NIMBLE ENERGY

OperationsHERO

Measurement Isn’t Enough:
How AI/ML models will change the practices of energy and facilities Management

Company Introductions

Be the **HERO** of your Operations

HeroHQ
Work/PM
Assets

EventHQ
Internal/External
Events

EventAutomation
BAS Integration
Schedule Overrides

InventoryHQ
QR-Barcode
Check-In/out

EnergyHQ
Utility Data Automation
Energy Analytics
Reporting

PlanningHQ
Capital
Project Budgeting

Today's Talk:

1: AI methods and risks

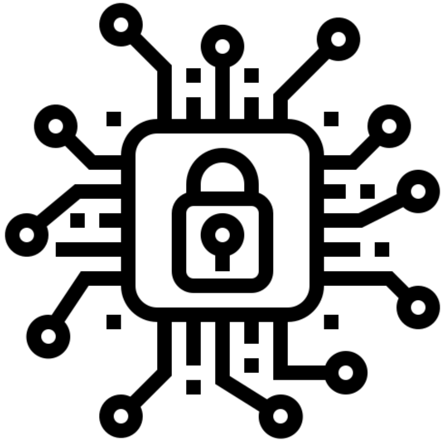
2: Why measurement is no longer enough

3: Modeling vs measurement case studies

AI conversations are increasingly about risk

Data Privacy

Data Security



Network Security

Terminator

AI/ML modeling methods don't need to create risks

You can benefit without:

- Unleashing AI on your internal networks
- Giving AI control over your BAS
- Integrating or aggregating all your systems

Why measurement is no longer enough

The energy game is changing, fast

Rates are rising, while new technologies, occupant behaviors, and grid issues are increasing complexity.

$0.105/kWh

May 2020

27%

increase

$0.133/kWh

September 2023

Source: EIA

More complex operations from new technologies

Including the rise of renewables, electrification, advanced controls, IoT, EVs, battery storage, and IAQ concerns.

How buildings are used is changing dramatically

Occupant behavior is shifting with the growth of remote and hybrid work and education.

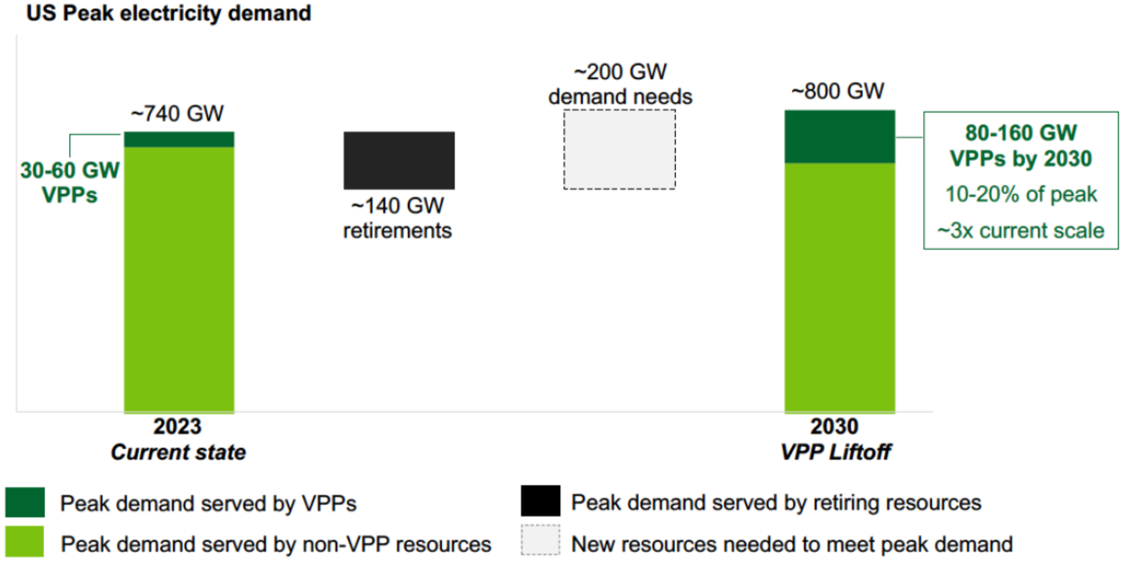
Grid instability is creating new opportunities

There are new incentives to help stabilize the grid by using flexible load management and challenges with outages.

