

Artificial Intelligence, Real Savings

ICF's Approach to Data-Driven Decision Making with AI

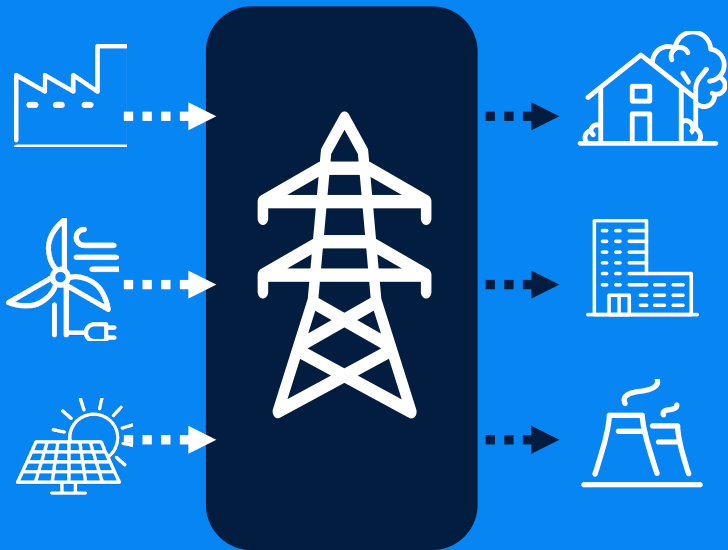


Greg Donworth
Data Science Manager

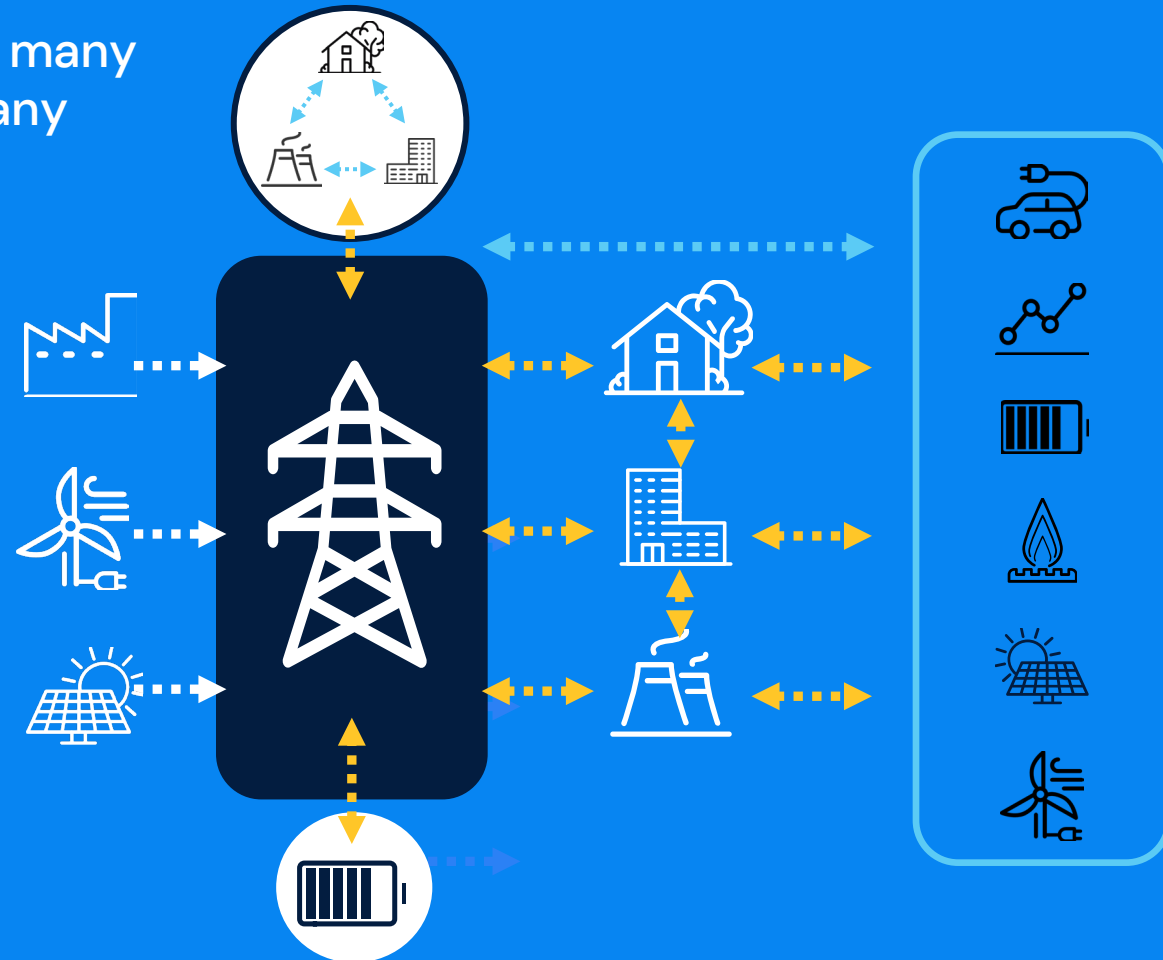
01/30/2024

Utility industry is moving to an “Orchestrated Decentralization” Model

From one
to many



From many
to many



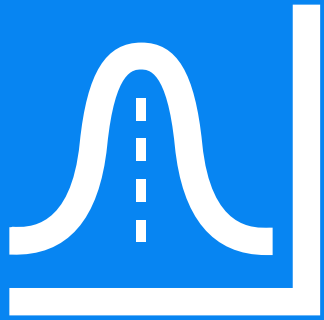
This has implications for:



- DER integration & electrification, decarbonization
- Grid modernization
- Reliability & resiliency

- Utility program design
- DER value realization
- Affordability and equity

How can we....



Manage the load growth from building and transportation decarbonization?



Optimize the charging and dispatch schedules of controllable devices?



