

IEEE Super Session ***“Distributed Bulk” Storage!***

Independent Testing of Complete CES Systems

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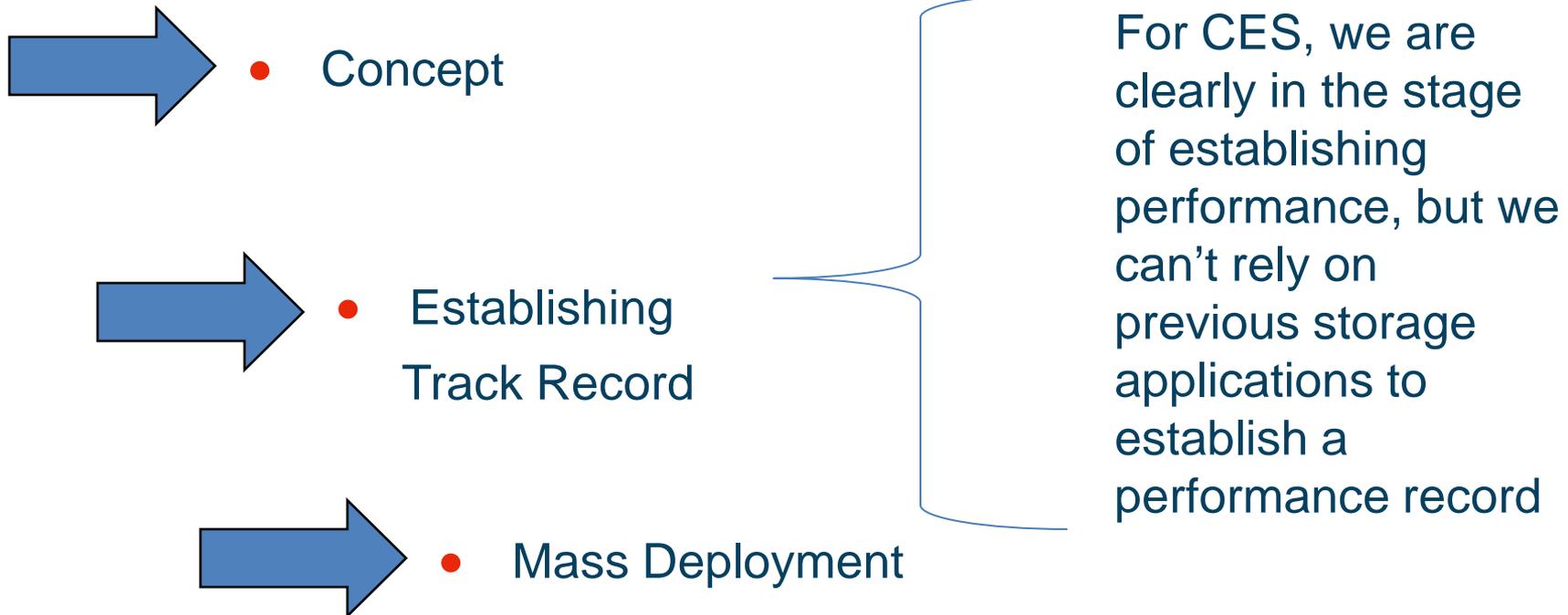
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Role of Testing in Advancing CES Storage

- No group will encounter any “resistance” in advocating the need for testing of any advanced energy system, but CES presents a few challenges that need to be considered
- The challenges presented by CES are not simply in the fact that we have a new technology, but rather in the manner for which CES is going to be utilized
- Despite a great deal of activity in storage, the “precedent” has not yet been set for Community Energy Storage Systems

Stages of Development for New Applications

- Each new technology follows a predictable path to acceptance and if fortunate, mass deployment



