Keeping the Lights On With ‘Insight-O-Meter’

NEC’s AI-enabled Prediction Solution for Utilities

Himanshu Shekhar

NEC Corporation of America, AI & Analytics Group

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What are we going to talk about today?

The Insight-O-Meters

1. Challenges in the Energy/Utility Sector
2. Hackathon an Opportunity
3. Solution – Hackathon Build & Further
4. SAS App Factory – a game changer, & how we leveraged it
5. Impact of Overall Solution

Challenges

Energy Generation, Distribution & Consumption

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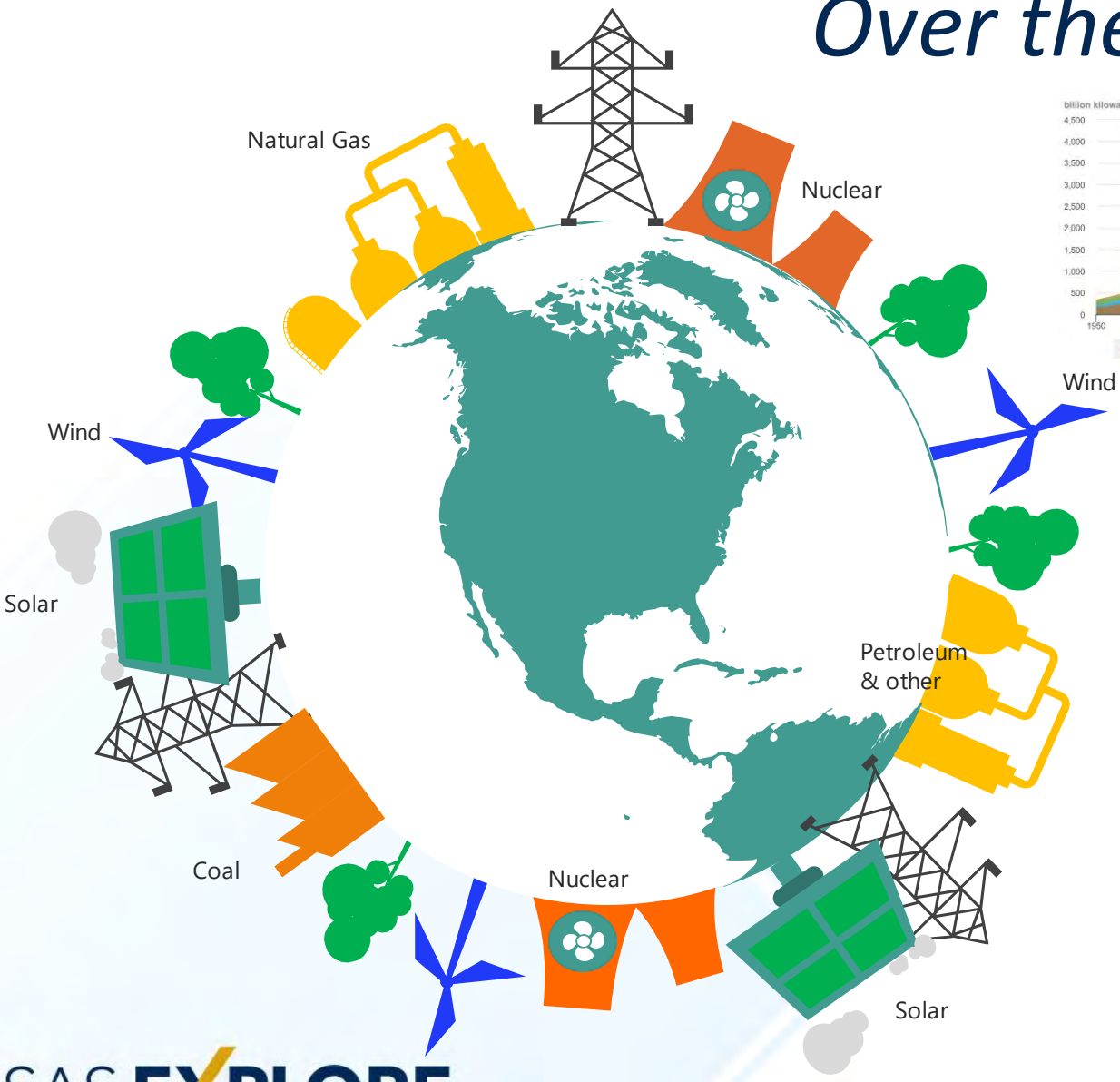
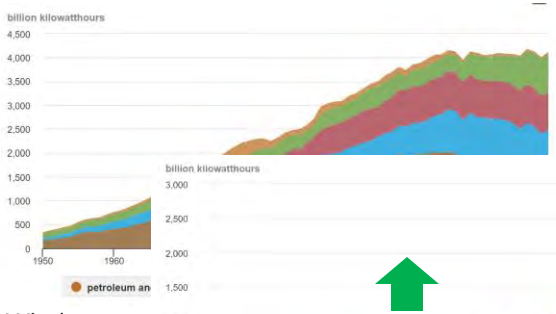
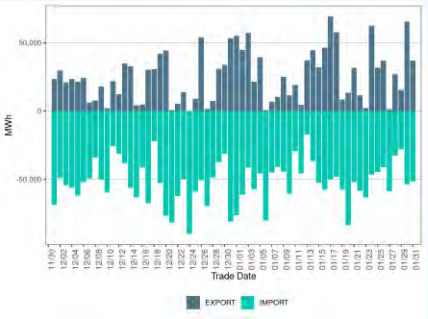
Generation: Energy Sources *Over the Years*





USE

STORE



TRADE/TRANFER

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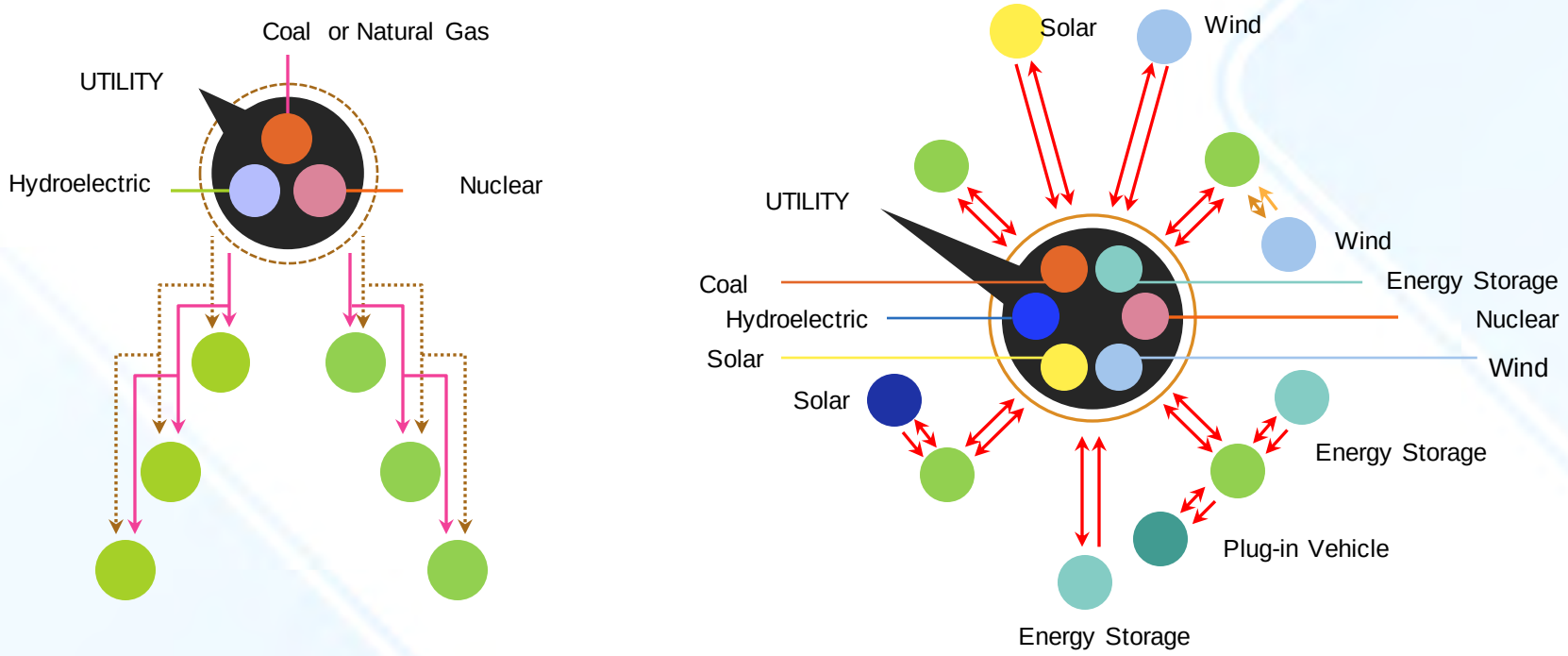
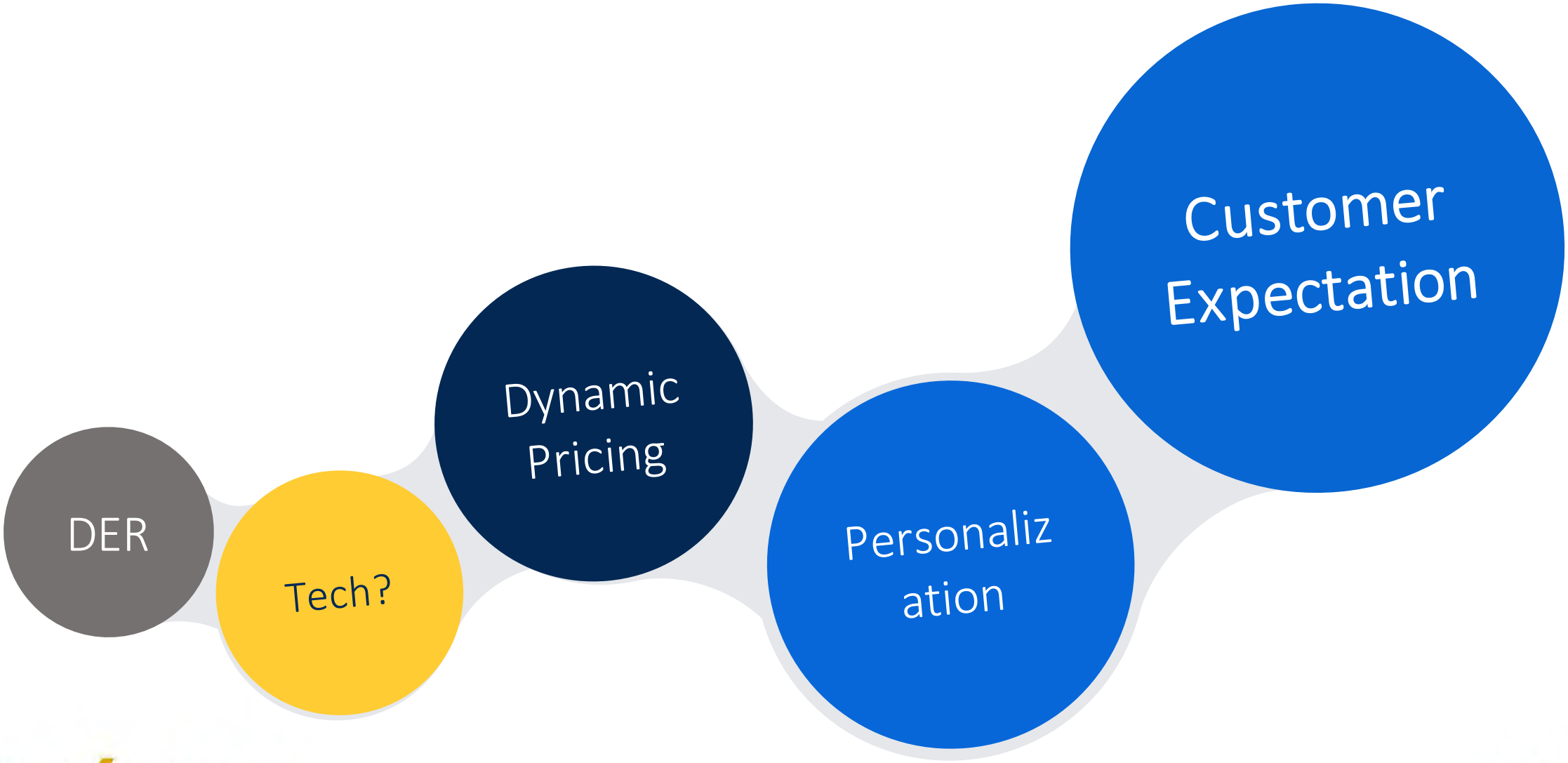
Distribution: Transition of the Grid
Reactive to Smarter

