KCP&L SmartGrid Demonstration

Kansas House Energy & Environment Committee
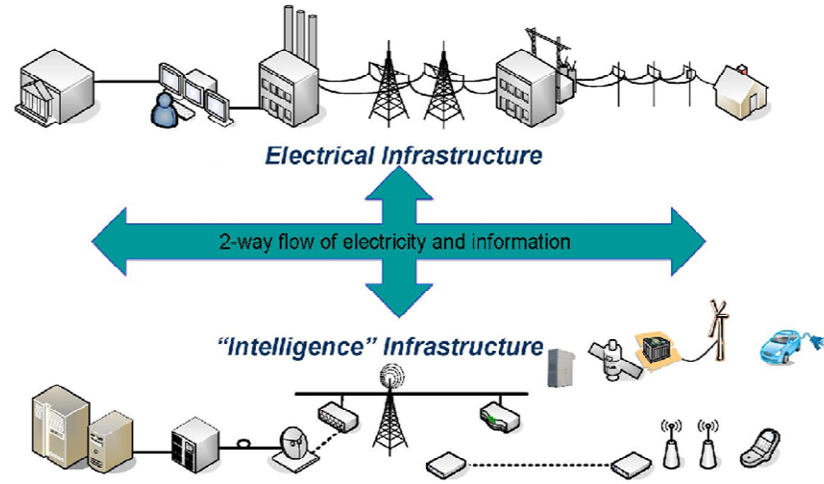
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Director, SmartGrid

February 7, 2013
Topeka, KS

What is SmartGrid?

SmartGrid is basically the integration of digital equipment & communications into the electric utility infrastructure. It enables a 2-way flow of information & energy.

National Institute of Standards Smart Grid Depiction

Like many industry transformations, it is a ***journey***, *not a destination.*
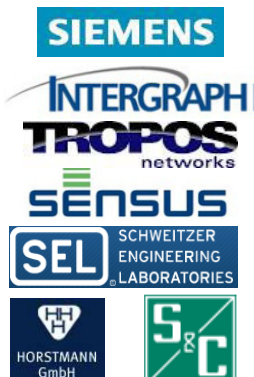
KCP&L Demonstration Objectives

- First, **it demonstrates a complete, end-to-end smart grid** — from smart generation to smart end-use — that will deliver improved performance focused on a major substation in an urban location.

- Second, **it introduces new technologies, applications, protocols**, communications and business models that will be evaluated, demonstrated and refined to achieve improved operations, increase energy efficiency, reduce energy delivery costs and improve environmental performance.

- Third, it incorporates a **best-in-class approach to technology integration**, application development and partnership collaboration, allowing KCP&L to advance the progression of complete smart grid solutions — with **interoperability standards** — rather than singular, packaged applications.

