

# WISE

WATERLOO INSTITUTE  
FOR SUSTAINABLE ENERGY



# LECTURE SERIES

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## A PUBLIC LECTURE PRESENTED BY THE WATERLOO INSTITUTE FOR SUSTAINABLE ENERGY

**Monday April 22, 2024**  
**1:30 pm – 2:30 pm (EST)**

**Venue: Carl A. Pollock Hall (CPH)**  
**Room no. 4335**

### ZOOM LINK:

<https://us02web.zoom.us/j/4640082022?omn=86138857153#success>

## VIRTUAL POWER PLANTS: NAVIGATING THROUGH FOUNDATIONAL CONCEPTS, TECHNOLOGIES INVOLVED, STRATEGIC IMPACTS, AND DEVELOPMENT CHALLENGES

**Amir Miragha, PhD, SMIEEE, Global Senior Principal  
Architect, Schneider Electric**

The increasing deployment of Distributed Energy Resources (DERs) necessitates a system for their effective management, addressed by Virtual Power Plant (VPP) platforms. By using advanced software and communication technologies, VPPs aggregate DER capacities, enabling them to function collectively as a single, adaptable, and dependable power source. This system permits the dynamic optimization and dispatch of DERs according to demand, market conditions, and grid needs, offering vital services like peak load management, frequency regulation, and backup power, thus boosting grid stability and promoting the use of renewable energy. VPPs serve a wide array of stakeholders, including consumers, utilities, energy traders, and DER manufacturers, by optimizing resource utilization and improving energy reliability. This lecture aims to provide a thorough insight into VPPs, discussing the key technologies involved, the critical role of forecasting and optimization, barriers to VPP implementation, and the importance of DER data access. It will also compare VPPs with Microgrids and Distributed Energy Resource Management Systems (DERMS), highlighting their unique characteristics and operational differences. The session will conclude by discussing what is expected from a VPP portal, emphasizing how VPPs enhance the integration and optimization of distributed energy resources.

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### Biography



Amir Miragha's career in electrical engineering began in 1996 as a Research Engineer at the Electric Power Research Center (EPRC) in Tehran, Iran, focusing on flicker assessment of electric arc furnaces, with applications at the YAZD Alloy Steel Plant. From 1998 to 2003 at Niroo Research Institute (NRI), he held various research and managerial roles, contributing to the energy consumption reduction of electrical auxiliary systems and the optimization and retrofitting of control systems in steam power plants. Additionally, he served as the Director of Publication at NRI, overseeing the preparation and publication of a well-received bi-lingual journal in the power system engineering domain. In 2004, Amir was at the forefront of exploring microgrids at ETH-Zurich, a field that was gaining momentum with its emerging terminology and concepts around that time. His academic journey continued with a Ph.D. and Post-Doc at the University of Waterloo (2006-2010), where he focused on the optimal planning and operation of energy hubs and integrated energy systems, as well as studying the grid impacts of alternative fuel vehicles. Amir held positions at the University of Waterloo as an Adjunct Assistant Professor in Chemical Engineering (2013-2019), focusing on process optimization and the hydrogen economy, and as Adjunct Associate Professor in Electrical & Computer Engineering (2017-2020). Honored with 25 national and international awards, Amir actively contributes to DER Interconnection and Smart Grid communication standards, including work on IEEE 1547, IEEE 1547.10, and IEEE 2030.5. He is a Senior Member of the IEEE and holds degrees in electrical engineering from K. N. Toosi University of Technology (B.Sc., 1995), KTH Royal Institute of Technology (M.Sc., 2005), and the University of Waterloo (Ph.D., 2010).

**ALL ARE WELCOME!**

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