

Settlement of Load Serving Charging Energy for Energy Storage Resources that Directly Serve Load under Order 841

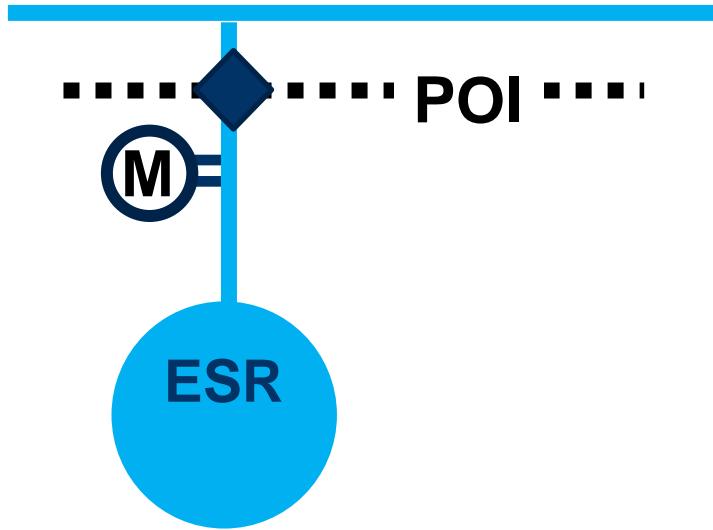
Andrew Levitt

May 20 DER Subcommittee

- Energy Storage Resource Notice of Proposed Rulemaking in November 2016
- Order 841 Final Rule on Electric Storage Participation in Regional Markets issued February, 2018
- PJM Compliance Filing Dec 3, 2018 targeting **Dec 3, 2019 implementation**
- FERC acceptance of new Energy Storage Resource and Capacity Storage Resource definitions on Feb 3, 2019 (all of ER19-462)
- PJM submitted additional clarifying Tariff language May 1, 2019 in response to FERC Request for Clarification
- FERC acceptance of PJM compliance filing still pending (ER19-469)
- FERC discussion of Order 841 at May 16 open meeting.

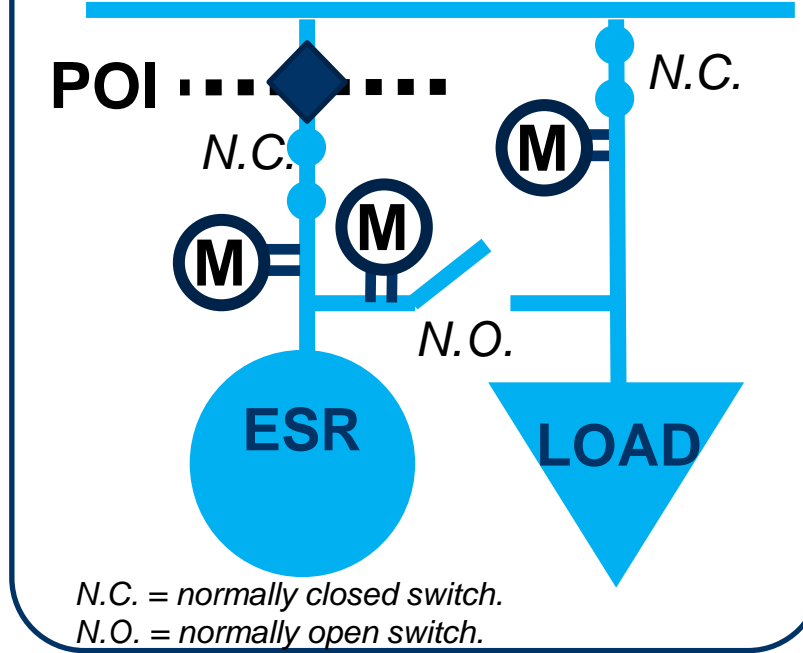
Plain old “front of meter ESR”

