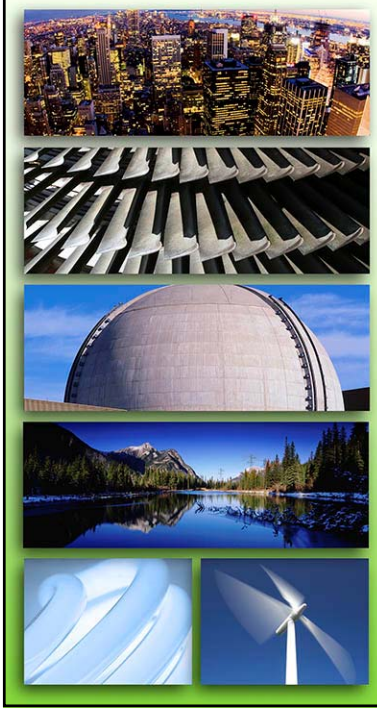

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Task 2.5: Distributed Energy Resource Controller

v0.1

Smart Grid Advisory Meeting

June 23-24, 2009

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Distributed Resource Controller Requirements

Smart Grid host demonstrations project plan 2.5

Requirements for a local controller for end-use resources

- Decision support functions
- Configuration, control, monitoring, and automation
- Responsive to a broad range of coordination signals (e.g. controls, curtailment, price, frequency)
- Trigger responses in support of grid and market needs (e.g. load shift, load reduction, additional generation, reliability)

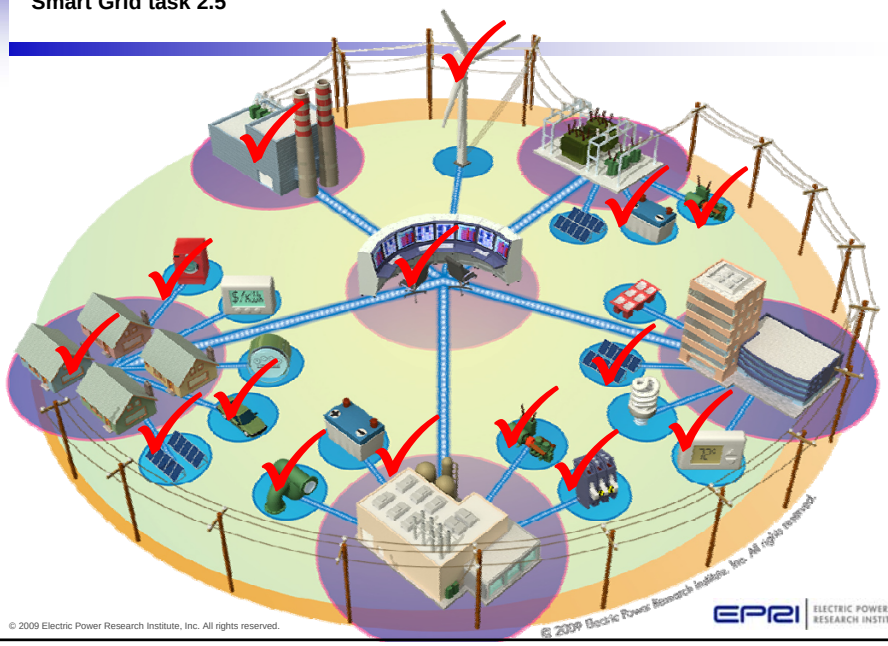
Proof of concept or reference system

- Clarify emerging requirements
- Demonstrate configurable preferences & priorities

Alignment with the six critical elements of the SG demonstration

Distributed Resource Controller Requirements

Smart Grid task 2.5



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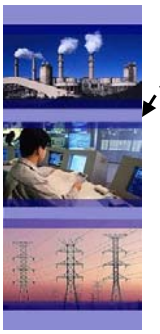
Separating the DR/DER device name or category from it's characteristics



Characteristics

If we get what we ask for … we don't need to care if it's one specific type of product, or even a dynamic changing mix of products.

What Characteristics and corresponding assumptions qualify a device or system as a Distributed Energy Resource?

DR / DER

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The key is the DER characteristics

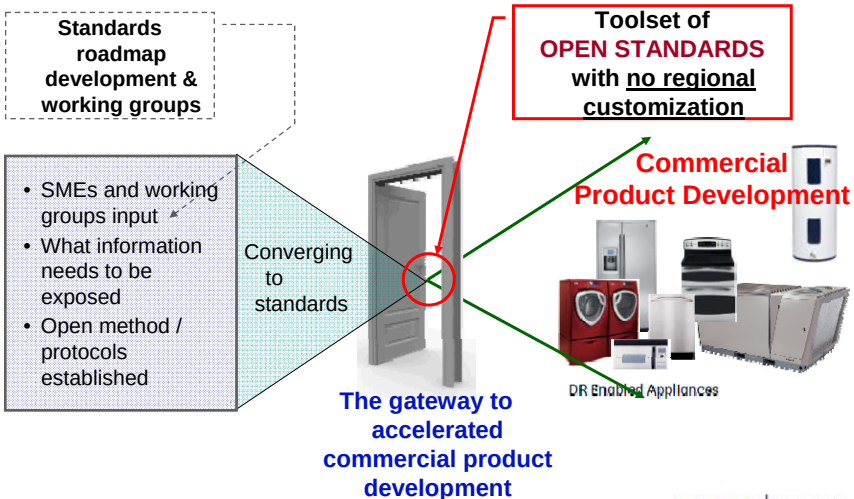
List the capabilities in lieu of identifying a specific physical device

