

SCC: Empowering Smart and Connected Communities through Programmable Community Microgrids

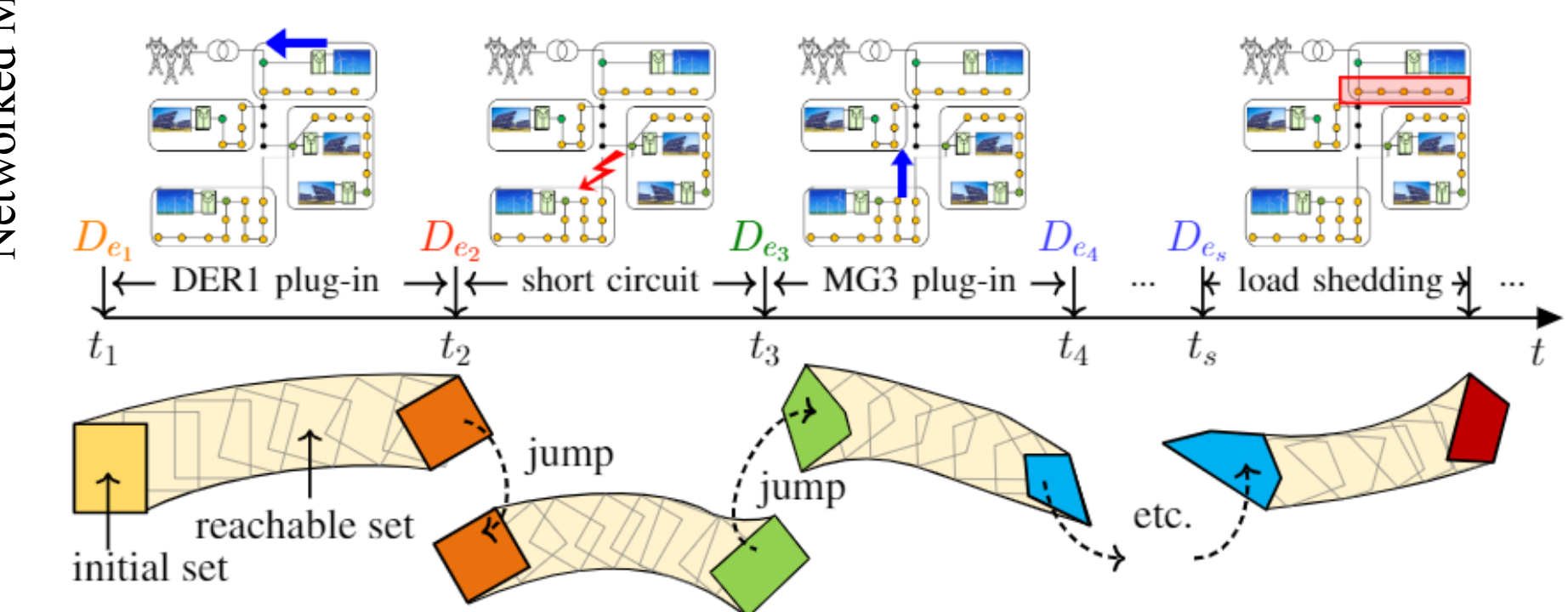
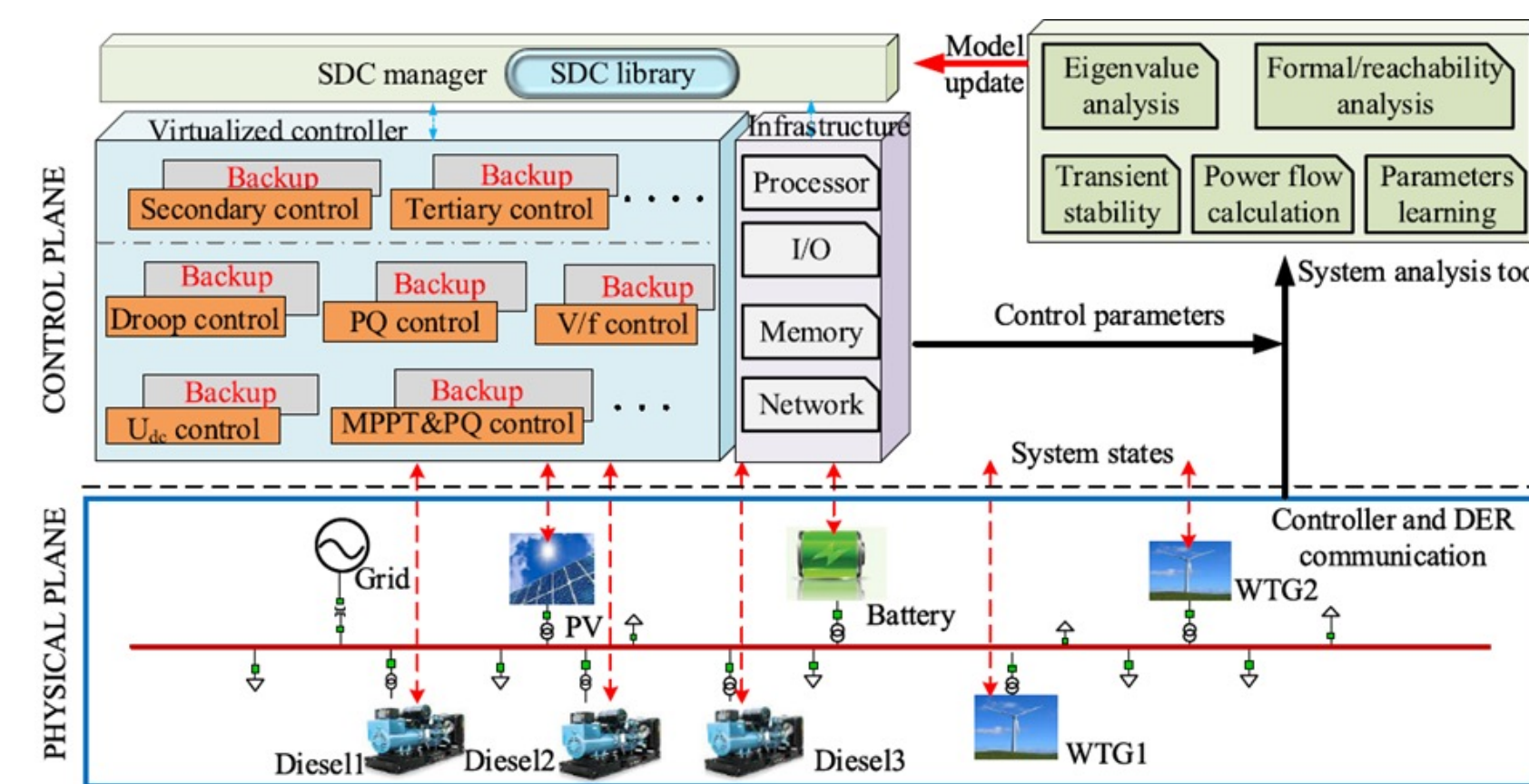
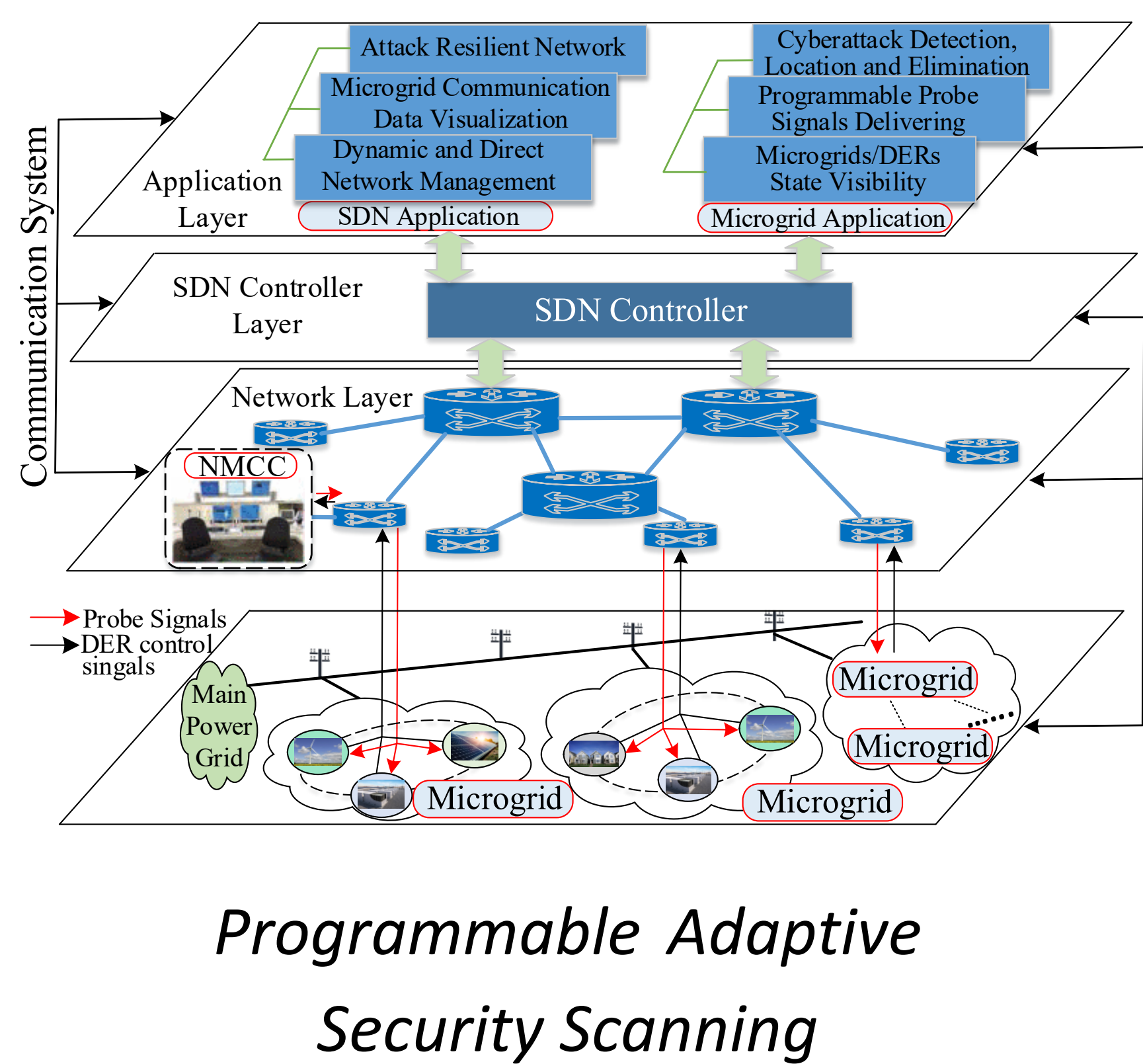
Peng Zhang¹, Peter Luh², Baikun Li², Fei Miao², Carol Atkinson-Palombo², Amir Herzberg², Joel Rinebold³, Mark Wick⁴, Erin Steward⁵, Michael Ahern⁶, Roderick Kalbfleisch⁷, Rick Conant⁸, Annie Philip⁹