Utility grid



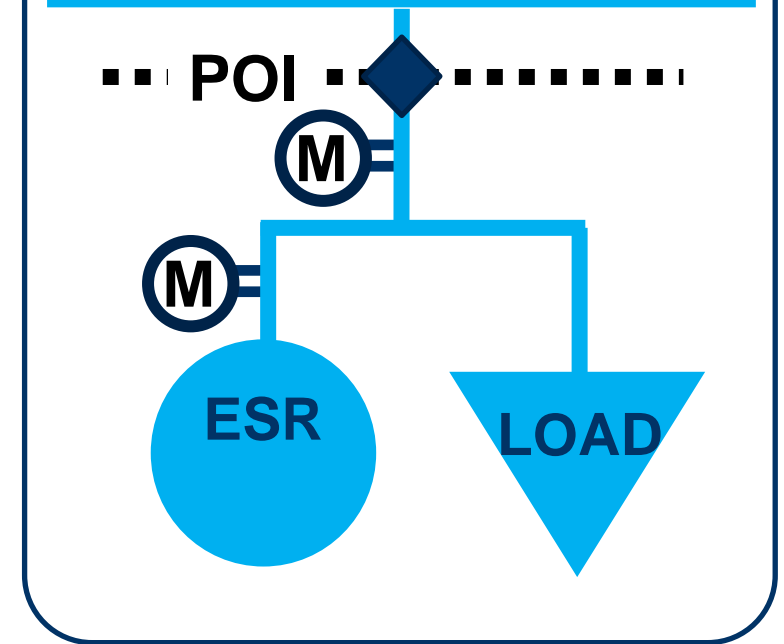
“Resilience” ESR

Utility grid

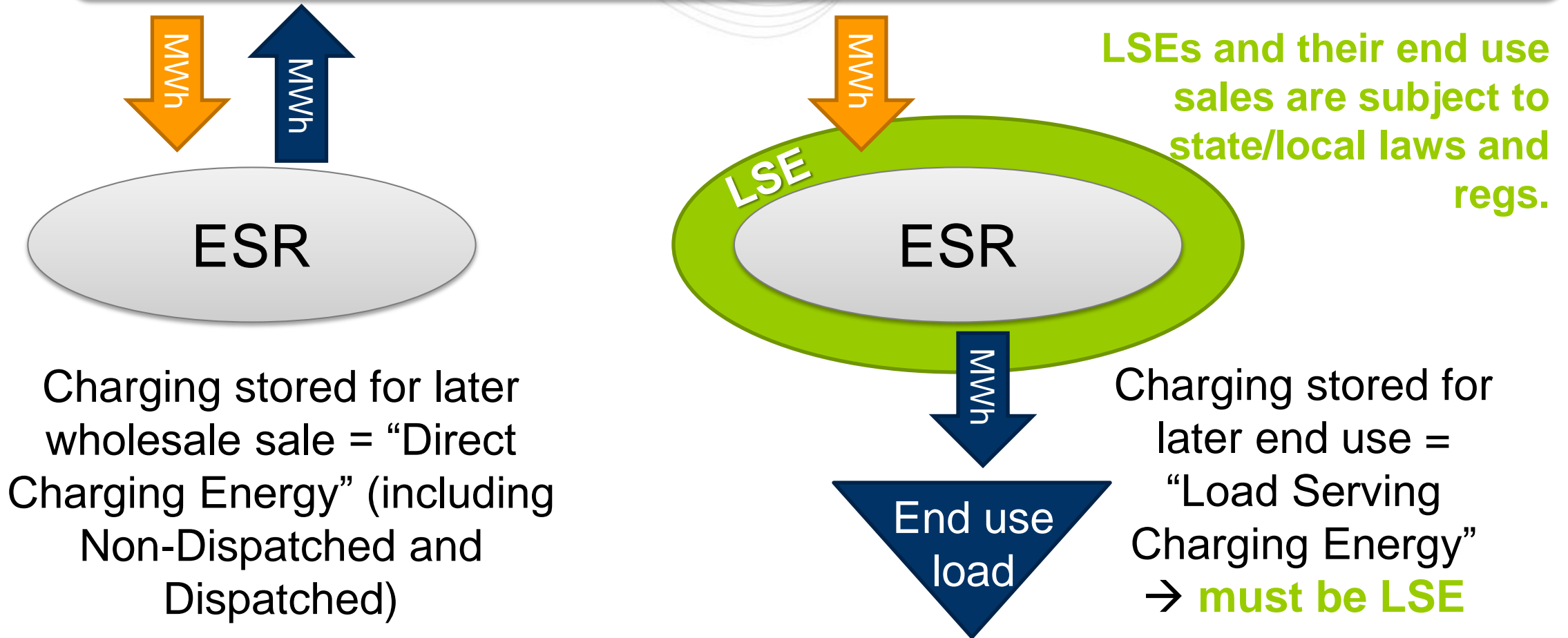


“Customer-side” ESR

Utility grid



PJM Energy Market



*“**Direct Charging Energy**” shall mean the energy that an Energy Storage Resource purchases from the PJM Interchange Energy Market and (i) later resells to the PJM Interchange Energy Market; or (ii) is lost to conversion inefficiencies, provided that such inefficiencies are an unavoidable component of the conversion, storage, and discharge process that is used to resell energy back to the PJM Interchange Energy Market.*

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OATT Att. K Appendix Sec 1.4A.1 (a): Energy that an Energy Storage Resource Model Participant purchases from the PJM Interchange Energy Market must be Direct Charging Energy.