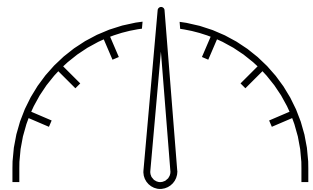
Match customers with the best measures to help the customer and utility?



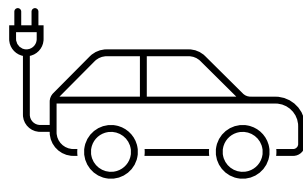
Stay on top of the constant change that our industry is facing?



Necessary Ingredients to a Successful AI Implementation



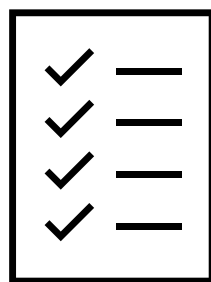
AMI



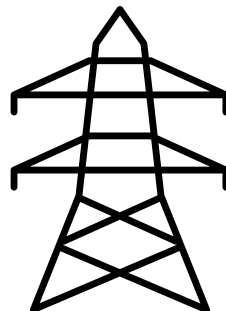
Telemetry



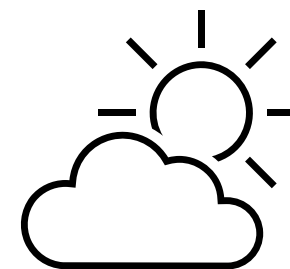
CIS



Participation

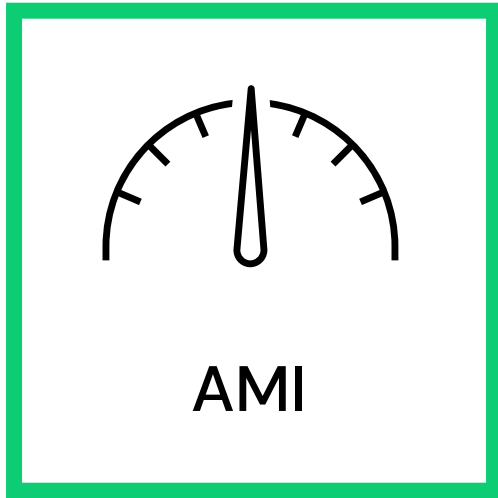


Topology



Weather

→ Large Amounts of Data



35,040

Data Points per
Meter/Year

17.52B

Data Points per
Year for a Utility
with 500,000
Customers

→ Necessity of Cloud Computing



How does ICF use this data to build platforms that help utilities make decisions?

