



The importance of IoT for the Smart Grid

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IoT

A devices, mechanical or digital provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction

Source: WIkipedia

Smart Grid

- 1. The digital technology that allows for <u>two-way communication</u> between the utility and its customers.
- 2. Consists of controls, computer, automation, and new technologies and equipment working together.
- 3. Consists of controls, computers, automation, and new technologies and equipment working together
- 4. Responds quickly to changing electric demand (&supply)





IoT + Smart Grid





Without IoT the Smart Grid is of limited value

- Rapidly increasing *variable* generation with *decentralized* ownership and location and increased electrical demand
 - Millions of *things* that can be both suppliers and consumers
 - Demand is as important as supply
- Grid reliability and stability concerns
 - Traditional DR (shed peak demand) is of limited value ¹
 - Balancing the grid between supply and demand will be really complex
 - How to address reactive power



What does it mean?

On the demand side

Direct control of things?

If so, what controls what, when, and how?

If not and since traditional DR is of limited value, what is the most optimal information exchange model?

On the supply side

What information should be communicated to the suppliers?

How do they do settlement?

How do they do forecasting?







GFO-15-311 Advancing Solutions that allow customers to manage their energy







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Transactive Energy Services

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RATES

- \$3.2 million CEC funding + Vendor Match + SCE Support
- Development and continuous 24/7 testing of platform, communications, tariff and interfaces to SCE and CAISO
- Proof of Concept Pilot 120 homes on SCE Moorpark Substation circuits
- 24/7 operation of RATES for more than a year
- Bi-Directional communication with HVAC, Pool Pump, Electric Vehicle, Photovoltaic and storage devices
- Real time HAN interface, Green Button interface



TeMix - Transactive Energy



Source: Dr. Cazalet, TeMix

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Retail Automated Transactive Energy System

The RATES project report can be found at <u>https://ww2.energy.ca.gov/2020publications/CEC-500-2020-038/CEC-500-2020-038.pdf</u>

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HVAC, WiFi Lighting, Plug Loads, PV, Storage, Pool pump, EV



IoT+ Smart Grid Enhancing Solutions

Shape: advance notice to things to reshape their load

Shift: let things know the best times to use more or less energy

Shed: reduce peak demand for emergency – traditional DR

Shimmy: requests fast response from the things



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