Additional Variability & Need for Information Flow



Consumption: *A new role of the Consumer*



It’s not Cheap to Avoid Blackout

Opinion
Javier Blas

How London Paid a Record Price to Dodge a Blackout

The UK heat wave also saw an unhappy benchmark in the energy crisis.

electricity demand collided with a bottleneck in the grid, leaving the eastern part of the British capital briefly short of power. Only by paying a record high £9,724.54 (about $11,685) per megawatt hour – more than 5,000% higher than the typical price – did the UK avoid homes and businesses going dark. That was the nosebleed cost to persuade Belgium to crank up aging electricity plants to send energy across the English Channel.

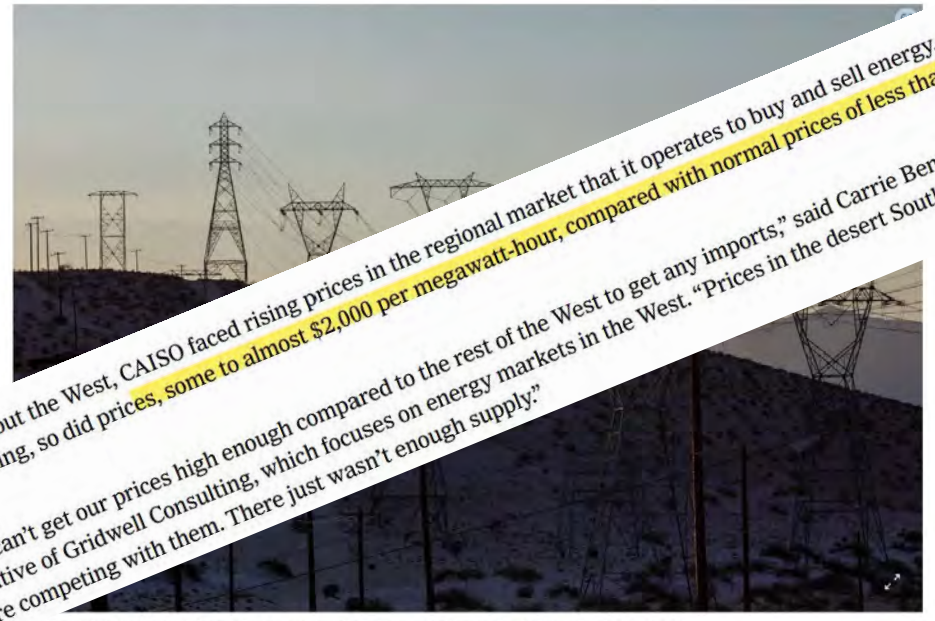
daily energy and commodities newsletter.

n to many outside the power industry, parts of London came remarkably close – even as it was recovering from the hottest day in British history. On July 20, surging

Dodging Blackouts, California Faces New Questions on Its Power Supply

Extreme heat is testing the way energy is generated, delivered and traded — and raising the prospect of perpetual emergencies.

Give this article



With temperatures soaring throughout the West, CAISO faced rising prices in the regional market that it operates to buy and sell energy. As electricity demand kept increasing, so did prices, some to almost $2,000 per megawatt-hour, compared with normal prices of less than $100.

“Where the risk comes is if we can’t get our prices high enough compared to the rest of the West to get any imports,” said Carrie Bentley, the co-founder and chief executive of Gridwell Consulting, which focuses on energy markets in the West. “Prices in the desert Southwest were a little higher, so we were competing with them. There just wasn’t enough supply.”

wer lines in Cathedral City, Calif. During a heat wave this month, the operator of California’s electric grid faced the highest demand the system had ever seen. Alex Welsh for The New York Times

By Ivan Penn
Ivan Penn, who has written extensively about the electric grid, reported from Los Angeles.

Published Sept. 25, 2022 Updated Sept. 26, 2022

California finds itself on edge more than ever with a lingering fear: the threat of rolling blackouts for years to come.

Despite adding new power plants, building huge battery storage

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Hackathon 2023

An Opportunity to Innovate & Create!

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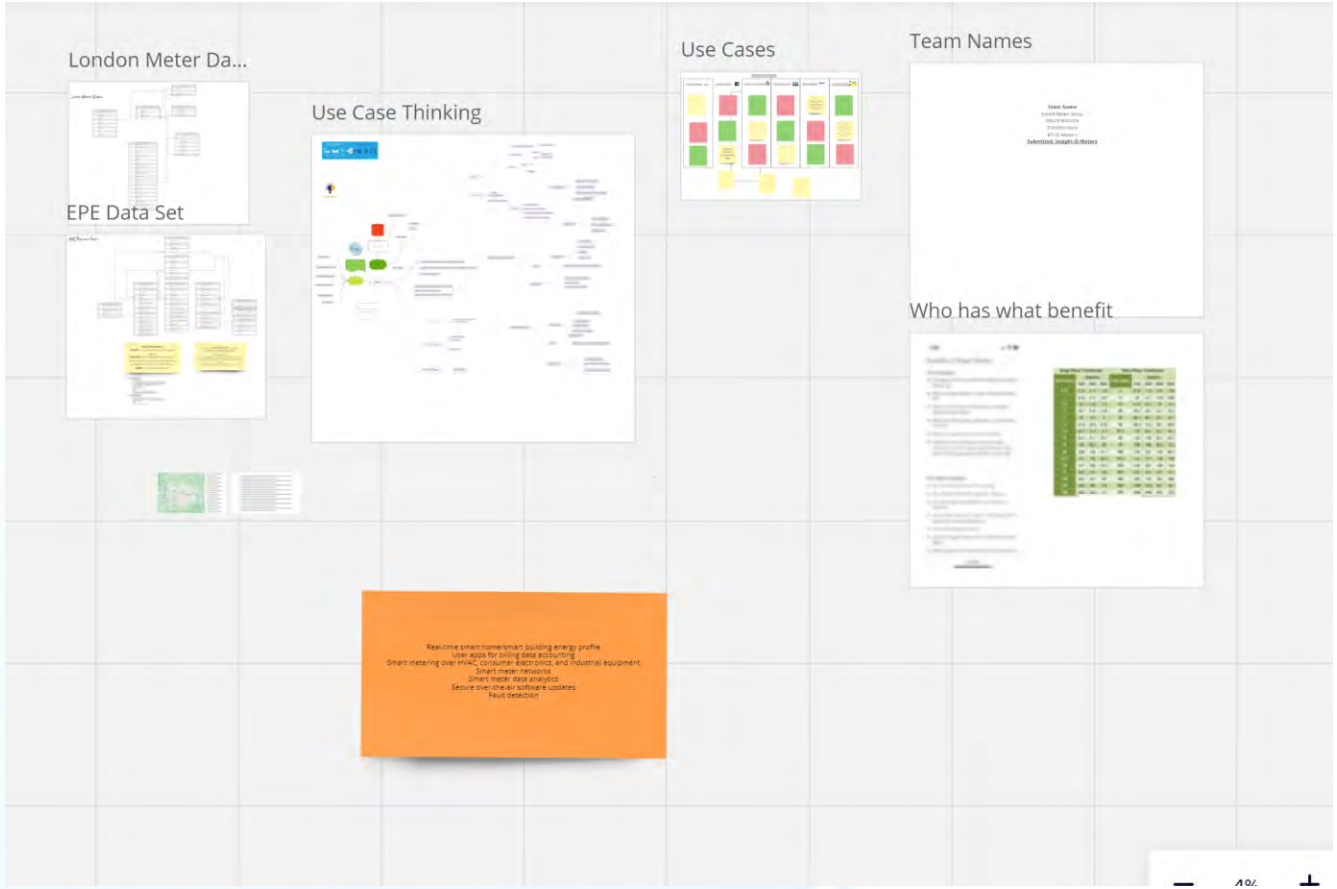
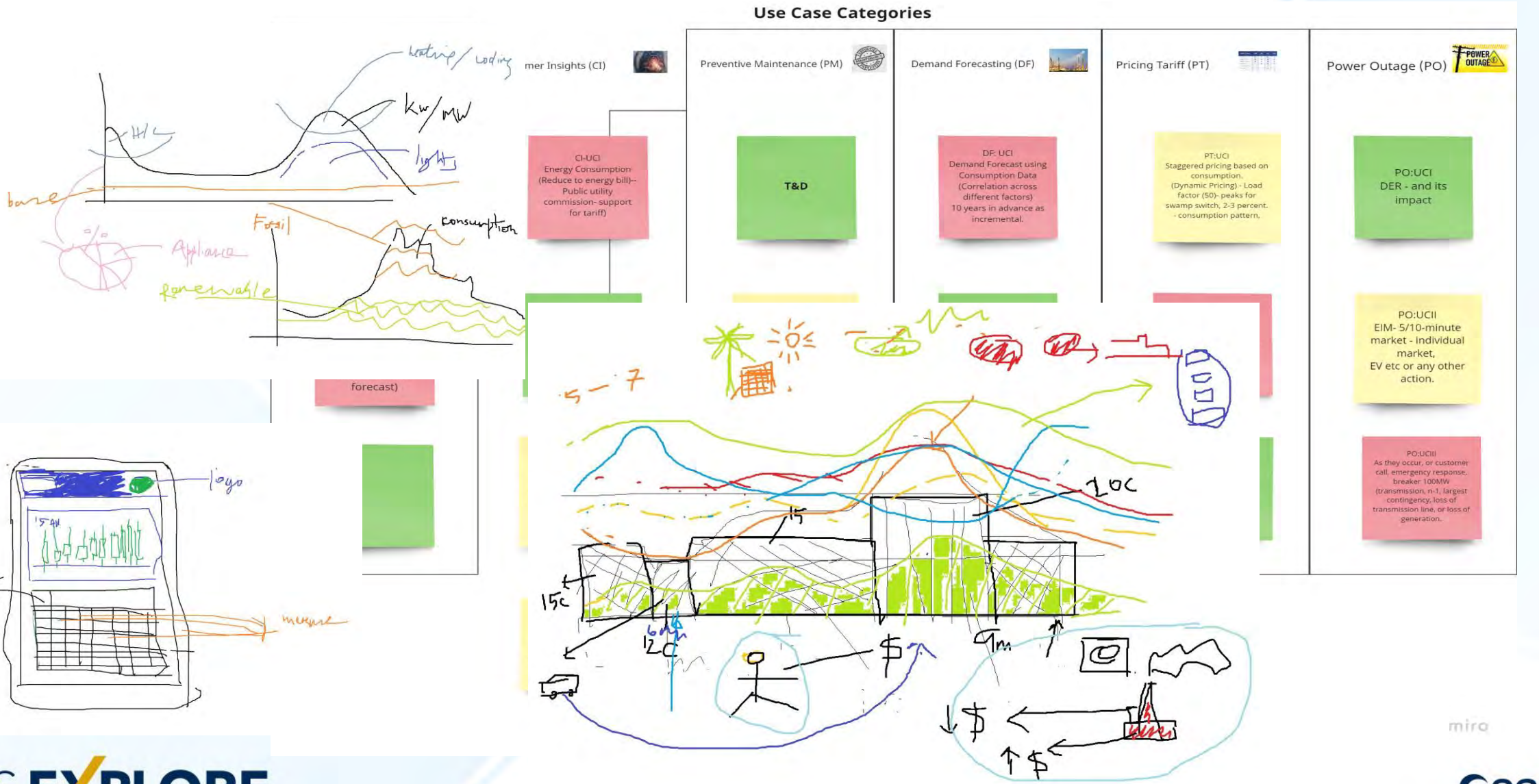
The Journey