We lack the human resources & experts to capitalize

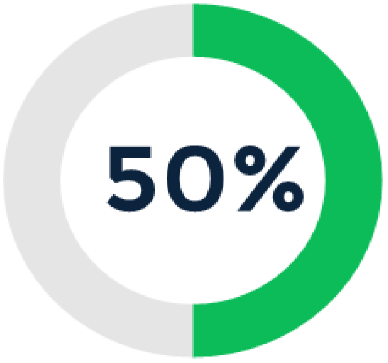
$70B+

in building energy incentives available annually from utility, federal, state, and local programs



Massive virtual power plant growth opportunities

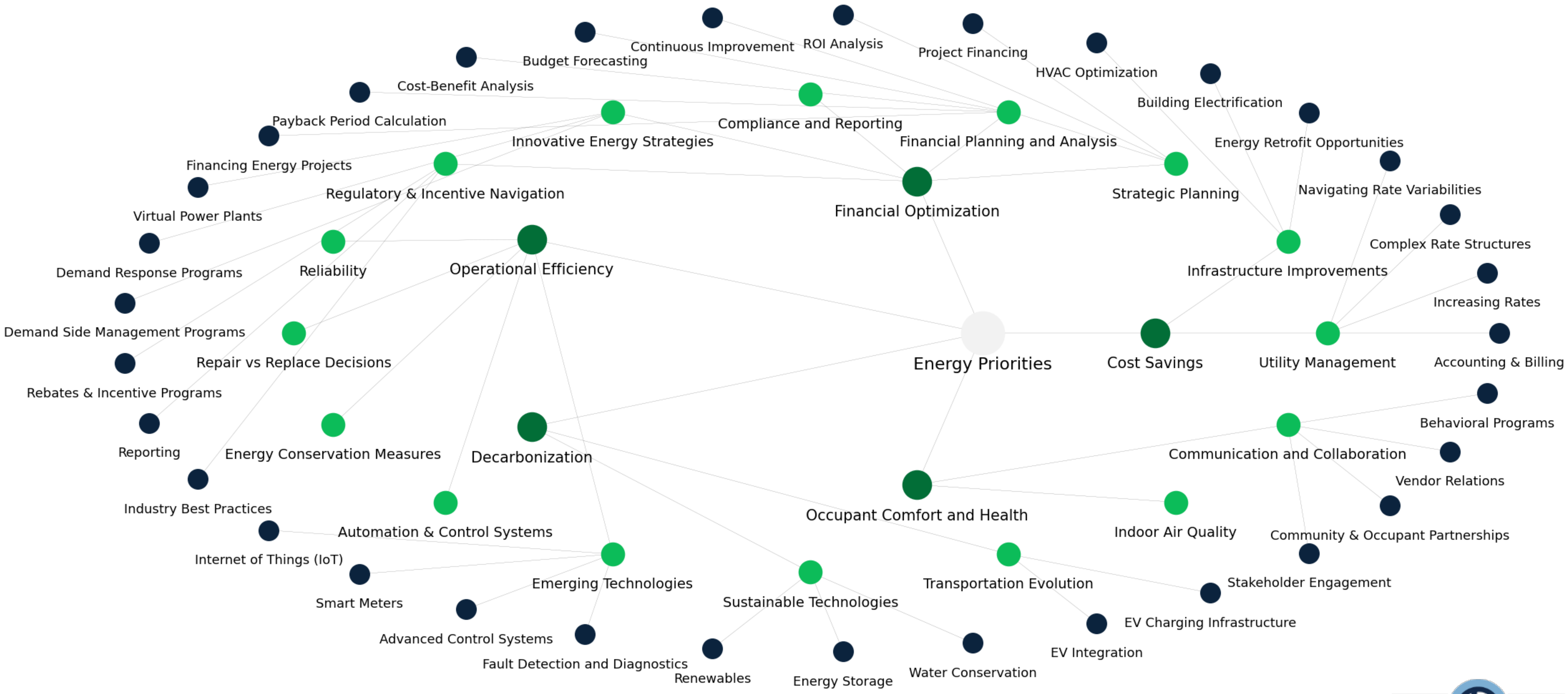
Source: DOE



of the energy professional workforce plans to retire within 10 years

Source: AEE

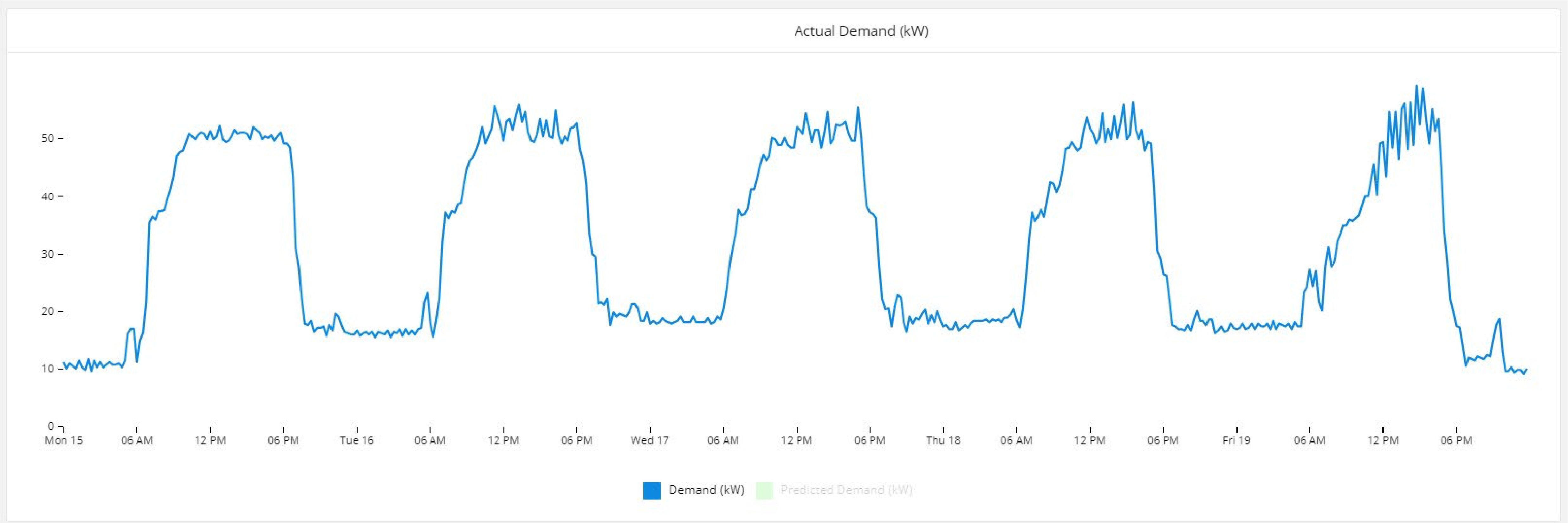
Leading to missed opportunities and priority paralysis



