



Non-Synchronous Energy Electronics, LLC



AI Data Center Interconnection Solutions;

**AC/DC/AC systems using back-to-back PCS Energy Storage Solutions
for
AI Data Center Integration**

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NSEE is partnered with Sabre Canada of Calgary and Indrivetec of Zurich to deliver PCS Projects, in Canada & the USA



- Sabre Canada, based in Calgary, is the commercial lead on the projects
- Sabre packages the Power Converter Systems, transformers and switchgear at their facility in Calgary



- Indrivetec provides the power converters from their factory in Bulgaria, and engineering and technical support from their head office in Zurich



SWISS engineering



Presentation Description

The need for Power Flow Control and Grid Stability while integrating erratic AI loads;

This presentation describes the variety of solutions that NSEE/Sabre can supply for AI Data Centers to interconnect to the bulk power grid. With this solution, the modelling requirements for interconnection permitting in markets like ERCOT are much more simple.

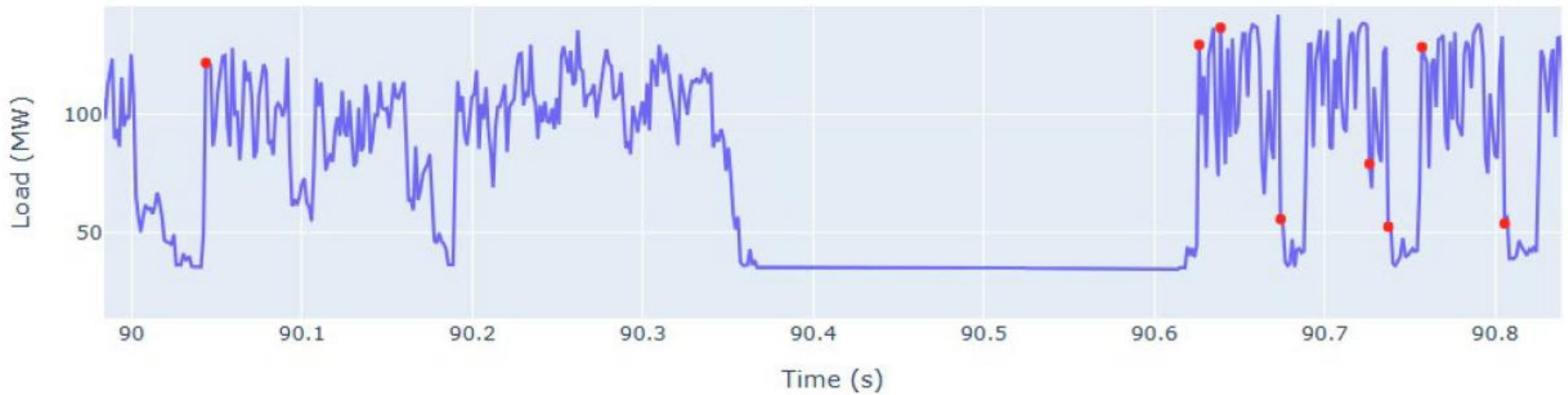
We concur that it should be the burden of a data center developer to include power conditioning systems that will smooth out the load drawn from the grid, such that it appears stable, and can even help support instabilities in the grid caused by others or events.

The loads must also be able to curtail to protect the bulk grid in times of stress. We contend that this should be able to be done with mSec. level response, similar to a BESS Fast Frequency Response operations.

The following slide shows how erratic an AI Data Center load can be.

The presentation also shows how a wide variety of storage and on-site generation assets may be connected in order to ensure seamless operation of the Data Center, essentially using the Power Conversion Interface as an Uninterruptible Power Supply.