Direct Charging Energy is settled as “negative generation”

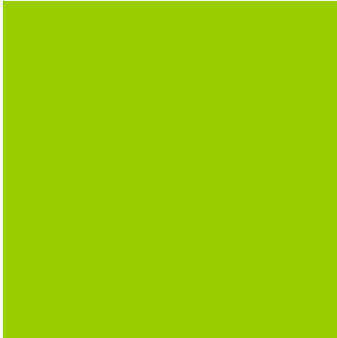
“Load Serving Charging Energy” shall mean energy that is purchased from the PJM Interchange Energy Market and stored in an Energy Storage Resource for later resale to end-use load.

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OATT Att. K Appendix Sec 1.4A.1 (a): Energy that an Energy Storage Resource Model Participant purchases from the PJM Interchange Energy Market must be Direct Charging Energy.

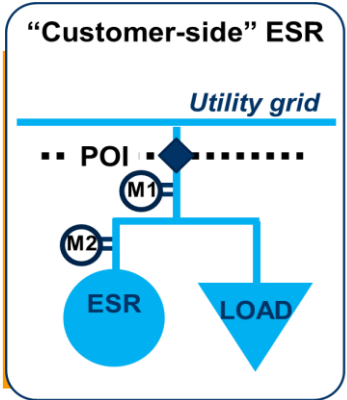
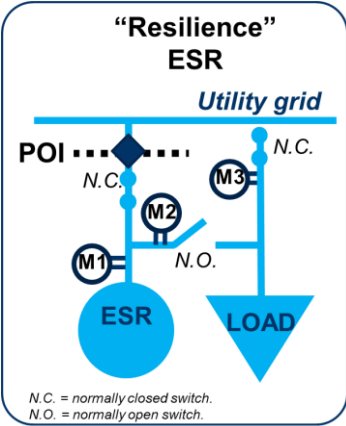
→ Only a Load Serving Entity may purchase Load Serving Charging Energy.

Load Serving Charging Energy is load. Just like all load, LSCE is settled as wholesale load for the LSE, and generally also has a retail settlement.



1. Settling Load and Direct Charging Energy Load Serving ESR

2. Metering and Method to Identify Load Serving Charging Energy at a Resilience ESR

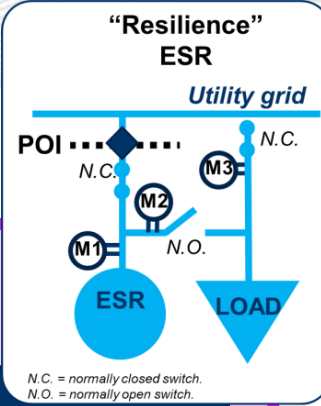


3. Metering and Method to Identify Direct Charging Energy at a Customer-side ESR

1. Settling Load and Direct Charging Energy at Load Serving ESR

1. PJM expects ESR Power Meter submitter (either EDC, ESR owner, or other) to report initial ESR charging settlement as either 100% load or 100% negative generation.
2. Meters and arithmetic used to distinguish monthly Direct Charging Energy that was returned to PJM from the monthly Load Serving Charging Energy that was directly discharged to load.
3. EDC to use new PJM-developed ESR meter correction process and existing Load Reconciliation process to back out the relevant monthly charging quantity (pro-rated across applicable intervals at the applicable interval LMP) from the initial settlement and replace with the correct settlement.