Case Study 1: Measurement Needs Context

Measurement without context

Measurement alone makes it hard to tell which are good or bad days



Models make it easy to find and diagnose potential issues

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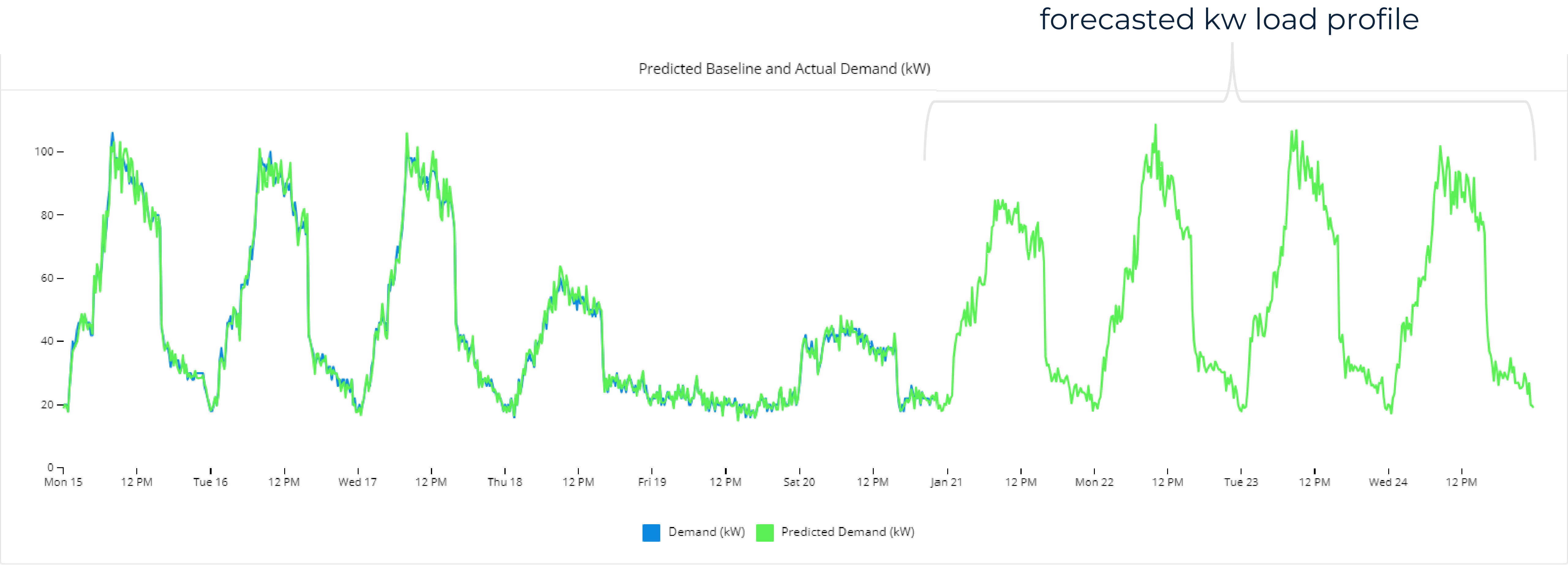
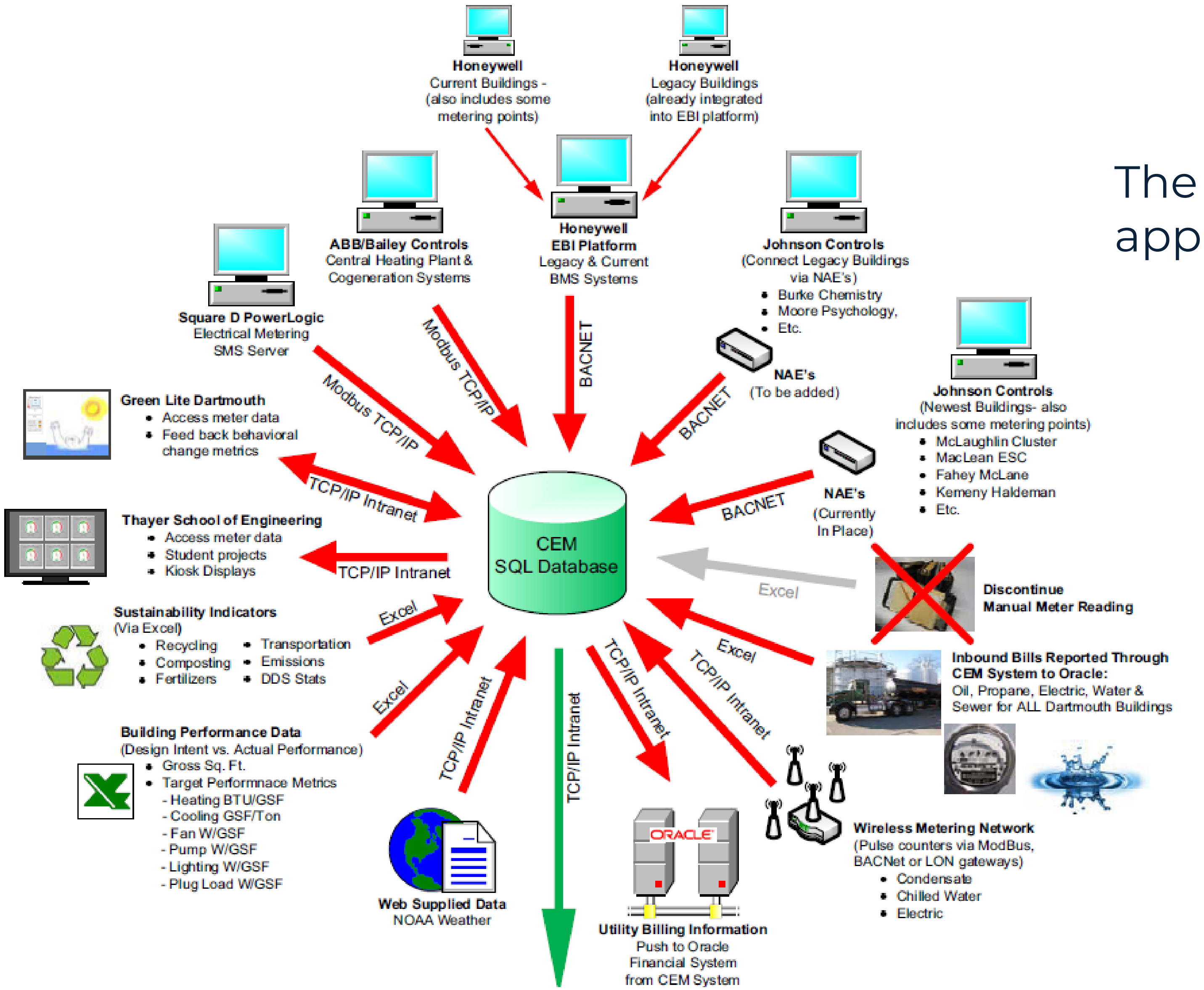
Models make it possible to predict the future