The Insight-O-Meters



A nudge to do more

Design Thinking



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Meet the Team

The Insight-O-Meters

SANKALP M

SHRIKANT K

KAMLESH J

RAJEEV Y

SHAILEN T

VEDANGI S

Team Lead

HIMANSHU S

ADITYA J

BALAJI TS

SAS HACKATHON 2023

ENERGY

APP FACTORY CLOUD

SUSTAINABILITY

The Insight-O-Meters

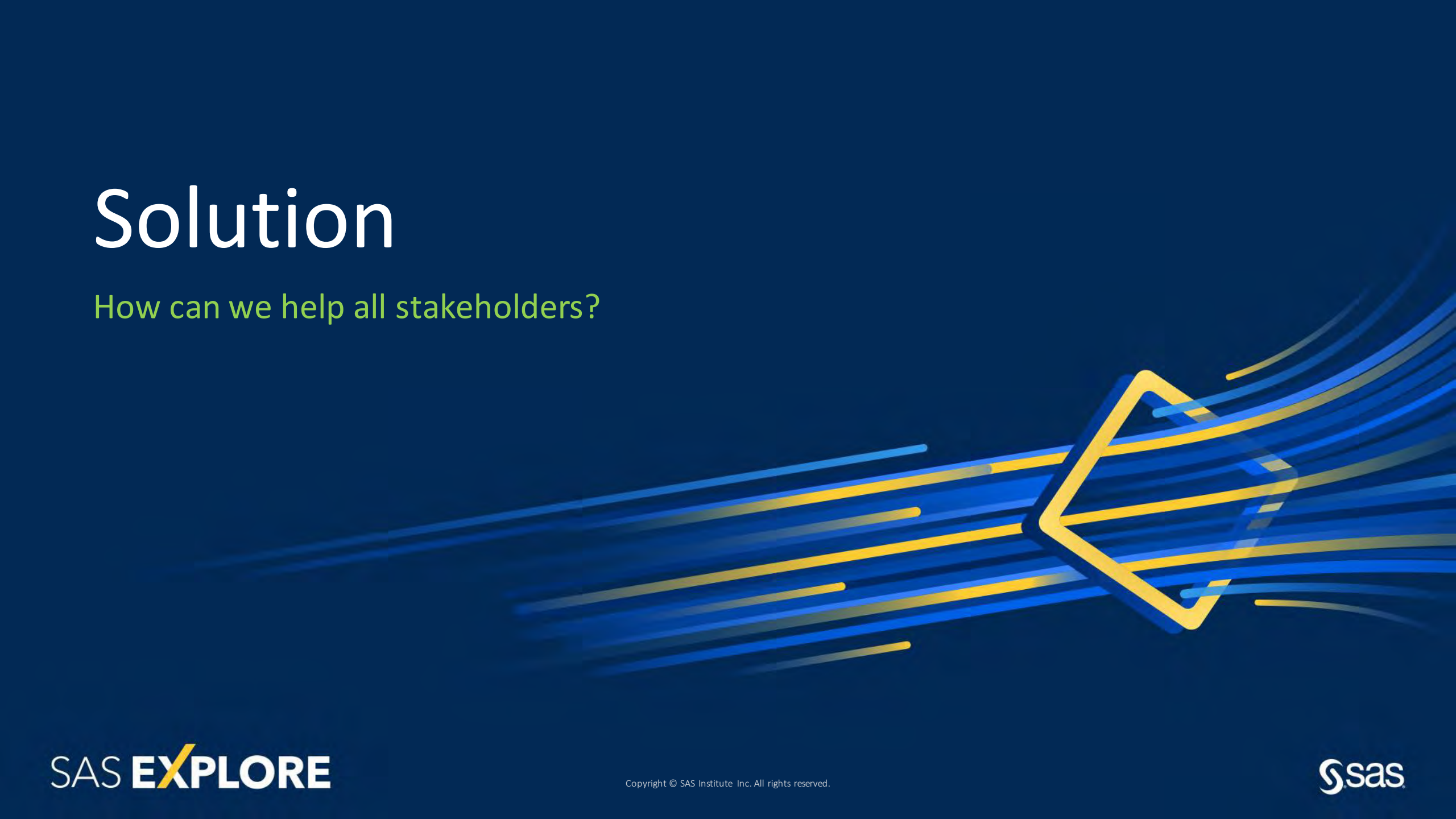
NEC, US

CHAMPION

Using smart-meter data to improve sustainability.

Solution

How can we help all stakeholders?



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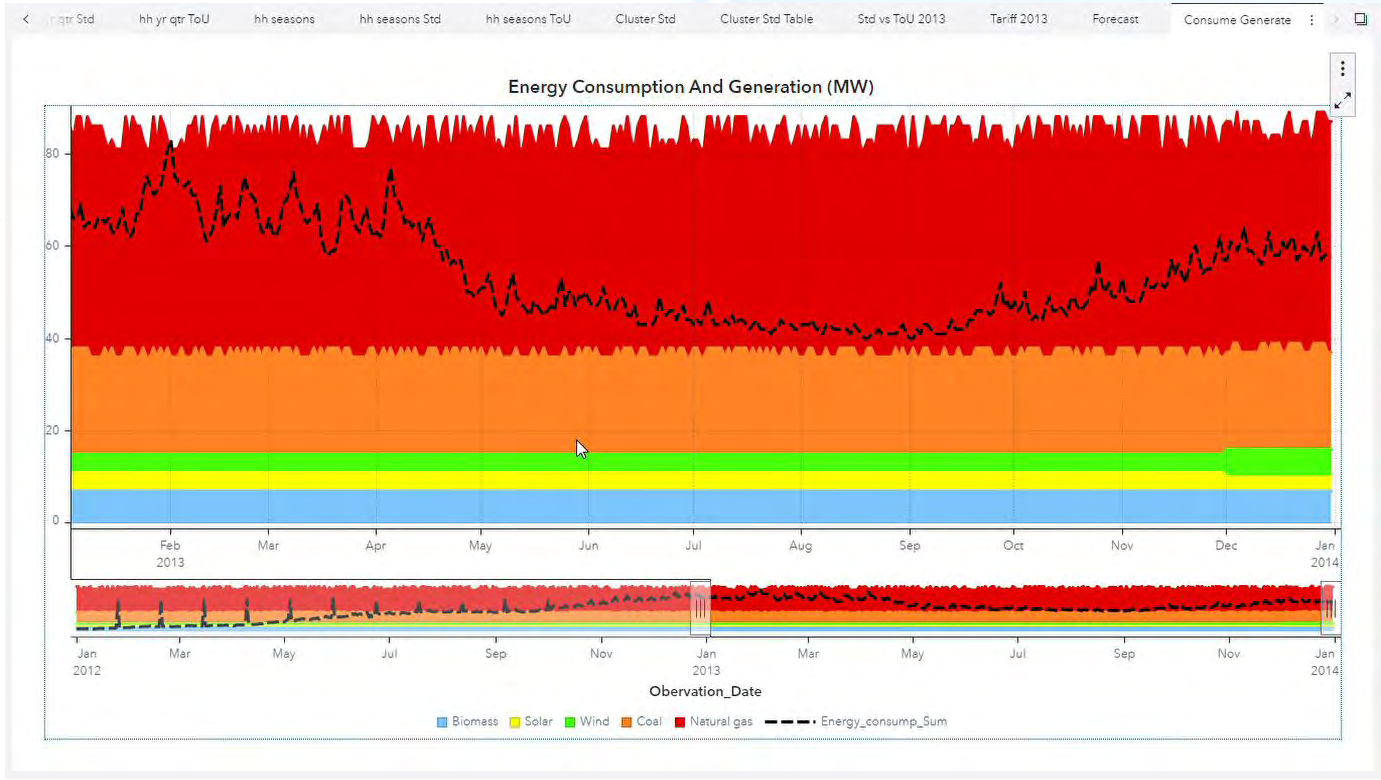
Addressing the Variability

- Once we capture the demand against power generation
  - can easily modulate the generation

- Depending on what source
- Natural Gas (e.g.LMS 100) is quick
- Other sources have to be alive* to

