



# ORFEUS – A Platform for Stochastic Modeling to Assess Operational Risk in Power Systems

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Loudon Energy Analytics / Princeton University

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# Rana Mukerji: Founder and President

•Mr. Mukerji founded Loudon Energy Analytics in 2024 to provide cutting-edge electricity market analytics and advisory services to help companies succeed in a rapidly changing electricity market landscape where traditional asset classes are giving way to renewable and distributed generating resources. Loudon Energy Analytics aspires to introduce advanced modeling techniques to electric utilities, asset owners in wholesale electricity markets and financial institutions for the transition to a decarbonized sustainable energy system.

•Prior to founding Loudon Energy Analytics, Mr. Mukerji was Senior Vice President of Market Structures for the New York Independent System Operator (NYISO) for more than 18 years from 2006 to 2024. As the Head of the Market Structures function of the New York Independent System Operator (NYISO) Mr. Mukerji laid the foundation for the next generation of electric markets by implementing the building blocks for the market structure needed to transition to a green and sustainable energy grid.

•Before joining the NYISO, Mr. Mukerji spent seven years with ABB in Raleigh, NC and Zurich, Switzerland where he served as Vice President and General Manager and Group Senior Vice President. At ABB, Mr. Mukerji had global responsibility for ABB's Power Technology Asset Management and Consulting services. He also led ABB's \$500 million global Utility Partner Business, overseeing 3,000 employees in 35 countries.

•Mr. Mukerji was with General Electric in Schenectady, N.Y. from 1990 to 1999 where he was General Manager of GE's Power Systems Energy Consulting business. At GE, Mr. Mukerji helped establish the GE-MAPS software as an industry standard tool for evaluating competitive power markets.

•He graduated from the Indian Institute of Technology with a Bachelor's degree in Electrical Engineering. He earned a Master of Engineering degree in Electric Power Engineering and a Masters of Business Administration from Rensselaer Polytechnic Institute. He is a graduate of Harvard Business School's Advanced Management Program.

•He was elevated to a Fellow of Institute of Electrical and Electronic Engineers for "leadership in the design and implementation of wholesale electricity markets"





# DOE ARPA-E Perform Project

- The Perform Project, launched in 2019 under Kory Hedman's leadership, develops systems that represent the relative delivery risk of each asset and balance the collective risk of all grid assets
- Princeton University developed the ORFEUS engine under DOE's Perform Project, which Loudon Energy Analytics has obtained an exclusive license to commercialize



# The ORFEUS Software Pipeline

Statistical  
Analysis

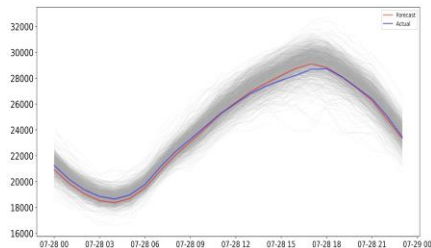
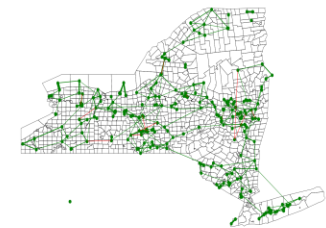
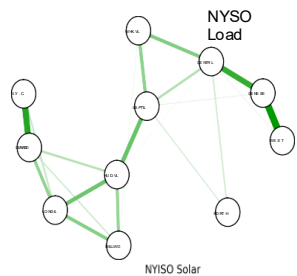
Scenario  
Generation

Unit Commit-  
ment & ED

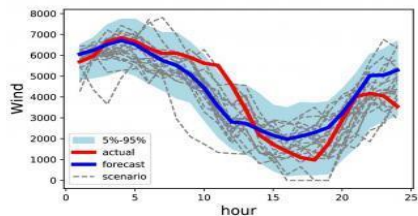
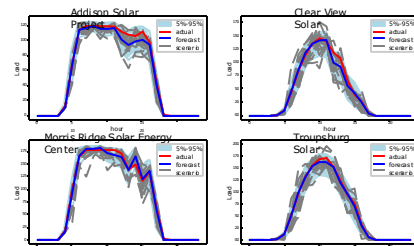
Risk Allocations  
& Cost Curves

Financial  
Products

# Market Emulator - Scenario Generation



	Addison Solar Project	Clear View Solar	Morris Ridge Solar Energy Center	Troupsburg Solar
Addison Solar Project	1.00000	0.340813	0.07082	0.347281
Clear View Solar	0.340813	1.00000	0.040573	0.070828
Morris Ridge Solar Energy Center	0.07082	0.040573	1.00000	0.008614
Troupsburg Solar	0.347281	0.070828	0.008614	1.00000



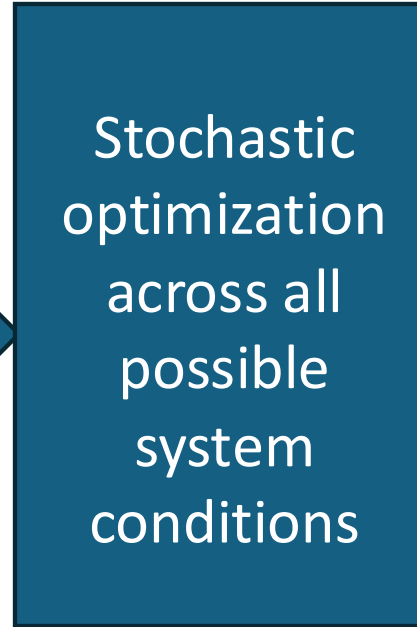
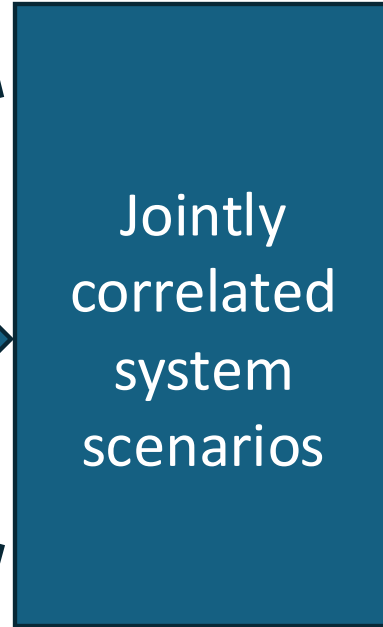
The Market Emulator module will capture the temporal and spatial correlations for load, solar and wind generation to create a set of realistic system conditions using Monte Carlo methods.

# Market Emulator – Stochastic Optimization

Correlated  
load  
scenarios

Correlated  
solar  
scenarios

Correlated  
wind  
scenarios



Optimal Day-  
Ahead  
Storage  
Schedule

Nodal Day-  
Ahead LMP  
Forecasts

# ORFEUS - Applications

- Stochastic scheduling of generation and storage assets to minimize tail risk outages
- Optimizing micro-grid interactions with ISO/RTO run wholesale markets
- Connecting data centers with economic and grid reliability considerations





LOUDON ENERGY  
ANALYTICS

# ORFEUS: A Market Evaluator for the NYPA AGILE Lab

- Expanding AGILE's Digital Twin to cover economic and market aspects of New York's power grid.
- Developing multi-attribute optimization paradigm for battery assets evaluating fundamental tradeoffs between system risk, production cost, and environmental performance





# Loudon Energy Analytics

**Providing cutting edge electricity market analytics for a decarbonized power grid.**

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