¹Stony Brook University; ²University of Connecticut; ³Connecticut Center for Advanced Technology; ⁴Energy and Innovation Park, New Britain; ⁵Mayor of New Britain; ⁶Worcester Polytechnic Institute; ⁷Eversource Energy; ⁸RLC Engineering; ⁹PSEG Long Island IRG, FY2018

Community-identified problems

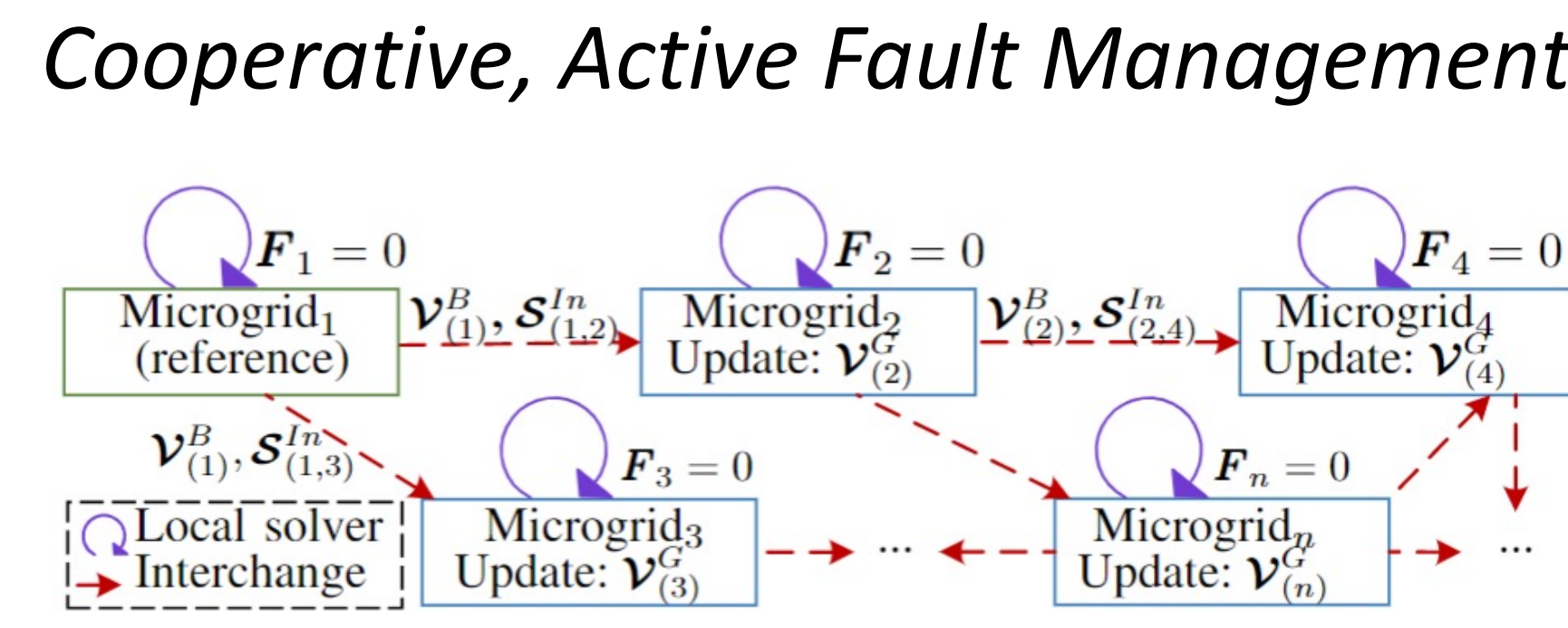
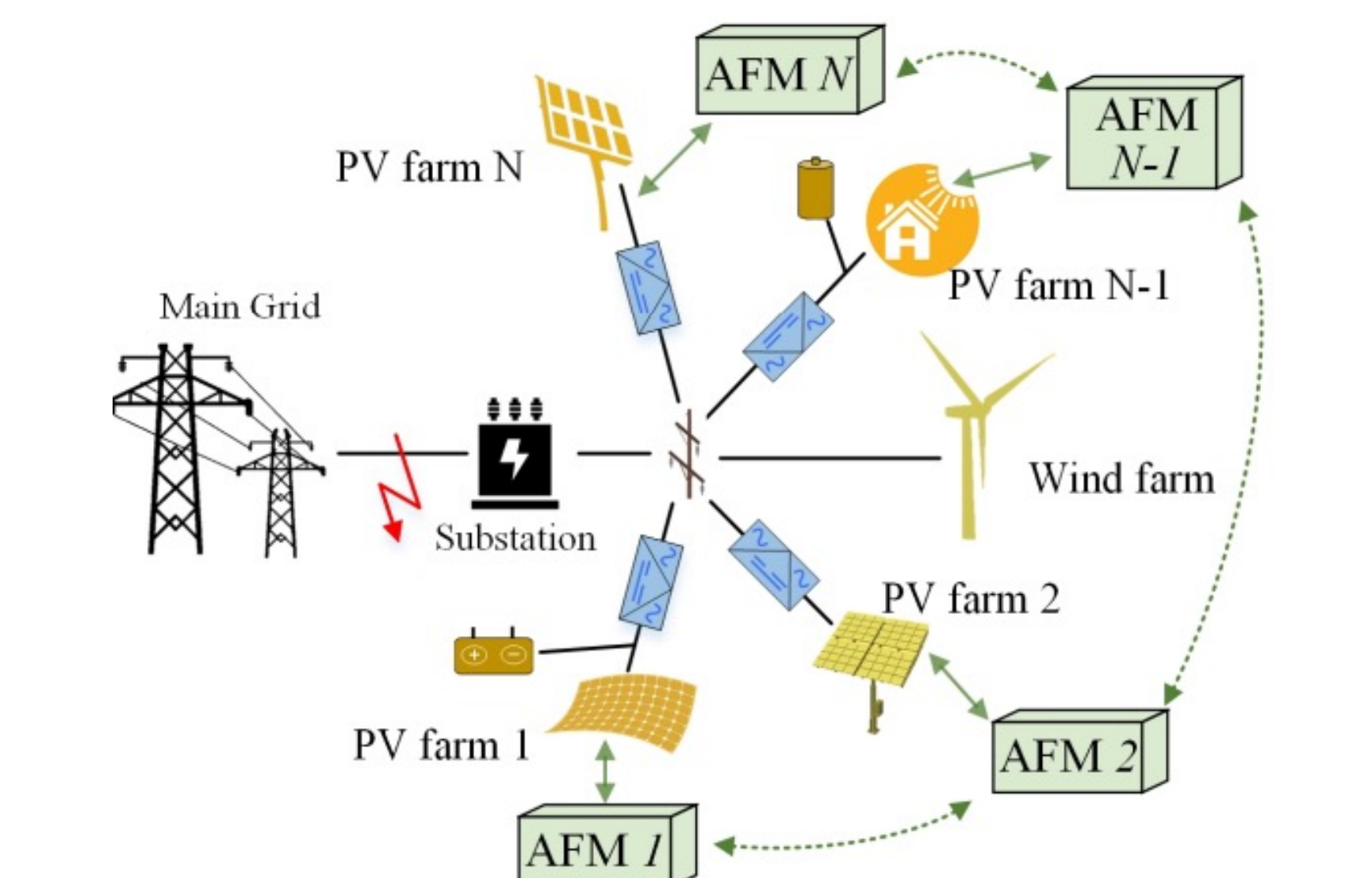
- Improve electricity resilience and reduce power outages
- Increase hardware independence and scalability in computing
- Ensure stability, cyber-security and privacy