Adjust the capacity up and down



SAS Event Stream Processing

SAS EXPLORE

* running

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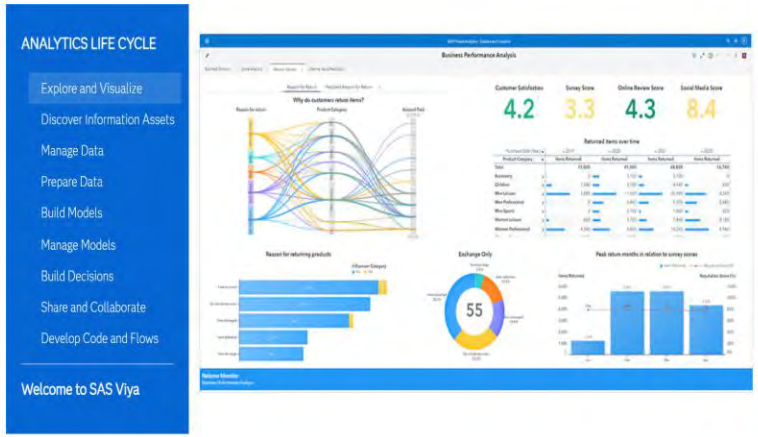
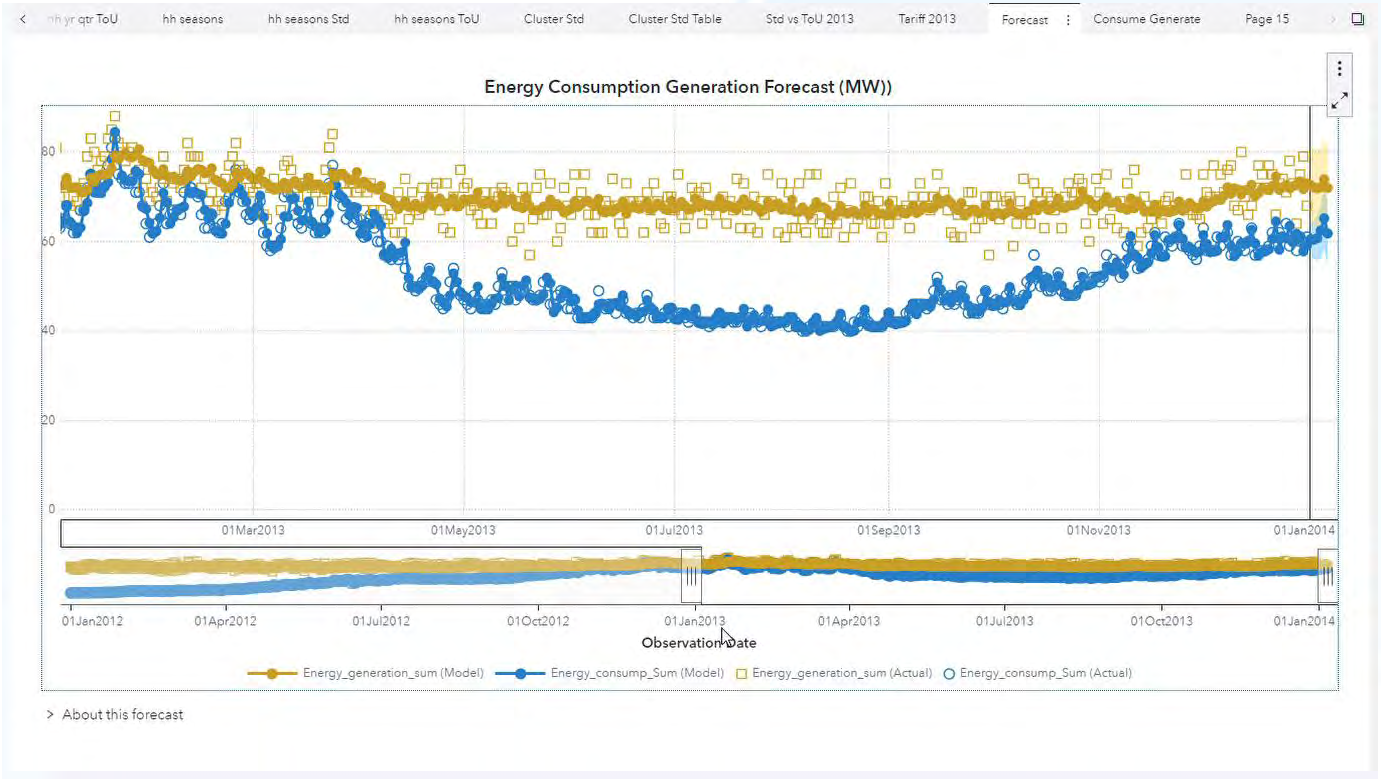
Forecasting the Demand and Generation

- Forecast ahead to Address
  - what can be traded in the market.
  - Saves $ and Reduces waste or CO_2 emission equivalent.





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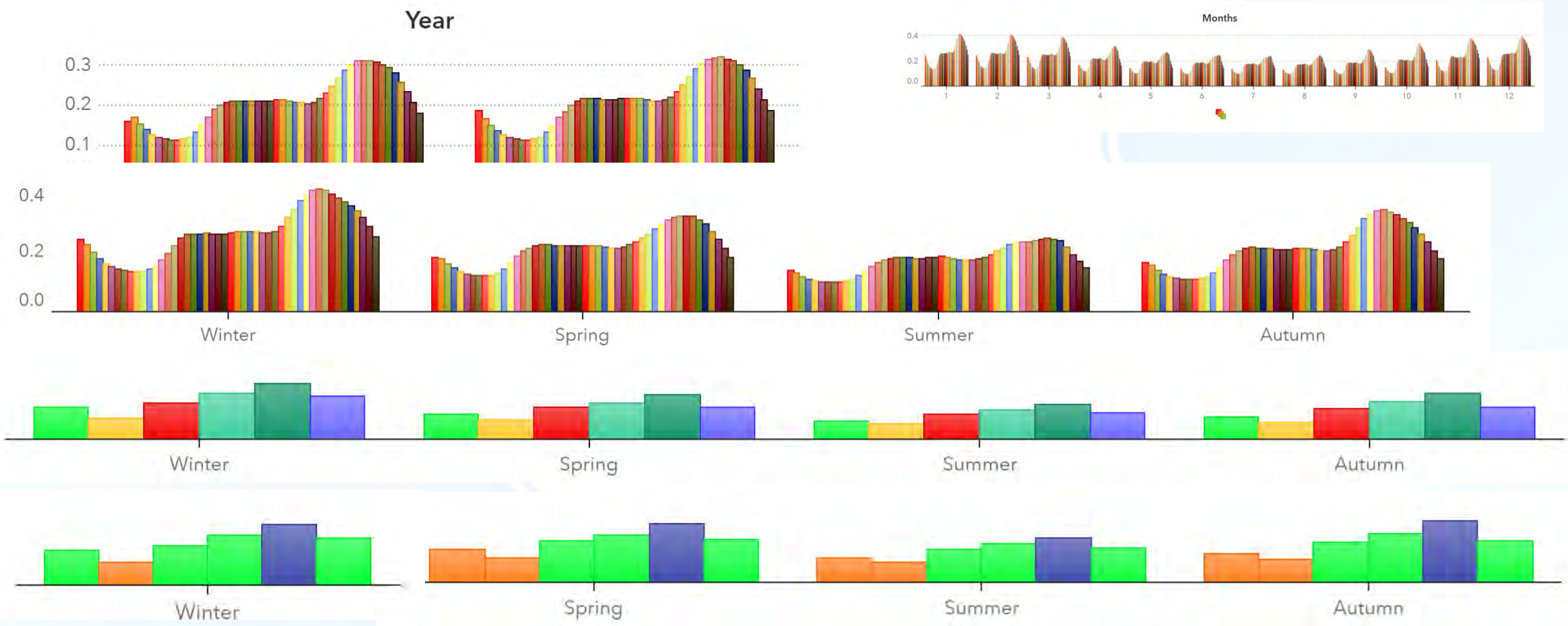
Shifting the Demand Curve & Influencing Consumer Behavior



Time of Use (ToU) -Tariff

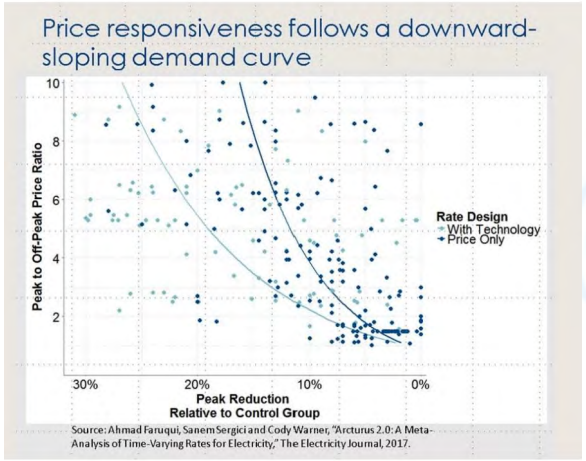
Dynamic Pricing : Study* Results

10-14%

Peak Demand REDUCED

10%

Bill SAVING



BILL DECREASE

Without Changing USAGE Behaviour

66.7%

Who participated in Pilot

The bigger the peak to off-peak price ratio#, the bigger the peak demand reduction

TOU rates

save customers money

and

reduce utilities' peak demand

* Results from studies by Faruqui

#we can build models on SAS to price that

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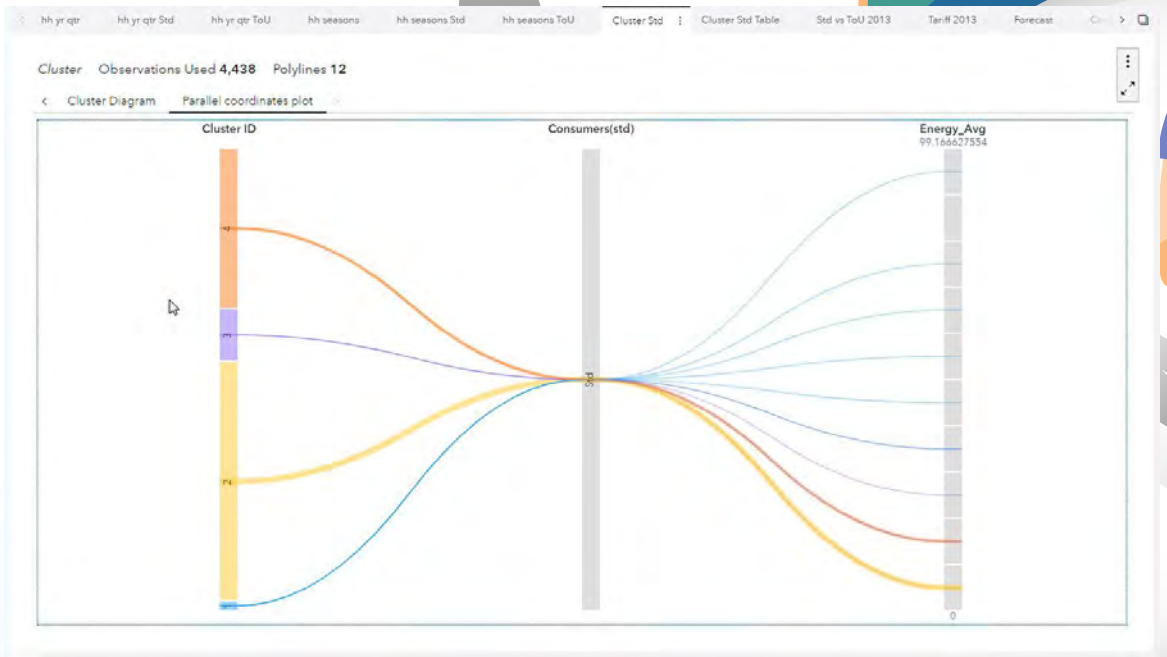
Why Stop on ToU

