Disruptions to the Power System

Natural Events
- Storms / Hurricanes
- Earthquakes
- Fires
- Volcanic Activity

Increasing Load
- Marijuana Legalization
- EV Charging

Aging Infrastructure
- Weathered Towers
- Bridge Instability
- Road Wear & Tear

Terrorism
- Cyber Attacks
- Physical Attacks
Hurricane Sandy: In 2011, 70% of residents left without electricity in Jamaica
Disruptions to the Power System | Natural Events

Earthquake: 2011
Tsunami in Japan causes nuclear radiation leakage from meltdown of nuclear power reactors
Disruptions to the Power System | Natural Events

Kilauea Volcano: 2018 - crews rush to shut down Puna Geothermal Venture plant (25% of the Big Island's power) to avoid release of toxic gases
Disruptions to the Power System | Terrorism

2015 Ukraine power grid cyberattack: 30 substations were switched off, and about 230,000 people were left without electricity for a period from 1 to 6 hours in sub-freezing temperature conditions.
Disruptions to the Power System | Aging Infrastructure

Sinkhole: Japan residents lost power and water for days and gas leaks filled the air with powerful toxins
Disruptions to the Power System | Aging Infrastructure

Bride Collapse: I-35 Bridge in Minneapolis collapsed and resulted in bridges across the state to be further reviewed for infrastructure concerns.
Disruptions to the Power System | Aging Infrastructure

Power Lines: Power lines fall in Padukah, KY over highway causing multicar accident in 2015
Disruptions to the Power System | Increasing Load

Peak Loads: Legal growers use 1% of US Energy annually, equaling $6B
Disruptions to the Power System | Increasing Load

Grid Stability: 2% growth in power usage in Colorado after marijuana legalization
Disruptions to the Power System | Increasing Load

Grid Stability: An indoor grow system for only 4 plants sucks up as much energy as 29 refrigerators.
What is Big Data?

Internal Utility Data
- Customer Records
- Interval Reads
- Register Reads
- Meter Events
- Work Orders
- GIS for Assets

External Public Data
- Temperature
- Wind Speed
- Property Tax
- Video
- Social Media
- Government Advisories
Big Data Frequency

- **NANOSECOND** – Cyber Threats
- **SECOND** – Voltage
- **MINUTE** – Interval Readings
- **HOURLY** – Temperature
- **DAILY** – Theft Investigations
- **MONTHLY** – Register Readings
- **YEARLY** – Revenue
Data Dimensionality

**Date**
- Year
- Month
- Week
- Day

**Geography**
- Service Area
  - State
- County
- Block
- Street

**Rate**
- Standard
- Time of Use

**Customer**
- Commercial
- Residential

**Measurement**
- kWh
- Voltage
- Current
- Resistance
- Reactance
- Inductance
- Capacitance
- Impedance
- Frequency
Data Correlations

**Internal Utility Data**
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**External Public Data**
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Disruptions to the Power System

Natural Events
- Outage Prediction

Increasing Load
- Non-Technical Loss

Aging Infrastructure
- Asset Inspection Service
- Asset Failure Prediction

Terrorism
- Multi-Site Industrial Cybersecurity Solution
- Access Control Systems

Big Data Can Help
Analytics Solutions

COMPLETE SOLUTION
Targeted solutions created through problem solving collaboration

FLEXIBLE SOLUTION
Integration of Honeywell solutions with utility proprietary solutions

OPEN COLLABORATION
Solution for connected offering needs through innovation

OPERATIONAL EFFICIENCY ANALYTICS
Applications:
- Non-Technical Loss
- Outage Prediction
- Asset Inspection Photogrammetry with UAVs

360° SITUATIONAL ANALYSIS
Applications:
- Integrates Honeywell applications
- Streaming Data - Weather / wind / lightning strikes
- Traffic feeds
- Security system feeds
- Energy use forecast models

HONEYWELL SENTIENCE IoT PLATFORM
Applications:
- Analytical Models from all HON Verticals available
- APIs –Thermostat, Sensors, EE Programs
- “Rent-A-Data Scientist”
- Sentience custom services

Honeywell offers utilities more choices and integration options
HONEYWELL SENTIENCE IOT PLATFORM
CONCEPTUAL ARCHITECTURE

DATA LAKE LAYER

- Property Tax
- Micro-Economic
- Weather Alerts
- Crime Statistics
- Satellite Imagery

REUSABLE ANALYTICS MODEL LAYER

- Optimization Models
- Example Thermostat Models
- Example Aero Sensor Models

MACHINE LEARNING FEEDBACK LOOP

UTILITY PREMISE

- Honeywell Application
- AMI Application on Server
- Transformer Monitor

Meter

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360° Situational Analytics

Proactive Preparation and Predictive Insights

Leading Edge Functionality

Speech Analytics: Call center analysis of propensity of customers calling in outages prior to, during and after storm.

Scenario Planning Tool: Relevant timeframe predictions for staging mobile assets and preparing personnel.

Train a Model for the Service Territory: Predictions should be relevant to a segment of a service territory for accuracy.
Outage Prediction

BIG DATA from various sources to create a situational awareness dashboard from which a utility’s operation center can respond to predicted and current outages in near real-time.

- Weather
- Traffic & Construction
- Outage Alerts
- Physical Security Threats
- Fleet Logistics

AMI Network

Honeywell Experion® Orion Console
Honeywell IntuVue® 3D Weather Radar
Survelant Partner
Honeywell Xtralis Fire & Security Monitoring
Intermec by Honeywell
Increasing Load | Non-Technical Loss

- Water Conservation Verification
- Load Shed Program Verification
- Non-Technical Loss Revenue Protection
- Meter Damage Detection
- Case Management and Field Tools
Aging Infrastructure | Commercial UAV Software & Services

Drones are used as a tool to enable image data upon which analytics may be based

Flight planning & mission coordination software
Image hosting for indexed videos & images
Solar Panel Inspections
Meta-data from images used as input for other applications
Future: Robotics for line repair and Inspection
DATA FROM INSPECTIONS ENABLES NEW SOLUTIONS

ASSET FAILURE PREDICTION ANALYTICS

Big Data - Statistical Regression Analytics Predicts Asset Failure
Preparing Utility Substations for the Physical Security Requirements of NERC-CIP-014
THANK YOU!

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