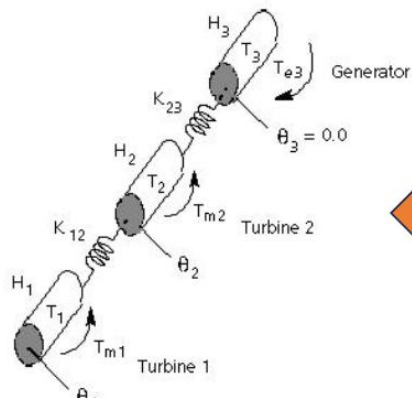
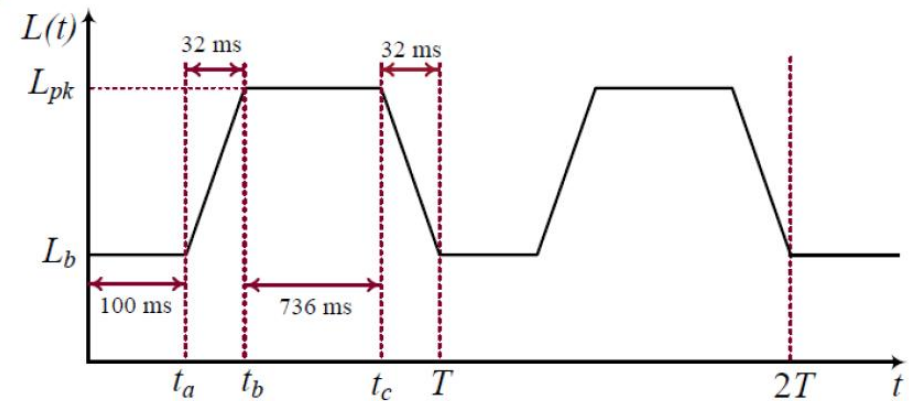
A real world example of the kind of AI Data Center load profiles that need to be smoothed by the ESS. Ultra-Capacitor solutions are used when the duty cycle is too great for batteries, or a combination of the two if bulk storage is also required.



AI Data Center Load Changes w/generators



Co-location with conventional generator



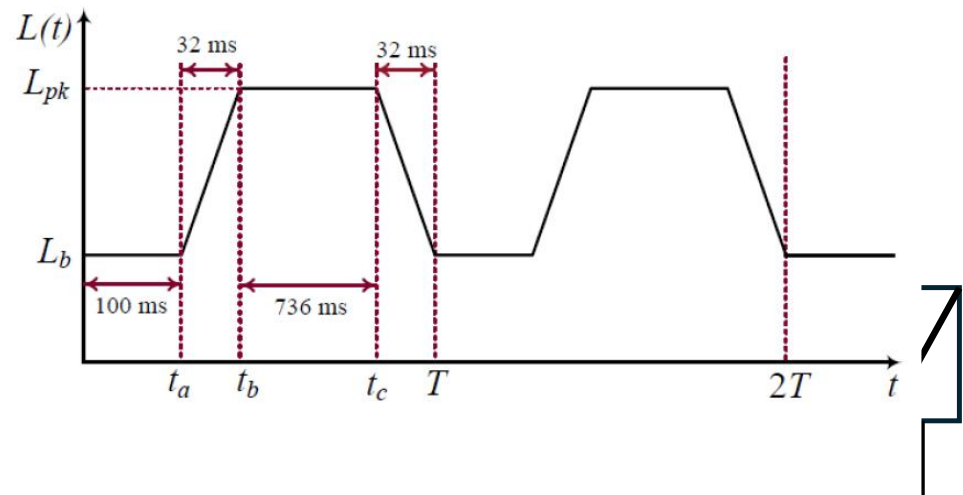
Energy goes to the generator shaft



AI Data Centers and BESS life (this makes the case for Ultra-Capacitors)



