PJM Black Start Compensation

System Restoration Strategy Task Force
May 7, 2013
Blackstart Generators in PJM can be compensated by:

- FERC-approved rate (Paragraph 6 in Schedule 6A of PJM OATT)
- Base Formula Rate (Paragraph 5 in Schedule 6A of PJM OATT)
  - No Documented Capital Costs – proxy cost recovery
- Capital Cost Recovery (Paragraph 6 in Schedule 6A of PJM OATT)
  - Documented Capital Costs
  - Capital Cost Recovery Rate – NERC-CIP Specific Recovery
  - Capital Cost Recovery Rate
Annual Revenues Calculated from Formulas in Paragraph 18 of Schedule 6A

- **Traditional Black Start Generator**
  \[
  \{(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\} \times (1 + Z)
  \]

- **Automatic Load Rejection (ALR) Black Start Generator**
  \[
  (\text{Training Costs}) \times (1 + Z)
  \]
Fixed Black Start Service Costs (Fixed BSSC)

\[
(Fixed \ BSSC) + (Variable \ BSSC) + (Training \ Costs) + (Fuel \ Storage \ Costs) \times (1 + Z)
\]

Fixed BSSC (Capital Costs) can be calculated by:

- Base Formula Rate
- Capital Cost Recovery Rate – NERC-CIP Specific Recovery
- Capital Cost Recovery Rate
- FERC Approved Rate
Net CONE * Black Start Unit Capacity * X

Where

- Net CONE = Net Cost of New Entry ($/MW Year) for the CONE Area where the Unit is Located
- Black Start Unit Capacity = ICAP (MW)
- X = Black Start Service Allocation Factor
  - 0.01 for Hydro, 0.02 for Diesel/CT, and zero for ALR
Fixed BSSC – Capital Cost Recovery Rate - NERC-CIP

(Net CONE * Black Start NERC-CIP Unit Capacity * X) +
(Incremental Black Start NERC-CIP Capital Costs * CRF)

Where

• Black Start NERC-CIP Unit Capacity is capped at 100 MW for Hydro & 50 MW for Diesel/CT
• Incremental Black Start NERC-CIP Capital Costs = Documented NERC-CIP Capital Cost
• CRF = Capital Recovery Factor (from tables)
Fixed BSSC – Capital Cost Recovery Rate

(FERC Approved Rate) + (Incremental Black Start Capital Costs * CRF)

Where

• FERC Approved Rate = FERC Approved Capital Cost Recovery Rate
• Incremental Black Start Capital Costs = Documented Capital Costs
• CRF = Capital Recovery Factor (from tables)
CRF is a levelized CRF based on the Age of the Black Start Unit

<table>
<thead>
<tr>
<th>Age of Black Start Unit</th>
<th>Term of Black Start Commitment</th>
<th>Levelized CRF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5</td>
<td>20</td>
<td>0.125</td>
</tr>
<tr>
<td>6 to 10</td>
<td>15</td>
<td>0.146</td>
</tr>
<tr>
<td>11 to 15</td>
<td>10</td>
<td>0.198</td>
</tr>
<tr>
<td>16+</td>
<td>5</td>
<td>0.363</td>
</tr>
</tbody>
</table>
Alternative NERC-CIP CRF based on the expected Capital Improvement Lifespan (as determined by the applicable depreciation period published by the IRS)

<table>
<thead>
<tr>
<th>Capital Improvement Lifespan (Years)</th>
<th>Levelized CRF</th>
</tr>
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<tbody>
<tr>
<td>16-20</td>
<td>0.125</td>
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</tbody>
</table>
System Restoration Strategy Task Force’s Proposed Tariff Change Correction to add Applicable Recovery Period

<table>
<thead>
<tr>
<th>Capital Improvement Lifespan (years)</th>
<th>Applicable Recovery Period/Term of Commitment (years)</th>
<th>Levelized CRF</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-20</td>
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CRF is calculated based on the following Assumptions

