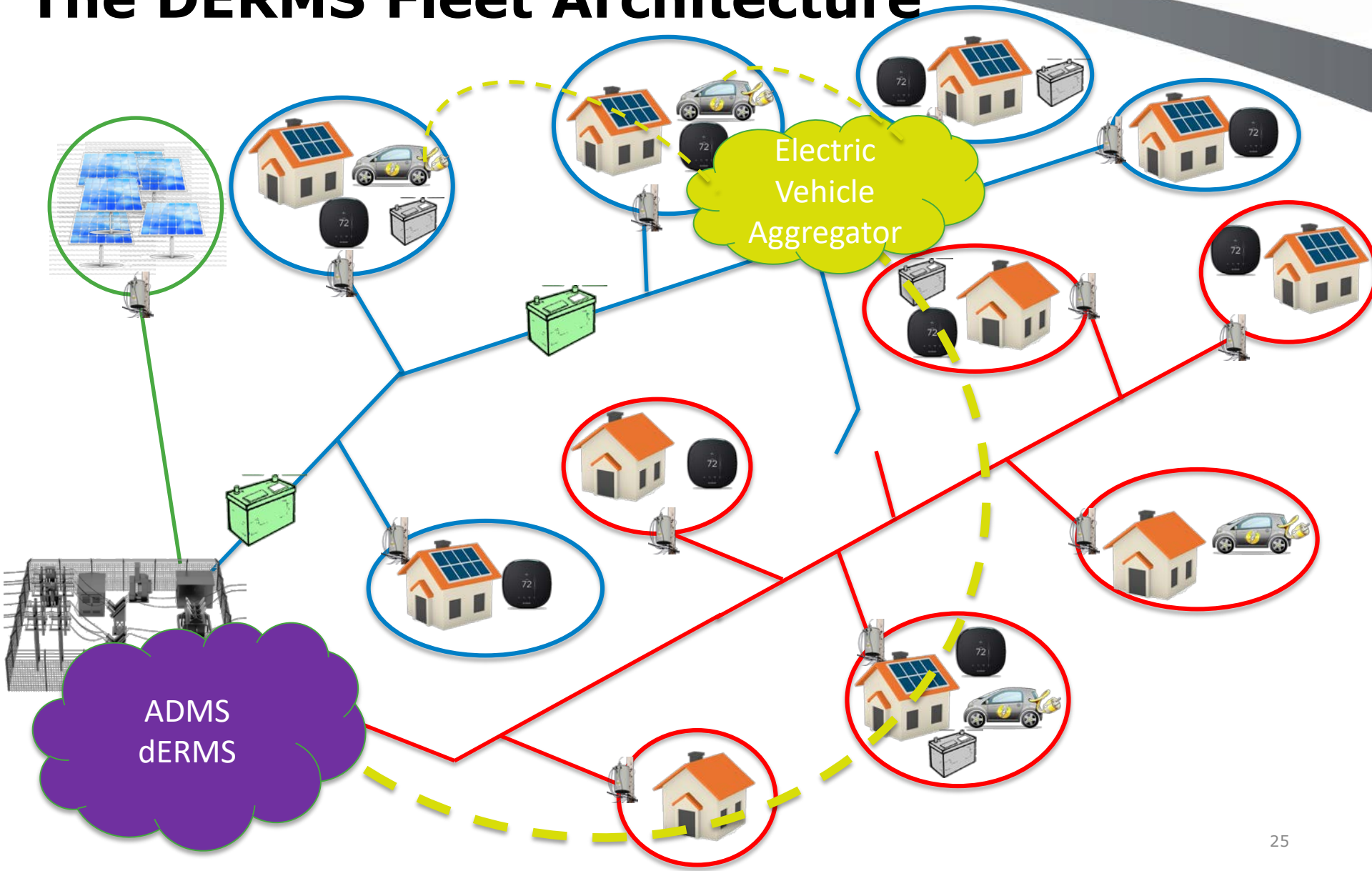

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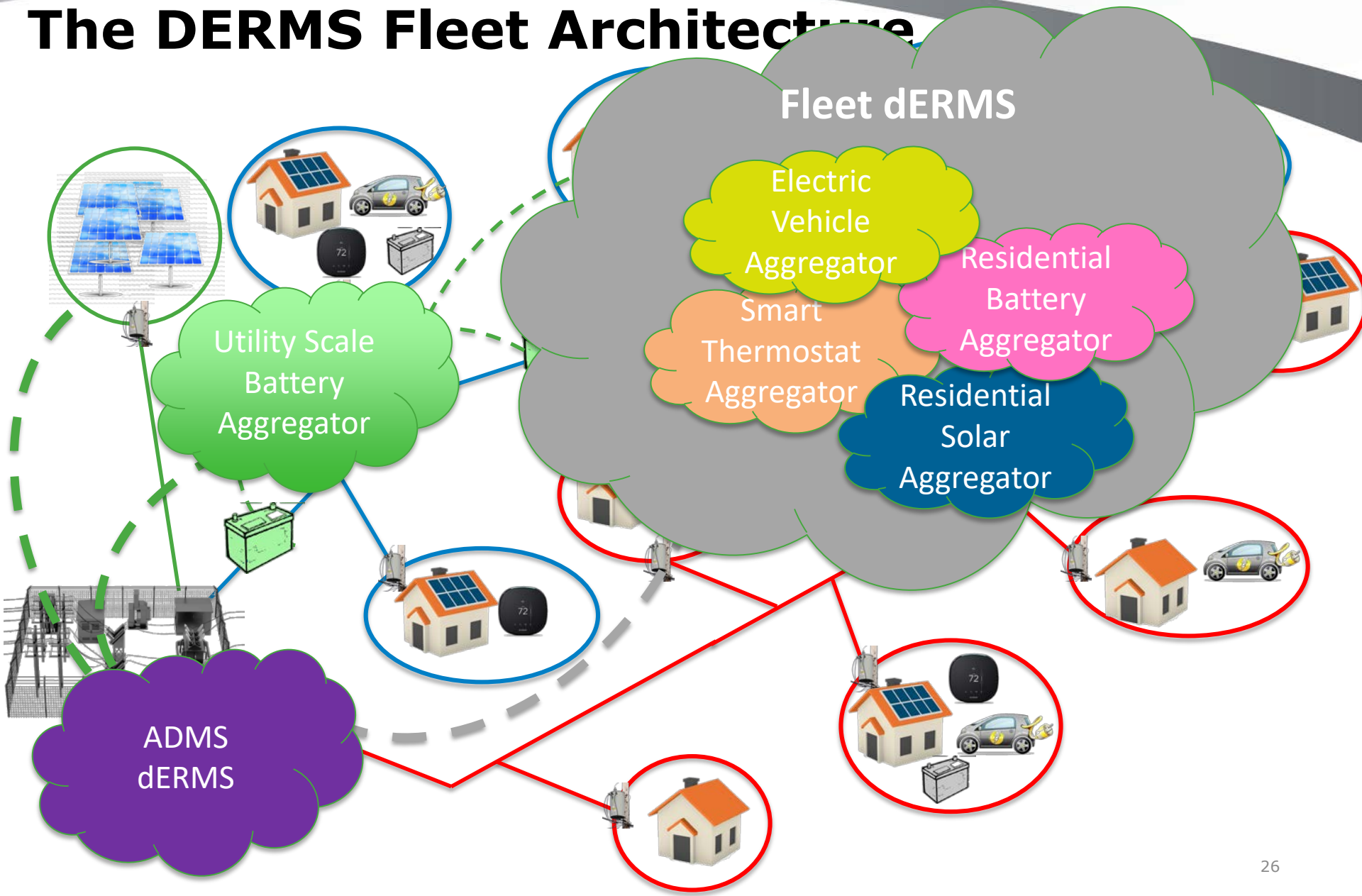


THIS IS THE "DERMS"