AI data center load profile



Significant BESS lifetime reduction

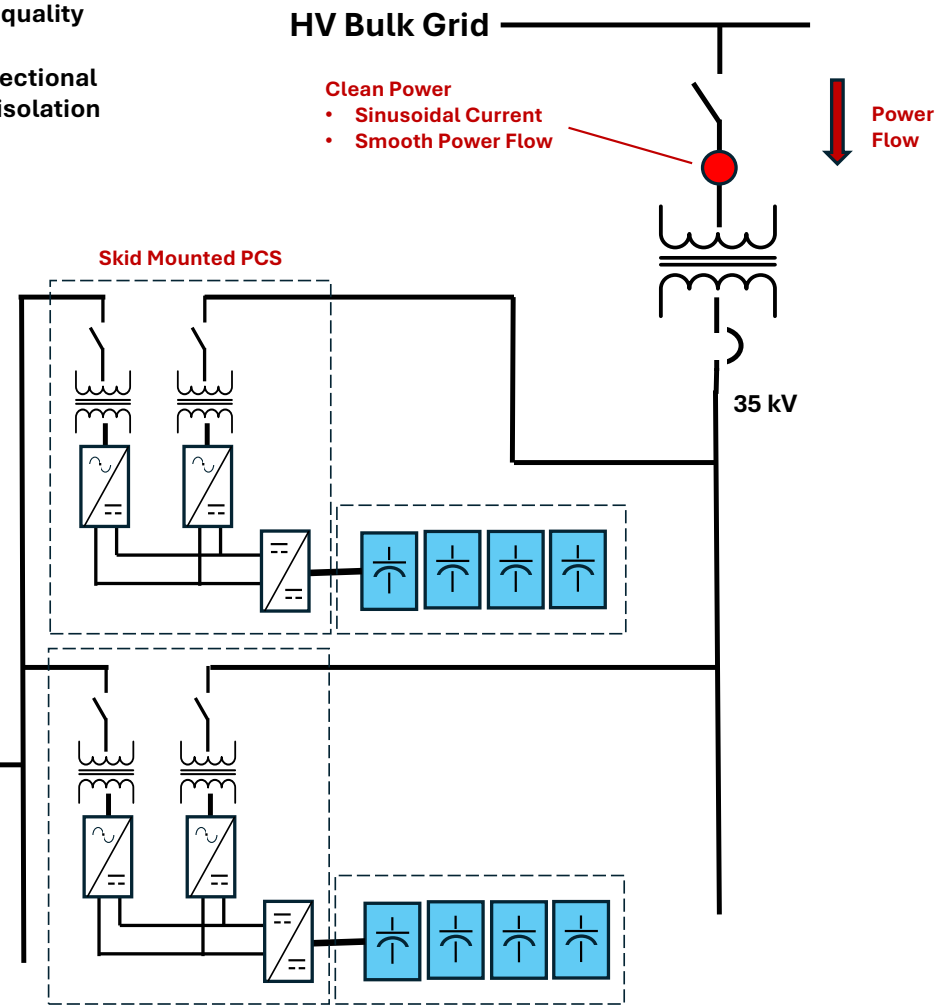
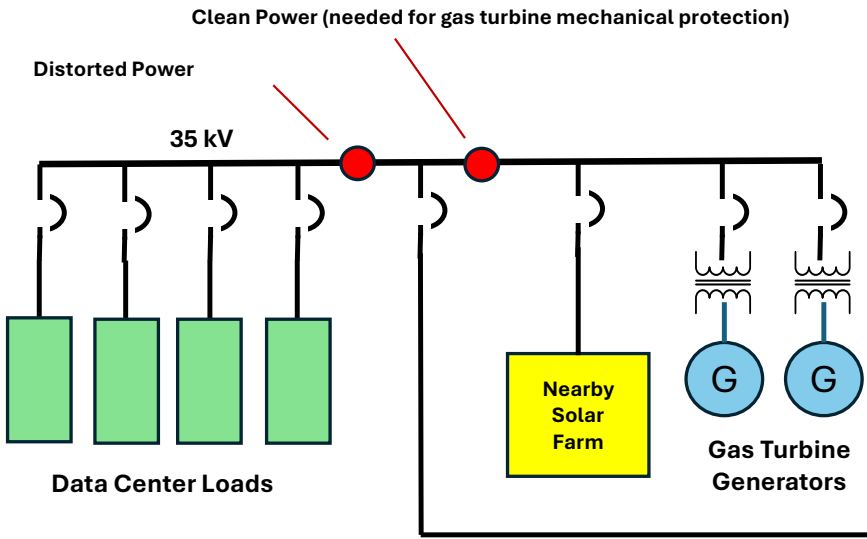
Energy goes to BESS with high ramp rate