- Finally, KCP&L's demonstration project provides critical energy infrastructure required to **support a targeted urban revitalization effort** in Kansas City's Green Impact Zone and support a more **sustainable future**.
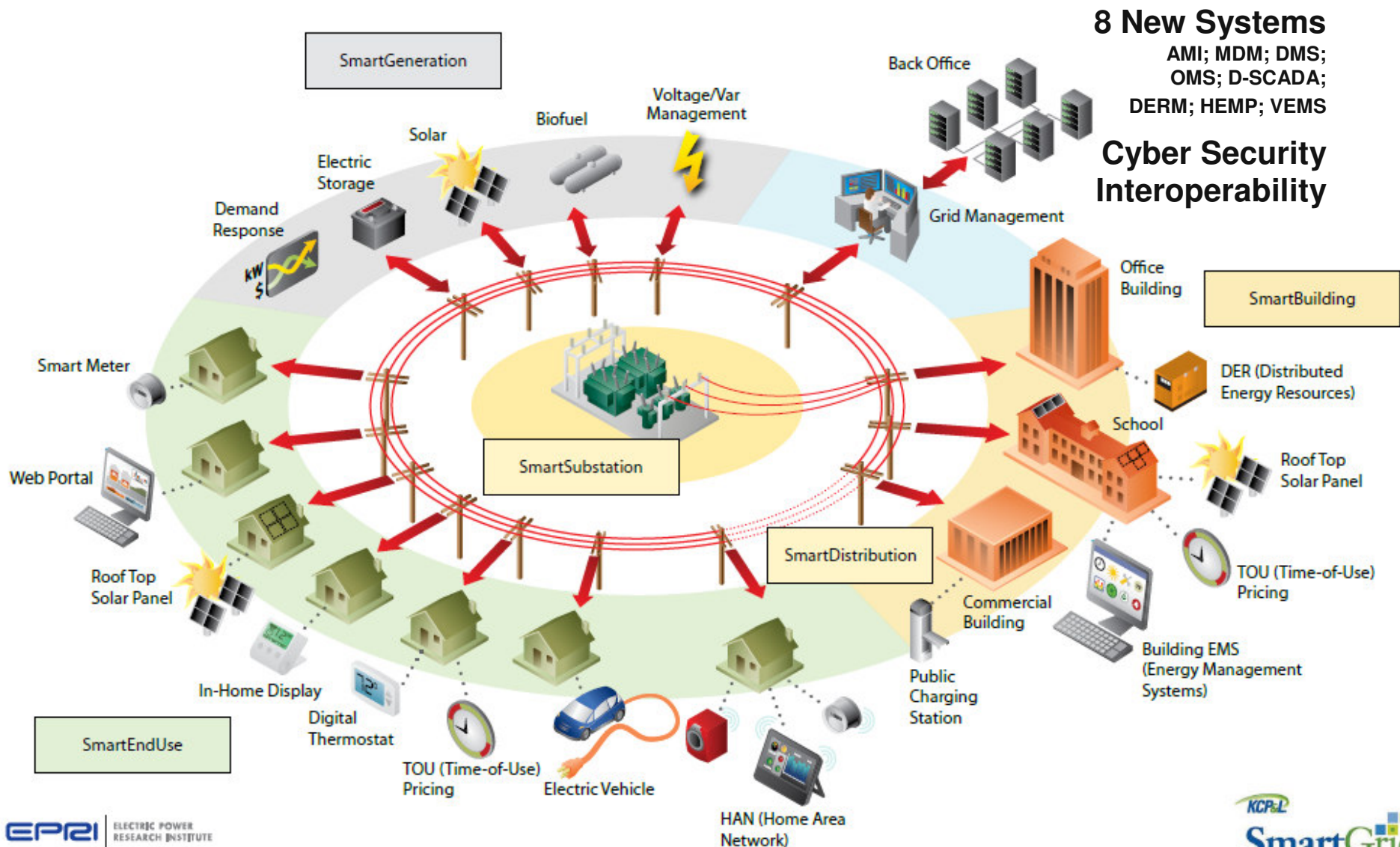
Scope of the Demonstration - we went "ALL IN"

Total Project Value ~ $58 MM (DOE SGDG = $24 MM; Partner = $7 MM) ….. $44 MM spent thru 2012

Smart Distribution

- Distribution Management System (DMS) with D-SCADA and OMS
- IP/RF 2-way DA Network
- Advanced DA
- Smart Substation

SIEMENS
INTERGRAPH
TROPOS networks
SENSUS
SEL SCHWEITZER ENGINEERING LABORATORIES
HORSTMANN GmbH
S&C

Smart Metering

- Integrated CIS / MDM / AMI / OMS Architecture
- Smart Meters
- Advanced Metering Infrastructure (AMI)
- Meter Data Management (MDM)
- Data Analytics

Landis|Gyr+
eMeter
SIEMENS
INTERGRAPH

Interoperability And Security

- Enterprise Service Bus (ESB)
- IEC 61968, IEC 61850 (GOOSE and MMS), Open ADR, Zigbee SEP
- State of the Art Physical & Network Security (NISTIR-7628)