Utility Scale Battery Aggregator

Fleet dERMS

Electric Vehicle Aggregator

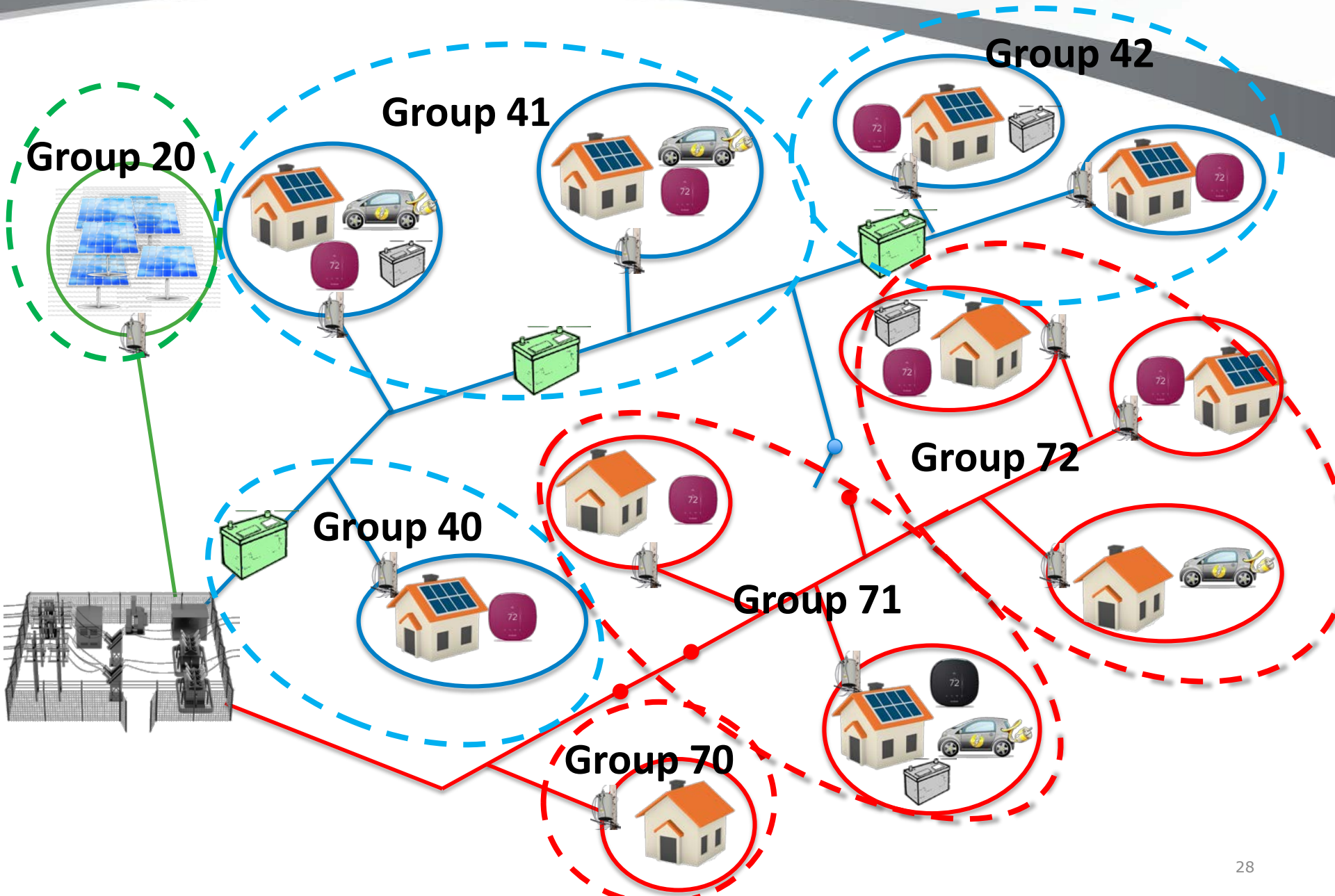
Smart Thermostat Aggregator

Residential Battery Aggregator

Residential Solar Aggregator

ADMS dERMS

Switching Order Coordination



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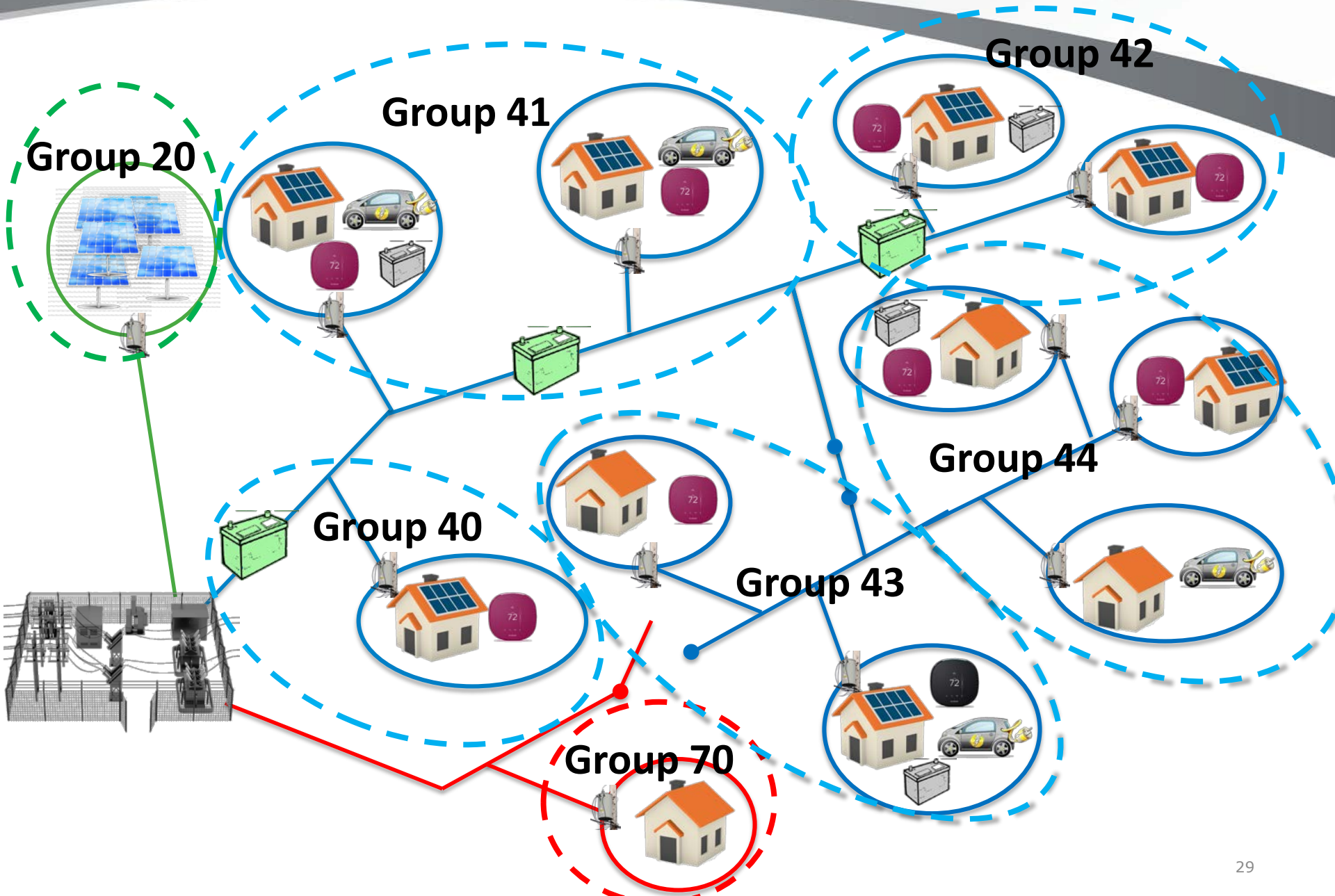
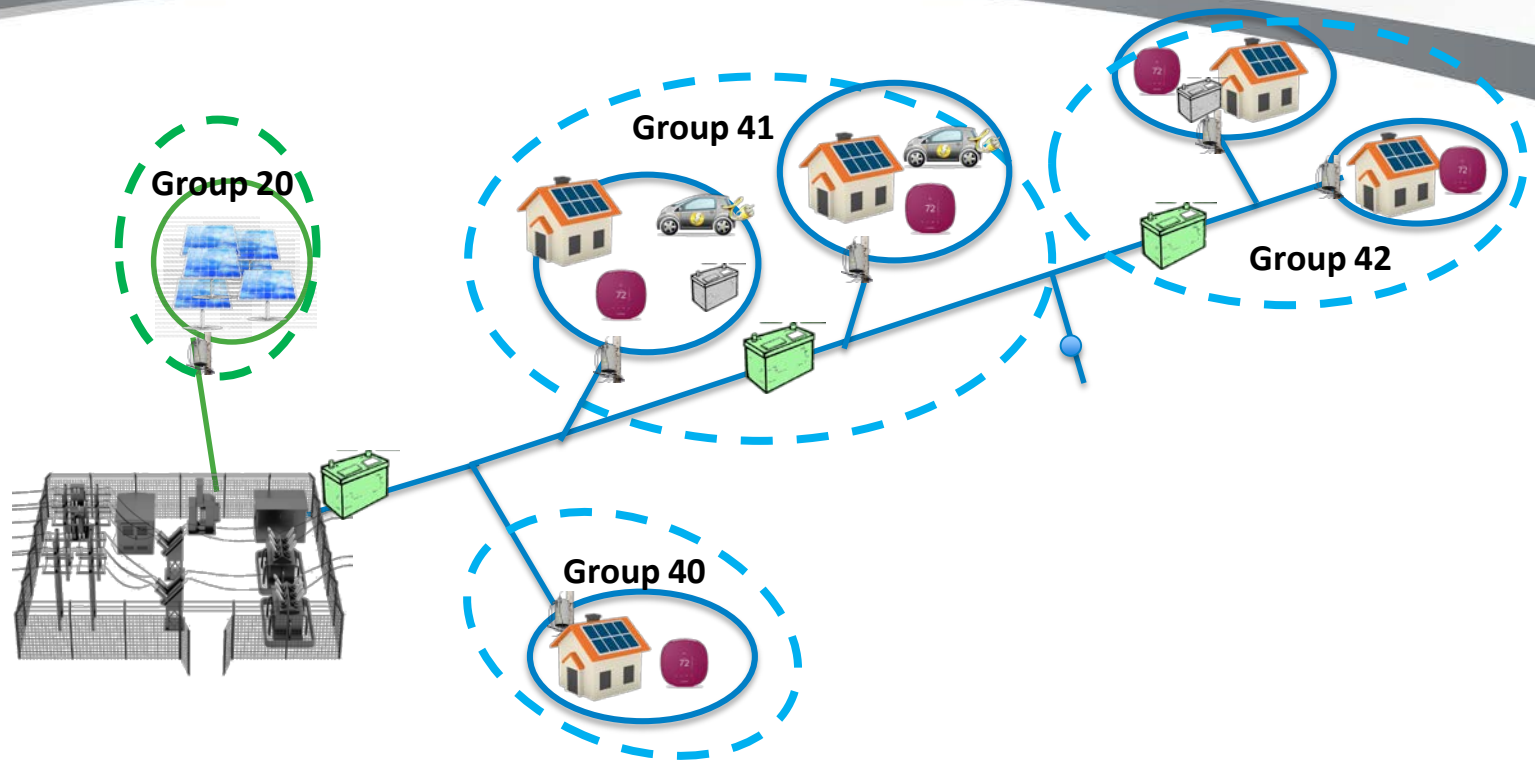
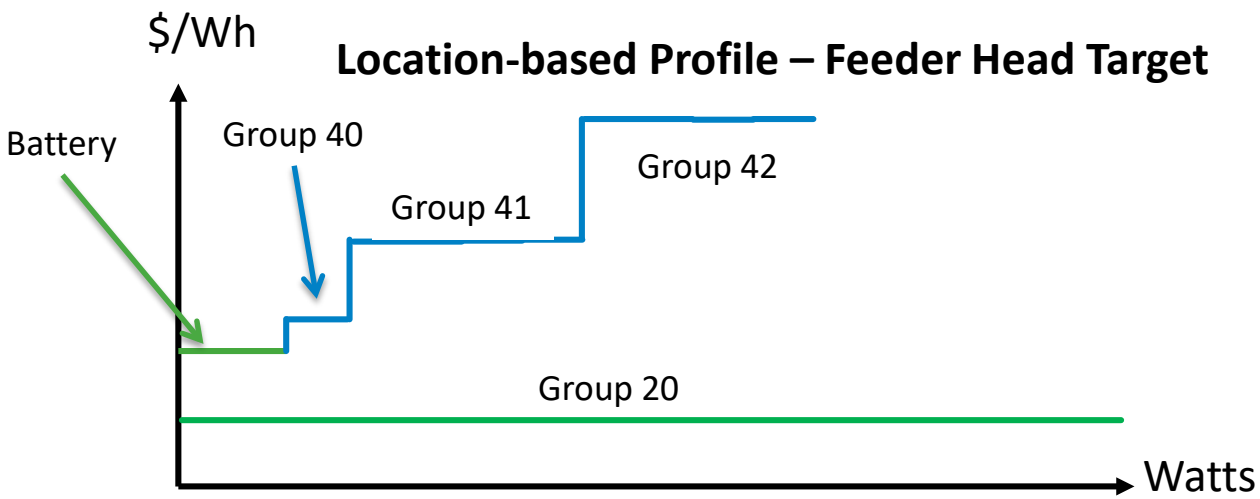