Project activities

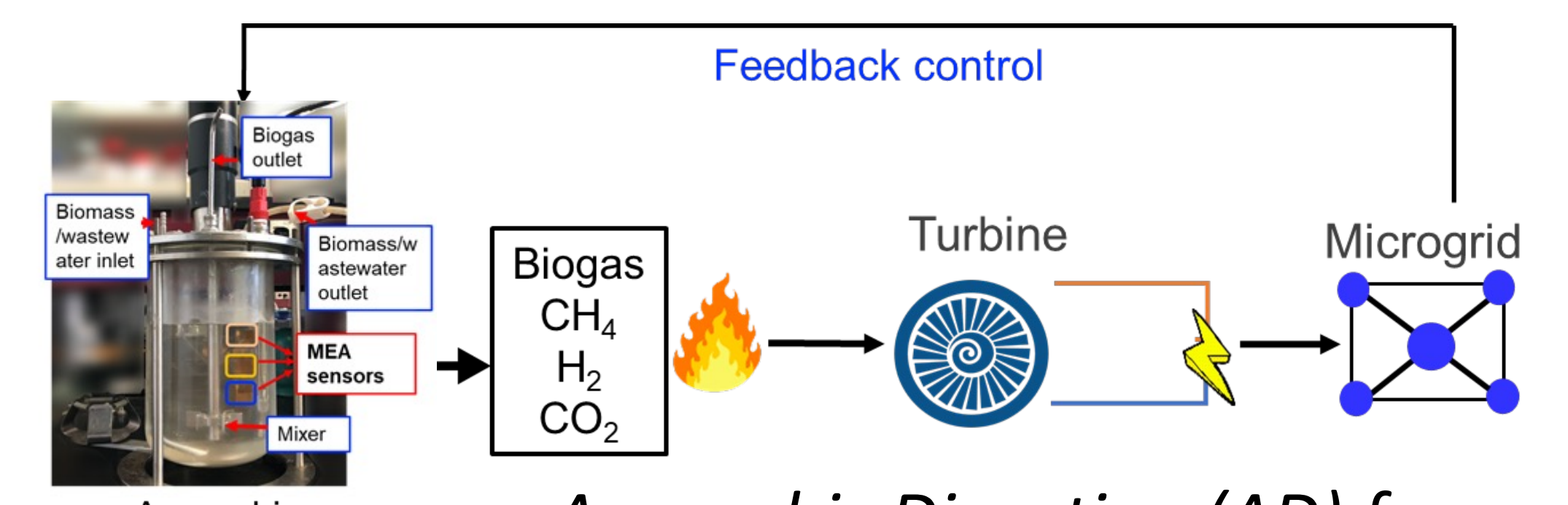


Intellectual merits

- Architect a Smart Programmable Microgrid
- Software-Defined Operation Optimization for Energy Resilience
- Devise Software-Defined stability, security and privacy



Smart programmable microgrid Prototype



Anaerobic Digestion (AD) for Biogas Production for Microgrids

Immediate Impact

- Distributed optimization for microgrids formation
- Fault ride through of renewable energy
- Elimination of botnets attacks
- Decoupled, resilient cyber-physical microgrids
- Reachable analytics for stability guarantee

Lasting Impact

- Coordination of distributed entities
- Large integration of renewable energy
- Adaptive security scanning
- Programmable microgrid controller
- Formally verify the fast and strongly-nonlinear dynamics

Next steps

- Demonstrate Smart Programmable Microgrid on Community Microgrids
- Incorporate New Types of Renewable Energy Generation for Decarbonization
- Establish startup company for technology transition

Publications:

https://www.nsf.gov/awardsearch/showAward?AWD_ID=2018492