Dr. Elina Spyrou

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Professional Experience

Jan 2023 – Present	**Imperial College London, London, UK**
	Leverhulme Lecturer, Dept. of Electrical & Electronic Engineering
Feb 2019 – Nov 2022	**National Renewable Energy, Golden, CO, USA**
	Research Engineer (after 1-year postdoc), Power Systems Engineering Center
	- Leading research projects and tasks on electricity market design, power systems operations under uncertainty, and participation models of emerging resources such as storage and distributed energy resources.
	- Developing and using multi-scale unit commitment and dispatch models.
	- Mentoring junior research staff and pursuing industry outreach.
Apr 2016 –Mar 2018	**The World Bank Group, Washington, DC, USA**
	Subcontractor through the Johns Hopkins University
Jun 2017 – Sep 2017	**National Renewable Energy, Golden, CO, USA**
	Graduate Intern, Strategic Energy Analysis Center
Jun 2015 – Aug 2015	**California Independent System Operator, Folsom, CA, USA**
	Graduate Intern, Power Systems Technology Development
Sep 2012 – Oct 2013	**McKinsey & Company, Athens, Greece**
	Junior Business Analyst

Education

Sep 2014 – Dec 2018	**The Johns Hopkins University**
	PhD in Geography and Environmental Engineering
	Advisor: Ben Hobbs (IEEE and INFORMS Fellow)
	Dissertation: Long-run electric power system planning enhancements to address the inefficiencies of reactive, conflict-ignorant, and deterministic planning
Sep 2014 – May 2016	**The Johns Hopkins University**
	MSc in Environmental Science and Policy **GPA**: 3.97/4.00
Sep 2007 – Oct 2012	**National Technical University of Athens**
	5-year diploma in Electrical and Computer Engineering **GPA**: 9.62/10
	Major: Power Systems Minor: Decision Analysis

Teaching & Mentoring

Spring 2023	**Supervisor** for three final year projects (BEng and MSc)
Summer 2020	**Mentor** for one undergraduate student participating in the DOE Science Undergraduate Laboratory Internships (SULI)
Fall 2018	**Instructor, H.E.A.R.T. (Hopkins Engineering Applications & Research Tutorials)** Course: Planning the power system of the future: Renewable energy and climate change
2017-2019	**Mentor** for three graduate students at the Johns Hopkins University

Research Projects

Jan 2023 – Present	**Title**: Essential services for 100% renewable transformation of global power systems
Aug 2020 – Nov 2022	Role: **Principal Investigator**, sponsor: **DOE ARPA-E**, Budget: **$3.8 million** **Title:** An Integrated Paradigm for the Management of Delivery Risk in Electricity Markets: From Batteries to Insurance and Beyond **Partners:** The Johns Hopkins University, Electric Power Research Institute, Packetized Energy, kWh Analytics **Goal:** Design novel products for management of short-term uncertainty to reduce system costs and leverage flexibility by distributed energy resources.
Feb 2020- Sep 2022	Role: Lead Analyst, Sponsor: **DOE Wind Energy Technologies Office** **Title**: Atmosphere to Electrons to Grid **Goal:** Assess how wind power plants could offer grid services under uncertainty with respect to their output.
Jan 2021 – Jan 2023	Role: Analyst, Sponsor: **DOE Grid Modernization Laboratory Consortium** **Title:** Clusters of Flexible PV-Wind-Storage Hybrid Generation (FlexPower) **Goal:** Integrate hybrid power plants in short-term power system operations.
Feb 2019 – Sep 2020	Role: Analyst, Sponsor: **DOE Solar Energy Technologies Office** **Title:** Coordinated Ramping Product and Regulation Reserve Procurements in CAISO and MISO using Multi-Scale Probabilistic Solar Power Forecasts **Goal:** Compare systems costs and reliability of two approaches (historical, weather-informed) for estimation of ramping requirements.
Apr 2016 – Jun 2017	Role: Lead Analyst, Sponsor: **The World Bank Group** **Title:** Climate-Resilient Power System Planning (case study: Bangladesh) **Goal:** Design and apply methodology to incorporate the impact of flooding and temperature projections on the generation fleet in power system planning models.
Sep 2014 – Dec 2015	Role: Graduate Researcher at The Johns Hopkins University, Sponsor: **National Association of Regulatory Utility Commissioners** **Title:** Co-optimization for Transmission and Other Resources for Eastern Interconnection **Partners**: Energy Exemplar, Iowa State University **Goal:** Compare traditional transmission planning approaches to a co-optimized approach for generation and transmission planning.