DERMS Optimization Considerations

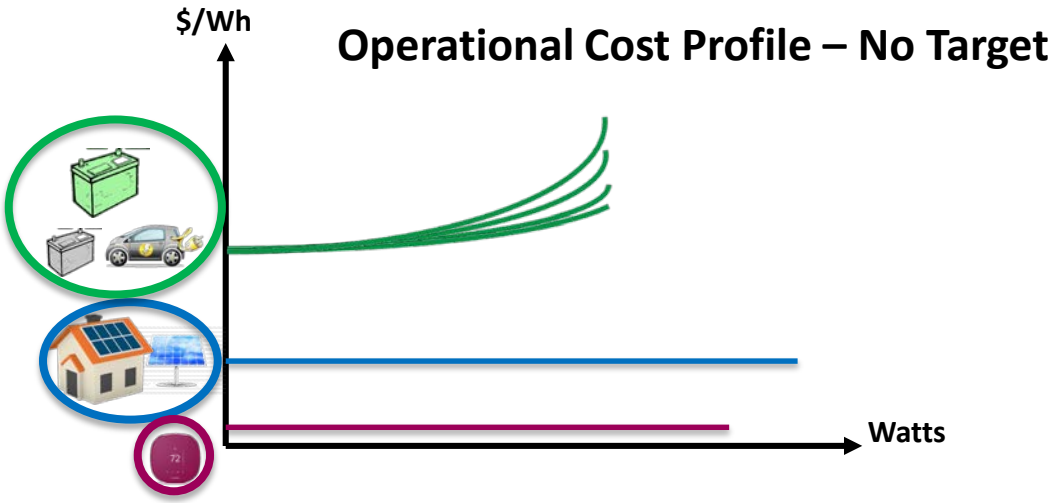
The “Hard Part” of DERMS

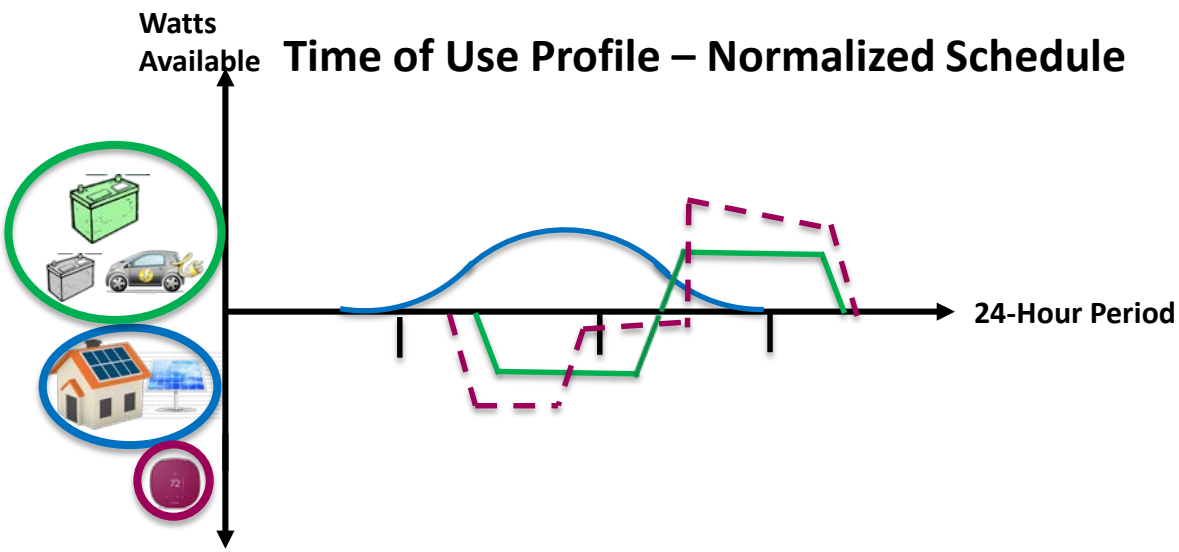
DERMS Locational Intelligence





DERMS Operational Intelligence

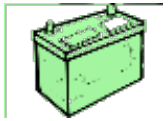




Some Considerations By Device

- Demand Response devices "value" is in offsetting loads.
  - Reduces the "costs" every participant is paid.
  - Demand response "magnitude" is inversely related with energy efficiency.
  - Customer Fatigue

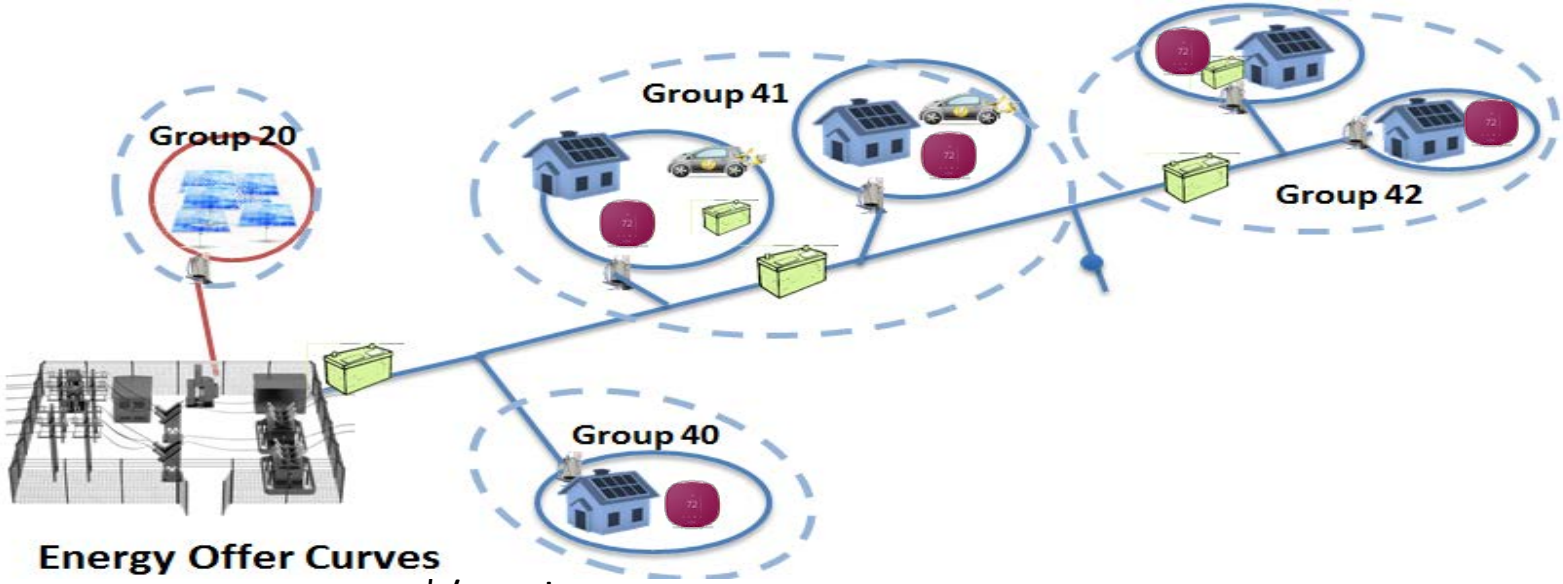
- Solar is cheap but can only participate during certain times.
  - Variability in actual participation is also affected by weather.
  - Generation can be paired with Energy Storage or "reverse demand response".