Block Diagram Example – Back-to-Back AC/DC/AC PCS



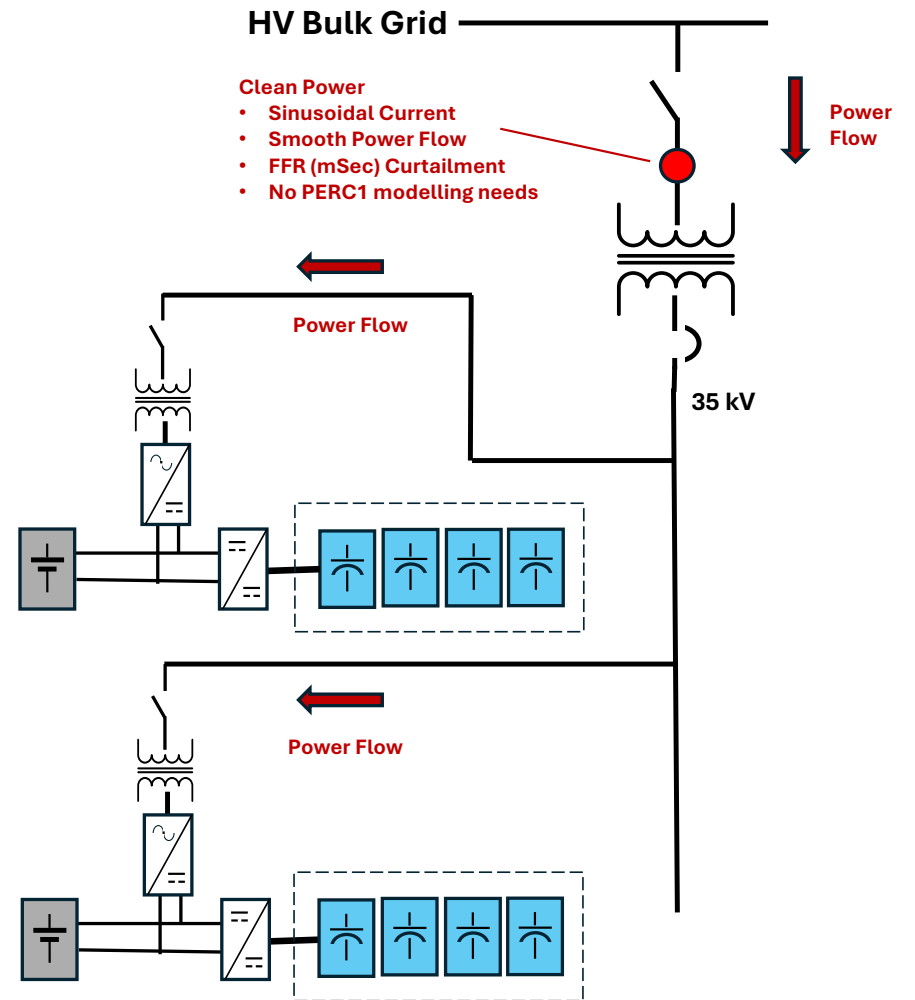
A solution for integrating data centers into the grid without the power quality concerns to the grid that AI data centers bring if synchronized. This solution provides clean power to the gas turbines as well as bi-directional power exchange and grid stability services to the bulk grid through DC isolation



Bulk Grid Interconnection



- The bulk grid only sees a PCS like that of a GFM BESS in charge mode
- The AI Data Center is fed from the DC Bus of the PCS in grid forming mode (GFM). The bulk grid does not see the erratic AI loads.
- On-Site generation can be connected to the Data Center bus as needed. Many different forms of generation can be integrated
- Modular system can be expanded as needed.
- Stability services can still be offered to the bulk grid during times of power curtailment