Cluster Classification for Conversion from STD to TOU



LCLid	stdorToU	Acorn	Acorn_grouped	Cluster ID (1)	Energy_Avg	Energy_Sum	Count_LCLid
MAC000004	Std	ACORN-E	Affluent	3	1.6894759537	1018.7540001	603
MAC000006	Std	ACORN-Q	Adversity	3	2.8178290598	1978.116	702
MAC000009	Std	ACORN-L	Adversity	3	8.4554273515	3957.1400005	468
MAC000012	Std	ACORN-E	Affluent	3	2.2414627189	1022.1069998	456
MAC000013	Std	ACORN-K	Adversity	3	5.3160250447	2971.658	559
MAC000016	Std	ACORN-K	Adversity	3	1.0069424084	384.652	382
MAC000019	Std	ACORN-K	Adversity	3	6.1025335161	4460.9520003	731

LCLid	Acorn	Acorn_grouped	Energy_Avg	Energy_Sum	Count_LCLid	Consumers(std)	Cluster ID (1)
MAC000105	ACORN-D	Affluent	51.405095752	37577.124994	731	Std	4
MAC000116	ACORN-E	Affluent	31.30217236	22881.887995	731	Std	4
MAC000249	ACORN-Q	Adversity	43.304127197	22128.408998	511	Std	4
MAC000274	ACORN-E	Affluent	33.782995895	24695.369999	731	Std	4
MAC000307	ACORN-E	Affluent	41.371149927	27594.557001	667	Std	4
MAC000321	ACORN-E	Affluent	35.975872367	23959.930996	666	Std	4
MAC000358	ACORN-E	Affluent	46.616824594	20464.785997	439	Std	4
MAC000379	ACORN-A	Affluent	33.110650886	16787.099999	507	Std	4
MAC000443	ACORN-E	Affluent	33.335556919	21668.111997	650	Std	4
MAC000450	ACORN-A	Affluent	72.267392846	30352.304995	420	Std	4
MAC000557	ACORN-A	Affluent	64.954793664	40921.520009	630	Std	4
MAC000569	ACORN-A	Affluent	36.168447612	22786.121996	630	Std	4
MAC000693	ACORN-E	Affluent	32.614559483	20286.255999	622	Std	4
MAC000697	[illegible]	Affluent	32.2407[illegible]74	[illegible]001	623	Std	4
MAC000916	ACO[illegible]E	[illegible]	[illegible]	[illegible]088.61600	[illegible]	Std	4
MAC000966	ACO[illegible]H	[illegible]	[illegible]75	[illegible]71	[illegible]2325	[illegible]99	[illegible]0	Std	4
MAC001036	ACO[illegible]G	[illegible]	[illegible]5341	[illegible]99	[illegible]608	[illegible]	4
MAC001145	ACORN-A	Affluent	61.807651154	37208.205994	602	Std	4
MAC001160	ACORN-E	Affluent	[illegible]	[illegible]	[illegible]	[illegible]	4
MAC001198	ACORN-E	Affluent	[illegible]	[illegible]	[illegible]	[illegible]	4
MAC001224	ACORN-E	Affluent	[illegible]	[illegible]	[illegible]	[illegible]	4
MAC001252	ACORN-E	Affluent	[illegible]	[illegible]	[illegible]	[illegible]	4
MAC001258	ACORN-D	Affluent	[illegible]	[illegible]	[illegible]	[illegible]	4
MAC001315	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4

Target Group

SAS Viya

SAS® Customer Intelligence 360

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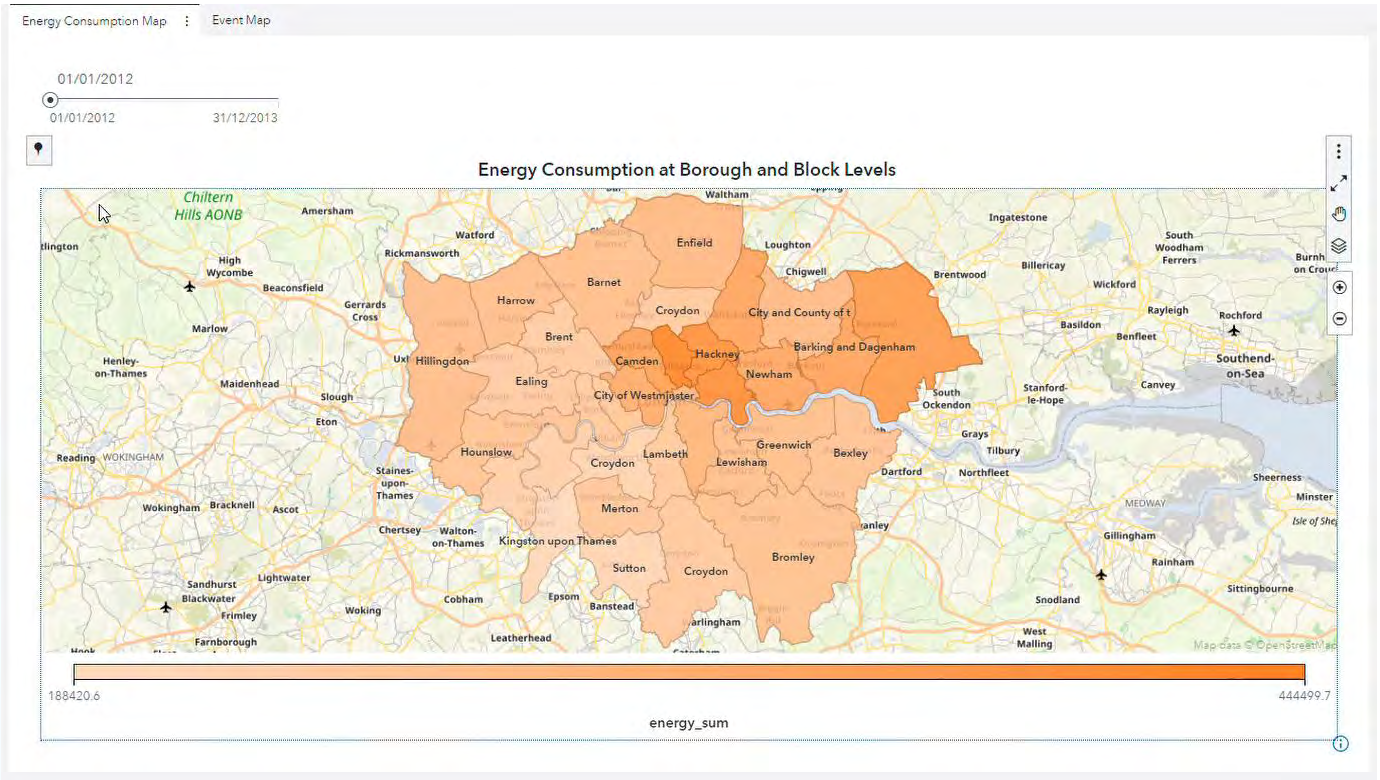
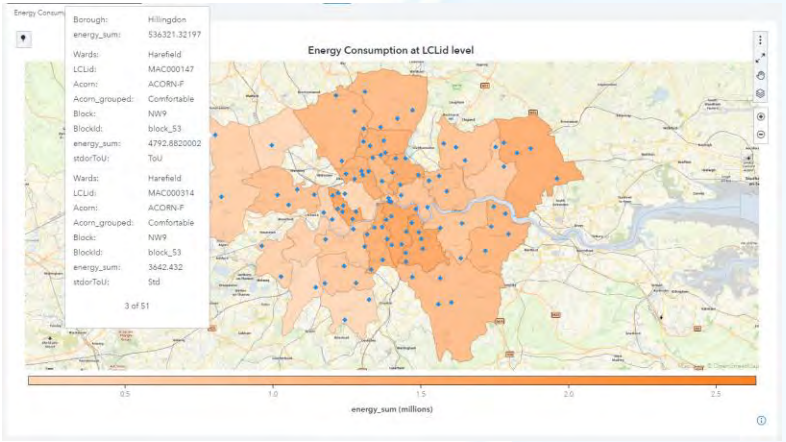
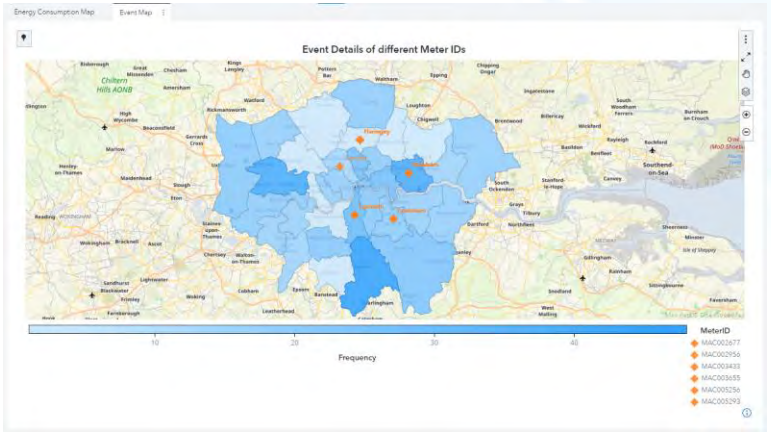
Understanding Energy Use: Consumption & Alerts

- Going from Boroughs to Wards and Districts and Individual Household







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Customer Journey & Customer Satisfaction*