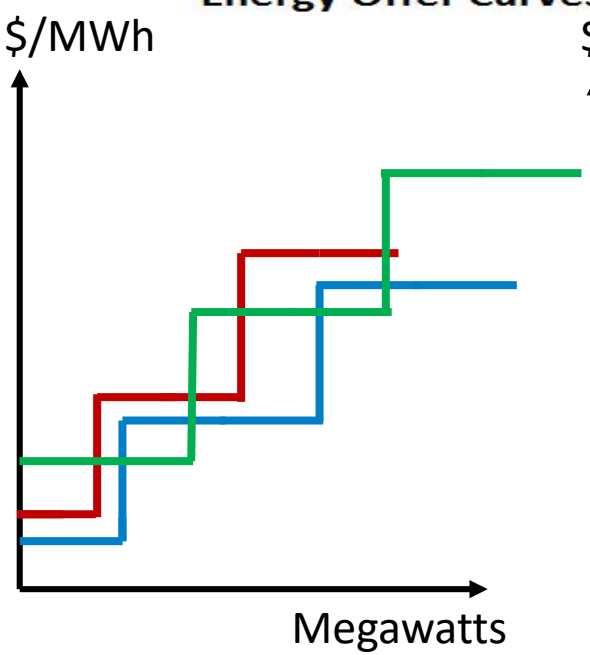
- Batteries' market participation value is variable.
  - Based on delta of the charge price and the dispatch price.
  - Oversizing the inverter allows for ancillary services but increases initial procurement cost.

- Line devices are a hidden cost that are incurred.
  - Voltage regulators, capacitor banks, and other devices may see increased operations with higher density of DER devices.

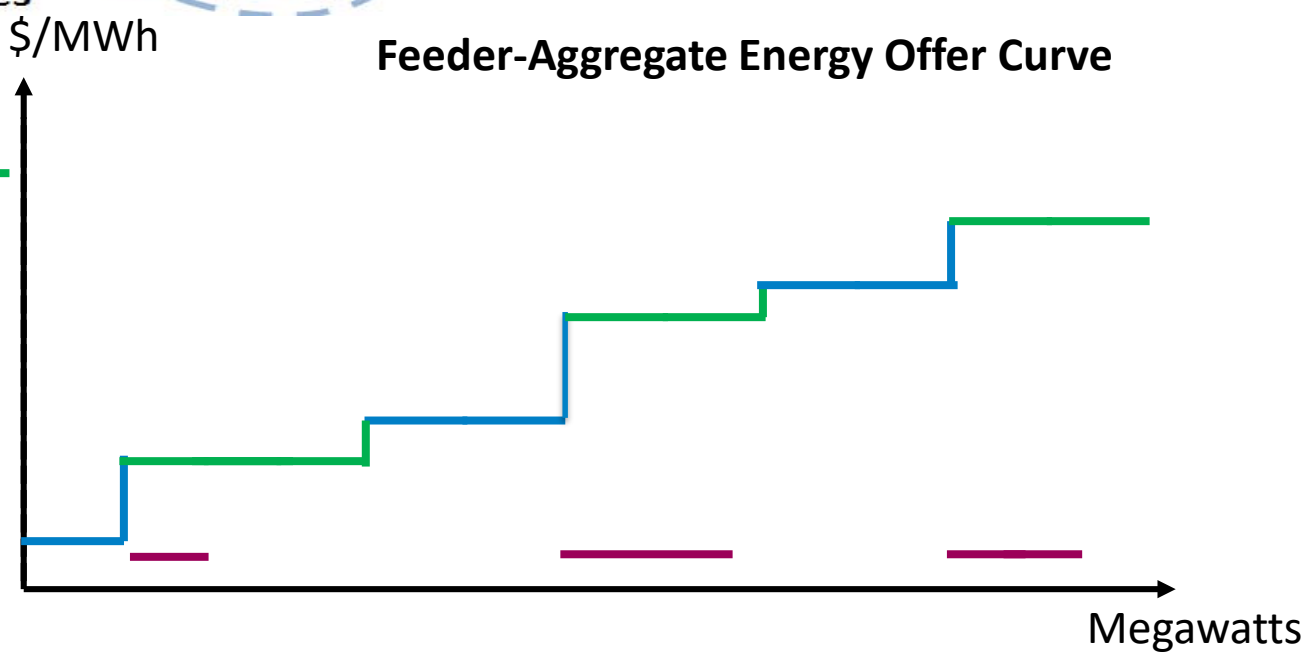
DERMS – Load Reduction and Generation



Energy Offer Curves



Feeder-Aggregate Energy Offer Curve



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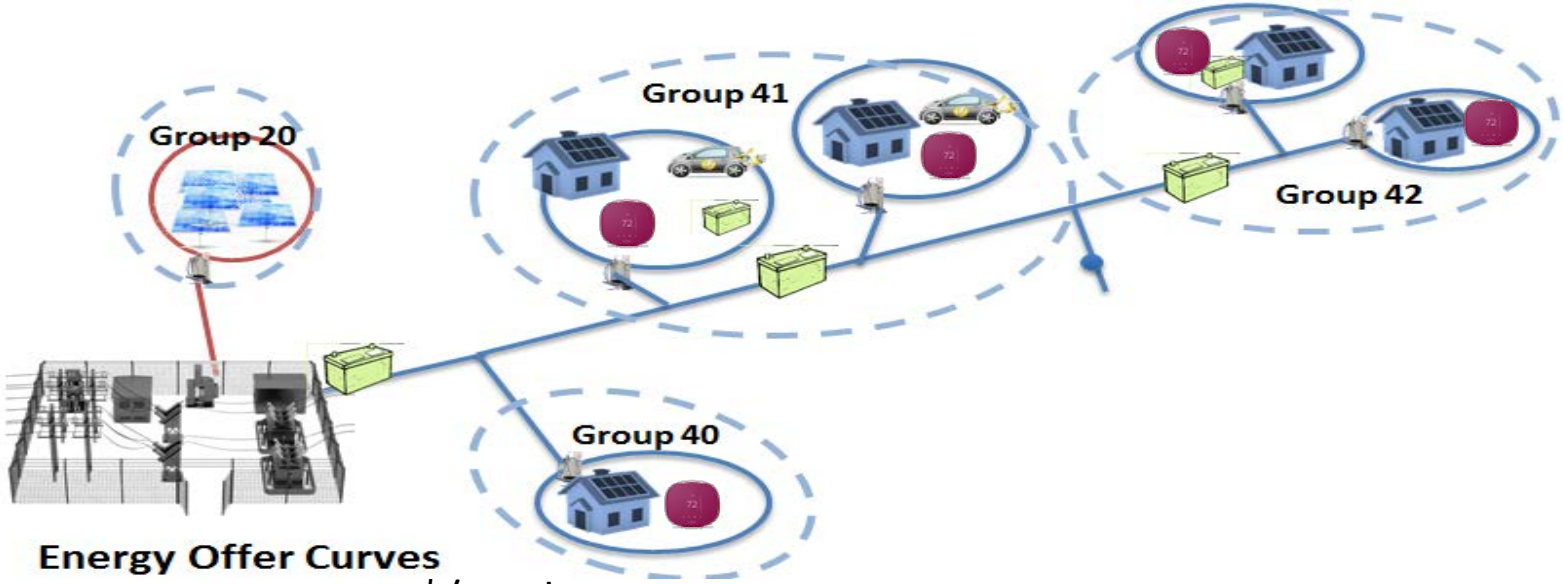

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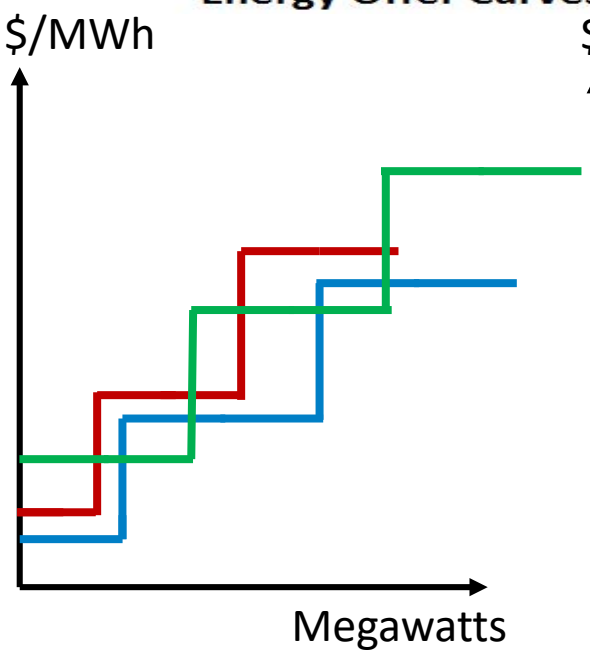