Example: Resilience ESR



Initial Settlement

PJM Settlements

Debit

100% of Charging

ESR

LSE

Final Settlement

PJM Settlements

Meter Correction

Credit

90% of Charging

10%

ESR

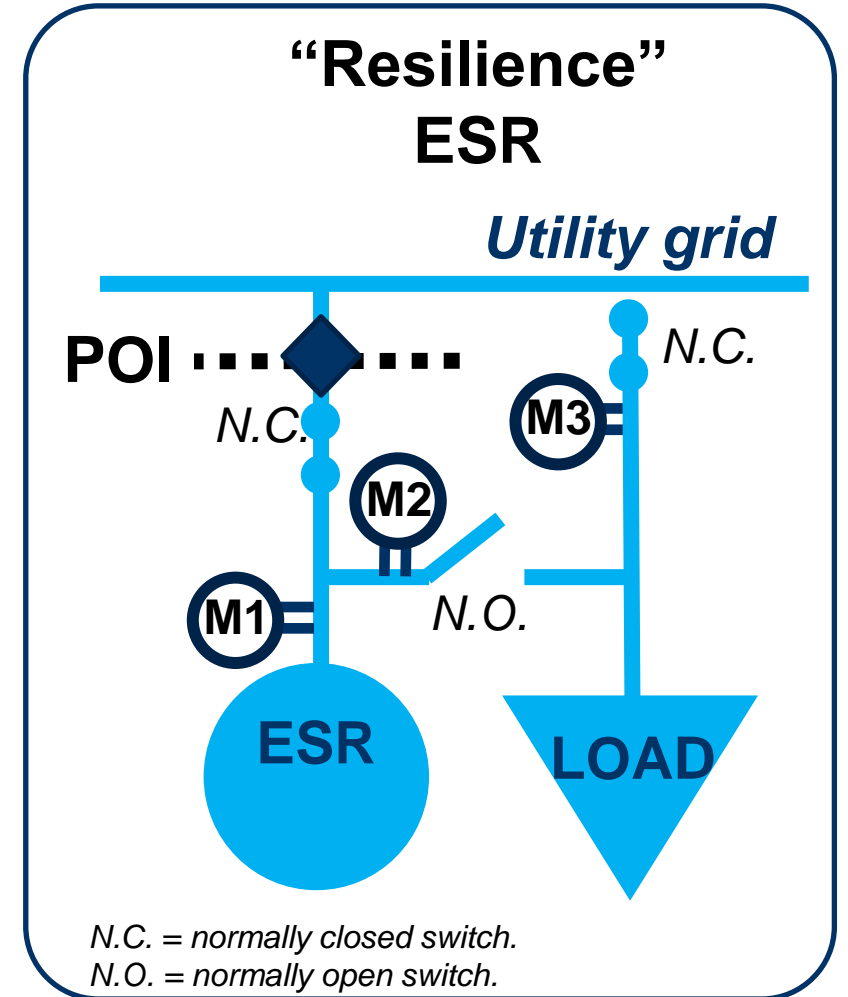
Load reconciliation

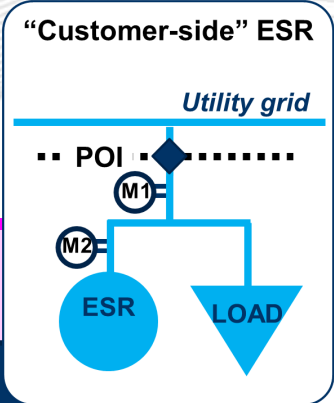
Debit

10%

LSE

1. Initial settlements are Direct Charging Energy (i.e., negative generation)
2. Monthly Load Serving Charging Energy quantity calculated
3. EDC to use PJM ESR Meter Correction process to net down the monthly Direct Charging Energy as a credit to the ESR Owner, in pro rata share of each withdrawal interval relative to LMP.
4. EDC to use PJM Load Reconciliation process to increase the monthly Load Serving Charging Energy for the designated Load Serving Entity for this site, e.g. in a per-interval share corresponding to Step 3