Case Study 2: Measurement Needs Lots of Data

Measurement requires many data integrations



The measure-everything approach circa 2010

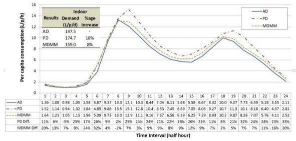
Models can extract big value from limited data

Low-cost/easy-to-acquire data

Basic building information

Utility bills

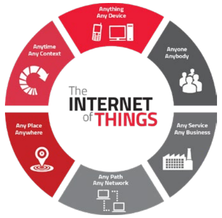
Weather



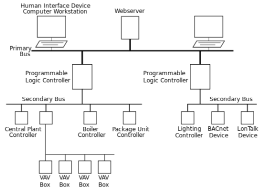
Smart meter interval data

High-cost/hard-to-acquire data

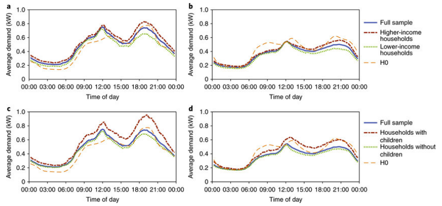
Detailed building information



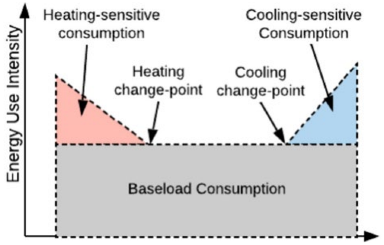
IoT data



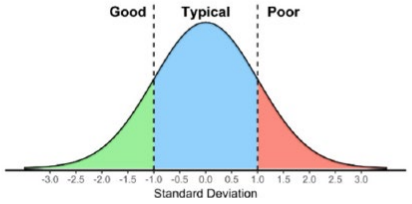
Control system data



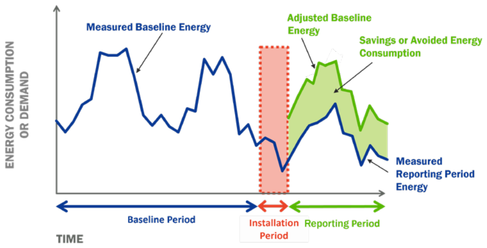
Infer load shapes



Disaggregate use by system



Benchmark efficiency



Forecast and measure impacts

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Case Study 3: Measurement Requires Lots of Staff and Expert Time

Measurement depends heavily on experts

ASHRAE LEVEL II ENERGY AUDIT

prepared for

Sample Education Report
700 West 21st Street
Cheyenne, Wyoming 82002

SAMPLE ELEMENTARY SCHOOL
2204 PLAINVIEW ROAD
CHEYENNE, WYOMING 82009

10461 Mill Run Circle, Suite 1100 | Owings Mills, MD 21

1. Executive Summary

The purpose of this Energy Audit is to provide Wyoming State Construction D
with a baseline of energy usage and the relative energy efficiency of the facili
Conservation Measures (ECM's). Information obtained from these analyses m
an Energy Conservation Program, Federal & Utility grants towards energy co
justify a municipal bond funded improvement program, or as a basis for replac

Building Type / Name	# Bldgs	# Stories	Year Reno
Elementary School	1	3	198

The study included a review of the building's construction features, historica
review of the building envelope, HVAC equipment, heat distribution systems
maintenance practices.