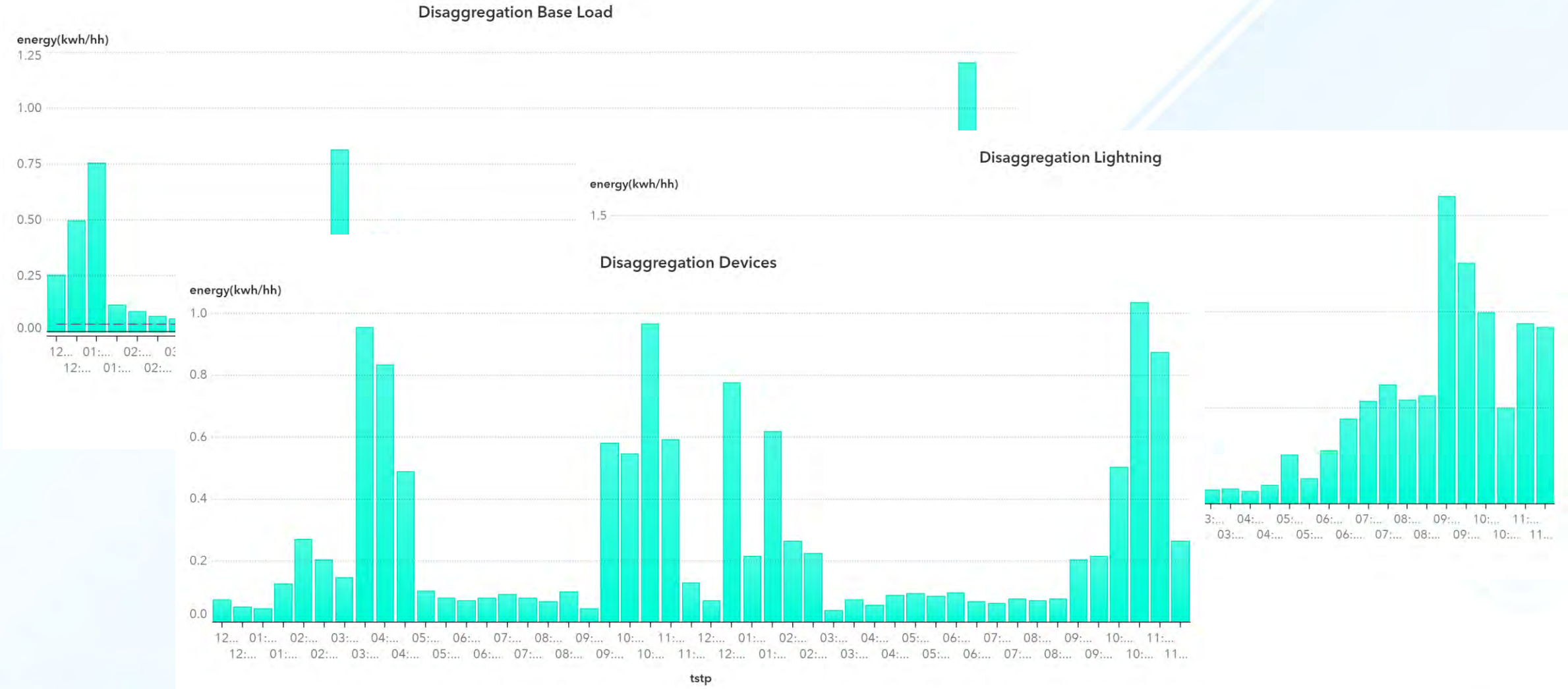
*McKinsey study

Role of the new Energy Consumer

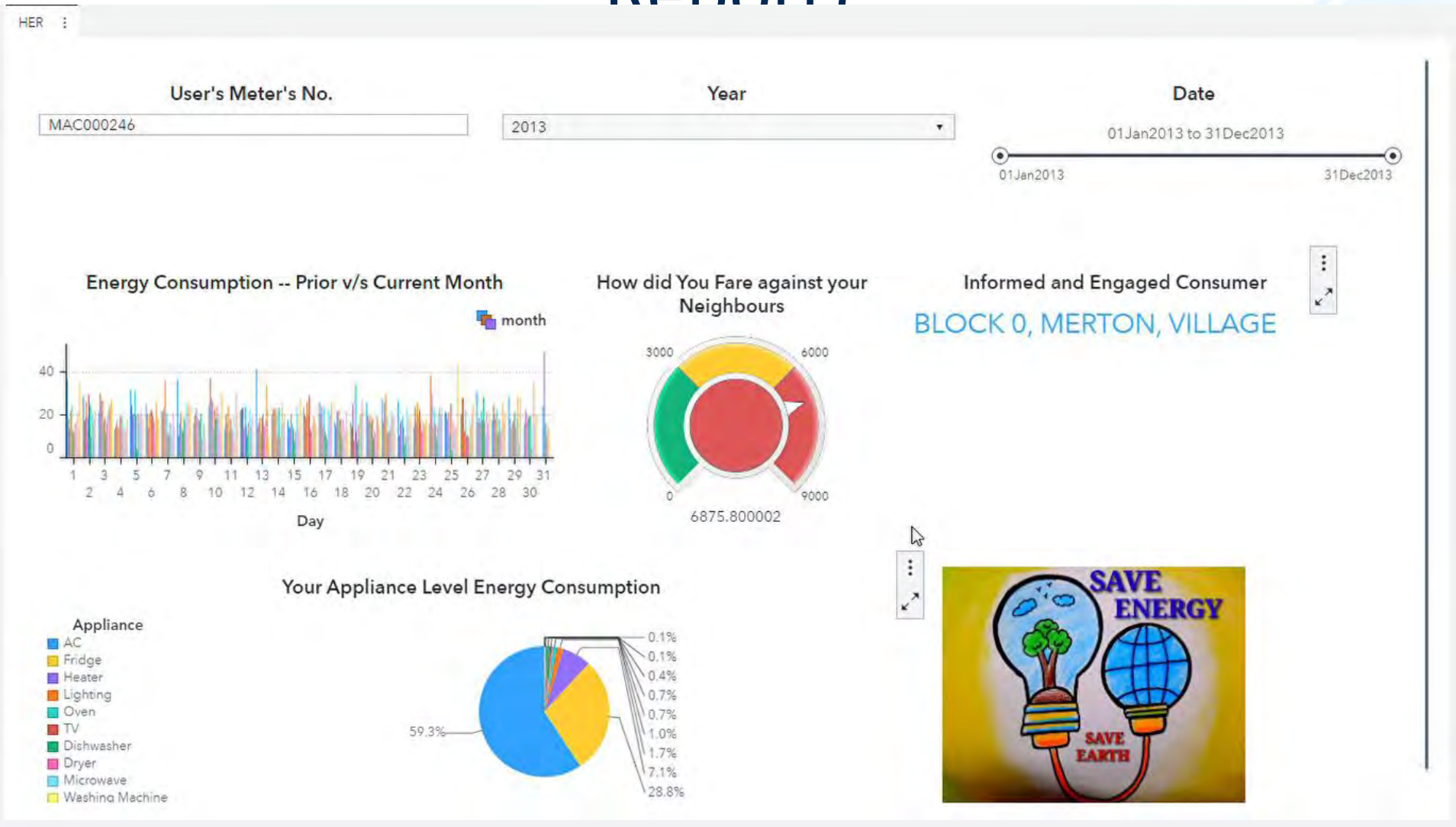
- Consumer is a Partner
- Distributed Energy Resource (DER) aggregators are exploring how local energy devices can participate
- Models for managing Distributed and Participatory Systems

We want to be our members' energy provider and partner of choice. Today we sell energy, capacity, and grid services. In the future, ***we're going to be buying grid services****. With behind-the-meter devices, we're going to be* ***buying capacity from our members***

Engaging the Customer: Disaggregation



Engaging the Customer: HER (Home Energy Report)



SAS App Factory

A game changer!

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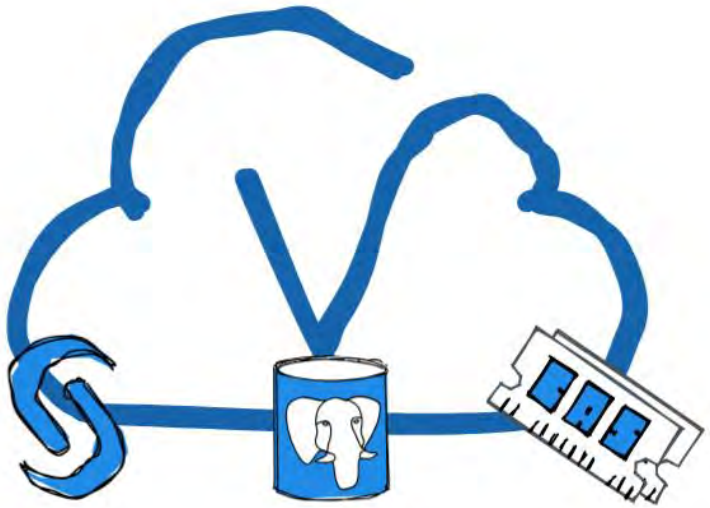
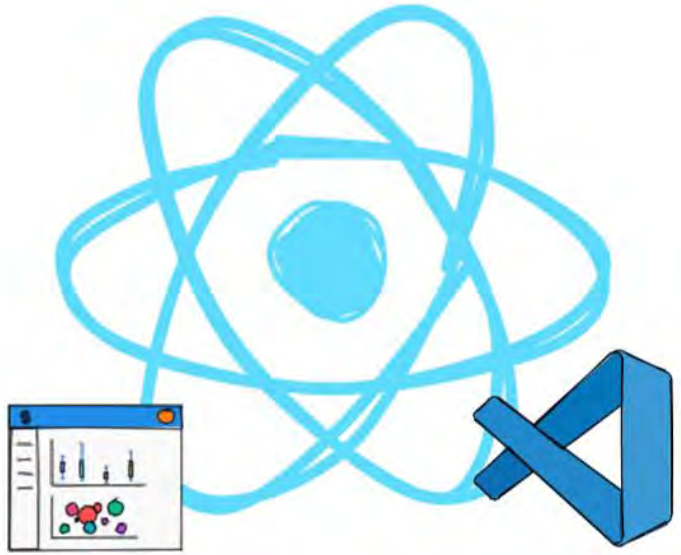
Who is Going to Use SAS App Factory



Data Scientist

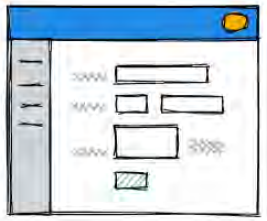
(Viya user, SAS programmer, data literate analyst)



React UI developer

(or Angular or Vue or Svelte or whatever)

What an App Needs ?