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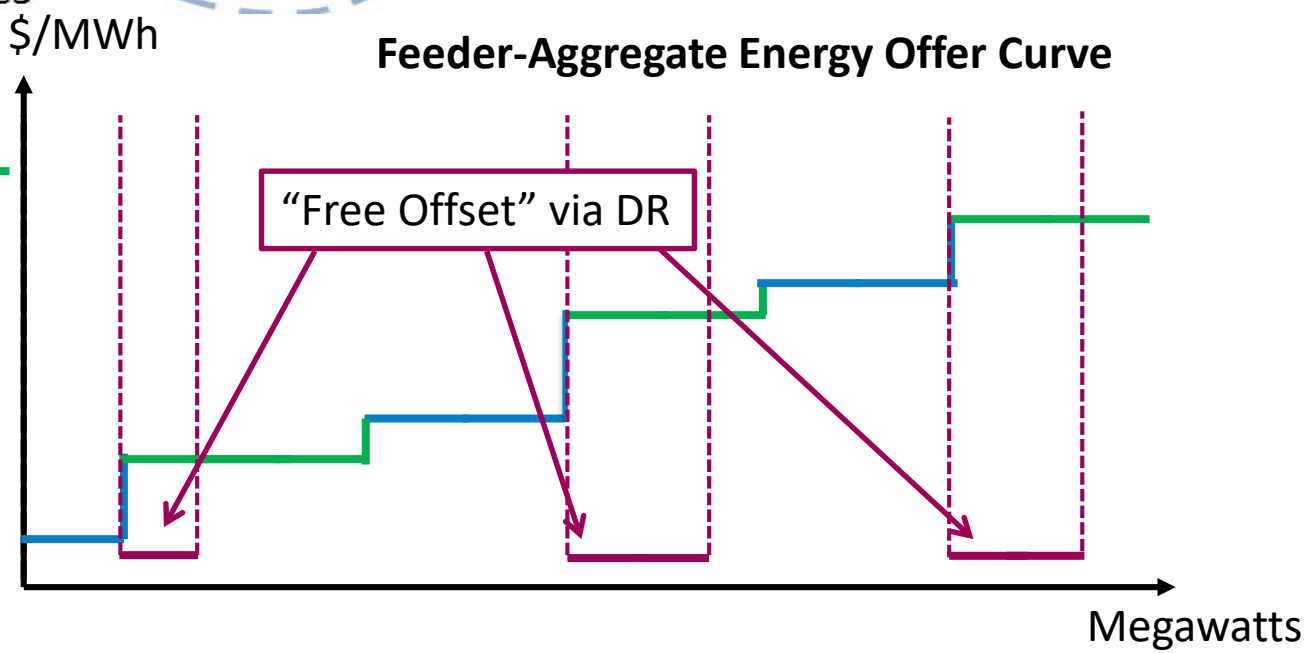

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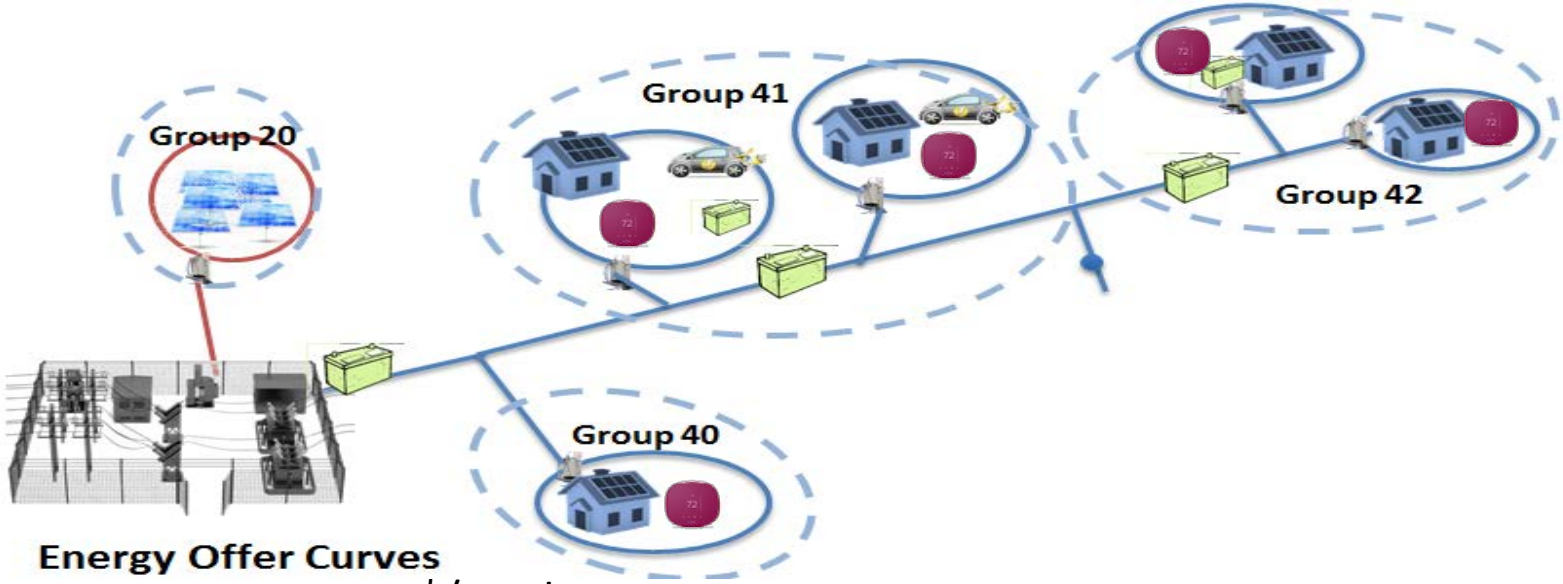

