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Modeling of Cyber-Coupled Power Systems with Attack-Defense Interaction

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Venue: Room **CD634**, Hong Kong Polytechnic University
Reception starts at 4:15pm
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Abstract

Recently, we have developed a comprehensive network-based model with consideration of the physical power flow process to study the cascading failure in cyber-coupled power systems. We take the coupling between power and cyber networks as being resulted from the interdependence of power nodes and cyber nodes. Importantly, interaction between two processes, one aiming to attack (cause damage) and the other aiming to defend (protect) the components in the power network, is considered in the model. This interaction offers a novel perspective to interpreting the interdependence of power and cyber networks. To study how an attacker or defender deploys resources to attack or protect a power component, four strategies in distributing the attack and defense strengths are considered, namely, even distribution, degree-based distribution, capacity-based distribution, and random distribution. To probe into the actual propagation process of a blackout, we define four critical time points, namely, start time, attack time, isolation time and end time, and use these time points to analyze and evaluate the effectiveness of different attack and defense strategies. The tit-for-tat defense strategy, in which defender adopts the same strategy as the attacker, is found to be the preferred defense strategy under most conditions. Moreover, allocating defense strength in terms of capacity-based distribution can most effectively suppress cascading failure.

About the Speaker

Dong Liu received the B.S. degrees from Sun Yat-sen University and Hong Kong Polytechnic University in 2014. He is now pursuing the PhD degree at the Department of Electronic and Information Engineering, Hong Kong Polytechnic University. His research interests include the applications of complex networks in the assessment of robustness of power systems and cyber physical systems.

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