User Interface

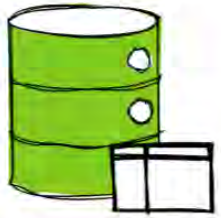
Looks nice

Interfaces with User

Auth provider

Authenticates users

Manages authorization



Database

Manages state and concurrency

Persists workflow and truth

Compute

Handles complex calculations

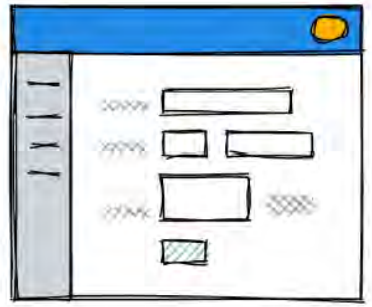
For SAS, primary source of value

File server

Lets users save files, content

Acts as staging area for app

SAS v9 app



Flex / Dojo

SASSServer12_1

SASLogon

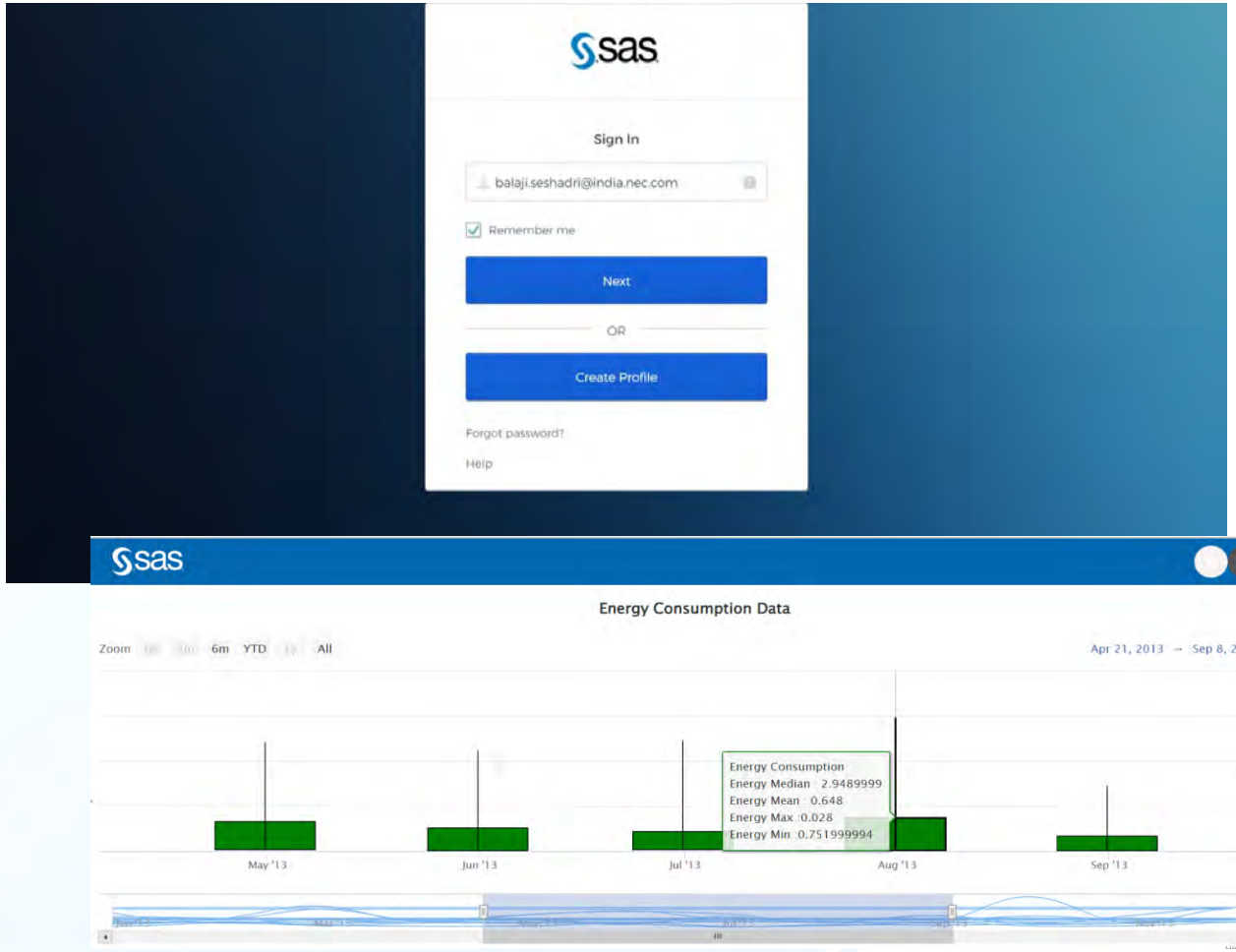
SharedServices

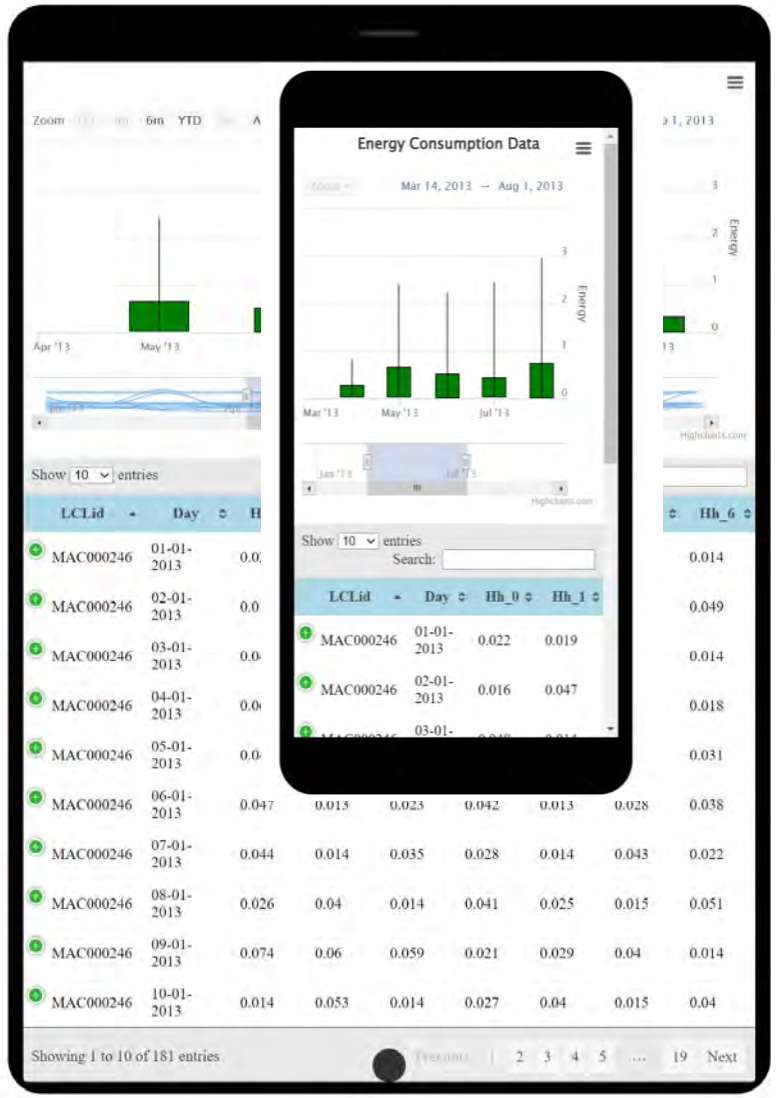
SASApp

~/.sasuser

Baremetal / OS

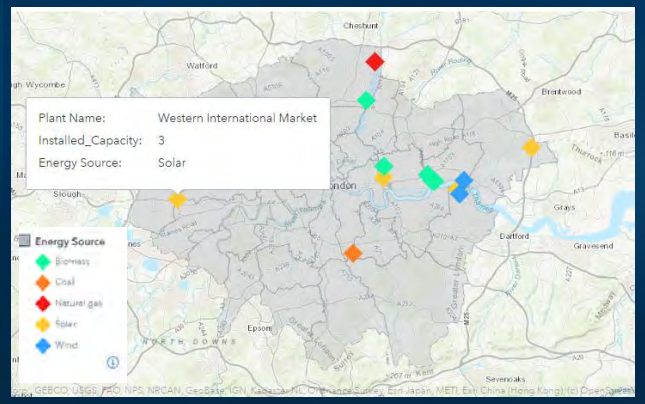
Engaging the Customer: Useful Real-time Data Across the Digital Channel



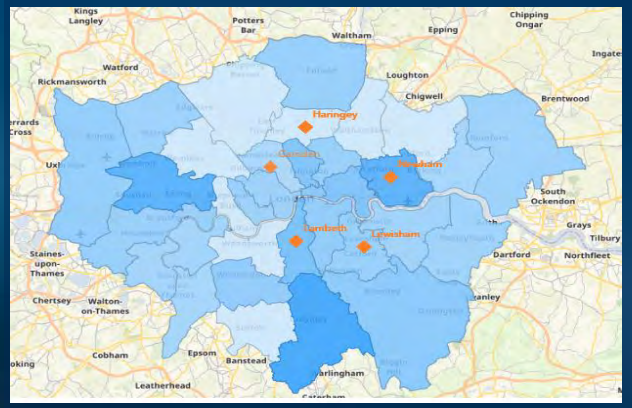


Utility Comp X

Operational Insight



Energy Sources



Operational Alert

NATURAL GAS	COAL	WIND	SOLAR
XX	XX	X	X

2	1	1	1
Temp Threshold	Magnetic Temper	Arc Detection	XXXX

31mph 19mph

High Low

AIR DENSITY

1.293 kg m–3

22°C 21°C

High Low

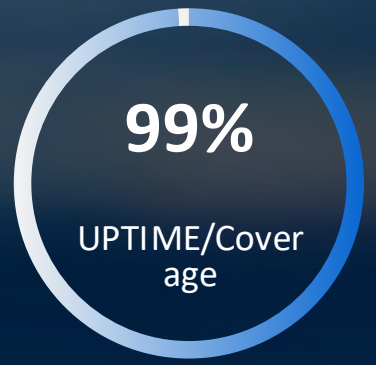
TILT

XXXX

Orientation

XXXX

Solar Wind Net Fossil Generation



Impact

Bringing it all together!

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Unlocking the Benefits!

