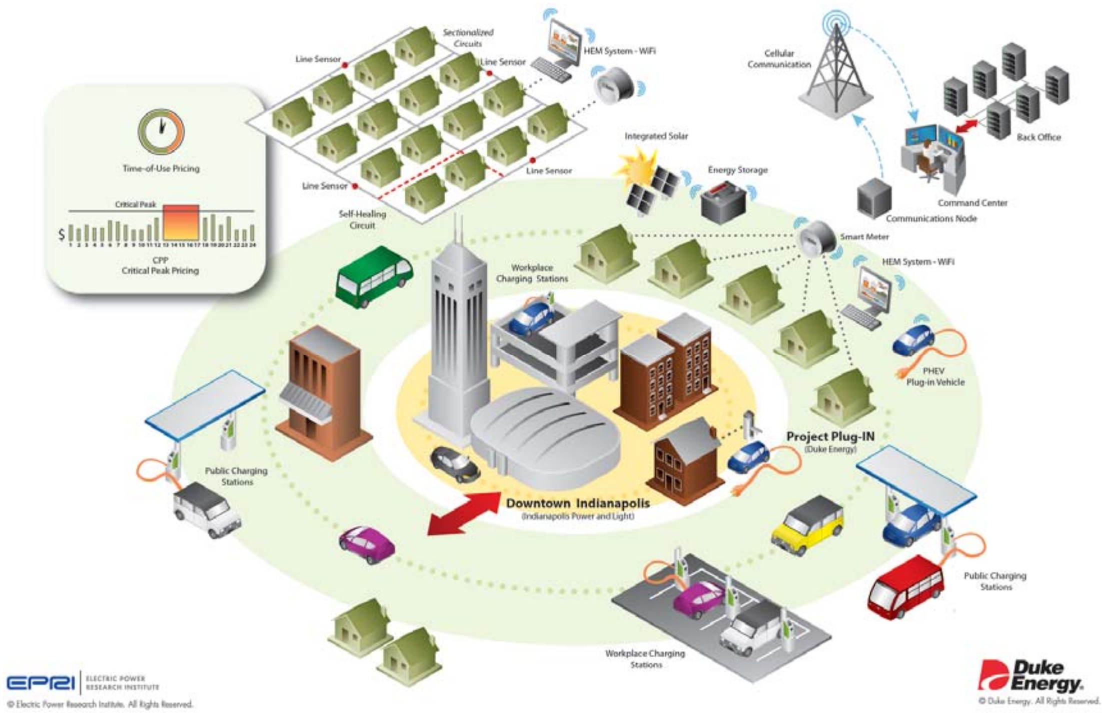
ELECTRIC POWER RESEARCH INSTITUTE

Duke Energy Smart Grid Demonstration Project



Duke Energy Project Overview

The objective of Duke Energy's Smart Grid Demonstration Project is to optimize distributed energy resources to achieve a more efficient and reliable grid, enable improved customer programs, and prepare for increased adoption of distributed renewable generation and plug-in electric vehicles (PEV). To achieve its goal, Duke Energy will install 40,000 advanced meters for customers, 8,000 communication nodes at transformers, and distribution automation including integrated voltage/ volt-ampere-reactive (VAR) control, self healing, sectionalization, and line sensors. Five homes will be equipped with solar photovoltaic panels, battery-energy storage, PEVs, and home energy management systems (HEM). The project will employ dynamic pricing for load control and intends for three to five hundred plug-in electric vehicles to be on the roads and charging by the end of 2011. A unique and valuable aspect of the project is the plan to evaluate commuter behavior, technical factors, and data management requirements relating to PEVs operating in different utility service areas; and measuring the impacts of multiple PEVs charging on the same transformer simultaneously.

EPRI Smart Grid Demonstration Project Overview

Electric Power Research Institute (EPRI) Smart Grid Demonstration Host-Site projects are part of a five-year collaborative initiative with 19 utility members focused on integrating distributed energy resources (DER) like demand response, storage, distributed generation, and distributed renewable generation to advance widespread, efficient, and cost-effective deployment of utility and customer-side technologies in the distribution and to enhance overall power system operations. Host-site projects apply EPRI's IntelliGrid methodology to define requirements for technologies, communication, information, and control infrastructures that support integration of DER. Operations experience, integration issues, and lessons learned will reveal the full range of standards and interoperability requirements needed to support the industry. Gaps revealed will identify critical areas of future smart grid research. Public updates are available on www.smartgrid.epri.com.

Project Criteria: 6 Critical Elements

Duke Energy's Smart Grid Project aligns with the six critical elements that EPRI has identified as key criteria to achieve the goals of our five-year Smart Grid initiative.

Integration of multiple distributed resource types

To further expose issues that need to be addressed and enable widespread integration of DER.

The project utilizes multiple distributed resources at both the customer and distribution level. Storage using Lithium-ion batteries will be utilized in multiple applications, several 2.5 kW photo-voltaic units will be installed for residential generation, and 40,000 advanced meters will be installed in customer homes. Home Energy Management Systems will be used in conjunction with dynamic pricing and intelligent end-use devices to test customer programs for energy efficiency and demand response. Project Plug-IN, a significant part of Duke Energy's project, focuses on PEV and the accompanying Electric Vehicle Support Equipment (EVSE).

Application of critical integration technologies and standards

To identify gaps associated with standards, harden critical integration technologies and advance adoption.

Duke Energy's project incorporates emerging technologies with existing technology and networks while promoting open protocols and standards. The project uses existing commercial cellular networks and will be installing communication nodes to utilize them. The project will test Smart Energy Profile in wireless and power line carrier (PLC) applications with the HEM and communication options for the EVSE in locations outside of the Smart Grid enabled areas.

Incorporation of Dynamic Rates or other approaches to link wholesale conditions to customers

To evaluate integration issues and incentives associated with customer response and linking supply with demand.

The project uses time-of-use (TOU) and critical peak pricing (CPP) for the customers with advanced metering services. Midwest Independent System Operator (MISO) has also proposed using Project Plug-IN to test control signal capabilities in order to optimize their wind generation loading.

Integration into system planning and operations

Demonstrate integration tools and techniques to achieve full integration into system operations and planning.

The project is integrated into system planning and operations in pricing with TOUs and CPPs, in peak reduction with Volt/VAR management, in consumer knowledge and participation with the HEM system and customer service prototype lab, and in testing and managing the localized impacts of PEV charging.

Compatibility with initiative goals and approach

Enable high-penetration of DER and advance interoperability and integration for the electric power industry.

The project aligns with EPRI's initiative goals and approach by early testing of multiple PEV and EVSE types, evaluating alternative communication strategies, and furthering the testing of integrated Volt/VAR management, advanced metering communications systems, stationary storage, and photovoltaic generation.

Leverage of additional funding sources

Secure required participation, commitment, and funding for a successful project.

The project has leveraged funding from state, federal, and private organizations including a Department of Energy American Recovery and Reinvestment Act (DOE ARRA) Stimulus grant, funding from the state of Indiana, a partnership with the neighboring utility, Indianapolis Power and Light, and partners from the Indiana-based Energy Systems Network (ESN) collaborative.

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