

Grid Integrated Resources

Update to Energy/Ancillary Services

DERS

March 2, 2018

Energy Accounting

At stakeholder request, the next three slides present EDC/LSE energy accounting under the GIR proposal.

We believe our proposal results in no change in unaccounted for energy vs. status quo rules.

Metering and Settlement Review

- GIRs are metered at the retail metering point (or points, for submetered EDC accounts)
- Meter read is reversed in sign so injections are positive and withdrawals negative.
- Positive values (injections) telemetered to PowerMeter
- Negative values (withdrawals) used for settlements, telemetered at PJM's option.
- Option to submeter individual DERs for regulation retained. Used only for regulation compliance and does not affect energy settlements.
- GIRs energy is settled in two segments:
 - Load Offset segment using DR rules
 - Injection segment using generator rules

Energy Accounting

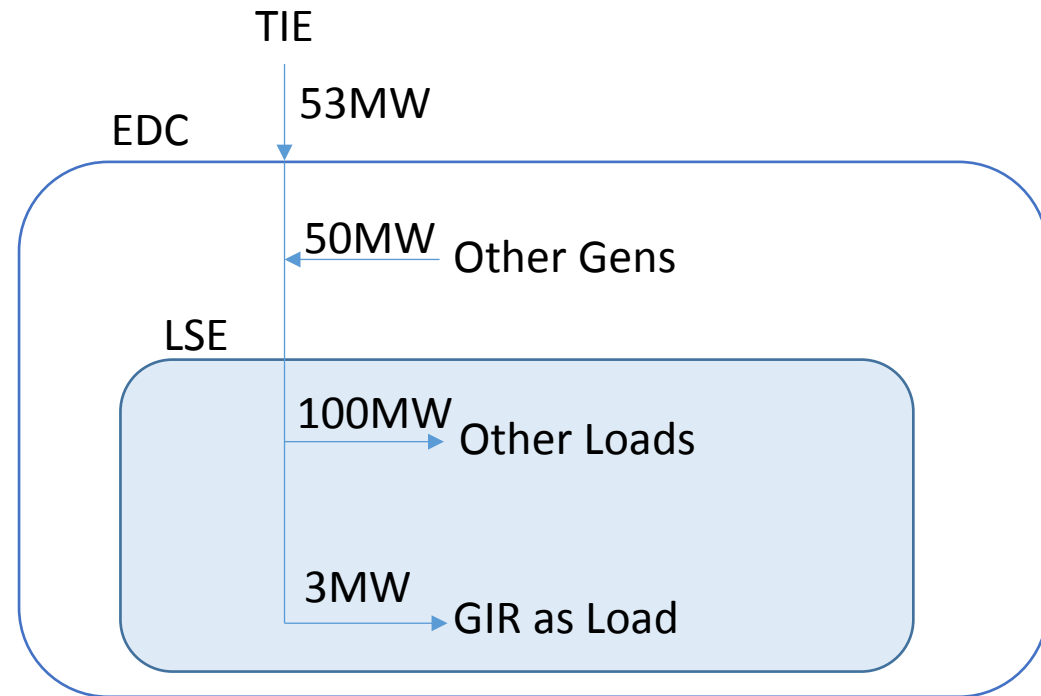
- Load offset segment GIR treated as demand response. No change on EDC or LSE settlements from status quo.

Injection segment:

- EDC territory load calculated using existing methodology:
 - $\text{EDC Load} = \text{Inflow at EDC Boundary} + \text{Generator Injections within EDC}$
 - No change to status quo.
- Retail withdrawals are measured unidirectionally (see PJM slides 3 and 4), reported by the EDC, and billed to LSE by PJM.
- Injections are treated as zero retail withdrawal, and do not affect LSE billing.
- Net impact is to preserve status quo for LSE billing

