



Introduction to Utility Analytics

Data Science After Dark

Feb 18, 2020


The Energy Authority

- Serves **public utilities** nationwide for trading and analytics.
- Analytics team provides various **forecasting and analysis** services.



Myself...

- Eina Ooka
 - Senior Quantitative Analyst
 - 8.5 years at TEA



Eina Ooka
Senior Quantitative Analyst
Seattle, Washington

A quantitative analyst and a practitioner specialized in stochastic modeling and forecast development. Utilizing machine-learning methodologies together with statistical methods to better forecast energy markets.

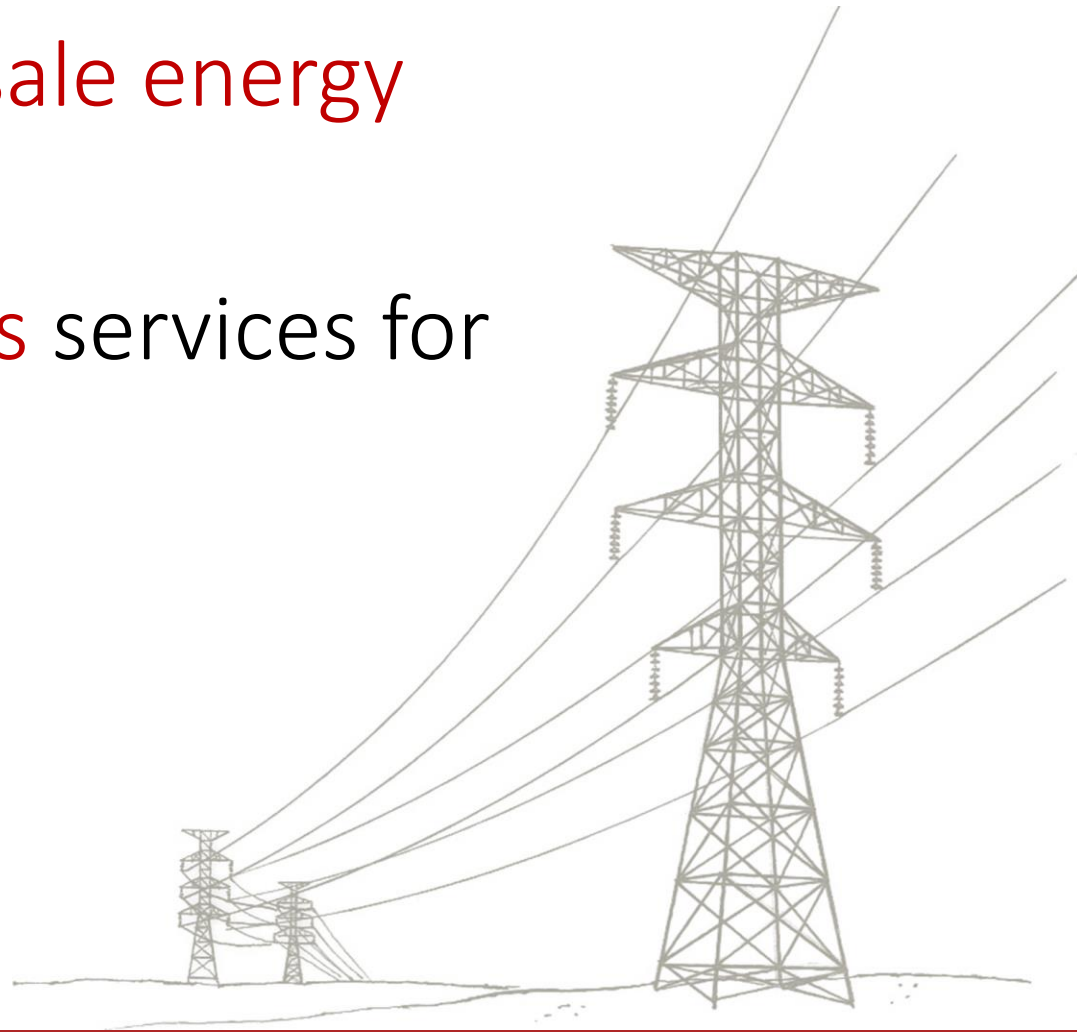
~ Area of Expertise ~
 Multivariate Stochastic Modeling: GLM, Gaussian process, PCA, copula, hierarchical modeling.
 Time Series Analysis: ARIMA, heteroscedastic models, outlier detection, seasonal decomposition.
 Machine Learning: regularization, feature selection, RandomForest, Neural Network.
 Deep Learning: time series regression using LSTM, GRU, Conv1dNN.
 Cost-Production Model: AURORAxmp, Planning&Risk.
 Coding: R, Shiny, (Python)

~ Eina's GitHub page ~
<https://github.com/einaooka> (Conference presentations available).