All of the following slides are demonstrations that do not contain PII or client data.

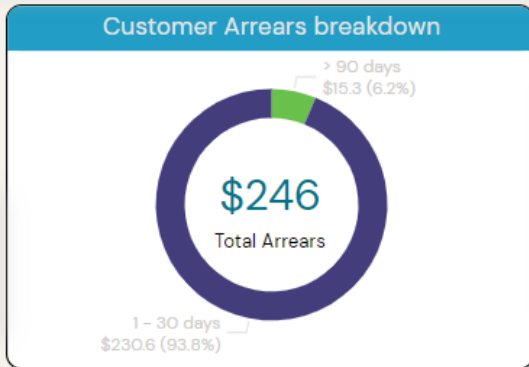
Current Account Level details for the customer - 920008964628

[← View Account list](#)

9.8%
Average Burden

9.80%
Electric burden

0.00%
Gas Burden



6,111.50
Actual Consumption (kWh)

5,882.65
Modeled Consumption (kWh)

SingleFamily
Home Type

Renter
Home Ownership

ACH50 < 20
Envelope Assessment

59002 Zip Code Open Account Status False Health & Safety ?

120 Shepherd Acton Road, Acton, MT 59002
Address

Simulated Account Level details for the customer - 920008964628

Account Number	Premise Number	Upgrade Name	Current Energy Burden	Reduced Energy Burden	Electric Savings (kWh)	Gas Savings (Therms)	Total Savings (kbtu)
920008964628	5110204148	Central AC Roof and Attic Insulation Insulation Wall Infiltration	9.80%	8.32%	890.91	400.84	43114.5
		Central AC Roof and Attic Insulation Wall Baseline Infiltration	9.80%	8.44%	820.30	312.87	34078.2
		Central Air Conditioner SEER 18	9.80%	8.67%	680.99	-0.23	2300.8
		Central AC Roof and Attic Insulation Wall Baseline Infiltration Baseline	9.80%	8.73%	642.87	5.92	2785.7
		Central Air Conditioner SEER 16	9.80%	8.87%	557.93	-0.23	1880.9
		Furnace Roof and Attic Insulation Insulation Wall Infiltration	9.80%	9.07%	441.62	424.49	43945.5
		ASHPI Roof and Attic Insulation Insulation Wall Infiltration	9.80%	9.14%	397.09	401.09	41454.1
		Baseline Roof and Attic Insulation Insulation Wall Infiltration	9.80%	9.14%	397.09	401.09	41454.1
		Room AC Roof and Attic Insulation Insulation Wall Infiltration	9.80%	9.14%	397.09	401.09	41454.1
		Basement Wall Wall R-10, Exterior	9.80%	9.17%	382.22	65.31	7834.0
		Furnace Roof and Attic Insulation Wall Baseline Infiltration	9.80%	9.20%	361.75	340.11	35236.9
		Lighting 100% LED	9.80%	9.22%	349.97	-7.61	433.4
		ASHPI Roof and Attic Insulation Wall Baseline Infiltration	9.80%	9.29%	311.13	313.11	32365.1
		Baseline Roof and Attic Insulation Wall Baseline Infiltration	9.80%	9.29%	311.13	313.11	32365.1

➔ Recommendation Engine: Optimize Customer Programs

DER Insight - Dispatch

Monthly Report

Individual Event Analysis

Event Participation Information

FLM Value Stack

Event Year

Year	Month	Day	EventGroup
2022	July	1	smart_temp
		19	smart_temp
		20	smart_temp
		21	smart_temp
		22	smart_temp
		25	smart_temp
	August	3	smart_temp
		4	smart_temp
		8	smart_temp
		9	smart_temp
		10	flex_temp
		16	flex_temp
September	18	flex_temp	
	23	flex_temp	
	25	flex_temp	
	26	flex_temp	
	30	flex_temp	
	1	flex_temp	
8	flex_temp		
9	flex_temp		
12	flex_temp		

Realized Load Management Value

● Distribution ● GHG ● Energy ● Transmission

Capacity Load Management Value

EventGr... ● flex_temp ● smart_temp

Average PJM Estimate (\$/kW-yr)

Capacity: \$51.9

Transmission: \$34.4

PJM Estimate (\$/kWh)

GHG Emissions: \$0.09

Distribution: \$0.043

0.86

AvgLoadShedPerD...
- Targeted

60,403

TargetedDevices

157,575.4

CapacityValue -
ST22 - EH plus Cap...