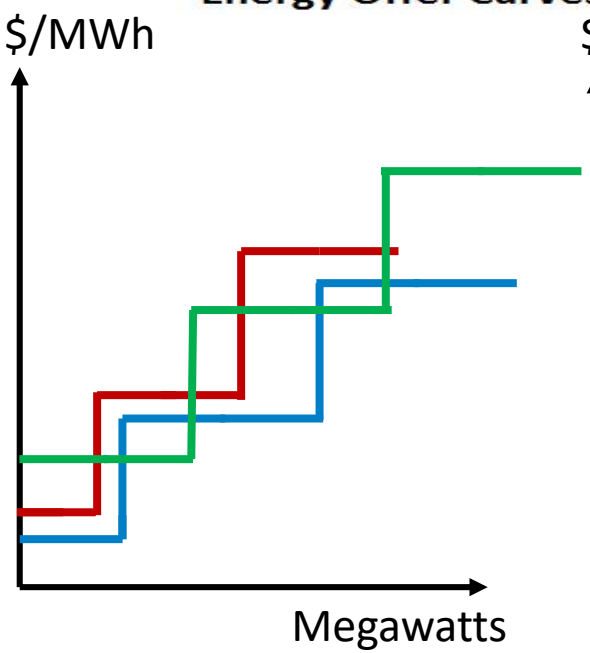

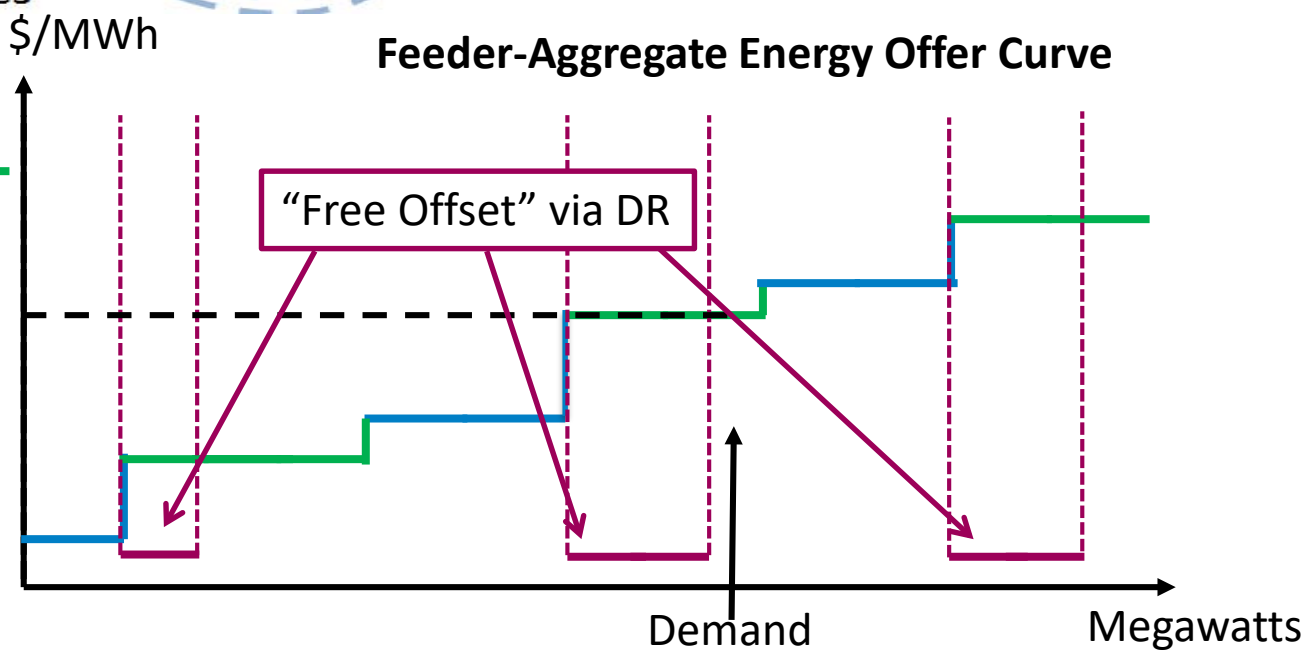

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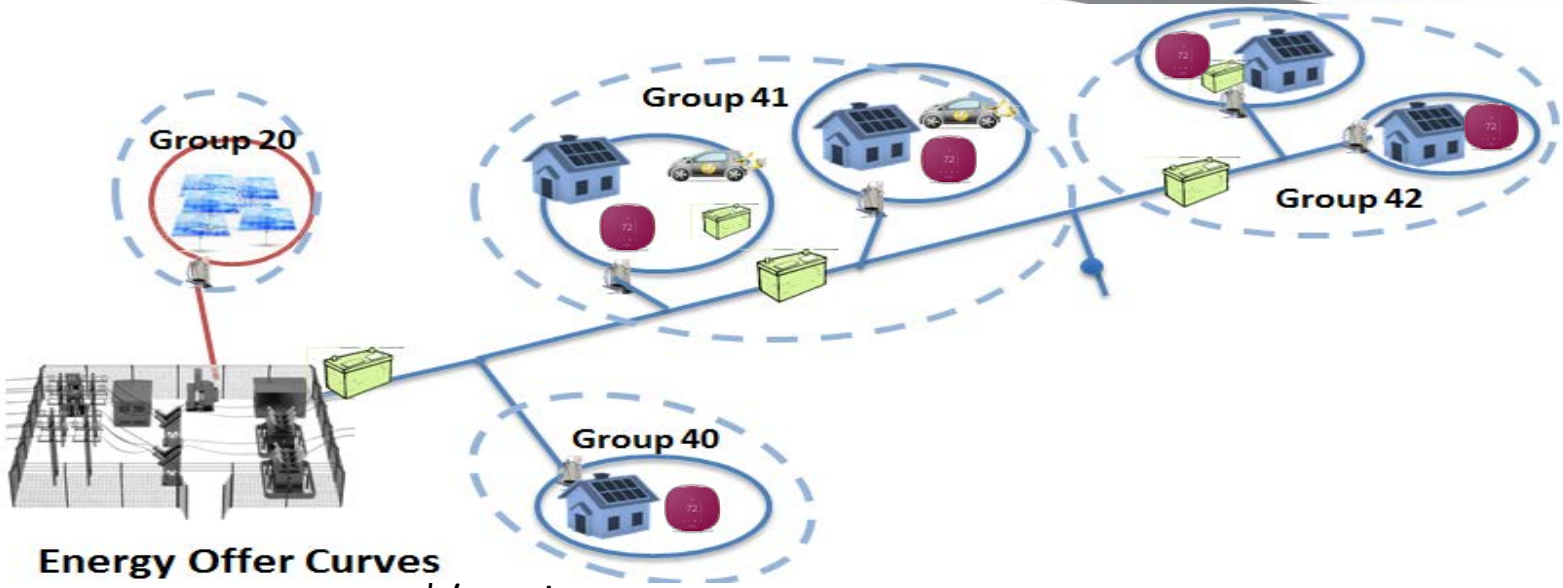

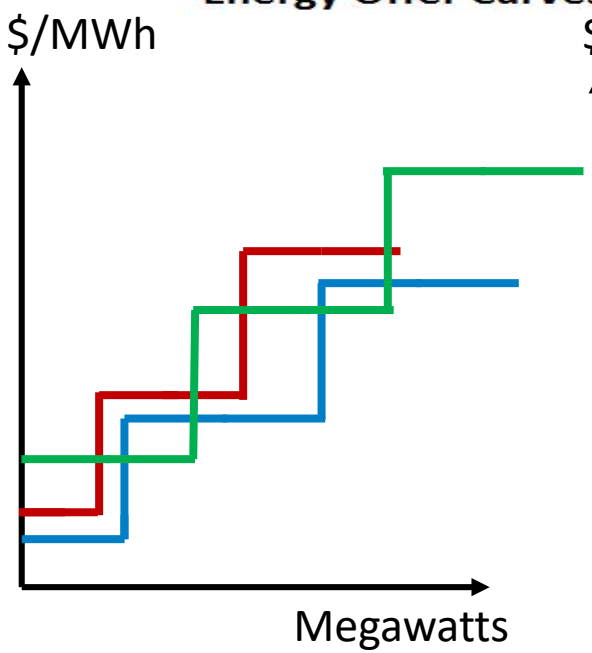

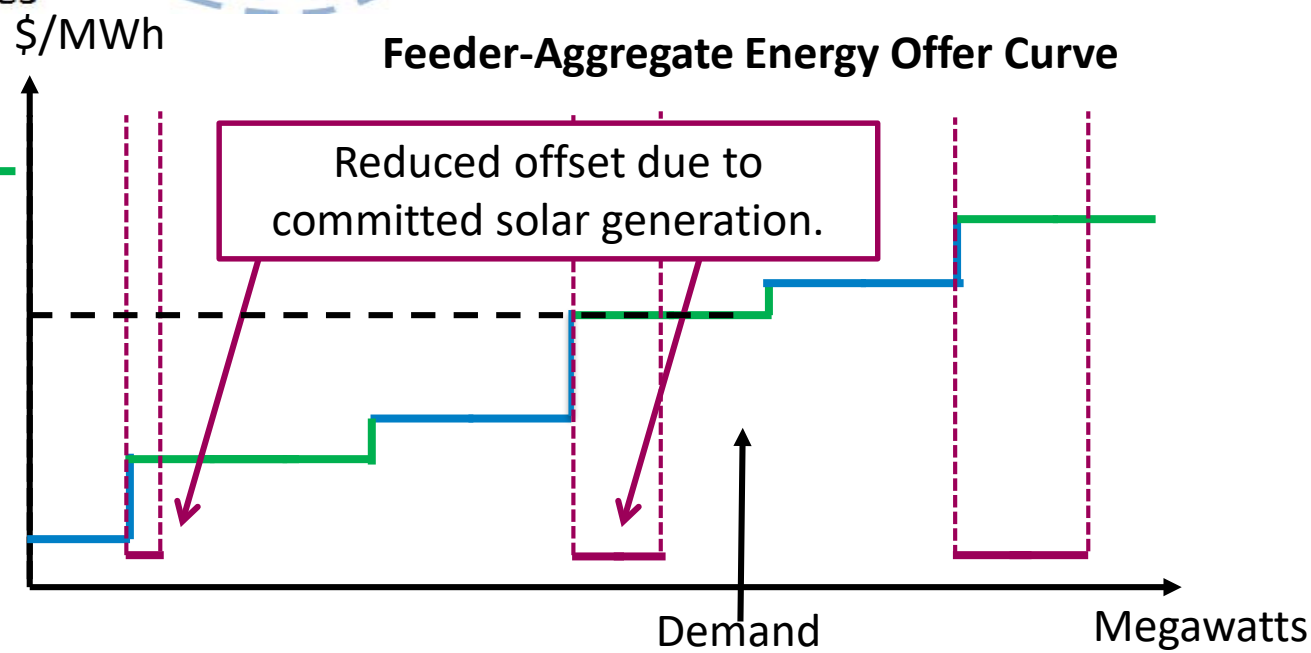

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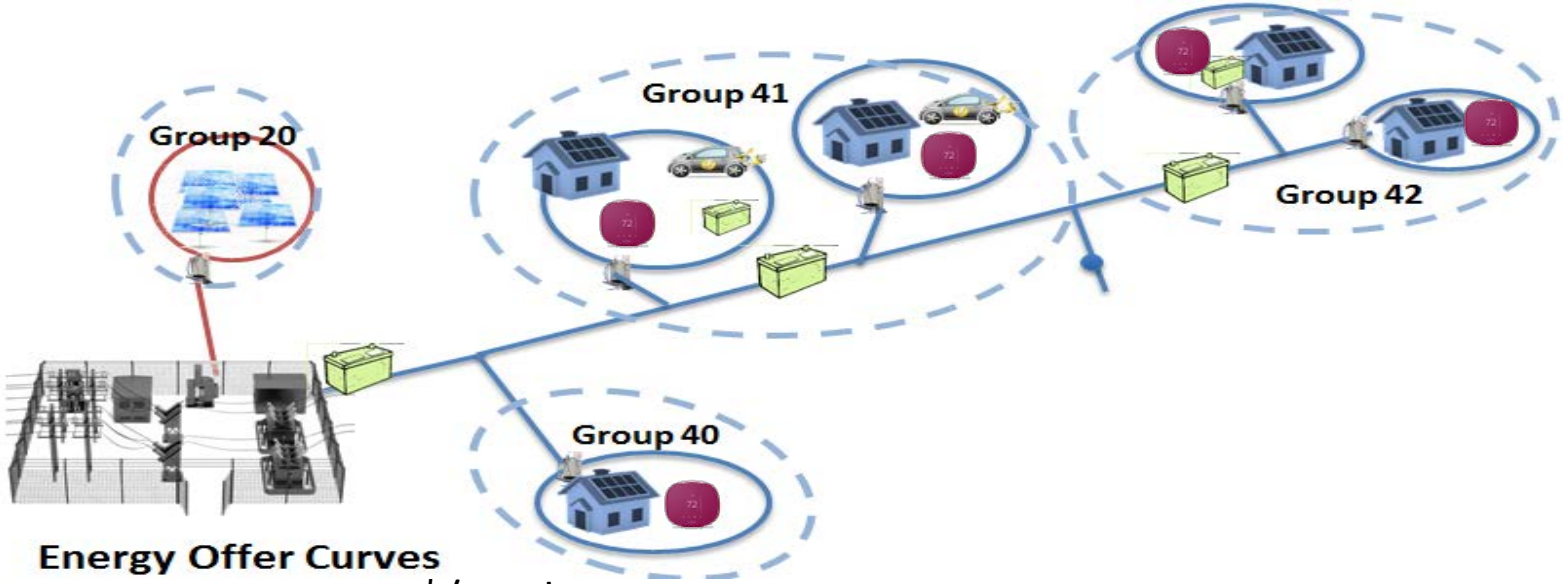