IBM
Structure™
Burns & McDonnell SINCE 1898

Smart End-Use

- Home Energy Management Portal (HEMP)
- Home Area Network (HAN)
- In-home Display (IHD) with Interval Data
- Commercial Building Energy Management System (BMS)
- Time-of-Use (TOU) Rates
- Electric Vehicle (EV) Charging

TENDRIL™

Smart Generation

- Distributed Energy Resource Management System (DERM)
- Demand Response (DR) Programs
- Residential / Commercial Rooftop Solar
- Utility-scale Battery Storage

Exergonix INCORPORATED
oati

Program Advisory and Management Services Partners

Structure™   Burns & McDonnell SINCE 1898   EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Truly Comprehensive Smart Grid Initiative

8 New Systems
AMI; MDM; DMS;
OMS; D-SCADA;
DERM; HEMP; VEMS

**Cyber Security
Interoperability**

SmartGeneration

Solar
Biofuel
Voltage/Var Management

Electric Storage

Demand Response

Smart Meter

Web Portal

Roof Top Solar Panel

In-Home Display

Digital Thermostat

SmartEndUse

TOU (Time-of-Use) Pricing

Electric Vehicle

HAN (Home Area Network)

SmartSubstation

SmartDistribution

Public Charging Station

Commercial Building

Building EMS (Energy Management Systems)

TOU (Time-of-Use) Pricing

Roof Top Solar Panel

School

DER (Distributed Energy Resources)

SmartBuilding

Office Building

Back Office

Grid Management

EPRI
ELECTRIC POWER RESEARCH INSTITUTE
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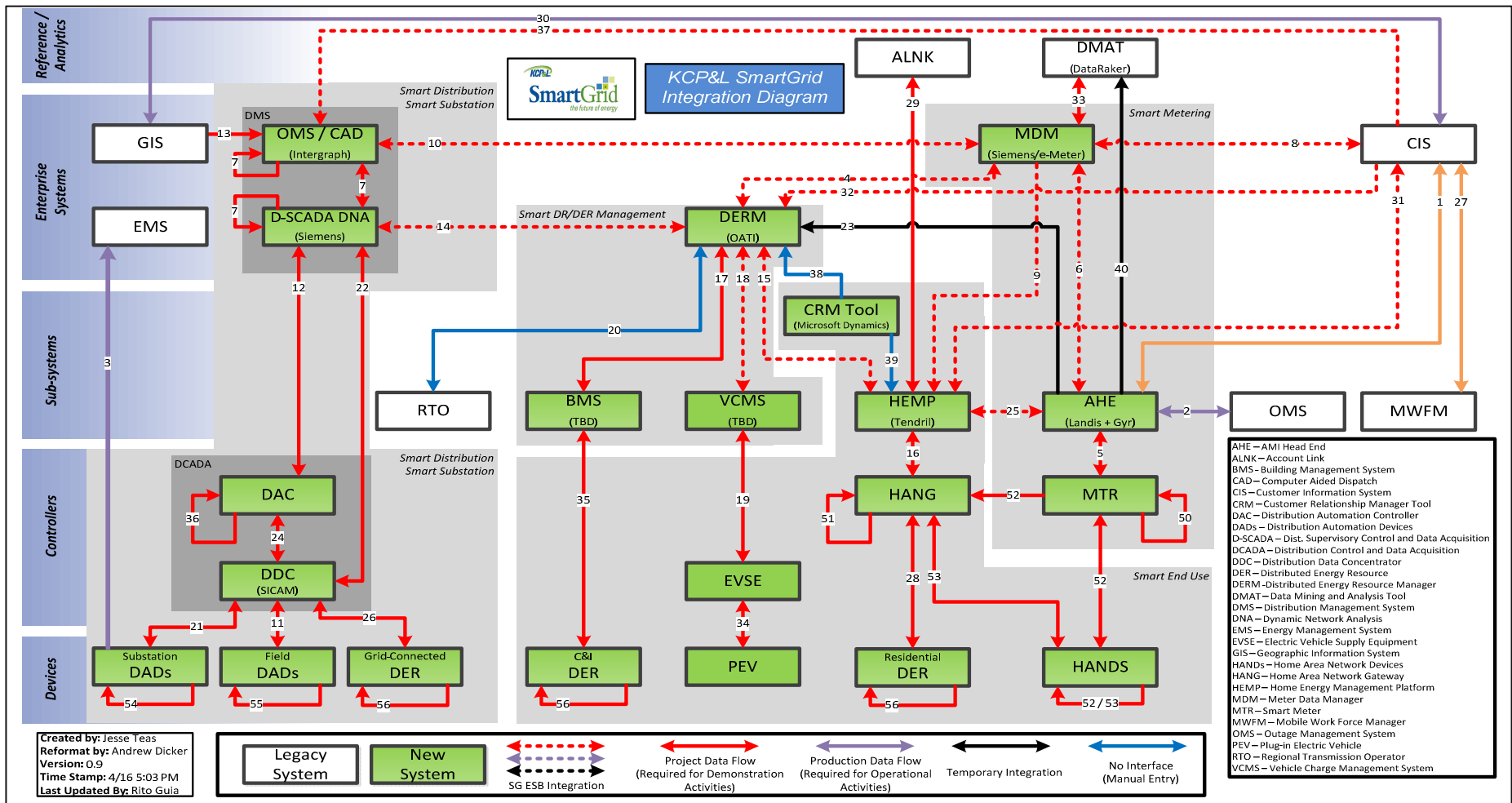the future of energy
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Project Area—Midtown Kansas City, MO