<https://www.linkedin.com/in/einaooka/>

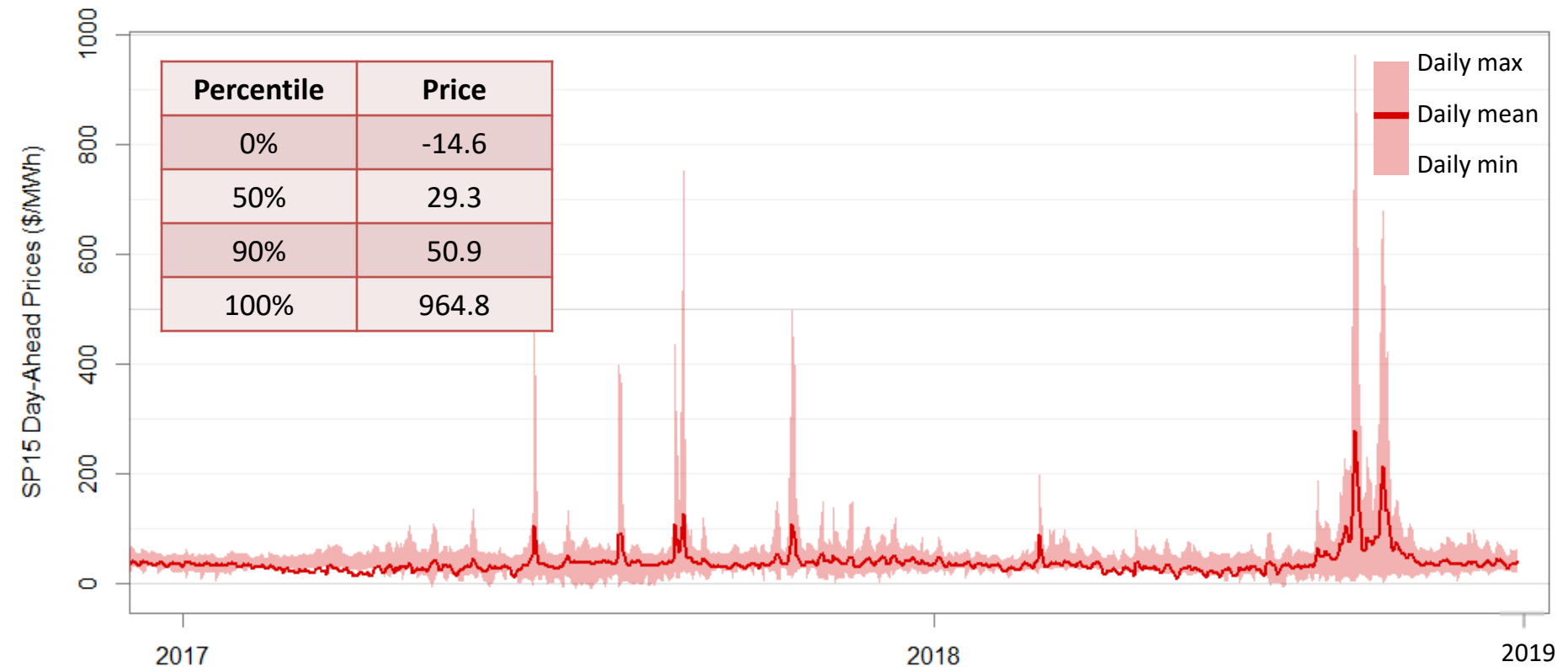
Agenda

- ✓ What are **wholesale energy markets**?
- ✓ Types of **analytics** services for power utilities.