THANK YOU!!

himanshu.shekhar@necam.com
+1917-525-7164

Appendix

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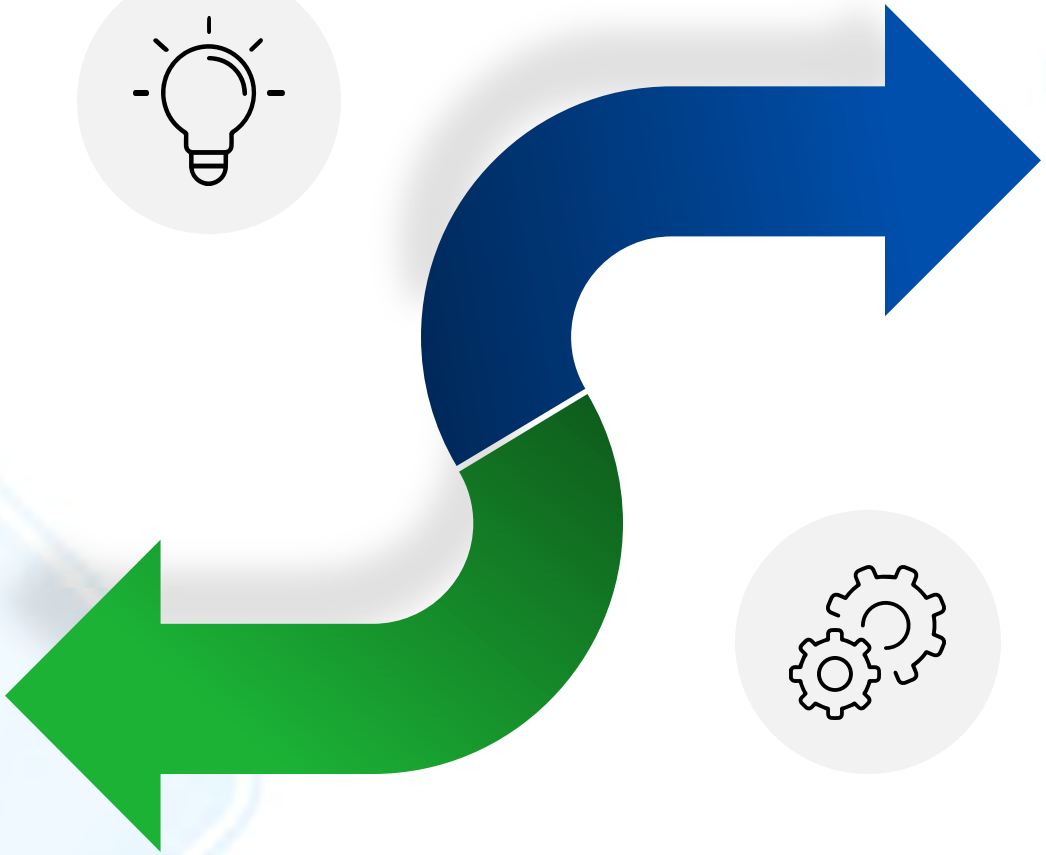
What NEXT

IMPROVEMENT

Improve the Forecasting & Disaggregation Algorithm



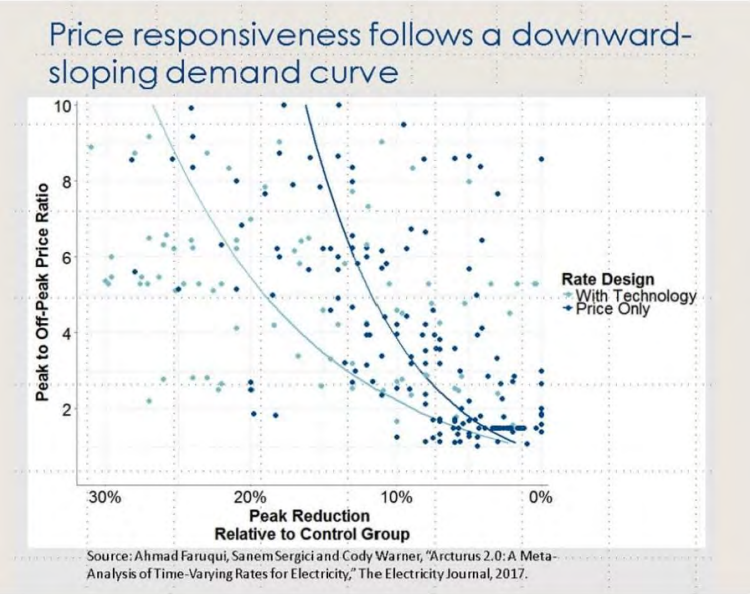
INTEGRATION

Take it and build it in a real-time data setting.

Why? Analyze the Data

Studies* have shown

- Time of Use (TOU) customers reduce their summer peak demand in the range of 10% to 14% and experienced bill savings up to 10%.
- Low and moderate income (LMI) customers responded to the price signals similarly to other customers.
- Two-thirds of the customers who chose to participate in the pilot would have seen a decrease in their bills even without changing their behavior.



- *If the TOU rate is well-designed, LMI customers who do not respond should be revenue neutral. The Xcel rate was designed so that customers who do not use it pay the same as they would have on their previous rate." Low and moderate income (LMI) customers responded to the price signals similarly to other customers.*

The bigger the peak to off-peak price ratio#, the bigger the peak demand reduction

TOU rates save customers money and reduce utilities' peak demand

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* Results from studies by Faruqui

#we can build models on SAS to price that

sas

Floating Texts

the threat of rolling blackouts for years to come.

California risks falling short during periods of peak demand, like the one it experienced on Sept. 6.

relying heavily on energy from other providers — the cavalry rushing over a distant hill.

climate change makes extreme weather events more frequent,

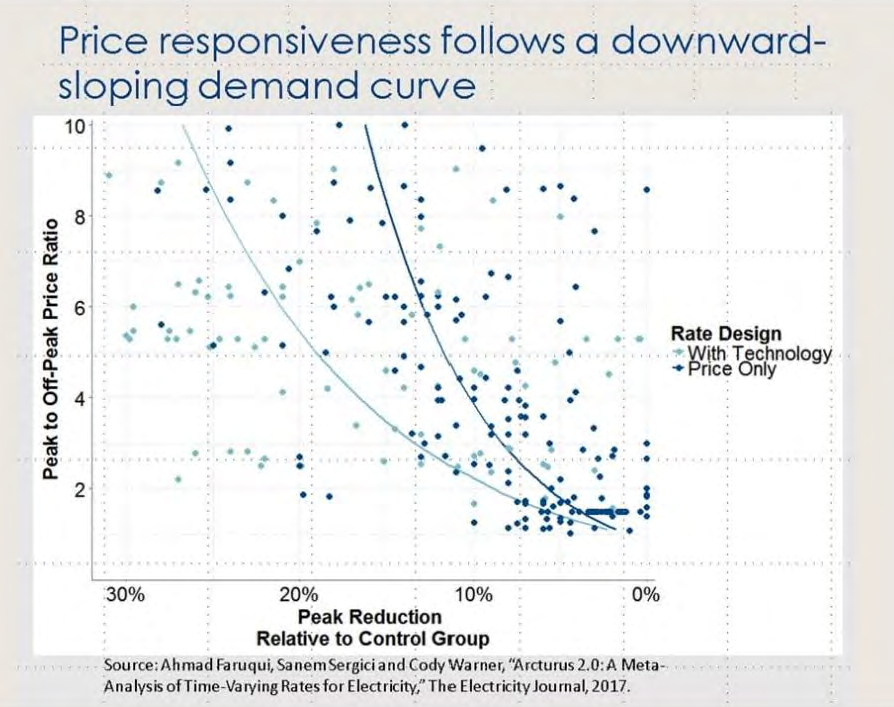
“Weather volatility wreaks havoc on energy systems,

power plant owners, energy traders who buy and sell excess power not committed in contracts,

as an increasing share of electricity is coming from solar and wind farms that produce power only when the sun shines or the wind blows, making the available supply more variable over a 24-hour period.

The bigger the peak to off-peak price ratio, the bigger the peak demand reduction

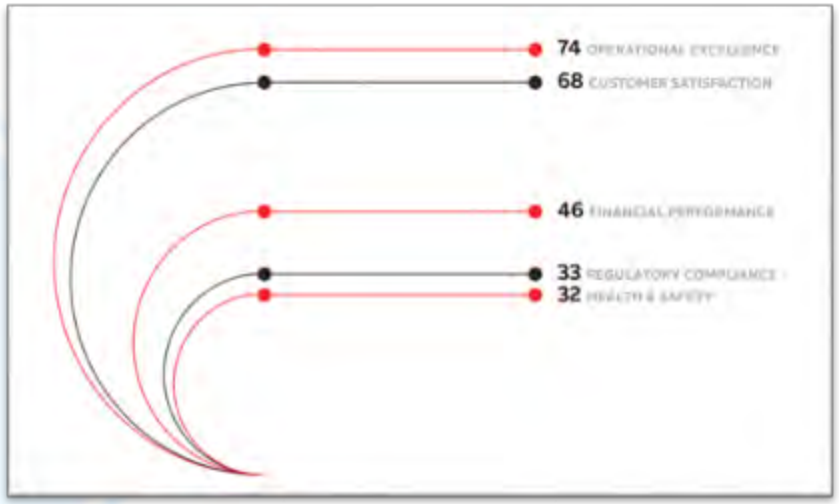
"If the TOU rate is well-designed, LMI customers who do not respond should be revenue neutral. The Xcel rate was designed so that customers who do not use it pay the same as they would have on their previous rate."



Utility Industry : Data Collected & Focus Area

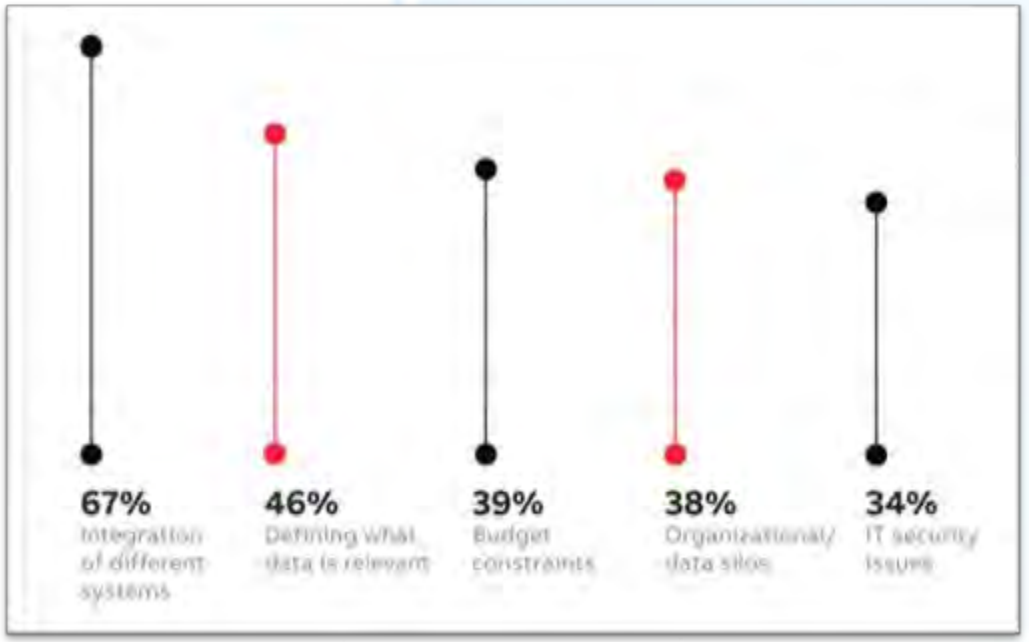
- AMI Meters is the most frequently collected data
  - Data Collection is not the challenge
  - Data Managed, Analyzed & Viewed is the challenge

- Top area for analytics performance is
  - Operational Excellence
  - Customer Satisfaction



Utility Industry Challenges

- Data Assets in Silos (Discovery)
- Hidden Across Hybrid Infrastructure (Cloud / on Prem)
- Data Relevance (Curation)
- Data Security Issues (Governance)



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