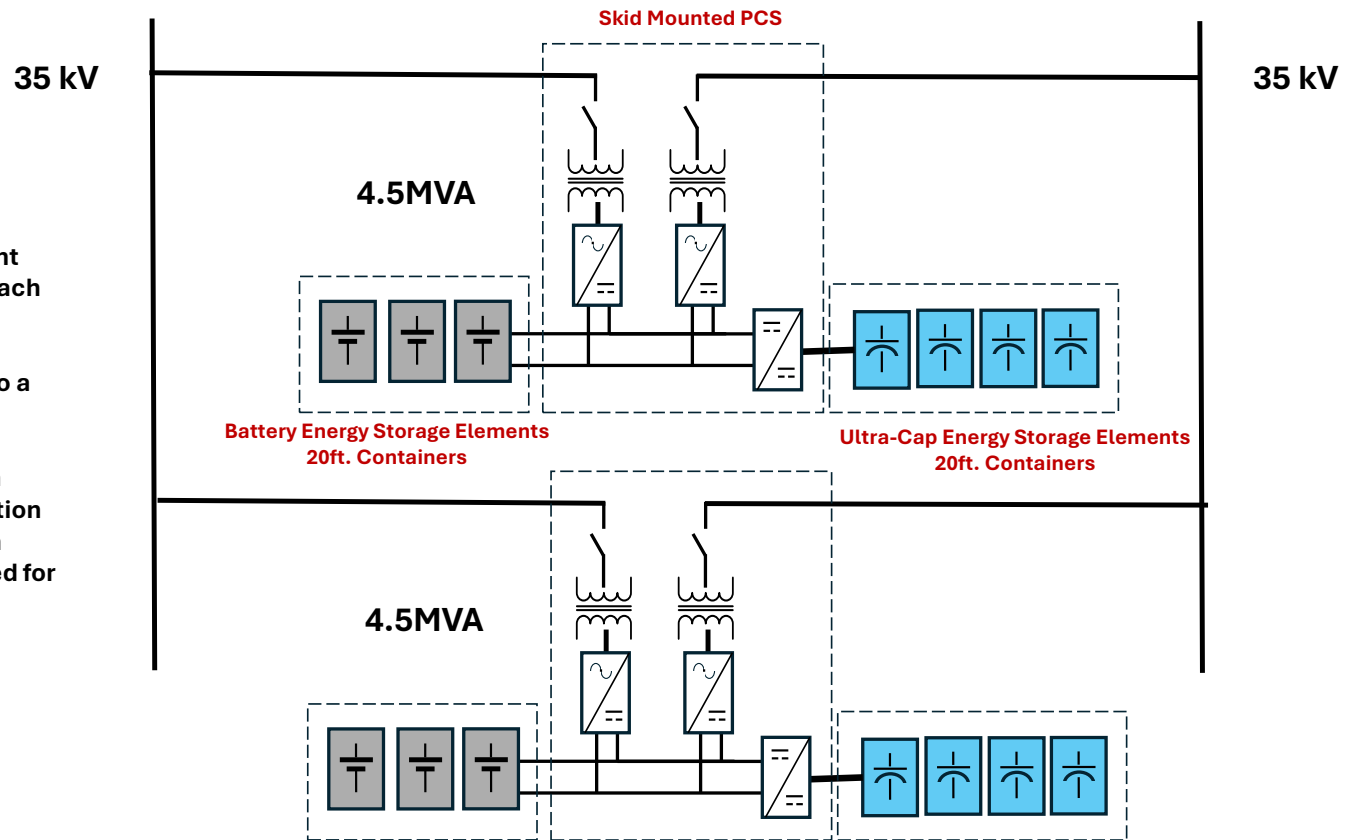
Many Units can be connected in parallel to achieve high power ratings, Grid Forming and Black Start on either side can also be supplied



35kV Feeders on the left and right sides are NOT synchronized to each other.

Each side is connected similar to a standard BESS connection..