Wholesale Energy Markets

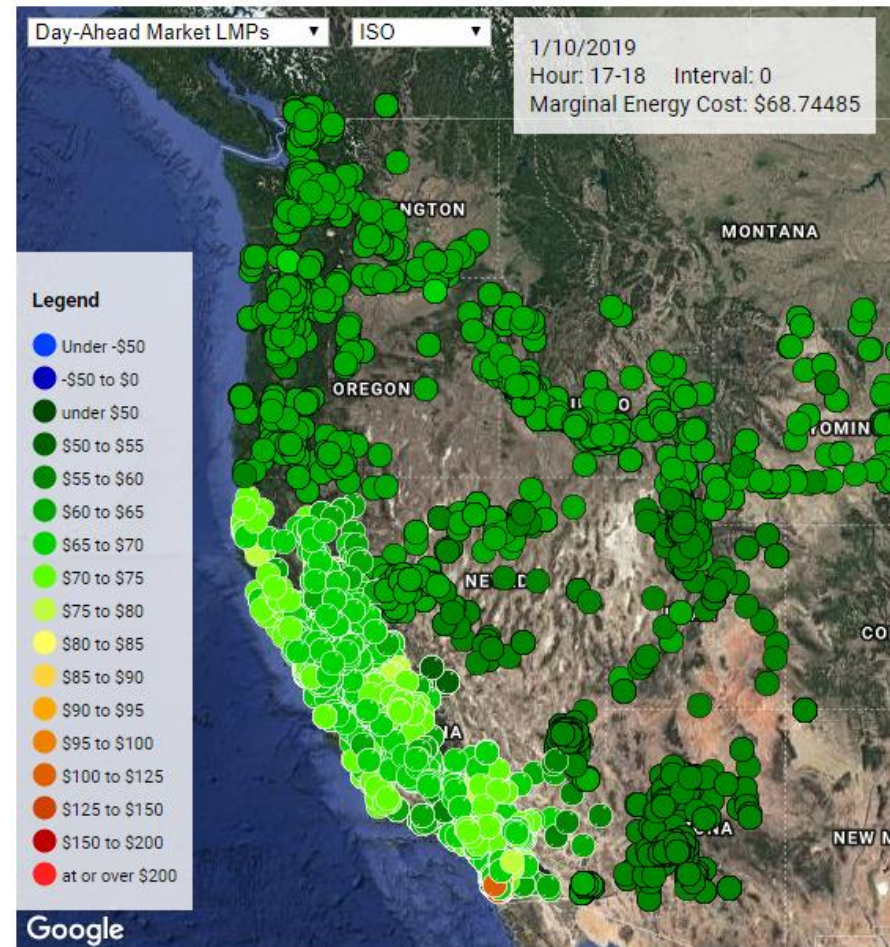
Wholesale Energy Price



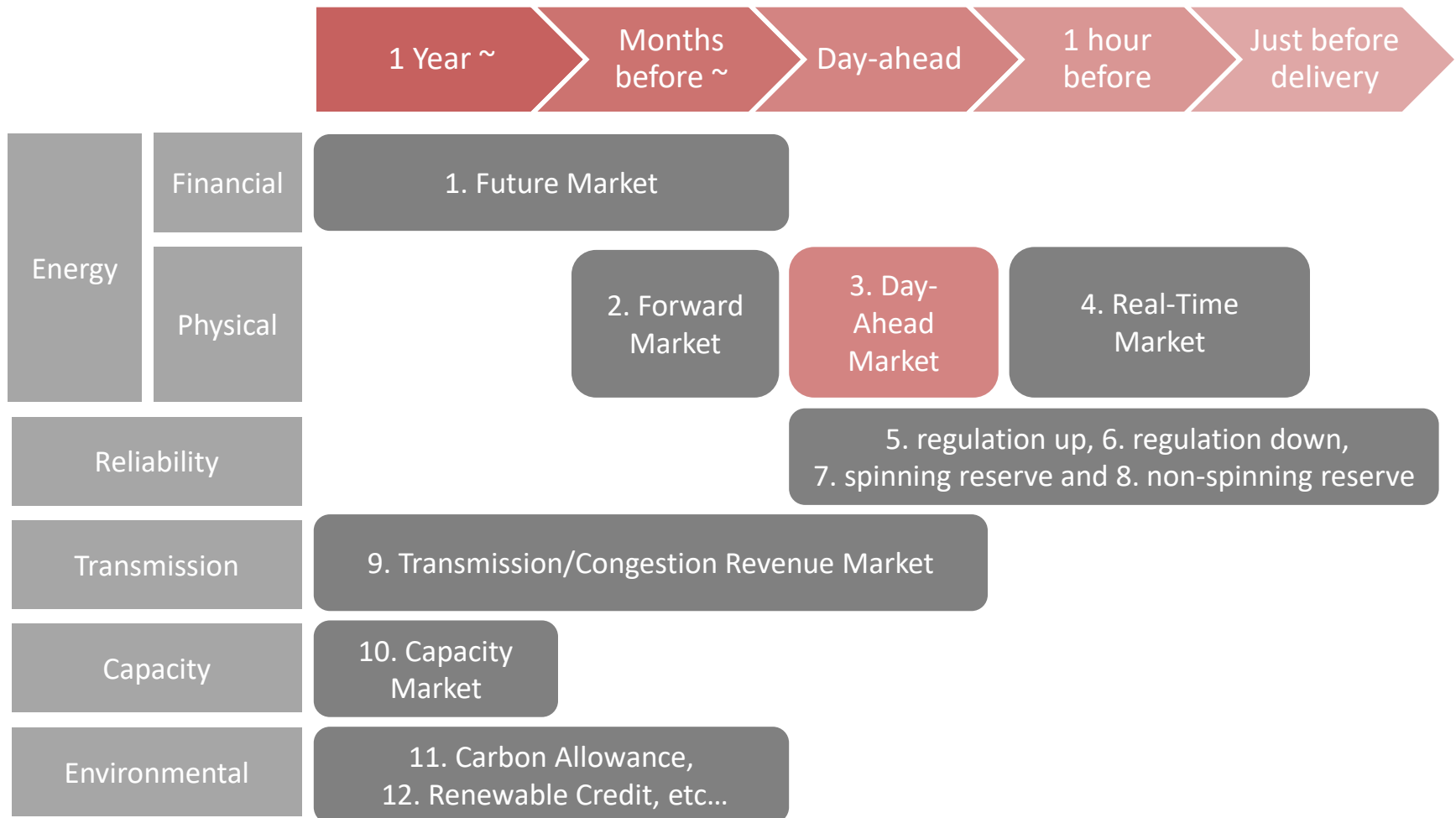
- Energy can't be stored → Volatility.

How many price nodes?

- Answer: thousands.
- Some markets are organized in a way that it generates a price at every resource and load node.
- This design incentivizes market participants to act in accordance with the benefit of the entire grid.



