Grid Integrated Resources

Energy Market Example

DERSC
January 31, 2018
Sample Facility

Native Load 8MW:
3MW Base
5MW Process

8MW CHP

2MW Diesel

EDC Meter
Interconnection, Relays, Metering

GIR treated as single aggregated entity, so long as maximum net injection and other interconnection conditions respected.

Approved to inject up to 10MW, including systems to prevent greater injections if required.

Read at EDC meter point reversed in sign and sent to PJM.
Nominal Cost Policy
Offer Segment 1: 8MW, CHP
Offer Segment 2: 2MW, Diesel
Offer Segment 3: 5MW, DR
Daily Operations

Diesel Off

EDC Meter
Reasoning
3MW of CHP running as base to offset load, not eligible for market
5MW of CHP offered at $90.00
2MW of diesel offered at $250.00
5MW of DR offered at $1,000.00 during operating hours

This is all “behind the scenes.” Only final offer curve visible to PJM/IMM

Remainder of example assumes site passes TPS test and is not mitigated. Price-Based offer used.
Compliance at EDC meter. GIR is only evaluated based on draw/injection at that point.

Retail load on historical operating days used to generate baseline.
Compliance

GIR clears 5MW HE5 and HE11-15, and 3MW HE16

During each obligated hour, GIR must deliver a combination of reduced draw and injections so that committed energy is delivered.

HE5: Baseline near 0, site must inject 5MW.
HE11: Baseline 3.6MW, site must inject 1.4MW.
HE16: Baseline 3.8MW, site must draw no more than 0.8MW.
## Compliance Detail

<table>
<thead>
<tr>
<th></th>
<th>HE5</th>
<th>HE11</th>
<th>HE12</th>
<th>HE13</th>
<th>HE14</th>
<th>HE15</th>
<th>HE16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(A) Baseline</strong></td>
<td>0 MW</td>
<td>3.6 MW</td>
<td>3.8 MW</td>
<td>2.1 MW</td>
<td>2.2 MW</td>
<td>3.7 MW</td>
<td>3.8 MW</td>
</tr>
<tr>
<td><strong>(B) Total Obligation</strong></td>
<td>5 MW</td>
<td>5 MW</td>
<td>5 MW</td>
<td>5 MW</td>
<td>5 MW</td>
<td>5 MW</td>
<td>3 MW</td>
</tr>
<tr>
<td><strong>(C) DR Obligation (max(A,B))</strong></td>
<td>0 MW</td>
<td>3.6 MW</td>
<td>3.8 MW</td>
<td>2.1 MW</td>
<td>2.2 MW</td>
<td>3.7 MW</td>
<td>3.8 MW</td>
</tr>
<tr>
<td><strong>(D) Max. Allowed Load (A-C)</strong></td>
<td>0 MW</td>
<td>0 MW</td>
<td>0 MW</td>
<td>0 MW</td>
<td>0 MW</td>
<td>0 MW</td>
<td>0.8 MW</td>
</tr>
<tr>
<td><strong>(E) Injection Required (B-C)</strong></td>
<td>5 MW</td>
<td>1.4 MW</td>
<td>1.2 MW</td>
<td>2.9 MW</td>
<td>2.8 MW</td>
<td>1.3 MW</td>
<td>0 MW</td>
</tr>
<tr>
<td><strong>(F) Deadband (0.2C + 0.1E)</strong></td>
<td>500kw</td>
<td>860kW</td>
<td>880kW</td>
<td>710kW</td>
<td>720kW</td>
<td>870kW</td>
<td>760kW</td>
</tr>
</tbody>
</table>

**DR Obligation (C, blue)** settled when LMP passes net benefits test.

Injection obligation (E, green) settled at all times.

*The 5MW minimum BOR deadband still applies. Since values in this example are less than 5MW, that minimum would be used instead.*
Compliance Example 2

LMPs exceed $1,000/MWh from HE5 through HE15. Result is GIR clears 7MW HE5 to HE7 and 10MW HE8 to HE15

HE5: GIR must inject 7MW. CHP ramps up from 3MW to 8MW and diesel runs at 2MW, providing 7MW.

HE8 and on: Site must continue to inject ~7MW. Additional 3MW provided by curtailing process load, providing 10MW.

Note that 3MW of base load and 3MW of base load CHP are both still running, but are not in the market.
Settlements

• DR delivered is portion of energy from baseline down to zero. Paid at full LMP when LMP exceeds Net Benefits Threshold, not compensated at other times.

• Injections are as metered. Paid at full LMP at all times.

• BOR deadband is 20% of DR obligation plus 10% of injection obligation, but no less than 5MW.
  • If total delivered energy is within deadband, GIR eligible for make whole payments just as any other energy resource.
  • If total delivered energy is outside of deadband, GIR liable for BOR charges.