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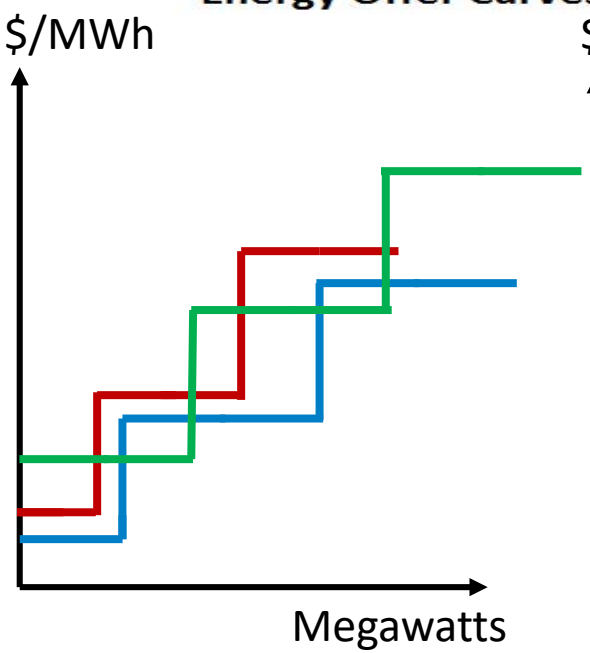

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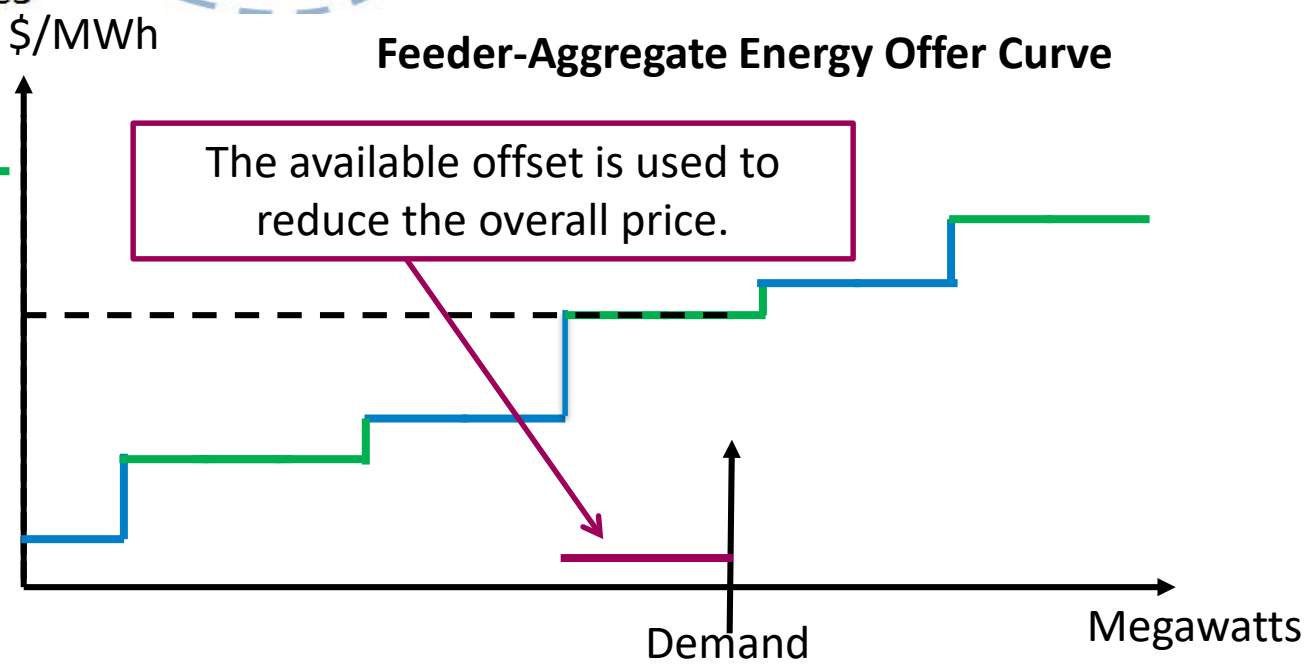

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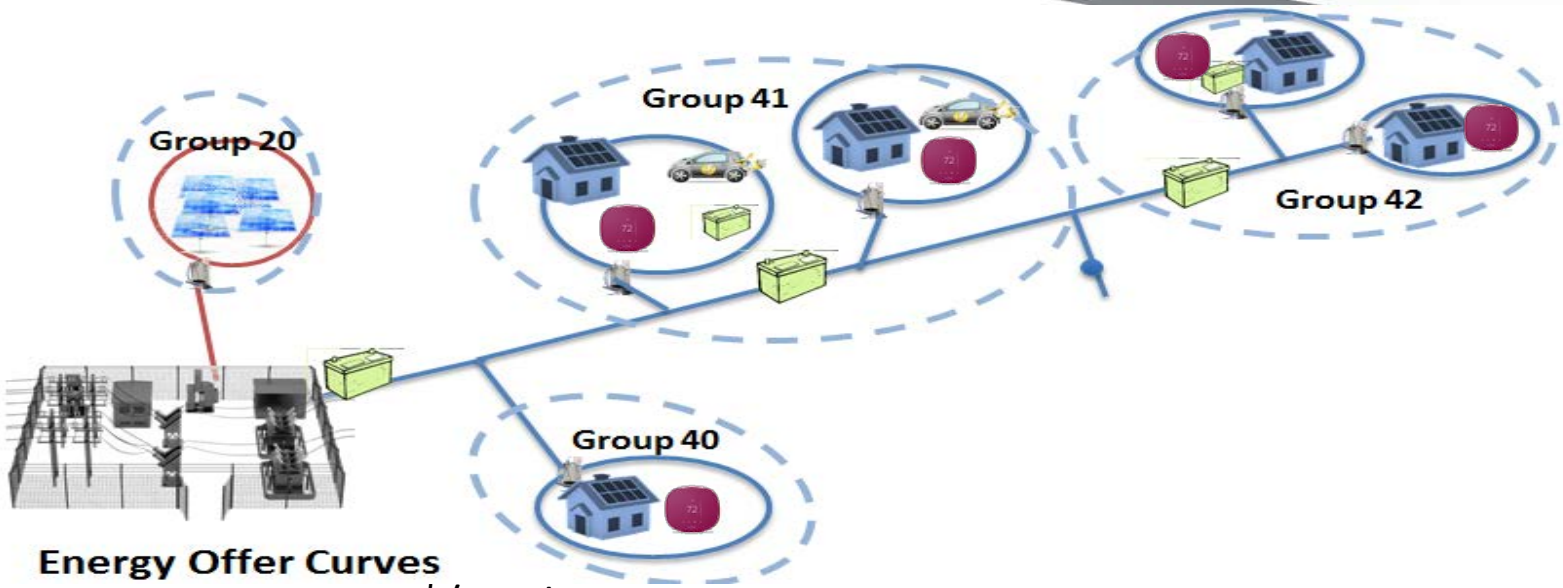