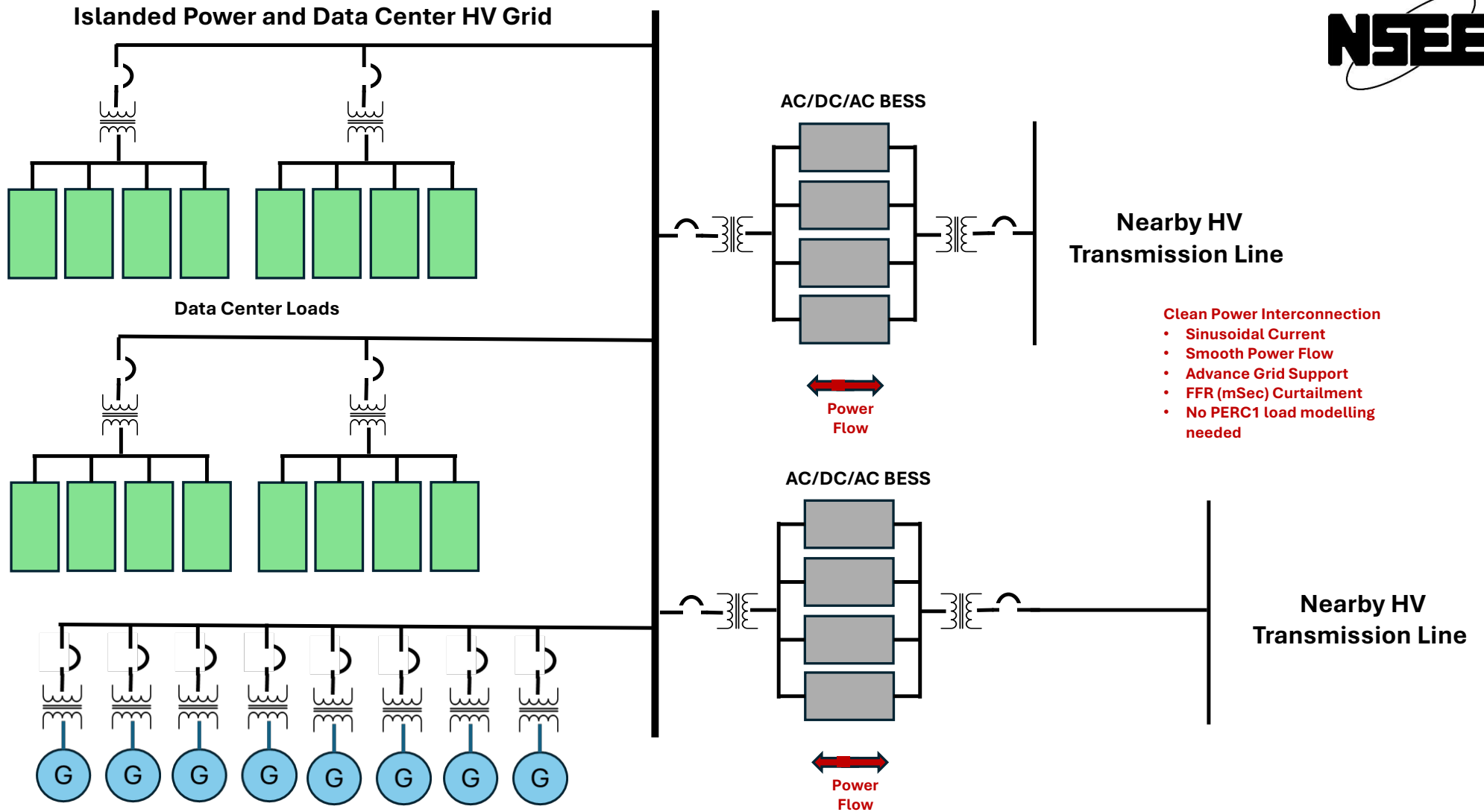
Batteries can also be mixed with Ultra-Capacitors for longer duration energy storage added to the high cyclic power conditioning needed for Data Centers



Example, planned large off-grid Power and Data Center



- **Some projects are being built off-grid to avoid interconnection delays.**
- **These projects could benefit from connecting some of their capacity to nearby transmission lines, permitting similar to a standard BESS project**
- **This would allow the project to bid into ERCOT markets without the usual complications of permitting large power and loads.**
- **By making use of nearby transmission lines, the connections could be sized to not require upgrades of these lines, and improve the stability and capacity of the areas around them.**