Wholesale Energy Markets



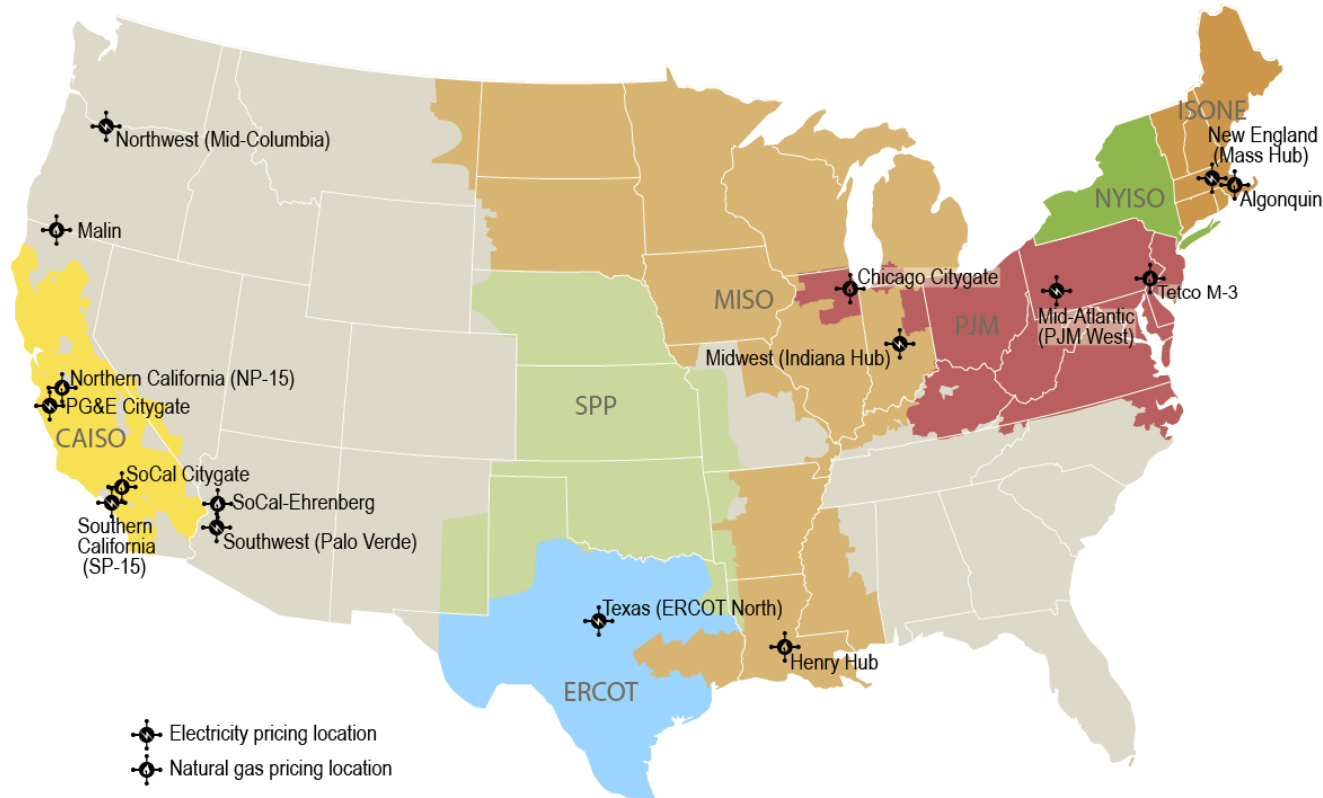
ERCOT Texas' Energy-Only Market

- How do we encourage resource build-out for reliability?
 - Capacity Market
 - Make the power prices spike enough.



Markets & Market Designs

Selected price hub locations for wholesale electricity and natural gas reported by Intercontinental Exchange



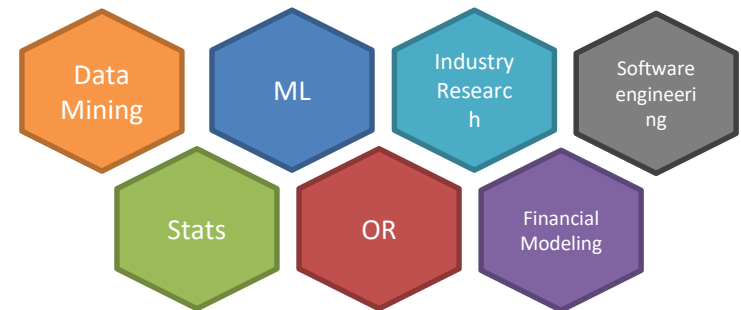
Note: Colored areas denote Regional Transmission Organizations (RTO)/Independent System Operators (ISO)
Source: U.S. Energy Information Administration based on Ventyx Energy Velocity Suite

Utility Analytics

WHOLESALE & RETAIL ANALYTICS

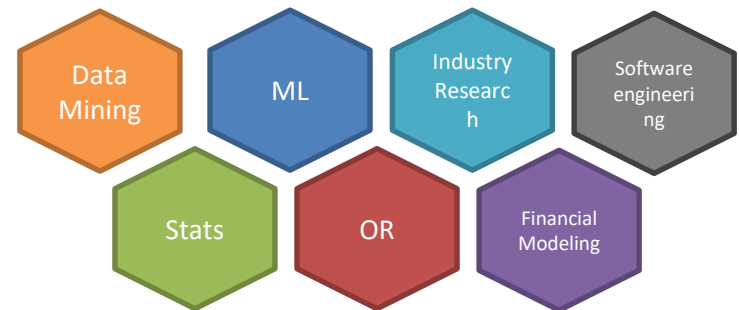
Wholesale Analytics

- Market Analysis
 - what's the impact of the wind generation in a region?
- Forecasting
 - Power prices
 - Load
 - Generation
 - Thermal
 - Variable & Hydro
- Optimization
 - Resource dispatch
 - How should I run my hydro generator for the next 2 weeks?
 - When should I schedule maintenance outages?
 - Bid strategies
 - Transmission right auctions
 - How much should I bid on which transmission lines?
- Risk Management
 - Stochastic portfolio modeling
 - Hedging strategies
 - Dynamic delta hedging
- Long Term Resource Planning
 - Investment and divestitures
 - What type of resources should we build at where?