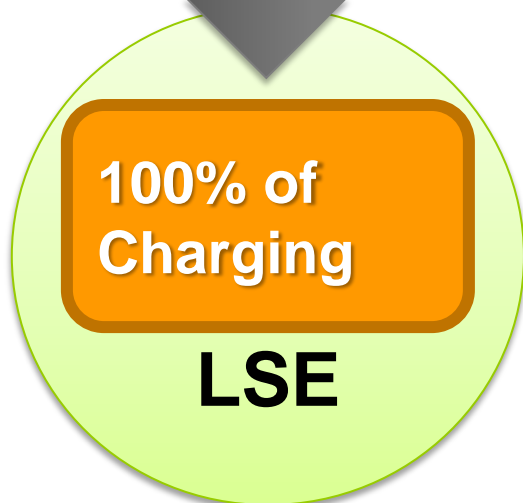




Initial Settlement

PJM Settlements

Debit



Final Settlement

PJM Settlements

EDC

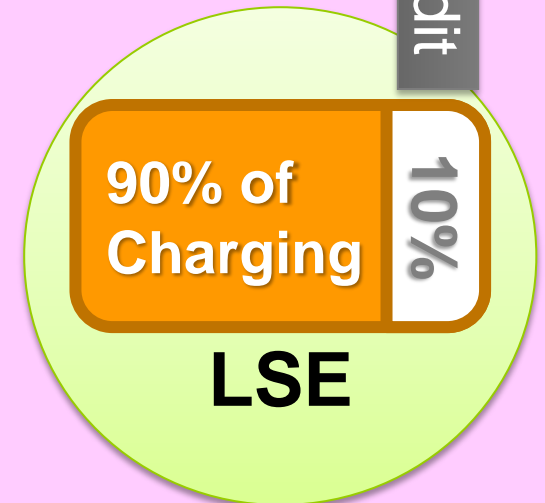
Meter Correction

Debit

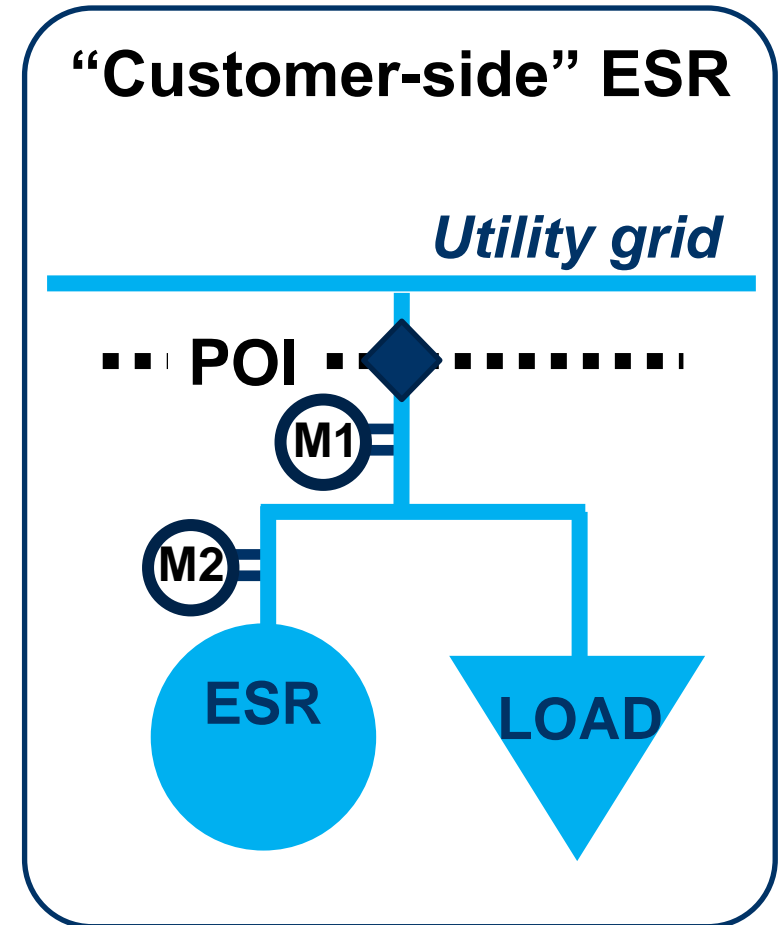


Load reconciliation

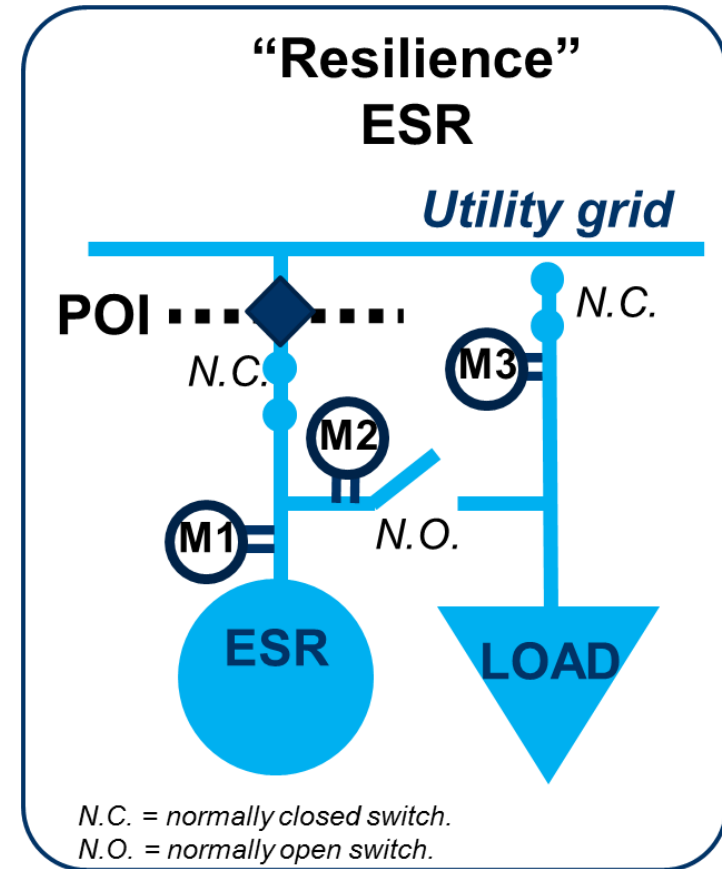
Credit



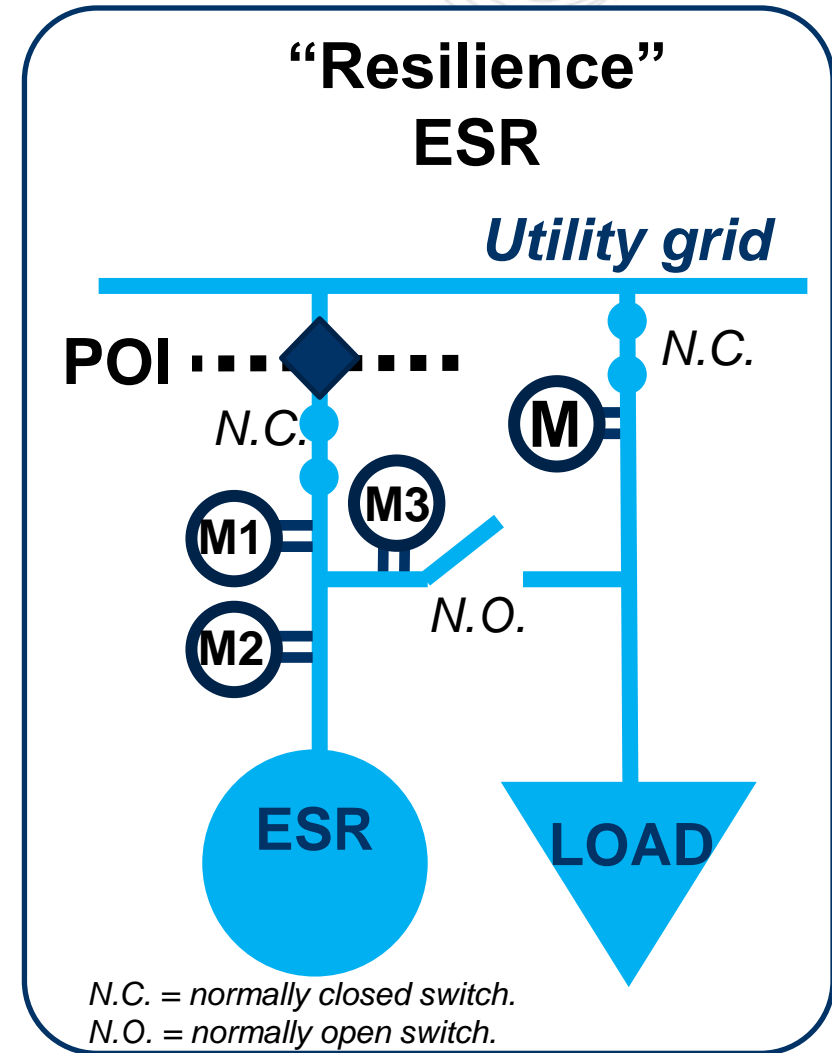
1. Initial settlements are wholesale sale to the LSE (“load”).
2. Site data used to derive monthly Direct Charging Energy quantity on an appropriate per-interval basis.
3. EDC to use PJM Load Reconciliation process to decrease the monthly load for the applicable Load Serving Entity for this site for the applicable intervals.
 - Only if EDC is capable of reducing the monthly retail bill purchase quantity by a corresponding amount.
4. EDC to use PJM ESR Meter Correction process to net up the monthly Direct Charging Energy in the applicable intervals as a charge to the ESR Owner.