Summary of Existing Energy Perfo	
Percentage Area Cooled	
Percentage Area Heated	
Total Percentage Area Conditioned	

Energy Conservation Measures

has identified four Non- Renewable Energy Conservation Mea
for each measure is calculated using standard engineering methods followed
ECM are provided in Appendix for reference. A 10% discount in energy savin
effects amongst the ECMs. In addition to the consideration of the interactive
contingency to the implementation costs to account for potential cost overruns

The following table summarizes the recommended ECMs in terms of descri
reduction, and cost savings.

Recommended Non- Renewable Energy Conservation	
Total Projected Initial ECM Investment	$86,499 *(In Current Dolla*
Estimated Annual Cost Savings Related to ECMs	$18,692 *(In Current Dolla*
Net Effective ECM Payback	4.63 years
Estimated Annual Energy Savings	11.13%
Estimated Annual Utility Cost Savings *(excluding water)*	12.09%
Estimated Annual Utility Cost Savings *(excluding water)*	$11,255
Estimated Annual Water Cost Savings	41.77%
Estimated Annual Water Cost and Consumption Savings	275kGal and $9

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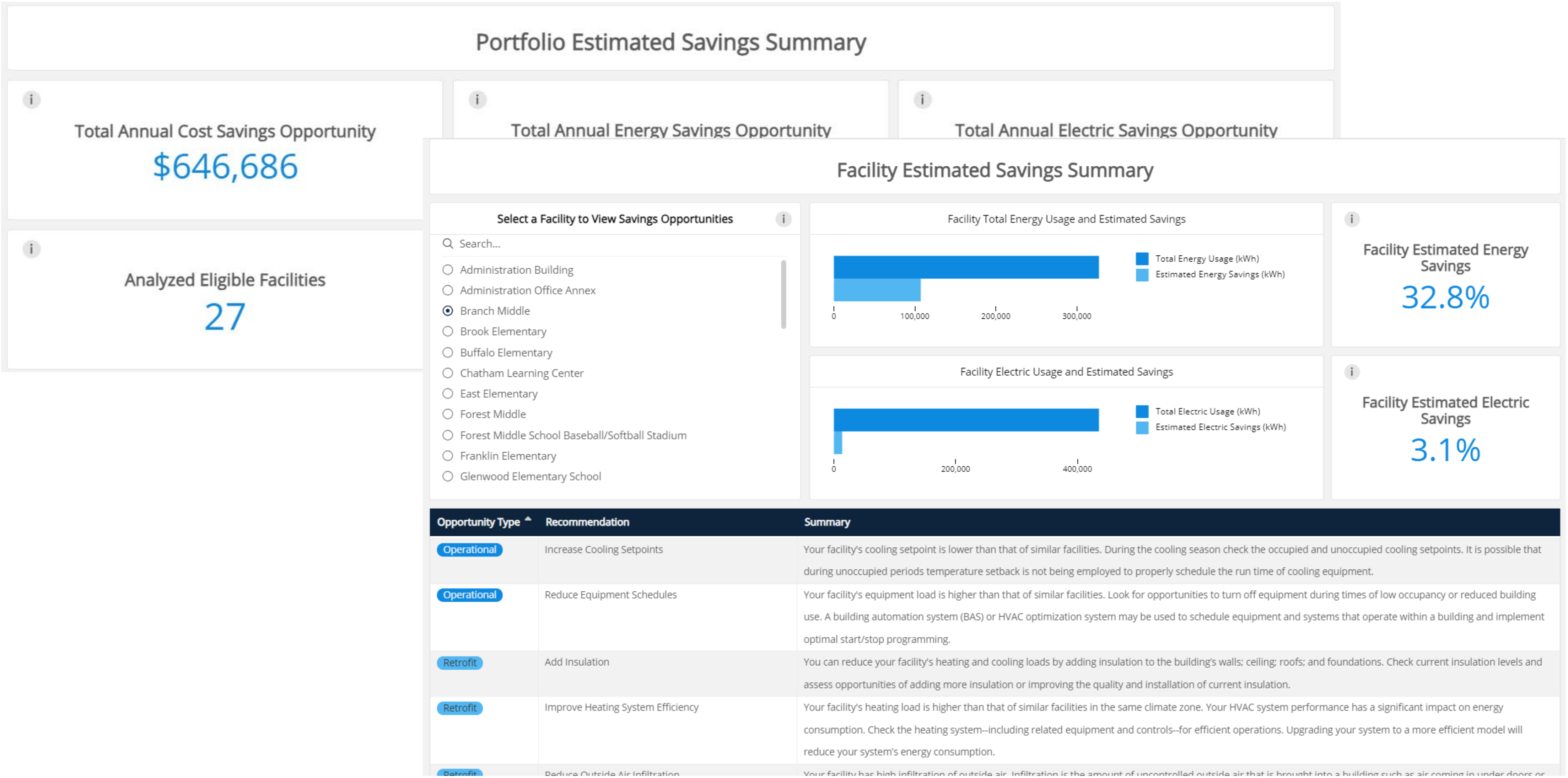
Models are automated, real-time, and scalable



