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ENERGY AND ENVIRONMENTAL ECONOMICS, INC.

San Francisco, CA

Senior Managing Consultant

Since joining E3 in 2019, Adrian works primarily in E3's resource planning group, where he helps clients achieve deep decarbonization goals while maintaining reliability using E3's RECAP model. In addition, Mr. Au also supports the asset valuation and market forecasting group in resource procurement trends, capacity market policy, and resource capacity accreditation. Adrian's recent projects include performing reliability studies across the Western US, including exploring the benefits of a regional resource adequacy program in the Pacific Northwest, studying the near- and mid-term capacity need in the Desert Southwest, and studying the operational benefits of machine learning-derived operating reserves for the California Independent System Operator (CAISO). Other works also include capacity market policy support for Independent System Operator (ISOs) and energy and capacity price forecasting for major developers to inform resource investments and contracts.

Mr. Au joined E3 upon receiving his B.S. and M.S.E in Mechanical Engineering from Johns Hopkins University, where his graduate research focused on the optimal capacity expansion and resiliency in the natural gas and electricity transmission nexus under various energy resource and policy scenarios and optimal material selection photovoltaic cell design.

Some of Adrian's recent projects include:

Hawaiian Electric, Resource Adequacy Workplan and Implementation (2023-Ongoing).

Hawaiian Electric retained E3 to independently evaluate and recommend an appropriate resource adequacy framework for Hawaiian Electric's future Integrated Grid Planning process. Adrian managed and led a study's technical analysis and stakeholder engagements to explore the benefits, tradeoffs, implementation complexities of three different reliability frameworks for Hawaiian Electric's Integrated Grid Planning process. Ultimately, E3 recommended the Planning Reserve Margin and Effective Load Carrying Capability framework to align with best practices across the industry. This ongoing engagement will continue to engage stakeholders and community members to help Hawaiian Electric establish a reliability target that balances cost, reliability, and equity.

Resource Adequacy and Resource Capacity Value Forecasting (2022-Ongoing).

Adrian manages E3's Resource Adequacy and Resource Capacity Value Forecasting group to develop a nation-wide view of grid reliability and resource capacity value. Using E3's loss-of-load probability model, RECAP, Adrian's work focuses on forecasting system reliability under the changing dynamics of resources mixes and the growing adoption of new electrified loads, like building electrification and data centers.

New York Independent System Operator, Capacity Market Accreditation Implementation Support (2022).

Like many capacity markets in the US, market designs are changing to adapt to the changing resource mixes. The New York Independent System Operator (NYISO) retained E3 to perform analysis to support a

transition and implementation of a new capacity accreditation methodology. Adrian managed the engagement to show tractable and simplified approaches to implementing NYISO's MRI and Marginal ELCC methodology in their market design.

Consortium of Utilities in the Desert Southwest, *Resource Adequacy in the Desert Southwest (2022)*.

In the aftermath of recent blackouts in California and Texas, a group of utilities in the Southwest retained E3 to provide an independent assessment of the resource adequacy situation in the Desert Southwest region. Adrian led the technical analysis using E3's loss-of-load probability model, RECAP, to explore the region's near- and mid-term reliability need under different climate, resource, and load uncertainties.

ARPA-E – DOE, *Deploying E3's RESERVE Tool to Enable Advanced Operation of Clean Grids (2021)*.

E3 developed the RESERVE modeling tool designed for system operators to dynamically calculate the need for operating reserves to mitigate system-wide risks from variability and forecast errors. Adrian supported RESERVE's python code development and quantified RESERVE-generated operating reserve's benefits on the CAISO footprint, using PLEXOS to assess the system's reduced production cost, reduced emissions, and improved operational reliability.

Rye Development and National Grid, *Long-duration Storage's Role in the Pacific Northwest (2021)*

With increasing electricity demand and coal retirements in the Pacific Northwest, E3 found the region faces a near-term capacity shortage of up to 7,000 megawatts (MW) by 2025 and up to 10,000 MW by 2030. In this study, Adrian quantified long-duration storage's value to the region's capacity position, its economic competitiveness, and its offtake opportunities for storage.

CITY OF BALTIMORE, OFFICE OF SUSTAINABLE ENERGY

Energy Engineering Intern

Baltimore, MD

June 2016 – July 2019

- Developed a demand response program to help reduce time-of-use rates for Baltimore City
- Identified energy savings through energy audits, heat transfer and thermodynamic analysis, and building load analysis
- Analyzed microgrid potential in the city's transport hubs to encourage more renewables and energy resilience

THE JOHNS HOPKINS UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

Graduate Research Assistant

Baltimore, MD

September 2018 – July 2019

- Developed a capacity expansion model in GAMS for the North American grid for the Siddiqui lab
- Investigated the resiliency of the natural gas and electricity transmission network of North America under resource supply shocks and renewable energy policy scenarios

THE JOHNS HOPKINS UNIVERSITY

OFFICE OF SUSTAINABILITY

Energy Analyst

Baltimore, MD

August 2016 – May 2018

- Implemented a combined heat and power plant and a heat recovery chiller in two university-owned facilities

- Provided technical and market expertise on thermodynamic and mechanical devices for energy-efficient HVAC technology

Education

The Johns Hopkins University Baltimore, MD
M.S.E., Mechanical Engineering (Energy and the Environment) 2019

The Johns Hopkins University Baltimore, MD
B.S., Mechanical Engineering 2018