IEEE Infocom’14: Networking Challenges for Cyber-Physical Systems

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Power system or **smart grid** as a large-scale cyber-physical system
What are the new technologies in power system or smart grid?
Distributed Renewable Resources

- Wind farm, photovoltaic (PV)
Phasor Measurement Units (PMUs)

- Measure both magnitude and phase angle of voltage waveform at particular locations in power grid.
- Synchronized measurements can be taken at rates of 30 to 120 samples per second.

Source: GE Digital Energy
Advanced Metering Infrastructure (AMI)

- **Smart meters**
- **Two-way communications**

Source: BC Hydro
More Controllable Loads

- Electric vehicles (EVs)

Source: BC Hydro
Energy Management Systems (EMS)

- Apps to support home energy management

Source: GE Nucleus
What are the challenges or opportunities?
Integration of Renewable Resources

- Random fluctuation in supply
- How to effectively integrate distributed renewable resources into the power grid?
- Balance of supply and demand

Source: IEEE Smart Grid
Controllable Loads

How to manage the controllable loads (e.g., electric vehicles) connected to the power grid?

- Demand response, pricing
Performance Evaluation

- Co-simulation

- Challenge: Connect, process, and synchronize data between both simulators using their respective interfaces.