# Artificial Intelligence In the Power Sector

Tenley Consulting


**Strategic Planning**

**Scenario Building, Uncertainty Analysis & Futures Thinking**

**Tech Trends Analysis & Future of Work Impacts**

**Economics & Policy Analysis**

**Model Building & Interpretation**

**Market Analysis**

**Report Writing**

# 40%

Improvement in Google Data Center Energy Efficiency

# AI is applicable … everywhere

# Today’s Talk

- Some definitions
- OEMs & consumer devices
- Utility operations
- Power delivery & generation
- Grid control - EVs
- Autonomous Energy Grids

# Some definitions

**Artificial Intelligence** “Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to *function appropriately and with foresight in its environment*.” (Nils J. Nilsson)

**Machine Learning** “Machine Learning is the science of getting computers to *learn and act like humans* do, and *improve their learning* over time in *autonomous fashion*, by feeding them data and information in the form of observations and real-world interactions.” (Daniel Faggella,

10 to

20%

reduction in unplanned downtime

## AI at end to end of supply chain

**OEMs**

"Brilliant Manufacturing"

SIEMENS

UC Berkeley collaboration

ABB

"Intelligent factory"

**Consumer Devices**

Alphabet

NEST and Google Home

belkin


Smart Plug

Hue Lights

# $31.5 MM

Saved by Duke Energy through “SmartGen” program (384 events)

## Utility Operations

Load forecasting (e.g., AleaSoft)

Wind & solar forecasting

Predictive maintenance

Energy trading

Call center operation, natural language processing, chatbots, etc

# Some standouts

NEW YORK STATE OF OPPORTUNITY. NY Power Authority

End-to-End Digital Utility

Integrated Smart Operations Center

GE Predix - anomaly detection, “digital twin”

C3 IoT - bldng enrgy mgr

AES

Full spectrum

“Cognitive Assets’”

HR - sentiment analysis

Strategy - Scraping ...NLP

Video - safety, damage

Exelon.

AeroLabs - drones

Oracle - chatbots

GE Predix - APM

C3 IoT - fraud detection

20%

increase in energy production from wind farms

# Power Generation & Delivery

**Generation examples**

GE’s “Digital Wind Farm”

Siemens Gas Turbine Autonomous Control Optimizer

NEXT Tracker for solar farms

**Delivery**

Data an sensors everywhere SCADA, PMU, etc

2X

more energy efficiency savings than smart thermostats alone, using Tendril DM

# Demand Management

## Stem - “energy superintelligence”

- Athena collects 400 megabytes per minute

## Tendril - DSM programs

- Detailed data enabling customer & utility actions

90 MM

Smart meters

in USA by 2020

# Grid Control & EVs

**Concurrent Trends**

Electrification … more complicated load mgt

Electric Vehicles… charging and demand mgt

EV Autonomous vehicles

SAEVs

# The final frontier?

## Autonomous Energy Grid

Goal: a self-regulating and self-healing grid …

- Autonomously absorbs routine fluctuations and intermittencies
- Autonomously responds to disruptions from storms

A LOT of research left, including solving the complexity at the proper time scales

More ones and zeros means less steel, less fuel, less carbon, better reliability


Thank You.
Michael@TenleyConsulting.com