Opportunity Type	Recommendation	Summary
Operational	Increase Cooling Setpoints	Your facility's cooling setpoint is lower than that of similar facilities. During the cooling season check the occupied and unoccupied cooling setpoints. It is possible that during unoccupied periods temperature setback is not being employed to properly schedule the run time of cooling equipment.
Operational	Reduce Equipment Schedules	Your facility's equipment load is higher than that of similar facilities. Look for opportunities to turn off equipment during times of low occupancy or reduced building use. A building automation system (BAS) or HVAC optimization system may be used to schedule equipment and systems that operate within a building and implement optimal start/stop programming.
Retrofit	Add Insulation	You can reduce your facility's heating and cooling loads by adding insulation to the building's walls; ceiling; roofs; and foundations. Check current insulation levels and assess opportunities of adding more insulation or improving the quality and installation of current insulation.
Retrofit	Improve Heating System Efficiency	Your facility's heating load is higher than that of similar facilities in the same climate zone. Your HVAC system performance has a significant impact on energy consumption. Check the heating system--including related equipment and controls--for efficient operations. Upgrading your system to a more efficient model will reduce your system's energy consumption.
Retrofit	Reduce Outside Air Infiltration	Your facility has high infiltration of outside air. Infiltration is the amount of uncontrolled outside air that is brought into a building such as air coming in under doors or

