FREEDM SYSTEMS CENTER

MicroC3 Industry Advisory Board
Meeting #2 Minutes
Tuesday, October 10, 2023

- Discussion of "Engineering Microgrids With Control Co-Design"
  a. We had a spirited debate over this paper from Mario found on the [MC3 IAB website](). Co-design optimization made sense in general but there was some question about whether improved performance was worth the effort. There was some disagreement with the assumption that microgrid design is a strictly linear process. Naturally there is some iteration today but not to the full level of co-design.
  b. The utilities are solely focused on the lowest cost solution to solve the current problem so that it receives approval from the Utility Commission. In their case, location and available space are often the primary constraints with performance as secondary. Value of resiliency is also very difficult to calculate. Later we noted that MC3 would be ideal for designing controls for microgrid expansions beyond their original coverage area (e.g., adding nearby customers to an existing microgrid without upgrading any generation or storage).
  c. There was some concern with asking today's microgrid designers to now add dynamic considerations to their design methodology. Will co-design only be understood by PhD's? Srdjan addressed this concern by noting that the user interface should look more like HOMER and less like python scripting. The goal is for the dynamics to be visible if desired but mainly controlled through background processing in the software.
  d. This led to a discussion of margins of operation for certain use cases. Remote or even off grid microgrids may have large impulse loads while other microgrids may have very steady dynamics until an unplanned islanding event. Grid forming inverters add another layer of complexity but increase resiliency. We debated battery systems versus flywheels, protection logic, active load management, and transient response. We noted that utility microgrids are designed mainly for long duration, backup power. In these cases, seamless transition is not as important as blackstart. And if it is, then the customer is highly likely to already have a UPS on site. Transients in island mode must still be managed and may be overlooked by microgrid designers. Some existing microgrid controls are overly sensitive to seamless island and need to allow time for recloser operation. The high

variability in microgrid use cases should not be an issue when designing the software.

- How to "sell" MC3?
  a. Srdjan asked about how to market this as a product: all together as one comprehensive package, in modular pieces to solve specific problems, or just to very targeted markets (like EV fleets)? He feels that our value proposition is providing one integrated tool suite that covers component selection to power management to transition functions. We noted that some customers may want only certain optimization functions while others may want the entire platform. The tool should allow customers to purchase what they need and add modules later. Gabor explained the Integrated Microgrid Controller Platform (IMCP), which is the basis for this MC3 package, already contains much of this functionality. There are several resources on the [MC3 IAB website](#) that discuss IMCP.
  b. One idea to demonstrate the value of co-design would be to compare typical design results with MC3 for the same system and constraints. This exercise might provide quantitative values to compare approaches similar to Mario's paper.
- Any ideas for a demo site?
  a. Srdjan explained that our best possible location would be an experimental microgrid with no "real" customers. But a full hardware system is much preferred to a digital twin. It seems strange that we can't work out something on campus but we've not had any luck yet. Utilities would really like to see EV fleets install microgrids to offset some distribution upgrade costs.

Attendees

Ken D.	Srdjan	Gabor	Harish
Matt F.	Matt O.	Trent	Luke
Dmitry	Jackie	Tim	Ken P.