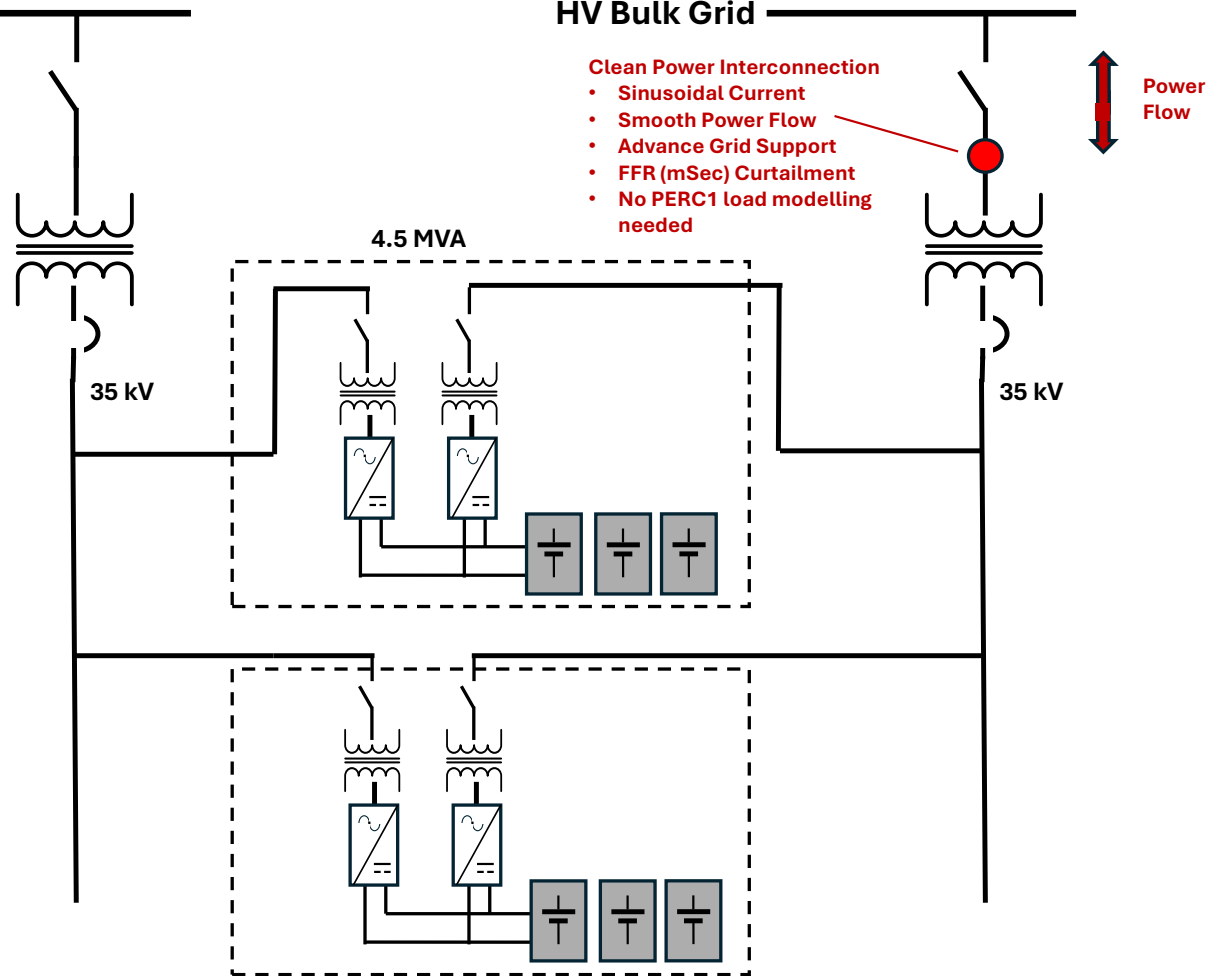


Block Diagram Example – Back-to-Back AC/DC/AC PCS

Islanded Power and Data Center HV Grid

HV Bulk Grid

- Each side connects to its grid as a standard BESS connection
- A series of 4MW connections, just like a standard BESS, many hundreds of MW can be connected and controlled as a single entity





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These, and other customized applications can be configured as needed. We look forward to discussing in further detail. For more information, please contact;

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