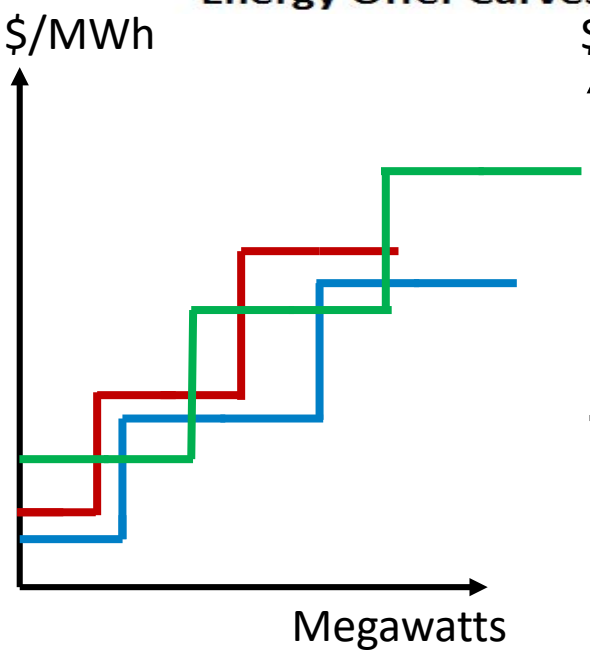

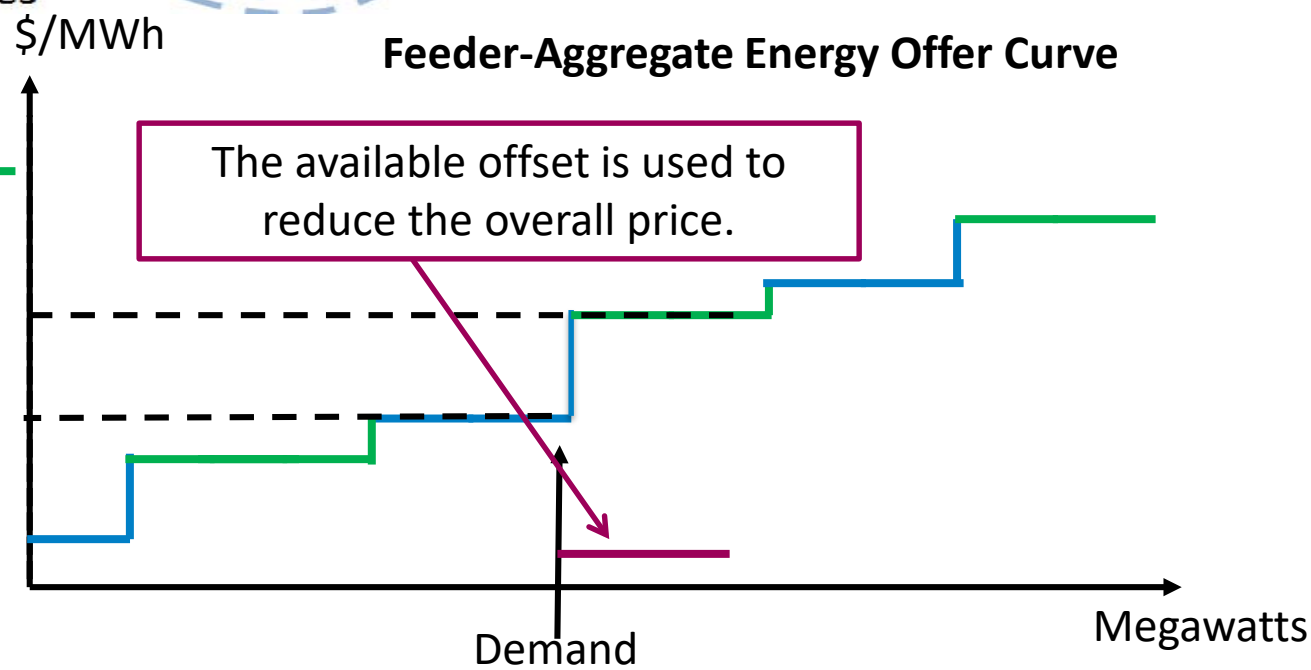

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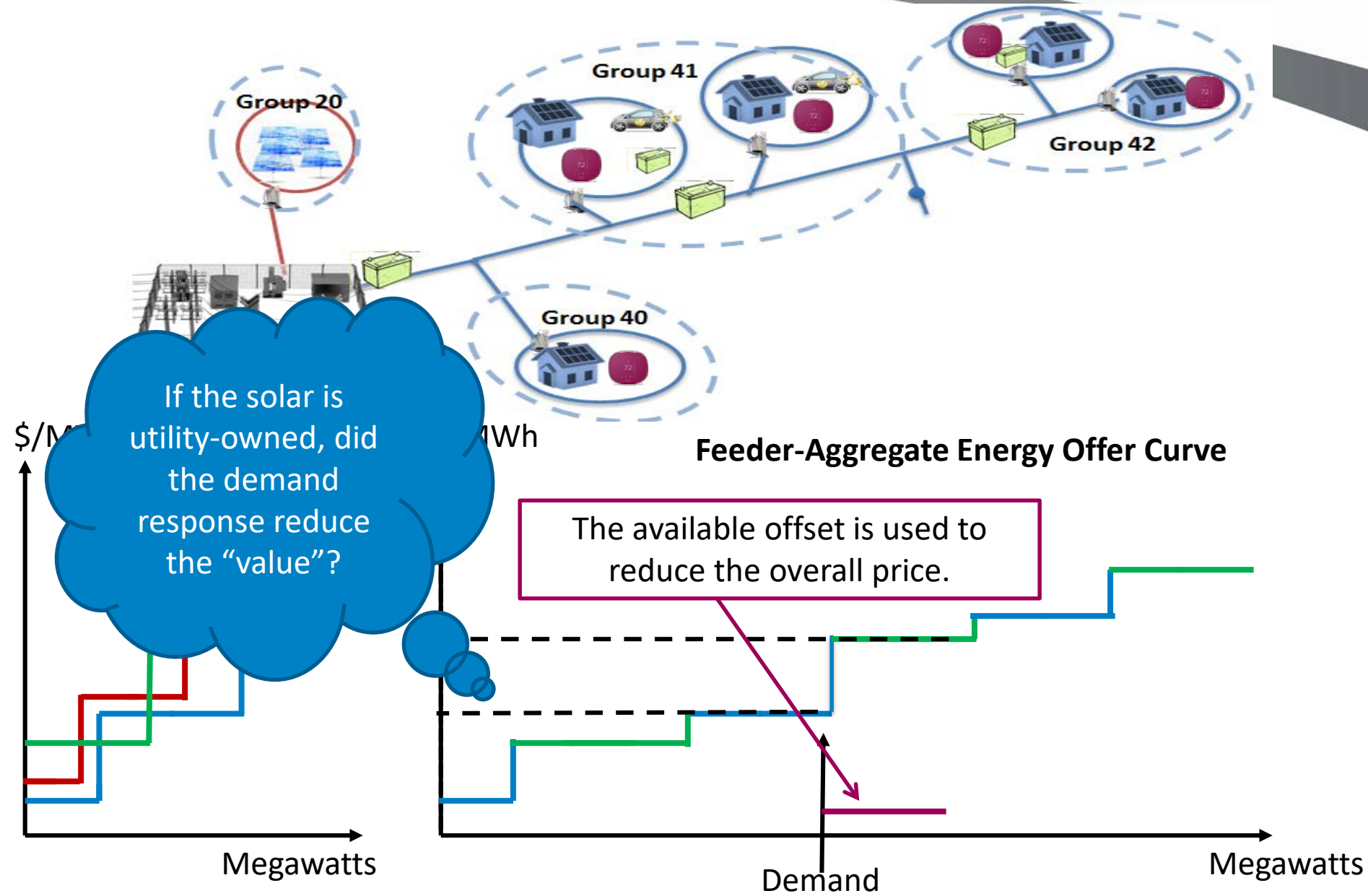
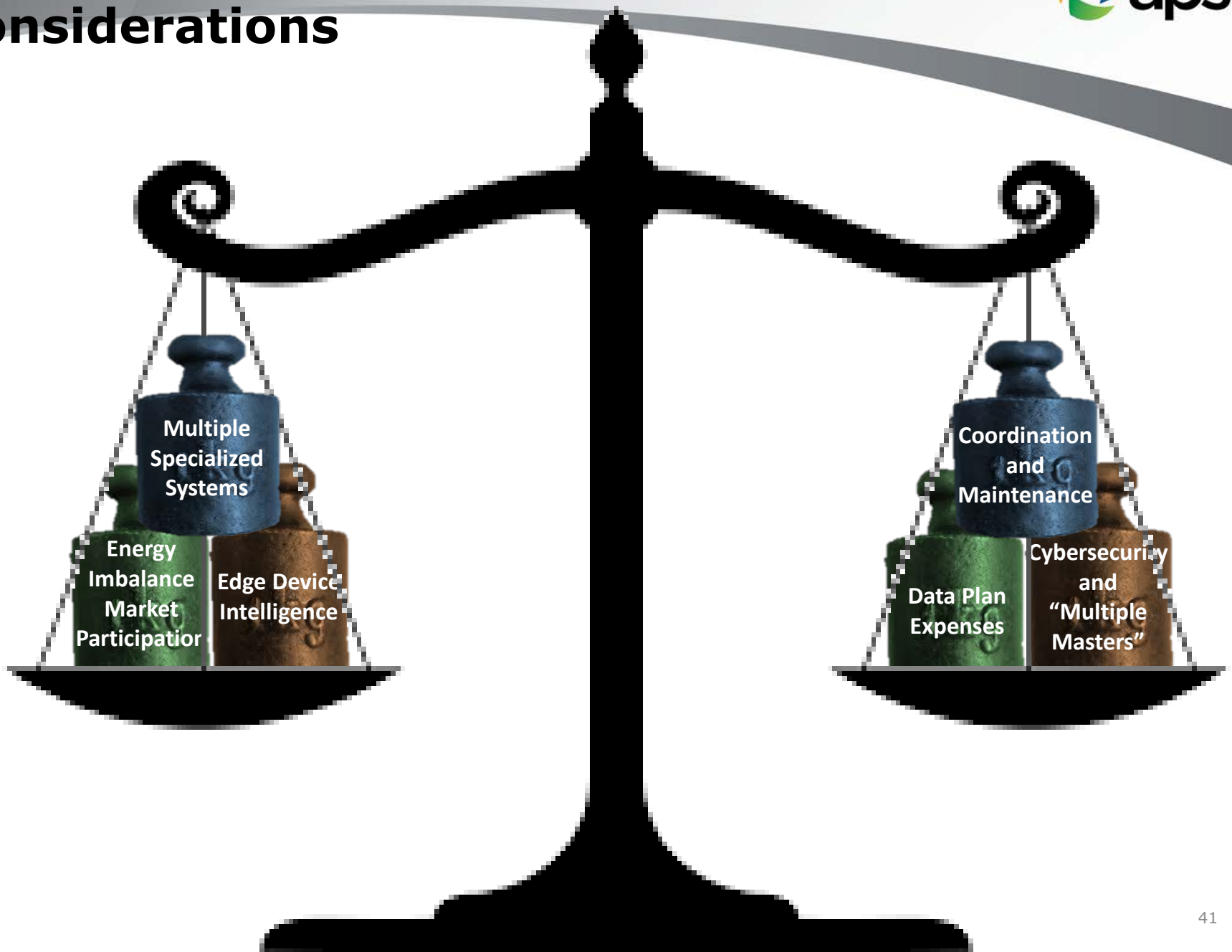


Communication and Architecture Considerations



Questions?
Comments?
Suggestions?