DER Device Definition Characteristics

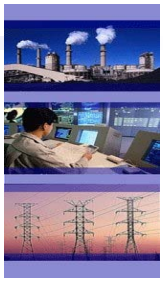
- Producer / Consumer (e.g. load or generation)
- Response times
- #Watts
- Persistent / Variable
- Operational "states" of the device
- Duration of resource response
- etc . . .

Path to commercial-ready DER products

Open standards & non-device-specific descriptors



Separating the physical devices/resources from their respective characteristics



DER
Includes DR

REC
"Resource Energy Controller"

GEN is viewed & accessed as a Grid Resource

GEN
Grid End Node

Applying Terms

Separating the physical devices/resources from their respective characteristics

REC
"Resource Energy Controller"

GEN is viewed & accessed as a single Grid Resource

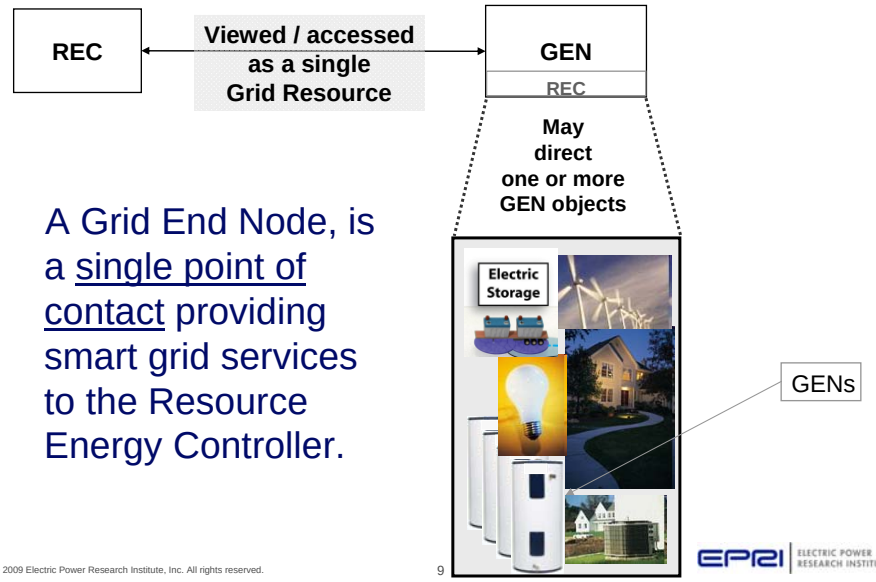
GEN
Grid End Node
REC

A **R**esource **E**nergy **C**ontroller (REC) directs energy resources at the grid end nodes via one or more GENs.

A **G**rid **E**nd **N**ode (GEN) is able to receive/unpack the electronic messages and react appropriately.

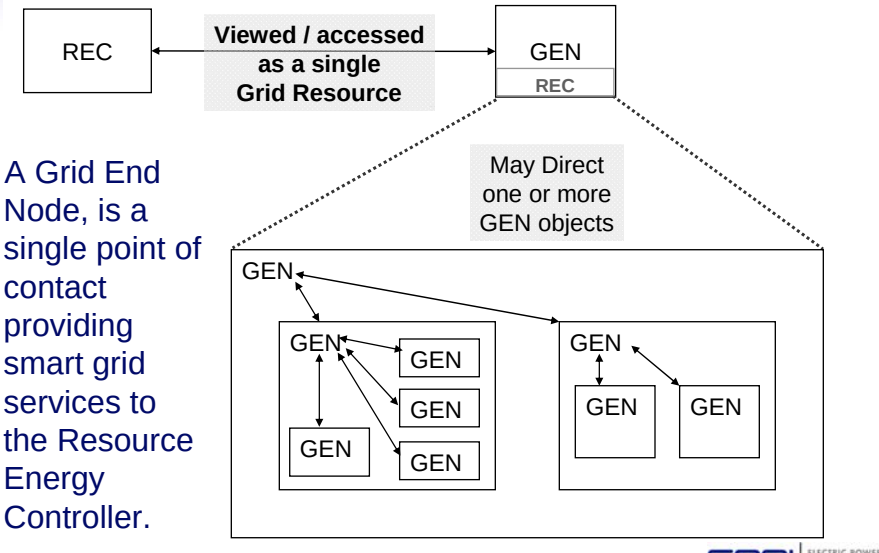
A **G**rid **E**nd **N**ode (GEN) can also act as a REC directing the response of subordinate GENs.