126,752.7

TransmissionValue -
FT - EH plus Transmi...

12,404.3

Energy Value

3.43

Dispatch Hours

8,492.6

GHGValue

4,057.6

DistributionValue

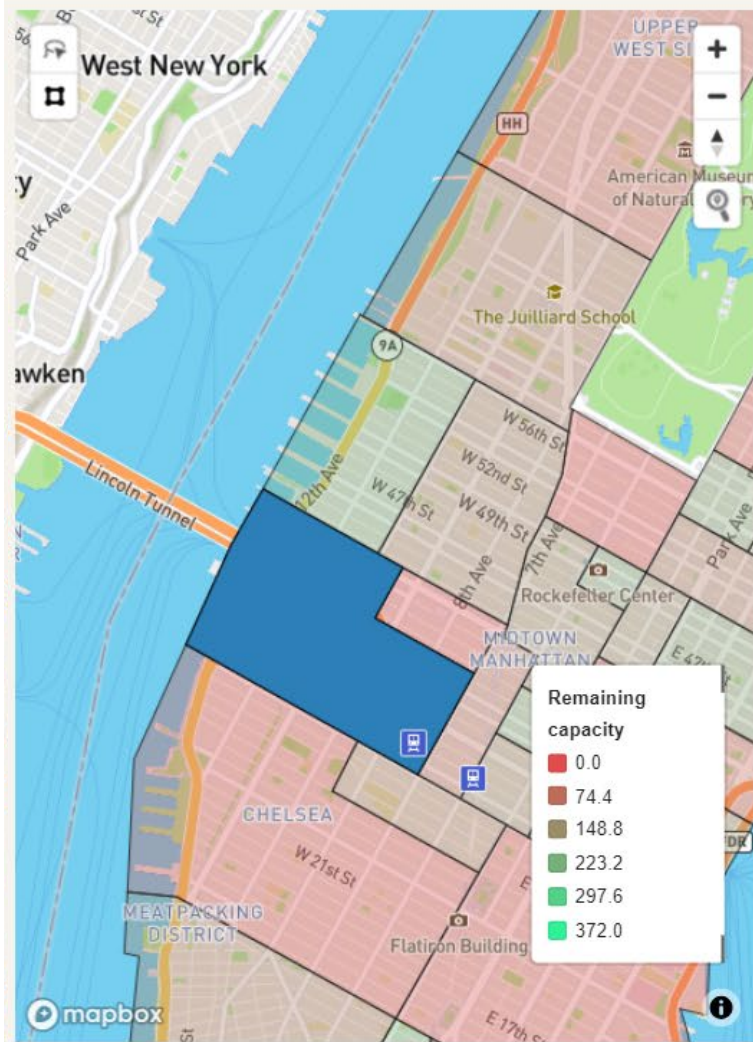
Value Stream Notes:

Capacity values are calculated using the \$ per kilowatt-year value (reported in the "PJM Estimate" table above), multiplied by the total kilowatt reduction during each of PJM's 5 Coincident Peak times for summer 2022. This value is then divided by 5 to reflect the average of the top 5 peaks.