Energy Accounting Example

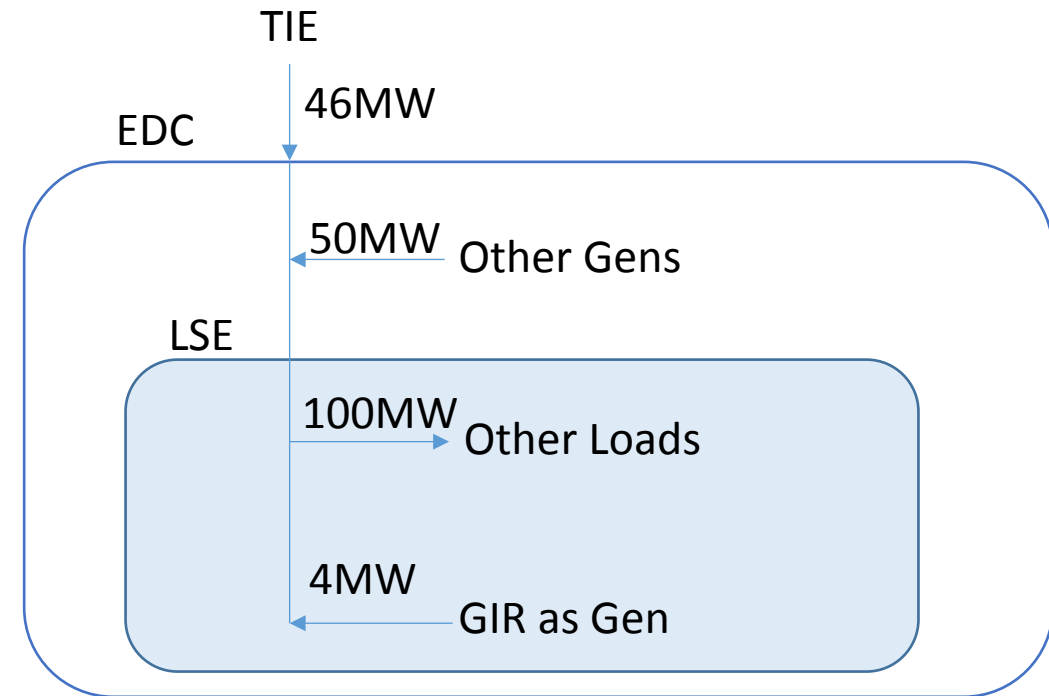
GIR not dispatched, acting as retail load



EDC load = 53MW + 50MW = 103MW

LSE load = 100MW + 3MW = 103MW

GIR dispatched, providing 7MW



EDC load = 46MW + 50MW + 4MW = 100MW

LSE load = 100MW + 0MW = 100MW

GIR settled as 3MW load offset, 4MW injection

Update: Nodal Energy Settlement

On Feb. 15th, FERC Order 841 specified that energy storage withdrawals and injections must be settled at nodal (Order 841 at 289). We extend this to apply to GIRs in general and update our proposal to comply.

- All energy sales by GIRs will be settled at the appropriate nodal LMP.

Update: Storage Charging Energy

Order 841 also specified that energy storage withdrawals are not retail sales. We update our proposal to comply.

- If storage is collocated with other DERs, additional metering rules apply:
 - Storage resource must have PJM-approved metering that measures energy entering the storage device from any out of market source (e.g., behind the meter solar).
 - Metering must enable determination of energy injected from storage vs. other behind the meter sources.
- Energy purchased for charging is calculated as:

$$\frac{\text{Injections from storage} - (\text{non market charging} * RTE)}{RTE}$$

Where RTE is storage round trip efficiency.

Storage Charging Energy Example

A storage device with 80% efficiency co-located with solar.
Storage device starts scenario at zero charge.

Interval	Withdrawal	Injection from Storage	Charge from Solar	Notes	Wholesale purchase
1	2MWh	0	0		750kWh
2	2MWh	0	1MWh		2MWh
3	0	1.5MWh	0	First 800kWh comes from solar. Remaining 700kWh injection offsets $700/0.8 = 875$ kWh from interval 2.	
4	0	1.5MWh	0	Represents $1.5\text{MWh} / 0.5 = 1.875$ MWh purchase, offsets remaining 1.125MWh from interval 2 and 750 kWh from settlement 1	

Storage Charging Energy Settlement

Settlement proceeds by one of two paths:

1. Retail tariff bills for charging at LMP
 - Charging energy reported to LSE
 - GIR not billed for charging energy by PJM
 - Retail-wholesale adjustment occurs between LSE and GIR
2. Retail tariff bills for charging at ordinary retail rate
 - LSE's InSchedule energy purchases reduced by charging energy quantity.
 - GIR's InSchedule energy purchases increased by charging energy quantity (note that the GIR effectively becomes an LSE for settlement purposes).
 - GIR receives "charging retail adjustment" credit on charging purchases at retail rate for each interval.
 - LSE receives opposite offsetting charge.