Recursive definition of a Grid End Node (GEN)



A Grid End Node, is a single point of contact providing smart grid services to the Resource Energy Controller.

Abstraction of a Grid End Node (GEN)



A Grid End Node, is a single point of contact providing smart grid services to the Resource Energy Controller.

The ***Elegant Simplicity*** of the REC-GEN concept

- **The REC does not need internal knowledge of the devices**
- **Commercial product engineers will design and maximize the response of the grid end node (GEN)**
- **New devices and systems added seamlessly without knowledge or concern about device internal components**
- **Smaller and easily managed communication protocols**
- **Fully scalable system with variety of GEN products/devices**
- **Avoids obsolescence of the utility/smart-grid messages and back-office IT design**

Example of an open standard

Standards:

- are called out in current legislation and SG developments
- are one of the 6 critical elements of the smart grid host site implementations
- enable third party development minimizing cost and increasing the motivation to produce enabled resources

OpenADR serves as one example of an open standard that enables a similar concept to what we have been discussing.

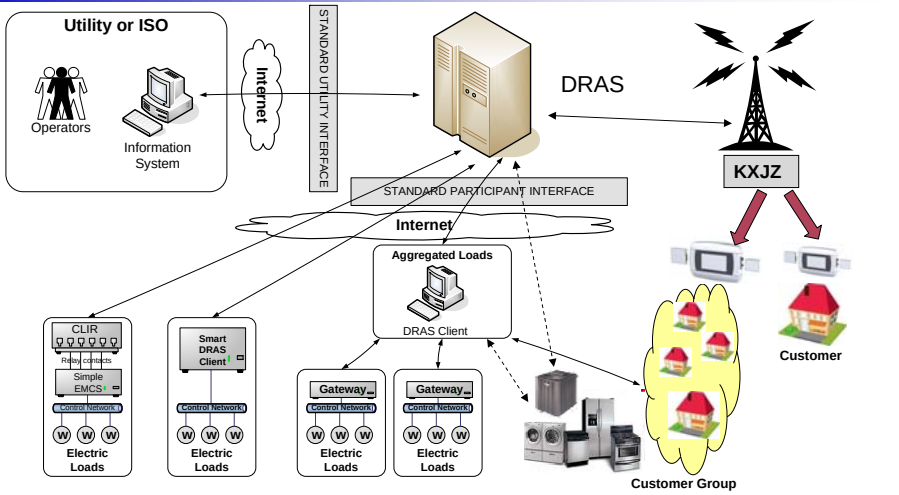
Demand Response Automation Server (DRAS):

is a secure, 2-way OpenADR-compliant (Open Automated DR*) server. Functions automate delivery of DR event information to facilities, aggregators, devices, etc. and subsequent response to:

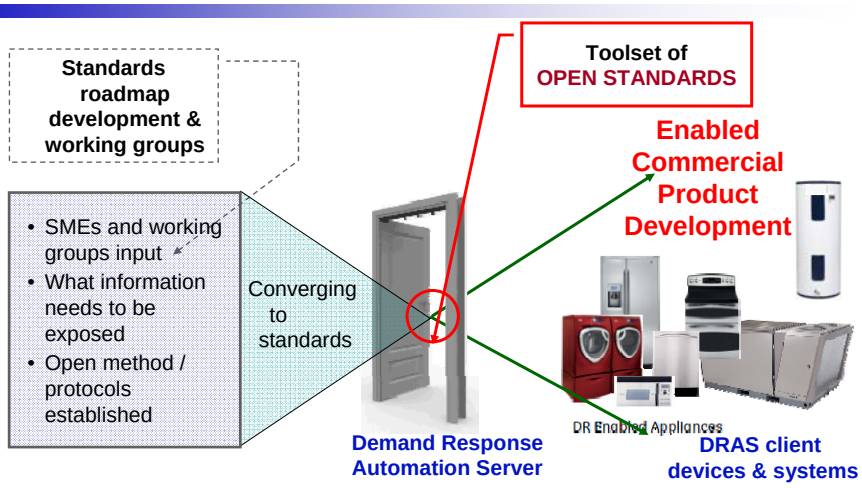
- **Allow Utility/ISO's to integrate or interface with a compliant DRAS.**
- **Provide controlled DR via control system interfaces to/from devices.**
- **Allow a variety of operators (e.g. customer facility and participating operators) to understand and control in their participation in DR programs – both dynamic pricing (RTP) and reliability.**
- **Create hierarchical systems that allow energy pricing information to be passed from utility to end device – with all layers sharing the same information model.**
- **Allow DRAS clients** to be deployed in a variety of form factors (gateways, internal to EMCS, appliance-embedded devices, etc.)**
- **More information and specification: http://openadr.lbl.gov/**

***** OpenADR is in commercial implementations in CA, listed in Smart Grid standards, and is in process of standardization.
****** A Client is a device or sub-system able to understand and respond to the communication messages to/from the DRAS.

OpenADR
Demand Response Automation Server (DRAS)



Path to a commercial-ready DER System



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