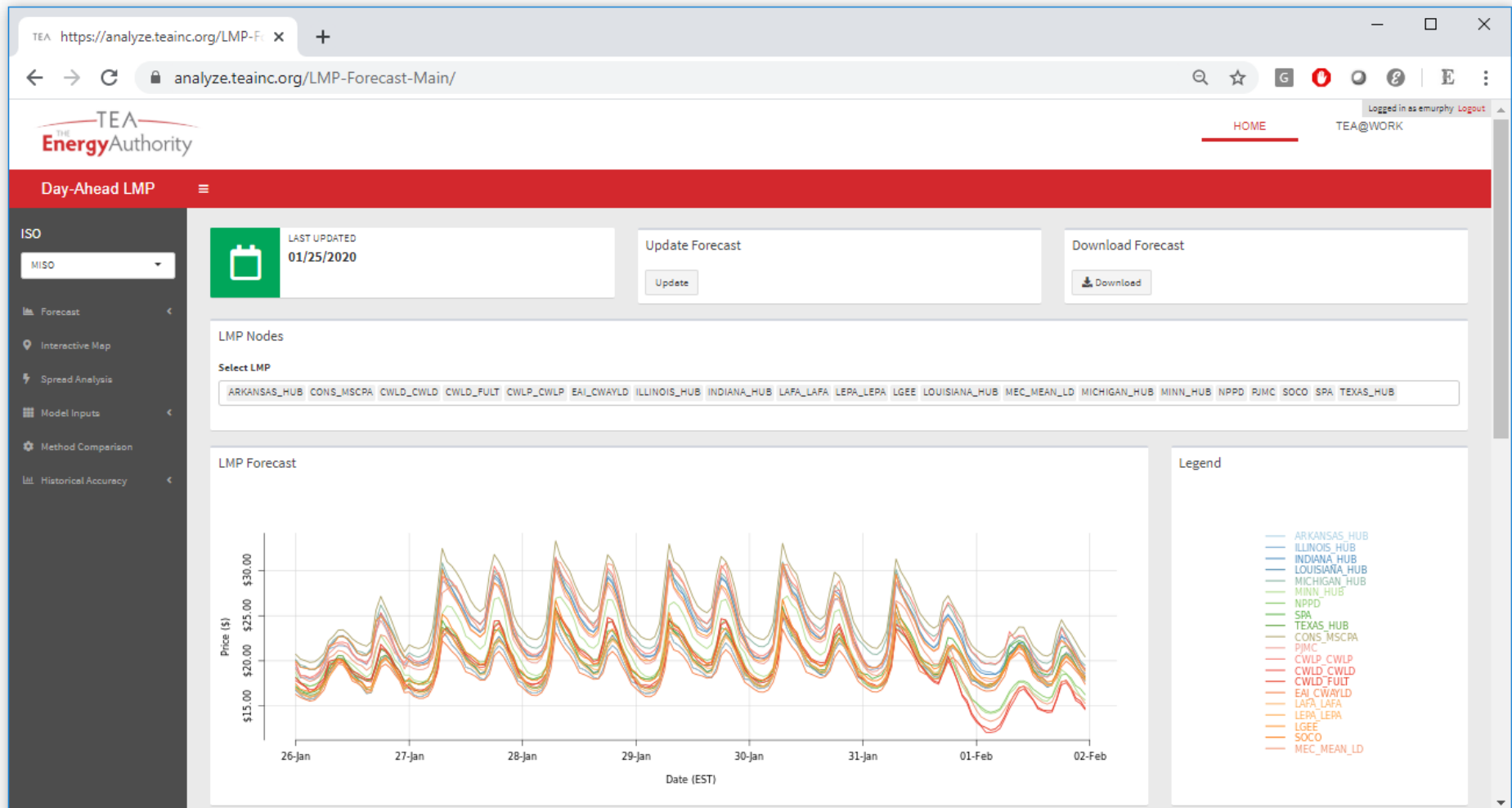
Retail Analytics

- Smart meter data analysis
- Distribution system analysis & optimization
- Outage prediction and management
- Retail rate analysis
- Customer behavior analysis and communication strategy