KCP&L's SmartGrid project in midtown Kansas City, Missouri includes the 150-block Green Impact Zone and surrounding neighborhoods, shown here in blue.

The Green Impact Zone is a cooperative effort to focus federal stimulus funding on projects in a targeted area of Kansas City, Missouri.
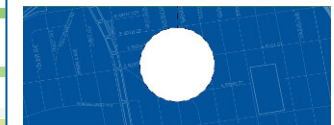
North: 35th Street

West: Main Street

East: Benton/Swope Parkway

Green Impact Zone

South: 52ndStreet

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KCP&L SmartGrid Integration Diagram

Legend/Acronyms:
- AHE – AMI Head End
- ALNK – Account Link
- BMS – Building Management System
- CAD – Computer Aided Dispatch
- CIS – Customer Information System
- CRM – Customer Relationship Manager Tool
- DAC – Distribution Automation Controller
- DADs – Distribution Automation Devices
- D-SCADA – Dist. Supervisory Control and Data Acquisition
- DCADA – Distribution Control and Data Acquisition
- DDC – Distribution Data Concentrator
- DER – Distributed Energy Resource
- DERM – Distributed Energy Resource Manager
- DMAT – Data Mining and Analysis Tool
- DMS – Distribution Management System
- DNA – Dynamic Network Analysis
- EMS – Energy Management System
- EVSE – Electric Vehicle Supply Equipment
- GIS – Geographic Information System
- HANDs – Home Area Network Devices
- HANG – Home Area Network Gateway
- HEMP – Home Energy Management Platform
- MDM – Meter Data Manager
- MTR – Smart Meter
- MWFM – Mobile Work Force Manager
- OMS – Outage Management System
- PEV – Plug-in Electric Vehicle
- RTO – Regional Transmission Operator
- VCMS – Vehicle Charge Management System

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Legacy System | New System

SG ESB Integration | Project Data Flow (Required for Demonstration Activities) | Production Data Flow (Required for Operational Activities) | Temporary Integration | No Interface (Manual Entry)