Awards and Scholarships

Oct 2022	**2022 ENRE Energy Best Publication Award, RUNNERS-UP** For paper entitled "Planning power systems in fragile and conflict-affected states"
Oct 2017 – Jan 2019	**The Alexander S. Onassis Foundation** Recipient of $24,000 to pursue doctoral research on power system planning models
2012	**George Kontaxis Award** Justification: ranking 1st among 100+ 2012 NTUA graduates in Power Systems
2011	**Gregory Farakos Award** Justification: ranking 1st among 200+ 2012 NTUA 4th year students specializing in Energy Systems
2007,08,09,11	**Hellenic State Scholarship** Justification: ranking 1st-4th among 400+ students of the Dept. of Electrical and Computer Engineering

Leadership and Service

2017 – Present	Reviewer, **Journals:** IEEE Transactions on Power Systems, IEEE Transactions on Sustainable Energy, Nature Energy **Conferences:** 2020 International Conference on Probabilistic Methods Applied to Power Systems (PMAPS) **Organizations:** World Resources Institute, Lawrence Berkeley National Lab **Awards:** Outstanding Reviewer, IEEE Transactions on Sustainable Energy 2020
2019 – Present	Session Chair, **INFORMS Annual Meeting**
Oct 2017 – Oct 2018	Chair and Board Member, Graduate Student Organization
Oct 2016 – May 2017	**Mentor** for a class of 4th graders participating in the STEM Achievement in Baltimore Elementary Schools (SABES)
Jun 2014	**Instructor,** Entrepreneurship seminars in Uganda (AIESEC)

Publications

[1] B.F. Hobbs, V. Krishnan, J. Zhang, H.F. Hamann, C. Siebenschuh, R. Zhang, B. Li, L. He, P. Edwards, H. Sky, I. Krad, **E. Spyrou**, X. Fang, Y. Wang, Q. Xu, S. Zhang, "How Can Probabilistic Solar Power Forecasts Be Used to Lower Costs and Improve Reliability in Power Spot Markets? A Review and Application to Flexiramp Requirements." IEEE Open Access Journal of Power and Energy, vol. 9, pp. 437-450, 2022.

[2] B. F. Hobbs, J. Zhang, H. F. Hamann, C. Siebenschuh, R. Zhang, B. Li, I. Krad, V. Krishnan, **E. Spyrou**, Y. Wang, Q. Xu, S. Zhang, "Using probabilistic solar power forecasts to inform flexible ramp product procurement for the California ISO," Solar Energy Advances, vol. 2, p. 100024, 2022.

[3] **E. Spyrou**, J. King, D. Corbus, Y. Zhang and V. Gevorgian, "Offering of Variable Resources in Regulation Markets with Performance Targets: An Analysis," *IEEE Transactions on Sustainable Energy*, vol. 13, no. 3, pp. 1620-1630, July 2022.

[4] B. Li, C. Feng, C. Siebenschuh, R. Zhang, **E. Spyrou**, V. Krishnan, B. F. Hobbs, and J. Zhang, "Sizing ramping reserve using probabilistic solar forecasts: A data-driven method," *Applied Energy*, vol. 313, p.118812, May 2022.

[5] S. Vijayshankar, P. Stanfel, J. King, **E. Spyrou**, and K. Johnson, "Deep reinforcement learning for automatic generation control of wind farms," in *2021 American Control Conference (ACC),* 2021*,* pp. 1796-1802.

[6] **E. Spyrou**, V. Krishnan, Q. Xu, and B. F. Hobbs, "What Is the Value of Alternative Methods for Estimating Ramping Needs?", in *2020 IEEE Green Technologies Conference*, 2020, pp. 159-164.

[7] S. M. Cohen et al., "Regional Energy Deployment System (ReEDS) Model Documentation: Version 2018," National Renewable Energy Lab, Golden, CO, No. NREL/TP-6A20-72023, Apr. 2019.

[8] **E. Spyrou,** B.F. Hobbs, M. Bazilian, and D. Chattopadhyay, "Power system planning in fragile and conflict-affected states," *Nature Energy*, vol. 4, no. 4, pp. 300-310, Apr. 2019. [**Chosen for April's cover**]

[9] N. Mukhi, D. Chattopadhyay, B.F. Hobbs, and **E. Spyrou**, "Building climate resilience into power system planning: the case of Bangladesh," World Bank Group, Washington, D.C., Working Paper No. ACS23320, Nov. 2017.

[10] J. L. Ho, W.J. Cole, and E. **Spyrou**, "ReEDS-Mexico: A Capacity Expansion Model of the Mexican Power System," National Renewable Energy Lab, Golden, CO, No. NREL/TP-6A20-70076, Sep. 2017.

[11] **E. Spyrou,** J. Ho, B. Hobbs, R. Johnson, and J. McCalley, "What are the Benefits of Co-optimizing Transmission and Generation Investment? Eastern Interconnection Case Study," *IEEE Transactions on Power Systems*, vol. 32, no. 6, pp. 4265-4277, Nov. 2017.