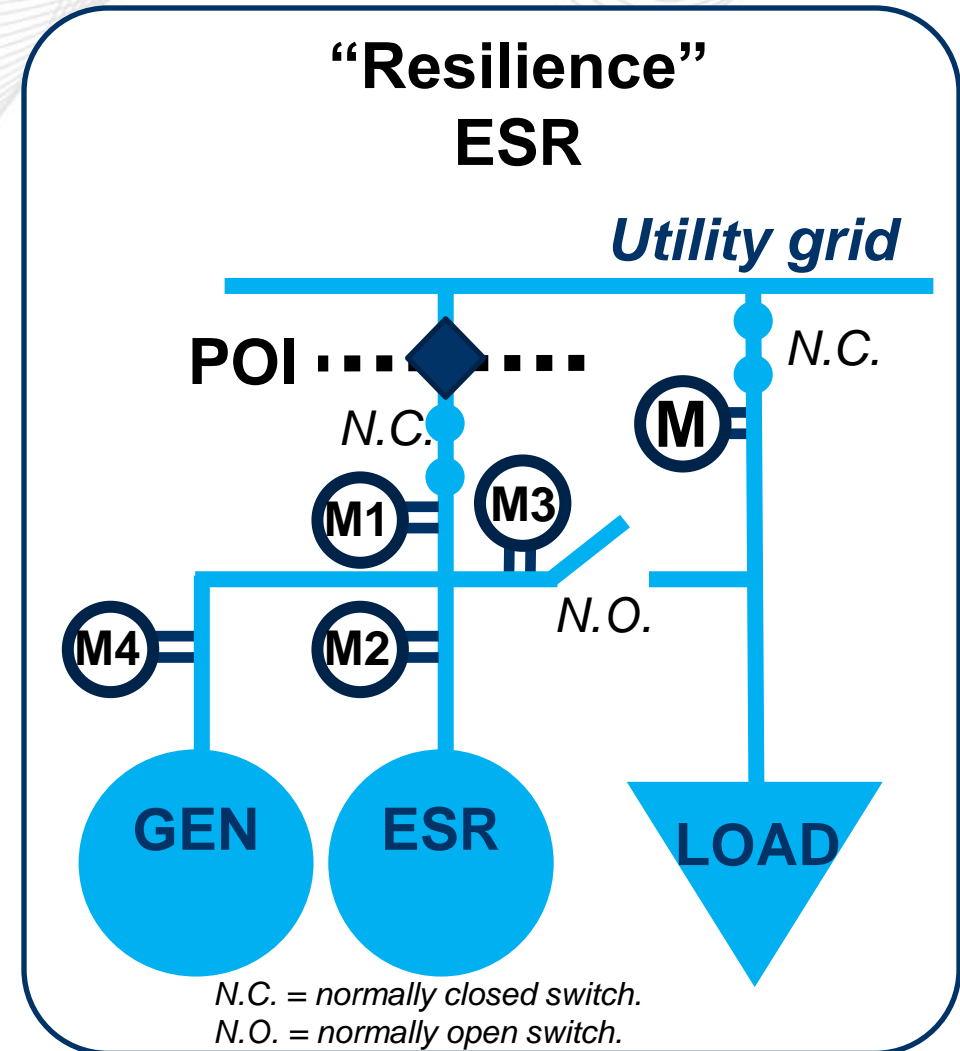
2. Metering and Method to Identify Load Serving Charging Energy at a Resilience ESR



- ESR can only charge from grid.
- M3 appropriately captures stored grid energy that is sent to end user → “Load Serving Charging Energy”.
- The sum of M3 over a month is the monthly Direct Charging Energy for ex-post adjustment as described above.