Education & Outreach – Part of the "Software"

In addition to traditional communications efforts, KCP&L is focusing on new **approaches to increase awareness and engage customers**:

- Neighborhood Assoc & Faith-based Outreach
- Community Outreach Events
- Educational Programs & Materials
- SmartGrid Support Team
- SmartGrid Website (kcplsmartgrid.com)
- Stakeholder Updates (MO & KS)
- Internal Education & Change Management

Education & Outreach – making it "real" Demonstration House and SmartGrid Innovation Park

Demonstration house (Metropolitan Energy Center's Project Living Proof)
Touch, feel, learn about and experience new, energy efficient and SmartGrid products
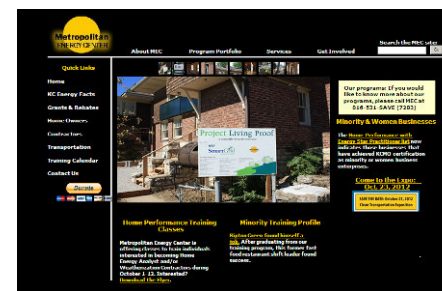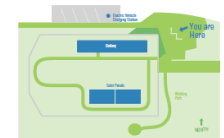

SmartGrid Innovation Park
Grid Battery, Solar Generation, EV Charging, Operating System displays, Educational Kiosk

Major Accomplishments and Milestones

2010

- Project Planning
- Stakeholder Meetings
- DOE Contract AMI Infrastructure
- SmartMeter Launch (Oct 18)
- Demonstration House
- Web Portal Launch
- IHD Launch

2011

- Bill Prediction
- Begin Substation Upgrades
- 1st Solar Installation
- Security Assessment
- System, Interface & Back Office Design
- Integration Planning
- Meter Data Mgmt Ph1
- System Upgrades

2012

- Grid Battery Storage
- Smart Substation
- Meter Date Mgmt Ph2
- Home Area Networks
- Smart Thermostats
- Solar Installations
- Time of Use Rate
- EV Charging
- Innovation Park
- System Upgrades

2013+

- Dist Mgmt System
- DERM
- Building Energy Mgmt
- Complete End Use Installations
- Full Integration & Cyber Security Acceptance Testing
- Final System Interoperability Testing
- Fully Operational SmartGrid
- Measurement & Benefits

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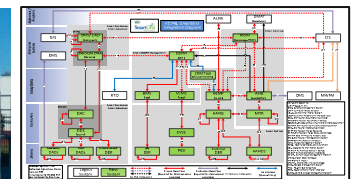
Additional Resources & DOE Credits

Please visit our Demonstration House at
Project Living Proof

www.kcenergy.org/projectlivingproof.aspx

Also visit our SmartGrid Innovation Park

4724 Tracy St, Kansas City, MO 64110

Learn more at www.kcplsmartgrid.com

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Appendix: SmartGrid Alphabet Soup

- **ADA** = Advanced Distribution Automation
- **ADR** = Automated Demand Response protocol
- **AMI** = Advanced Metering Infrastructure
- **BMS** = Building (Energy) Managemeht System
- **CIS** = Customer Information System
- **DA** = Distribution Automation
- **DERM** = Distributed Energy Resource Management system
- **DMS** = Distribution Management System
- **DR** = Demand Response
- **ESB** = Enterprise Service Bus
- **EV** = Electric Vehicle
- **HAN** = Home Area Network
- **HEMP** = Home Energy Management Portal (a web portal)

- **IHD** = In-Home Display
- **IP** = Internet Protocol
- **MDM** = Meter Data Management system
- **OMS** = Operations Management System
- **RF** = Radio Frequency ("wireless")
- SCADA = System Control And Data Acquisition
- **SEP** = Smart Energy Profile (a communication standard)
- **TOU** = Time of Use rate
- **Zigbee** = a low power wireless communication protocol (like WiFi)

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