

## IPUMSU

MICHIGAN STATE UNIVERSITY | INSTITUTE OF PUBLIC UTILITIES Regulatory Research and Education  
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# IPU Power Grid School 2020

May 4-6, 2020

*IPU Power Grid School covers the engineering and economics of the modernization and transformation of electric utility systems across the supply chain for power, from generation to transmission to distribution.*

## Program Agenda - preliminary

### Monday

- |                             |  |
|-----------------------------|--|
| 7:30-8:30 am                | <p><b>Registration and Breakfast</b><br/>A full breakfast is provided daily at 7:30 am in the Riverside Room (downstairs). Daily networking breaks are at 10:00 am and 3:00 pm.</p>  |
| 8:15-8:30 am<br>15 min.     | <p><b>Welcome and Introductions [Beecher]</b><br/>Kellogg Center – Lincoln Room (all sessions)</p>   |
| 8:30-10:00 am<br>90 min.    | <p><b>Fundamentals of Power Systems and Grid Infrastructure Part 1 [Mitra]</b><br/>Characteristics of electric power components and systems. Transmission and distribution systems; distributed resources and microgrids. Interconnected systems and balancing authorities. Interconnection standards and interoperability. Island systems. Line losses.</p>   |
| 10:30 -12:15 pm<br>105 min. | <p><b>Fundamentals of Electricity Markets, Economics, &amp; Regulation Part 1 [Rose]</b><br/>Wholesale market structure, operation, economics, and pricing. Role of private, nonprofit, and public power. Regulatory jurisdiction and coordination for generation, transmission, and distribution. FERC regulation and key rulings. Grid access and the Public Utility Regulatory Policies Act (PURPA). Climate change and carbon regulation.</p>                |
| 12:15-1:30 pm               | <p>Lunch at the Brody Hall Cafeteria (provided)</p>  |
| 1:30-3:00 pm<br>90 min.     | <p><b>Fundamentals of Electricity Markets, Economics, &amp; Regulation Part 2 [Rose]</b><br/>Energy, capacity, and ancillary services markets and allocation rules. Renewable Energy Certificates (RECs). Regional transmission organizations (RTOs). Aligning wholesale and retail markets. Market performance and oversight. Impact of changing marginal costs. Choice and default service. Path dependence and sunk costs. Market and policy uncertainty.</p> |
| 3:30-5:15 pm<br>105 min.    | <p><b>Fundamentals of Power Systems and Grid Infrastructure Part 2 [Mitra]</b><br/>Grid congestion, abnormalities, and vulnerabilities. NERC and other standards for quality, reliability, and security. Supply-side capacity, efficiency, and expansion. Grid modernization and intelligence (smart grids).</p>   |
| 5:30-6:30 pm                | <p><b>Networking Reception</b></p>   |

**Tuesday**

8:30-10:00 am **Grid Integration and Modeling for Distributed and Variable Resources [Mills]**  
90 min.

Engineering properties and efficiency of energy resources. Changing fuel mix. Relevance of scale. Value, costs, and benefits of renewable energy resources. Locational marginal pricing (LMP). Aggregation, bidding, and dispatching. Energy resource mapping tools. Modeling capacity expansion.

10:30-12:15 pm **Grid integration and Modeling (continued)**  
105 min.

12:15-1:30 pm Lunch at the Brody Hall Cafeteria (provided)

1:30-3:00 pm **Integrated Resource and Transmission Grid Planning [Bloom]**

90 min.

Modernizing integrated resource and transmission planning. Technological uncertainty and flexibility. Portfolio diversity and grid neutrality. Resource variability and spatial distribution. Challenges in forecasting supply and demand. Advanced tools, methods, and data for modeling and evaluation. Impact of developments in distribution on transmission. Regional planning and coordination. Findings of a national scale study of interconnection seams.

3:30-5:15 pm **Distribution System Optimization, Management, and Planning [Murray]**

105 min.

Increasing challenges for distribution systems. Beyond advanced metering infrastructure. Policy-driven metrics for innovation and optimization. Efficiency, flexibility, and cost criteria. Operating platforms. Distributed energy resource management systems (DERMS). Distribution management systems (DMS/ADMS). Volt-VAR Optimization. Investment and deferrals. Non-wires alternatives. Energy efficiency and demand response. Investing on both sides of the meter.

**Wednesday**

8:30-10:00 am **Power Grid Interdependency, Vulnerability, and Security [Ten]**

90 min.

Transmission and distribution grid vulnerabilities. Hardware and software solutions. Cyber-security assessment and protection. Utilities, big data, and cloud storage. Data security and privacy. Evolving threats to reliability and resilience.

10:30-12:00 pm **Grid Architecture and Technologies for Ensuring Reliability and Resilience [Murray]**  
105 min.

Problem definition. Evaluating options. SCADA systems. Distribution automation. Fault Location Isolation and Supply Restoration (FLISR). Automatic circuit reclosers. Utility-scale and distributed storage. Microgrids. Grid-edge technologies and innovation. Autonomous power systems and virtual power plants. Next generation smart grids. Practical solution sets. Experiments and pilots.

12:00-12:30 pm **Future of Electricity Grids, Business Models, and Regulation [Beecher]**

90 min.





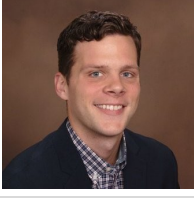


Trends in electrification and competing futures. Disruption, defection, and the death spiral. Emerging business and regulatory policies. Toward a new prudence.

12:30-1:45 pm Lunch at the Brody Hall Cafeteria (provided)

2:00-4:00 **Campus Energy Tour**

Please sign up in advance and bring safe footwear.

## PU Power Grid School 2019: Program Faculty

	<p>Janice BEECHER (beecher@msu.edu)          Director, Institute of Public Utilities, Michigan State University          Ph.D., Political Science, Northwestern University  <a href="http://www.linkedin.com/in/janice-beecher-33a61810">www.linkedin.com/in/janice-beecher-33a61810</a></p>
	<p>Aaron BLOOM (aaron.bloom@nexteraanalytics.com)          Chair, System Planning Working Group, Energy Systems Integration Group          NextEra Analytics          MPA, The Ohio State University and BA, Michigan State University  <a href="https://www.linkedin.com/in/aaron-bloom-08244921/">https://www.linkedin.com/in/aaron-bloom-08244921/</a></p>
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## IPU Power Grid School 2020

April 29-May 1, 2019 | Kellogg Center, MSU

### Program Information

#### Internet access

Free internet access is available throughout the Kellogg Center using the login MSUnet Guest.

#### Accessing program materials

Presentations and supplemental materials are available to all attendees. Please navigate to the attendee link on the program web page and enter the program password: \_\_\_\_\_.

#### Submitting questions during the program

Program attendees are encouraged to ask clarifying questions at any time. To queue up a question for speakers from your phone, tablet, or computer, visit [www.sli.do](http://www.sli.do) and enter event code #\_\_\_\_\_. Downloading the sli.do app is optional.

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