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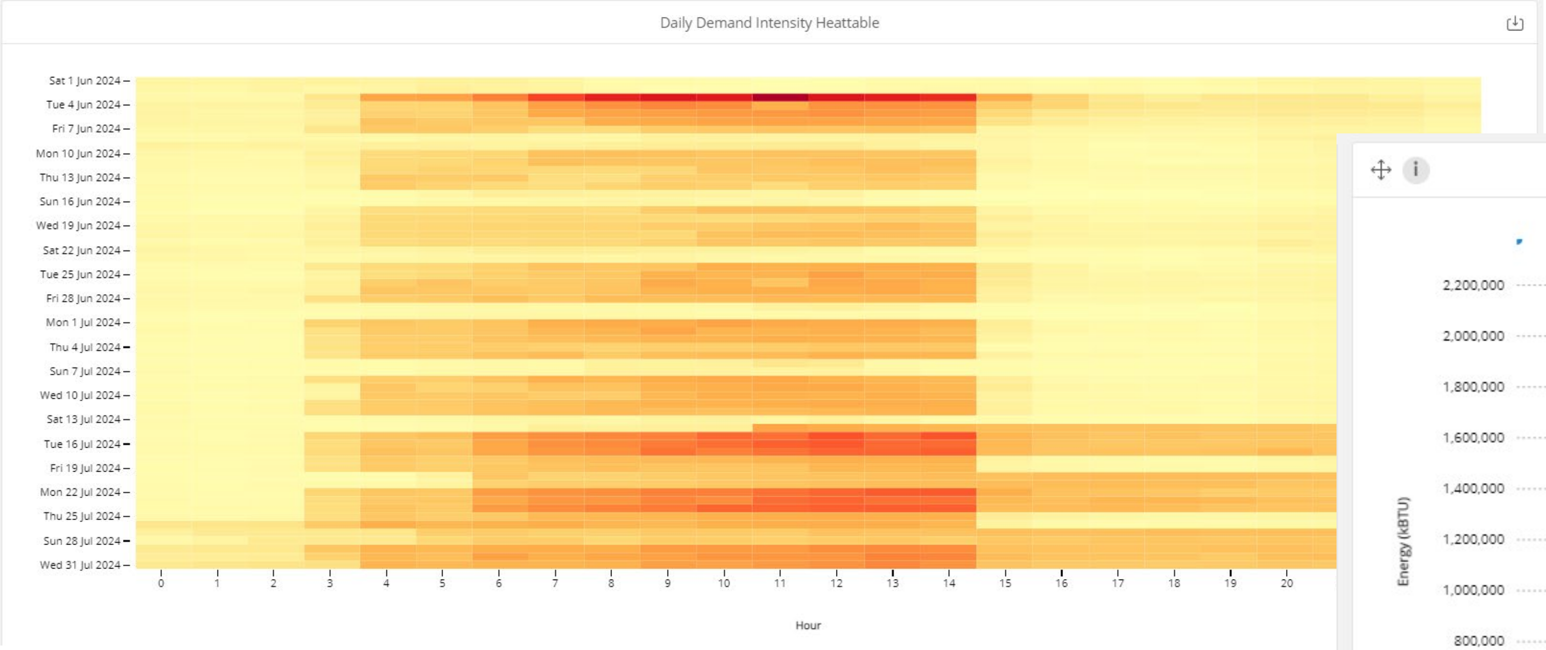
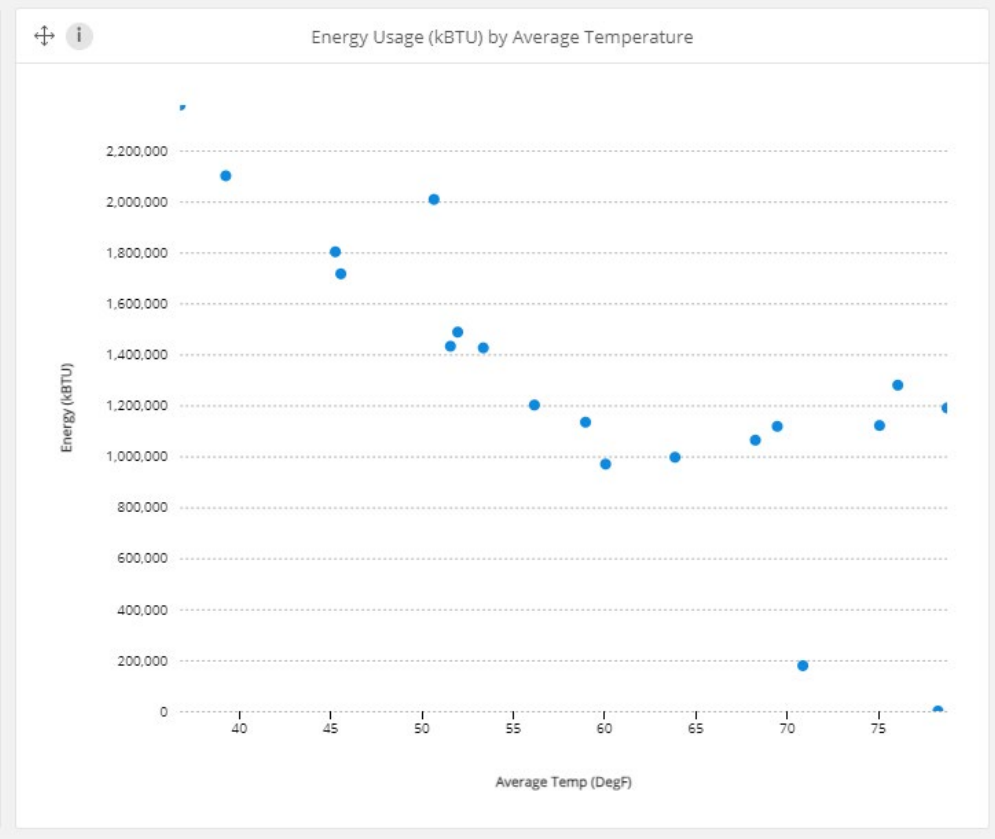
Models can run 24x7 and are inexpensive to deploy





Instead of continuously analyzing reports and dashboards, energy experts can be used efficiently when problems and opportunities are detected.

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The 10% Recap

- AI/ML modeling can provide benefits without creating new risks
- Measurement is no longer enough because:
  - The energy game is changing: costs + technology + grid instability
  - We lack the human resources & experts to capitalize
  - Leading to missed opportunities and priority paralysis
- Model-based methods solve these challenges by:
  - Creating the context measurement lacks
  - Generating big value from limited data
  - Reducing team and expert constraints
  - Running real-time, scalably, and 24x7 at low cost

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