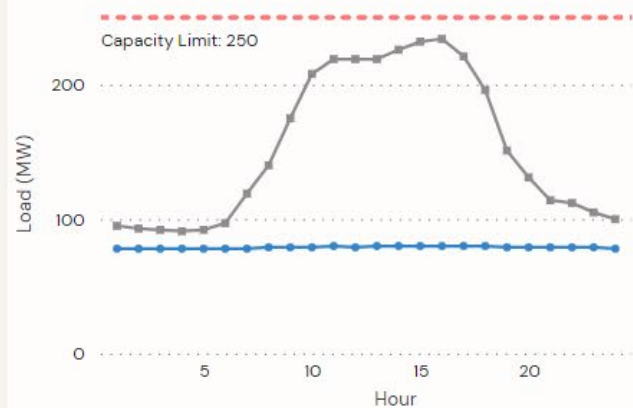
Transmission values are calculated using the \$ per kilowatt-year value, multiplied by the total kilowatt reduction during PJM's zonal transmission peak for PEPCO.

Energy values are calculated using the locational marginal price for every hour of the event, multiplied by the kW reduction in each hour of the event.

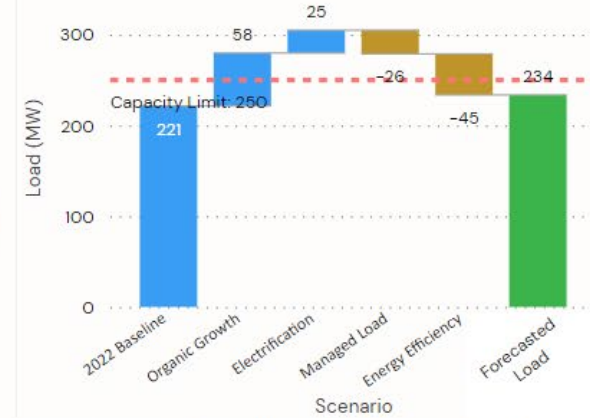
➔ Continuous Learning: DER Dispatch Optimization



Hourly Load shape for Pennsylvania for 2040

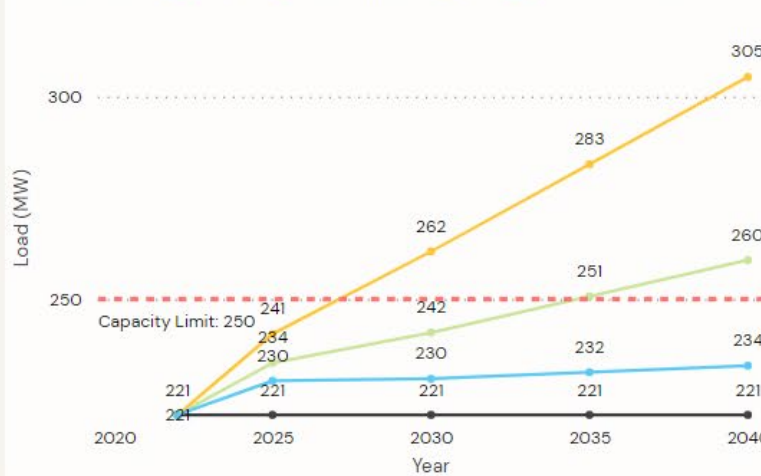


Forecasted Load for Pennsylvania for 2040



Forecasted Load for Pennsylvania

● 2022 Baseline ● + Growth ● + Electrification ● + EE ● + Managed Load



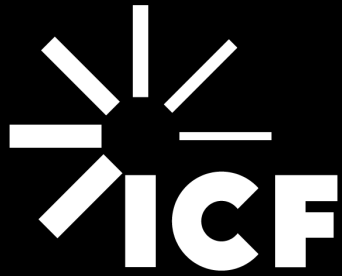
Substation(s) Upgrade Costs*

with growth & Electrification with EE & Load Management

2034	Upgrade Year_afterL...	Upgrade Year_afterL...
11	0	0
\$257,611	Upgrade kVA_afterLM	Upgrade kVA_afterLM
\$257,611	Upgrade Costs_after...	Upgrade Costs_after...
NPV Deferred/Avoid...		

* Upgrade costs assume upgrade is needed at 90% of the actual network capacity limit and additional transformer can be added to the substation including capacitor bank, relays and wiring. Fixed cost for upgrade is assumed. New substation is not considered. Costs takes inflation and time value of money into...

➔ Forecasting: DER/EE Adoption and Optimization




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