Utility Scale Devices established a track record through performance testing

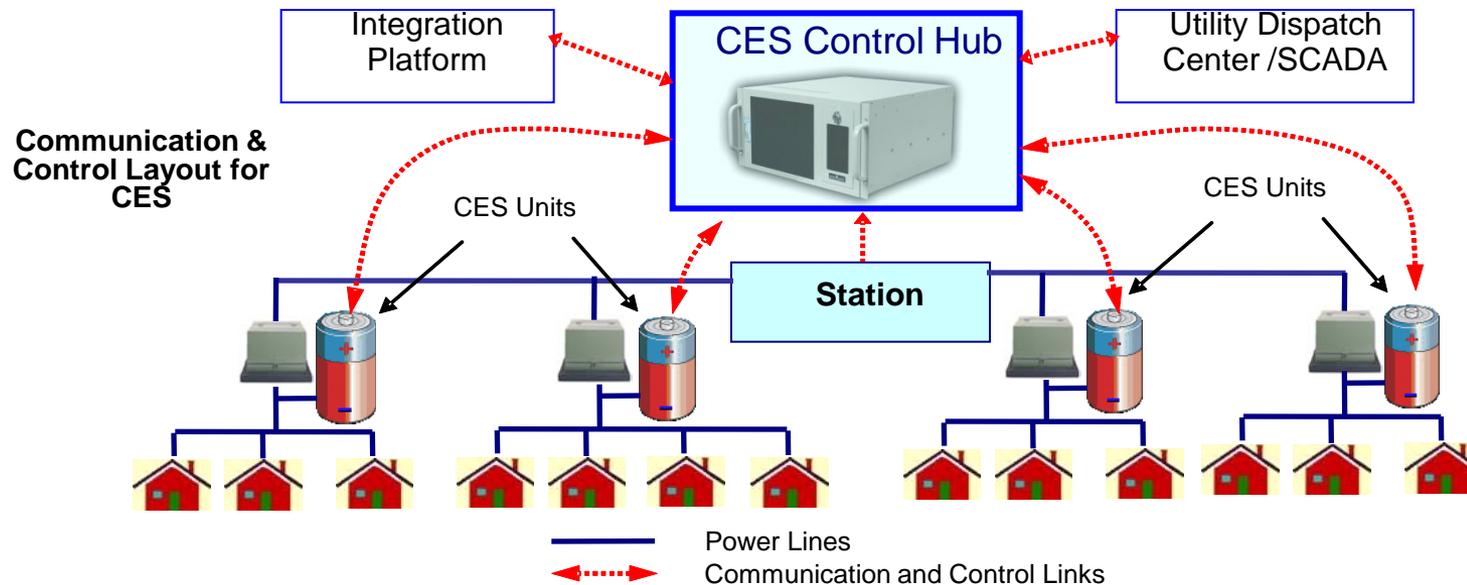
- Leads to successful deployments of applications
 - First 12 MW “Spinning Reserve” application (Chile)
 - “Ramping” applications in Hawaii
 - Flywheels and batteries being used for Frequency regulation
- However, the performance requirements of CES systems will require a more rigorous process



Differences with Community Energy Storage

- To date, Utility-scale devices have been utilized for single applications such as regulation or renewable ramping applications
 - Utilization factors make it difficult to attempt to perform additional applications
- However, Community Energy Storage will be asked to perform multiple roles
 - Peak Shaving
 - Voltage Support
 - Reliability – Back-up Power
 - Renewable Integration
 - Requirements to allow for T&D Capital Deferral
 - Potentially energy arbitrage and Ancillary Services
- Discovery is that as efforts to tackle the issue unfold, efforts to create guidance only generalize and do not provide practical recommendations for specific applications

Integration into Smart Grids



- Additionally, for the “Distributed Bulk” concept, the devices will not only need to perform the applications, but integrate into the smart grid communication infrastructure
 - Performance verification is not just focused on ability to meet the requirements of the specific application but also how devices are able to communicate with central controls centers

Demonstrations for CES are Now Starting

- Current Activity
 - DOE FOA efforts such as AEP and DTE Energy
 - Additional utilities such as SCE
 - Approximately 12 utilities demonstrating the applications
- Our industry should also be closely tracking the efforts that are taking place
 - Though some utilities are leading the use of CES, the concept is still an “unknown” to the majority of utilities and end-users
 - Negative ramifications for failure in the field will be difficult for a manufacturer
 - More significantly, negative ramifications for failure in the field will be severe for CES concept



Courtesy of Red Flow
- Zinc Bromide units



Conceptual design of CES

Testing Requirements for CES Systems

- Testing standards are still being developed, but in addition to safety testing and factory acceptance testing, emphasis will need to be placed on:
 - Performance testing
 - Efficiency, response rate, duration
 - Application Testing
 - Single Roles or ability to perform multiple roles
 - Ability to integrate into current communication systems
 - Life-cycle Testing
 - How many applications should a device perform based on the impact on the life-cycle of the battery?
 - Linking to secondary-life applications from EVs
 - Independent Verification of System Performance
 - Ability to integration with the Grid and community with other systems

What approaches are being used to certify, confirm, and test the units that we are now testing?

Where Can Manufactures Turn?

- IEEE Stationary Battery committee for high level guidance
- National labs such as Sandia have capabilities but in some cases, more discretion may be required
- Universities and States are looking to develop centers of excellence on storage
 - Case Western Reserve University in Partnership with AES are creating an “Energy Storage Verification Center”
 - Consortiums such as the NY- BEST (Battery and Energy Storage – www.ny-best.org) is working with NY Utilities and Brookhaven to test devices
- Independent Labs such as KEMA, are creating testing centers for community energy storage system
 - Offer ability to simultaneously test and develop new products and applications

Necessary Test Lab Characteristics and Qualities

- CES Devices are emerging technologies being targeted for Utility applications – hence labs should be familiar with requirements that are necessary for such applications
 - Lab should be capable of testing components (electricity storage device) as well as the whole system as a “black box” ready to be deployed in a utility environment
 - Lab should have practical field experience in utility applications in areas of safety, protection coordination, control and communication issues
 - CES is an emerging application that can utilize different storage technologies, ensure that lab has reputation of adhering to confidentiality agreements
 - Lab is not operated as a research center but has the capability to quickly determine results, causes, and impacts of test

Stakeholder Involvement

- To date, work is being done to help create a baseline for testing of devices
 - IEEE Stationary Battery Committee
- Current attempts at creating guidelines only shows that Storage can be a victim of its flexibility
 - In efforts to cover all in single documents, guidance is set at such a high level that it doesn't provide practical recommendations for specific applications
 - Process drives users to create their own set of tests to confirm the applications
- Efforts made be better focused on collecting approaches for the applications that are being placed in the field

Questions?

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