

# Saamrat Kasina, Ph.D.

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## **ENERGY AND ENVIRONMENTAL ECONOMICS, INC.**

Boston, MA

*Senior Managing Consultant*

Dr. Saamrat Kasina focuses primarily on issues related to system planning, market design, and resilience. He also conducts sophisticated benefit-cost analysis at the distribution level, supporting utility initiatives related to grid modernization and distributed energy resources (DER). His work includes leading the writing of a market assessment report for state of Maine, supporting a Northeastern utility's grid modernization filing, advising several utilities on joining the Western Energy Imbalance Market, and developing Integrated Resource Planning models for Community Choice Aggregators (CCAs) in California. Dr. Kasina joined E3 upon receiving both his Ph.D. in Environmental Engineering and his Master of Science in Engineering from Johns Hopkins University. Select projects at E3 include:

- Led a resilience assessment study quantifying system performance under extreme weather assessment for PNM.
- Optimization lead for ARPAE-E3 project on advanced methods to mitigate system-wide risks from variability and forecast errors.
- 3<sup>rd</sup> party assessor of PG&E's wildfire risk analysis models.
- Led the assessment and drafting of the Renewable Market Assessment report for the State of Maine. Study included a detailed assessment of the roadmap for the State including addressing key equity issues.
- Developed a grid modernization roadmap to support National Grid's Advanced Metering Functionality (AMF) and Grid Modernization Plan (GMP) filings in Rhode Island. Led benefit/cost analysis of AMF and GMP proposals.
- Co-authored a chapter on cost-effectiveness of Gridmod investments that is part of DOE's gridmod handbook.
- Developed Integrated Resource Planning models for California-based CCAs to support their strategic planning processes.
- Worked with a team of developers and utility personnel to investigate the economic benefits of flexibly operating solar power plants: allowing them to dispatch on a sub-hourly basis and provide grid reliability services. The study received a "Top Innovator 2018" award from *Public Utilities Fortnightly*.
- Led studies for several utilities to quantify the prospective economic benefits of joining the Western Energy Imbalance Market (EIM)
- Provided AURORA modeling support to assist a renewable energy developer in evaluating the future of California's energy market
- Assisted in asset evaluation for a power producer in the Western U.S. and analyzed the impacts of regulations on their market position
- As an intern, helped develop a set of long-term investment decisions to support the islands of Hawaii in achieving their goal of reaching 100 percent renewable energy using RESOLVE, E3's resource planning model

- As an intern, identified current market and planning practices in the Indian electricity sector as part of an advisory report to state electricity regulators

## **JOHNS HOPKINS UNIVERSITY – Doctoral Program**

Baltimore, MD

*Select projects*

2012 – 2017

### *Non-cooperative multi-regional transmission and generation planning*

Sep 2015 – July 2017

- Modeled strategic interaction between intra-regional stakeholders in transmission and generation investment models as Mathematical Programs with Equilibrium Constraints (MPECs)
- Quantified the value of cooperation in planning to adjacent ISOs by solving Equilibrium Problems with Equilibrium Constraints (EPECs)

### *Unit commitment approximations for capacity investment models*

July 2013 – July 2017

- Developed a tight linear approximation of the Unit Commitment MIP model
- Bridged long-term transmission planning and short-term operations using the UC approximation

### *Benefits of additional decision stages in Multi-Stage Stochastic Transmission planning*

2014 – 2015

- Developed a multi-stage, stochastic transmission and generation co-optimization investment model to quantify the benefits of additional decision stages
- Applied mathematical decomposition techniques to solve this large-scale Western Electricity Coordinating Council (WECC) model

## Education

Johns Hopkins University

Baltimore, MD

*Ph.D., Environmental Health and Engineering*

2017

Johns Hopkins University

Baltimore, MD

*M.S.E., Environmental Economics and Management*

2011

Indian Institute of Technology

Guwahati, India

*Bachelor of Technology, Biotechnology*

2010

## Selected Presentations

1. Kasina, S., “Non-cooperative Multi-Regional Transmission Planning,” Nashville, Tenn. *INFORMS*. November 2016.
2. Kasina, S., “Unit Commitment Approximations for Resource Planning,” University of Washington, Seattle, Wash. *Seminar for the Next Generation of Researchers in Power Systems*. September 2015.

## Publications and Reports

1. Kasina, S., B. Wheatle, C. Duff; E. Mettetal, L. Alagappan; N. Schlag, B. Woods, and E. A. Stanton. 2021. State of Maine Renewable Energy Goals Market Assessment. *Augusta: Governor's Energy Office*.
2. Kasina, S., B.F. Hobbs. "An Equilibrium Model for Non-cooperative Multiregional Transmission Planning." *European Journal of Operations Research*.
3. Sun, Y., Nelson, J.H., Stevens, J.C., Au, A.H., Venugopal, V., Gulian, C., Kasina, S., O'Neill, P., Yuan, M. and Olson, A., 2022. Machine learning derived dynamic operating reserve requirements in high-renewable power systems. *Journal of Renewable and Sustainable Energy*, 14(3), p.036303.
4. Nelson, J., S. Kasina, J. Stevens, J. Moore, A. Olson, M. Morjaria, J. Smolenski, J. Aponte. "Investigating the Economic Value of Flexible Solar Power Plant Operation," Energy and Environmental Economics, Inc. (E3), October 2018. (White paper.)
5. Hobbs, B. F., S. Kasina, Q. Xu, S. W. Park, J. Ouyang, J. Ho, P. Donohoo-Vallett. "What is the Benefit of Including Uncertainty in Transmission Planning? A WECC Case Study." In Tung X. Bui & Ralph H. Sprague Jr., Eds., "HICSS," IEEE Computer Society, pp. 2364-2371. 2016.
6. Ho, J., B. F. Hobbs, P. Donohoo-Valett, Q. Xu, S. Kasina, S. Park, Y. Ouyang. "Planning Transmission for Uncertainty: Applications and Lessons with the Western Interconnection." Report prepared for the Western Electricity Coordinating Council (WECC). July 2015.
7. Munoz, F. D., B. F. Hobbs, J. L. Ho, S. Kasina. "An Engineering-Economic Approach to Transmission Planning Under Market and Regulatory Uncertainties: WECC Case Study." *IEEE Transactions on Power Systems*, Vol. 29, No. 1, pp. 307-317. January 2014.
8. Munoz, F. D., B. F. Hobbs, S. Kasina. "Efficient proactive transmission planning to accommodate renewables." *IEEE 2012 Power and Energy Society General Meeting*, pp. 1, 7, 22-26. July 2012.