FREEDM SYSTEMS CENTER

MicroC3 Industry Advisory Board
Meeting #3 Minutes
Tuesday, November 14, 2023

- Ken Pulido, our new T2M Manager with ARPA-E, introduced himself.
    a. He's been with ARPA-E for several years but is new to our project. Most of his career was on the finance side of energy projects. We also did quick introductions to the rest of the board.
- Discussion of key MG problems faced by different customer classes
    a. We noted that MGs are unique and they could benefit from some standardization. But this is in conflict with the fact that utility circuits are not standardized. And for utility-owned MGs, they are usually at the end of a feeder and are not considered separate from the distribution grid. Duke needs standardization to plan for spare equipment and the safety of workers who service multiple MGs. But they also need some customization. Cost is the biggest issue and one distribution upgrade or even site purchase price could tank a MG project. Utilities require value stacking and island capability to convince the Utility Commission of cost effectiveness.
    b. The coops are deploying DER across their members and have 90 MW of BESS deployed across 13 coops. Value stacking is required and the main driver is load shaving to reduce transmission tariffs. They consider costs to convert some of these BESS to MGs. They solve the primary use case and then evaluate the investment to upgrade. Something like MC3 could make a network of microgrids economically feasible.
    c. What is the cost of uncertainty in planning and the cost of delays? One utility noted it costs them $50k a week for schedule delays. Duke also sees increased costs when transitioning from one vendor to another because they don't trust any earlier engineering design. New team basically redoes all the analysis from the previous vendor including work from Duke.
    d. Vendors agree that standardization is hard in the MG space. Different customers have different requirements and preferences for vendors they work with. And it never goes smoothly once you put installations in the field. ABB works around the world and interconnection rules vary greatly despite IEEE 1547. Some customers have stricter requirements than utilities (e.g., regulation curves, transition set points, fault recovery procedures, etc.). New technologies also

create issues. System integrator will know all these variables and having one team manage the process increases system reliability. Any design tool must be cognizant of all these interfaces.

    e. Ken P. wondered what percentage of microgrids involve multiple vendors. Harish noted that it depends. ABB will sometimes be the designer, major supplier and the integrator. Other times, they will just be the controls supplier.

- MC3 Opportunities
  a. Lack of trust from one vendor to another during MG design process is an opportunity. This was identified in the initial MC3 proposal. But the tool needs to correctly model each component's operation. Srdjan later said we may try to develop our own black box models from hardware testing and establish bounds for edge cases where device operation is unknown. We noted the challenge is to figure out the minimum information needed for an accurate model that also protects vendor IP.
  b. We noted the need for an [Interface Control Document](#) for different components. (The ICD is basically a contract for how the component responds to certain communications.) Gabor described the process for the computer chip industry. Circuits are kept secret but interface between chips is clearly published. Could the MG industry create something similar?
  c. Getting a black box model is difficult. But a standard test to confirm that the model matches the hardware also does not exist. Data sheets are getting better but dispatch for sequencing differs between hardware. New grid forming functions are not even tested yet. We noted there are different consortia and standards bodies working on these interface standards. UNIFI consortium is helping to define how to share black box model of grid forming inverters. But they have not received any models to date.
  d. Why would vendors share a black box model? One possible incentive might be expanding the market size but that still presents risks. A disincentive might be if the software were open source versus proprietary.

- Cost discussion
  a. What is the cost to the MG industry due to the lack of trust between vendors, integrators, and operators? Some commented that schedule delays are a bigger deal. NCEMC noted each week in delay added $50k to one project. That delay is higher cost than equipment sometimes.

- Summary
  a. MG standardization faces many barriers.
  b. Using a single vendor for control and integration can increase MG reliability.
  c. Establishing trust in the MG design process is necessary to reduce costs.
  d. Creating standards for interface data sharing is needed.
  e. Getting data for black box models will be challenging.
  f. Decreasing time to deployment has huge value.
  g. Our next meeting will have an in person option.

Attendees

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