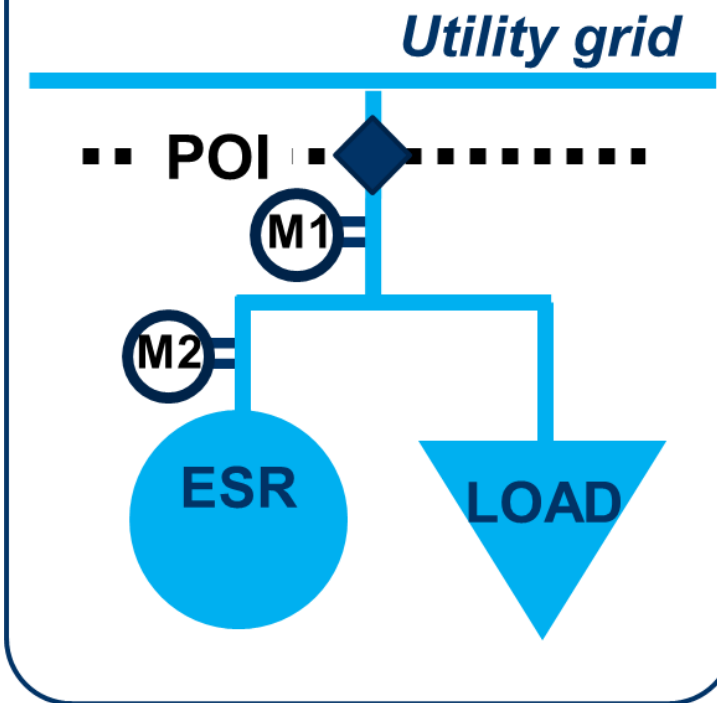


- ESR can charge from grid or on-site gen.
- EDC to determine how much of the ESR inventory that was discharged to the end user consisted of energy charges from the grid → “Load Serving Charging Energy”
 - If EDC reports that ESR inventory discharged to the end user consisted only of stored self-supplied on-site generation, then no Load Serving Charging Energy was consumed.

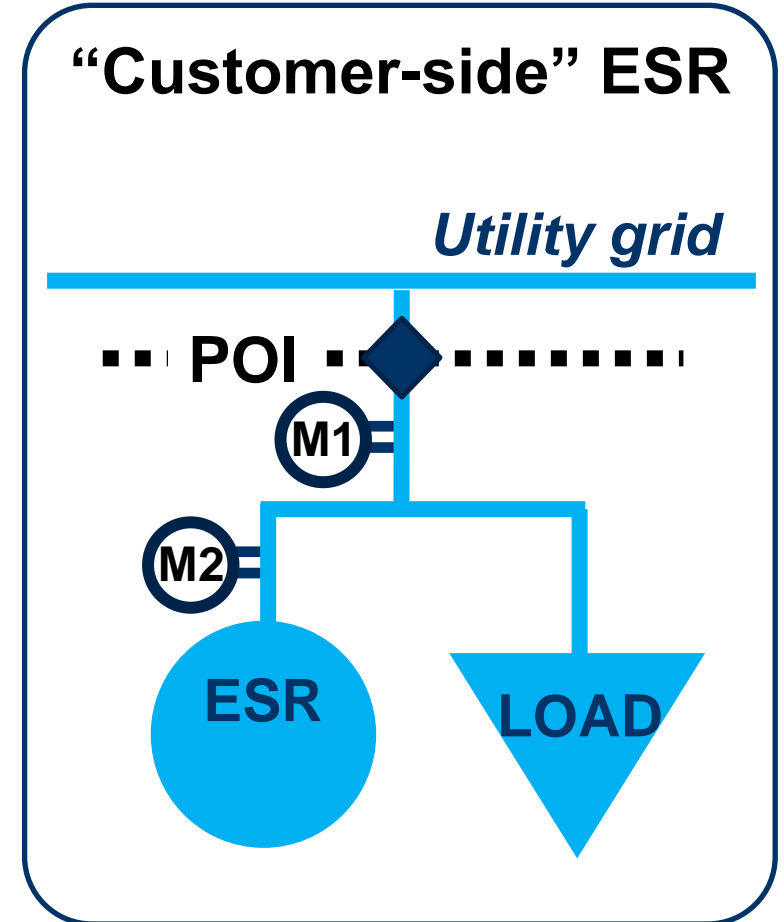


3. Metering and Method to Identify Direct Charging Energy at a Customer-side ESR

“Customer-side” ESR



- Net injections measured at M1 consist of previously-stored Direct Charging Energy.
 - Corresponding losses are also Direct Charging Energy. ESR can report losses to EDC through PJM, or EDC can work directly with ESR to quantify losses.
 - EDC calculates monthly Direct Charging Energy for ex-post adjustment by PJM as described above.
- M2 is required to identify which intervals the ESR was charging for ex-post adjustment.



- Net injections measured at M1 could consist of Direct Charging Energy, self-supplied charging energy, and/or on-site Generation.
 - The inventory in the ESR could also consist of a mix of grid energy and self supplied energy.
 - Losses corresponding to stored grid energy that is resold to PJM is also Direct Charging Energy.
- EDC calculates monthly Direct Charging Energy for ex-post adjustment.
- M2 is required to identify which intervals the ESR was charging for ex-post adjustment.