- 12% Internal Rate of Return on Equity
- 50% Debt / 50% Equity
- 7% Interest Rate
- 10 Year Debt Term
- 15 Year Depreciation
- 36% Federal Tax Rate
- 9% State Tax Rate
Variable Black Start Service Costs (Variable BSSC)

\[
{(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})} \times (1 + Z)
\]

Variable BSSC (O&M Costs) = Black Start Unit O&M * Y

Where

- Black Start Unit O&M = Black Start O&M costs equal to M15 Annual VOM including NERC Reliability Standards Costs
- Y = 0.01 unless a Higher or Lower Value is supported by Documentation (1-Y applied to Black Start VOM on Energy Cost Offer)
- Variable BSSC = Zero for ALR Units
\[(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\] \* (1 + Z)

Training Costs = 50 Staff Hours * $75/\text{Hour} = $3,750
• Training Costs are per Plant
\[(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\} \times (1 + Z)\]

- Fuel Storage Costs are for Oil Carrying Costs
- Black Start Units that use Fuels other than Oil Calculate Fuel Storage Costs as Zero
- ALR Unit’s Fuel Storage Costs are Zero
\{ \text{MTSL} + \left[ \left( \text{# Run Hours} \right) \times \left( \text{Fuel Burn Rate} \right) \right] \times \left( \text{12 Month Forward Strip} + \text{Basis} \right) \} \times \text{(Bond Rate)}

Where

- MTSL = Minimum Tank Suction Level
- # Run Hours = Actual Number of Run Hours as Defined in TO Restoration Plan (Lesser of 16 Hours or TO Requirement)
- Fuel Burn Rate = Actual Fuel Burn rate for Unit
- 12 Month Forward Strip = Average Forward Prices Traded May 1
- Basis = Transportation Costs + Variable Taxes
- Bond Rate = Moody Utility Index Baa1 Bonds May 1
Z Factor

\[(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\] \( \times \) \( (1 + Z) \)

Z is the Incentive Factor solely for Black Start units with a Commitment under Paragraph 5 of Schedule 6A

- \( Z = 10\% \) (0\% for Units on CRF Rates)
Base Formula Rate Example

- Estimated Annual Revenue for a 20 MW Oil Fired 30 Yr Old Combustion Turbine in Net CONE Area 1
  - Fixed BSSC = 20 * ($244.61*365) * 0.02 = $35,713
  - Variable BSSC = $200,000 * 0.01 = $ 2,000
  - Training Costs = 50 * $75/Hour = $ 3,750
  - Fuel Storage = {2000+[16*1950]}*(3.0+0.1)*0.05 = $ 5,146

Times (1+ 10%) = $51,270
### NERC-CIP Capital Recovery Rate Example

- **Estimated Annual Revenue for a 20 MW Oil Fired 30 Yr Old Combustion Turbine with $50,000 NERC-CIP Capital Cost**
  - Fixed BSSC = $244.61\times365\times0.02 + (0.363 \times 50,000) = $53,863
  - Variable BSSC = 200,000 \times 0.01 = $2,000
  - Training Costs = 50 \times 75 = $3,750
  - Fuel Storage = \{2000 + [16 \times 1950]\} \times (3.0 + 0.1) \times 0.05 = $5,146
  - Times (1 + 0\%) = $64,759
Capital Recovery Rate Example

- Estimated Annual Revenue for a 20 MW Oil Fired 30 Yr Old Combustion Turbine with $500,000 Black Start Capital Cost
  - Fixed BSSC = (0.363 * $500,000) = $181,500
  - Variable BSSC = $200,000 * 0.01 = $ 2,000
  - Training Costs = 50 * $75/Hour = $ 3,750
  - Fuel Storage = \{(2000+[16*1950])*(3.0+0.1)*0.05\} = $ 5,146

Times (1+ 0%) = $192,396
Black Start Cost Submittal Forms