[12] D. Chattopadhyay, **E. Spyrou,** N. Mukhi, M. Bazilian, and A. Vogt-Schilb, "Building climate resilience into power systems plans: Reflections on potential ways forward for Bangladesh," *The Electricity Journal*, vol. 29, no. 7, pp. 32-41, Sep. 2016.

[13] R. Johnson et al., "EISPC – Co-Optimization of Transmission and Other Resources," Prepared for: Grants & Research Department National Association of Regulatory Utility, Jan. 2015.

Selected Conference Presentations

[1] **E. Spyrou**, R. B. Hytowitz, B. F. Hobbs, S. Tyagi, I. Krad, M. Cai, and A. Khan, "Managing Imbalance Risk with Reserves and Flexibility Options", presented at 2022 INFORMS Annual Meeting, 2022.

[2] **E. Spyrou**, R. B. Hytowitz, B. F. Hobbs, S. Tyagi, and M. Cai, "An Integrated Paradigm for the Management of Delivery Risk in Electricity Markets", presented at 2022 IEEE PES General Meeting.

[3] **E. Spyrou**, R. B. Hytowitz, B. F. Hobbs, M. Al-Ashery, M. Cai, and S. Tyagi, "Flexibility Options: A Proposed ISO Product for Managing Energy Imbalance Risk," presented at 2021 IEEE PES General Meeting, 2021.

[4] **E. Spyrou**, R. B. Hytowitz, B. F. Hobbs, M. Al-Ashery, M. Cai, E. Ela, and Y. Zhang, "Flexibility Auctions: A Framework for Managing Imbalance Risk," presented at 2021 FERC Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency Through Improved Software, 2021.

[5] **E. Spyrou**, "Wind Bidding in Regulation Markets Accounting for Forecast Uncertainty," presented at 2021 ESIG Meteorology & Market Design for Grid Services Workshop, 2021.

[6] J. Zhang, B. Li, E. Spyrou, V. Krishnan, R. Zhang, H. Hamann, Q. Xu, and B. F. Hobbs, "Coordinated Ramping Product and Regulation Reserve Procurements in Caiso and Miso Using Multi-scale Probabilistic Solar Power Forecasts (pro2r)," presented at INFORMS Annual Meeting 2020, Virtual, USA.

[7] **E. Spyrou,** M. Bazilian, D. Chattopadhyay, and B.F. Hobbs, "Power System Planning in Fragile and Conflict-affected States," presented at INFORMS Annual Meeting 2020, Virtual, USA.

[8] **E. Spyrou**, Y. Zhang, H. Geman, B. F. Hobbs, R. B. Hytowitz, E. Ela, M. Almassalkhi, P. Hines, and J. Kaminsky, "An Integrated Paradigm for the Management of Delivery Risk in Electricity Markets: From Batteries to Insurance and Beyond," presented at INFORMS Annual Meeting 2020, Virtual, USA.

[9] **E. Spyrou**, J. King, A. Kumler, C. Bay, Y. Zhang, V. Gevorgian, and D. Corbus, "An Integrated Platform for Wind Plant Operations: From Atmosphere to Electrons to the Grid," presented at FERC Technical Conference regarding Increasing Market and Planning Efficiency and Enhancing Resilience through Improved Software, Virtual, 2020.

[10] **E. Spyrou**, V. Krishnan, B. F. Hobbs, Q. Xu, J. Zhang, B. Li, and R. Zhang, "The value of probabilistic forecasts for sizing flexible ramping products: A CAISO case study," presented at INFORMS Annual Meeting 2019, Seattle, WA, USA.

[11] **E. Spyrou** and B.F. Hobbs "Comparison of Tools to Address Profound Uncertainty in Power Systems," presented at INFORMS Annual Meeting 2018, Phoenix, AZ, USA.

[12] **E. Spyrou** and B.F. Hobbs "Who has an incentive to improve renewable day-ahead forecasts?" presented at IEEE PES General Meeting 2018, Portland, OR, USA.

[13] **E. Spyrou**, M. Bazilian, D. Chattopadhyay, and B.F. Hobbs, "Power System Planning in Fragile States: A Case Study of South Sudan," presented at INFORMS Annual Meeting 2016, Nashville, TN, USA.

[14] **E. Spyrou**, J. Ho, B.F. Hobbs, R. Johnson, and J.D. McCalley, "Proactive Transmission Planning: A Case Study of the Eastern Interconnection," presented at INFORMS Annual Meeting 2015, Philadelphia, PA, USA.

[15] **E. Spyrou**, J. Ho, R. Johnson, A. Bachert, S. Koppolu, B.F. Hobbs, J.D. McCalley, S. Lemos-Cano, and A. Figueroa, "Co-optimization of Transmission and Other Resources," presented at IEEE PES General Meeting 2015, Denver, CO, USA.