Case Study 1

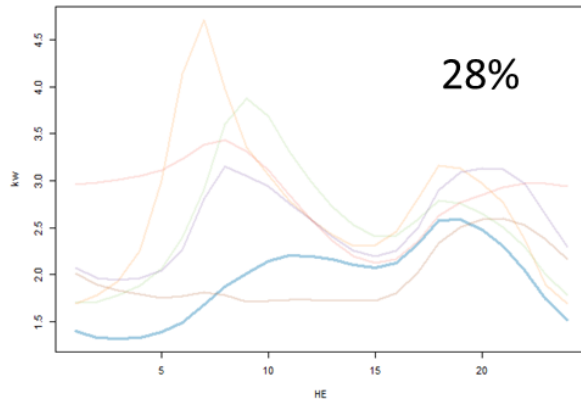
Power Price Forecasting



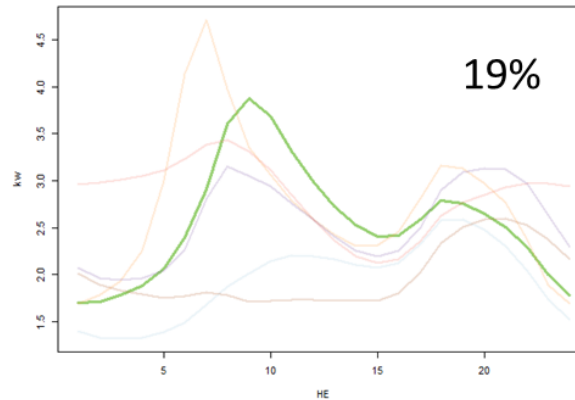
Case Study 2

Customer Personalization

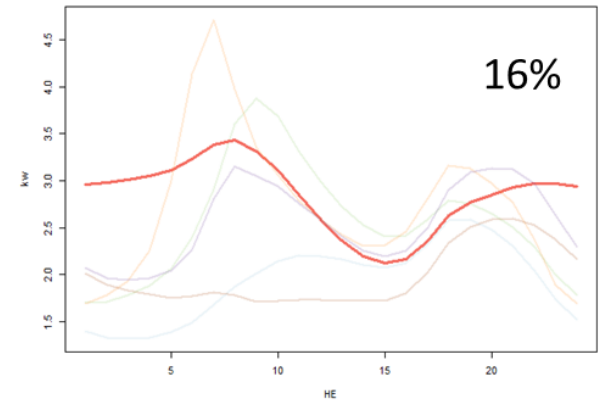
Evening Peakers



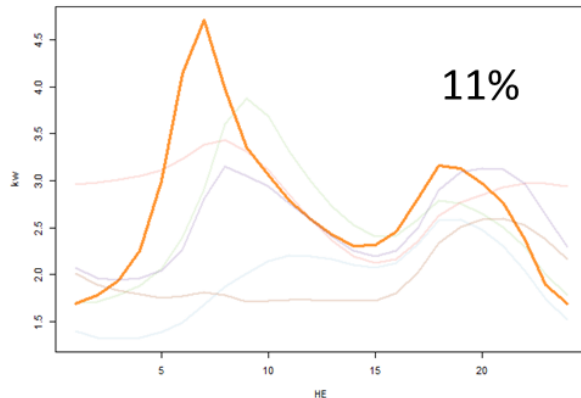
Late Risers



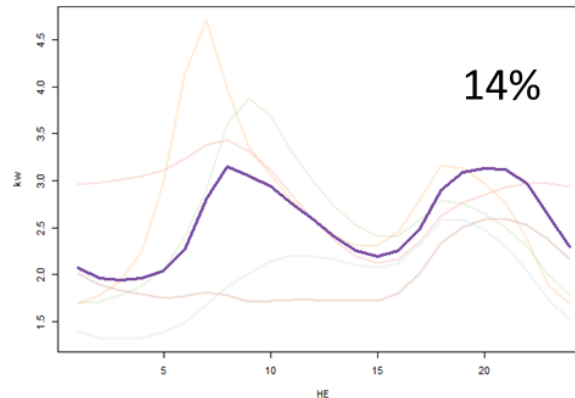
Warm at Night



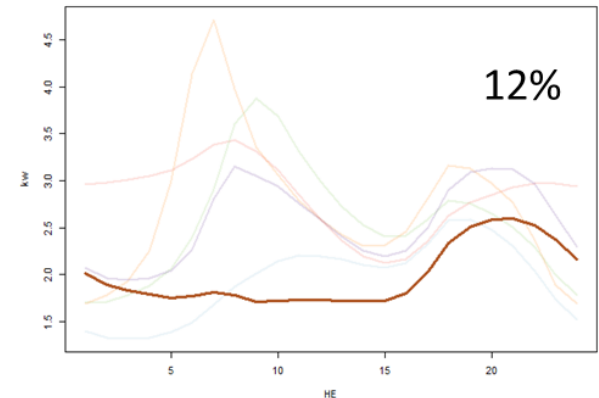
9 to 5'ers



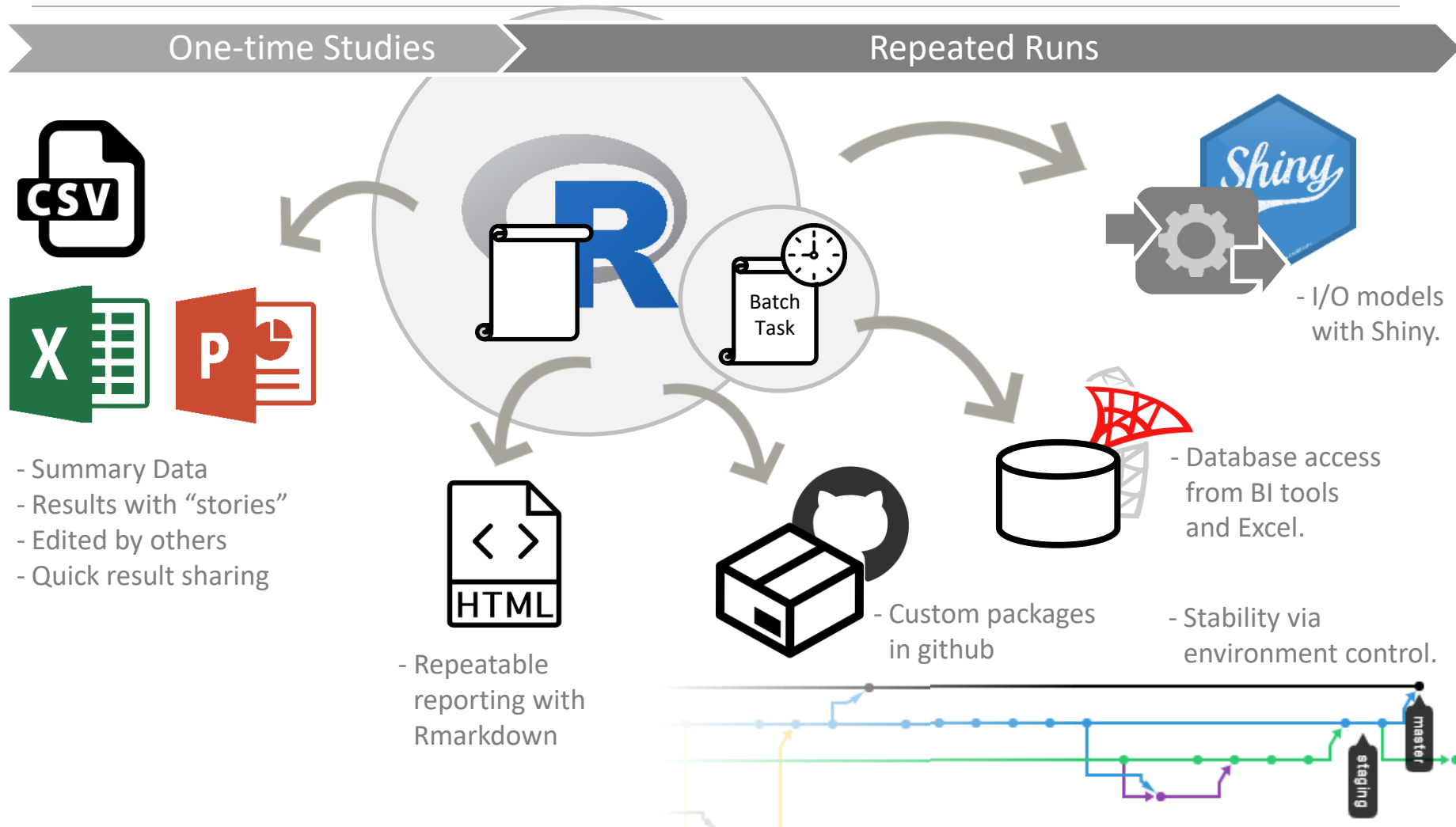
Twin Peaks



Night Owls



Delivery Methods



Thank you!

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