PJM PRD vs DR Table Comparison

Action item #4: An overview of the PJM process for DR participation in the capacity market

Overview

- The table below is presented in response to stakeholder requests to get an idea of how supply-side demand response and demand-side demand-response are treated in the PJM market.
- The details described below can be found in PJM Manual 18: PJM Capacity Market, Revision 37, April 27, 2017 available at http://pjm.com/-/media/documents/manuals/m18.ashx.
- The table below compares demand-side “Price Responsive Demand” in PJM with supply-side “Demand Resources” in their basic requirements, definition, measurement, compliance obligations, and market treatment under Capacity Performance
- This comparison is provided to the stakeholders as one example of how the demand side can participate in the capacity market and it is hoped will spark further conversation on how the demand-side can best participate in the forthcoming Alberta Capacity Market with the minimal set of complex rules on measurement, compliance, and market settlement that is apparent from the PJM rules provided below.

Basic Requirements

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Interval Metering Required	Yes	Yes
Supervisory Control Required	Yes, to ensure reductions happen as committed	Not required
Requires Link to Dynamic Retail Rates?	Yes, the point is that demand is reduced in response to price Dynamic Retail Rates change the price with changing bulk power system conditions which could be based on prices or emergency actions. The timing of retail price changes are not known in advance by customers.	No, demand is reduced based on declaration of emergency conditions Customers can be on any retail rate structure to participate on the supply-side.

Energy Market Participation

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Bid Required in the Energy Market	Yes, to get down to committed level at a price at or below price during emergency conditions At minimum, the demand bid could look like a single load level up to a specified price, say $1000/MWh, and then the MESL to be consumed at prices above $1000/MWh.	No, DR is called based on entering emergency conditions only. However, supply-side offers do submit a "strike price" at which they would reduce consumption. This is used to settle reduction of energy for energy market settlement that accompany emergencies. Historically set at the maximum price.

Baseline Peak Load Absent Response

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Baseline Before Response Assumed for Auction	**"Expected Peak Load Value". Explicit methodology for "Expected Peak Load Value" is not defined. This is forward looking** **One could expect that a "reasonable" expected peak load is the historic peak load (absent any demand response) adjusted for forecast load growth.**	**Peak Load Contribution (PLC), including "add-backs" to get what load would have been absent DR in the year prior to the auction. This is backward looking.** **Suppose in the previous year, metered peak load was 70 MW, but there was also a 20 MW DR action. This 20 MW action would be added back to get a PLC of 90 MW.**

Nominal Reduction Value

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Nominal Reduction Value	"Expected Peak Load Value" less the Maximum Emergency Service Level (MESL) If the expected peak load value is 100 MW, and the MESL is 70 MW, the nominal reduction value is 30 MW.	The amount of reduction submitted on the supply-side as if it were a generator called Nominated DR Value For Firm Service Level (FSL) options this is equal to the min{Summer PLC, Winter PLC} – FSL For Guaranteed Load Drop (GLD) the amount cannot exceed the min{summer PLC, winter PLC} Suppose the Summer PLC is 100 MW and the winter PLC is 70 MW as it is in PJM. For DR under FSL, the FSL must be below 70 MW to get any credit for DR as an annual resource For DR under GLD, a GLD value of 20 MW implies that in the summer the GLD must get down to 80 MW, and in the winter must get down to 50 MW to be an annual resource.

Expected Performance

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Expected Performance	Metered consumption no more than the MESL multiplied by an adjustment factor.	DR opting for FSL must reduce consumption to FSL as an annual resource. Guaranteed Load Drop (GLD) must reduce load by committed amount from the summer or winter PLC whichever is applicable at the time of the DR call.
Adjustements to Expected Performance	Adjustment to account for the idea that load can be greater than the 50/50 load forecast. Adjustment factor = max{1.0, (actual zone load – actual PRD load + DR and PRD add-backs)/(Final Zone peak forecast – Zonal Expected Peak Load Value)}	For winter only. Winter weather normalized peak divided by the zonal average of the 5 coincident peaks in December through February. This factor is multiplied by the Winter PLC to arrive at the Adjusted Winter Peak Load

Performance Measurement

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Performance Measurement or Compliance Shortfall	Highest hourly metered load during an emergency event less adjusted MESL	FSL Summer: Summer PLC – actual metered load FSL Winter: Adjusted Winter Peak Load – actual metered load GLD summer is the min{comparison load, PLC} – actual metered load and actual metered load must be less than PLC GLD winter is the min{comparison load, Adjusted Winter Peak Load} – actual metered load There are methodologies laid out in PJM Manual 19 for calculating comparison loads

Performance Penalties

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Non-Performance Compliance Penalties	Final Zonal Capacity Price + max{0.2* Zonal Capacity Price, $20/MW-day} and is multiplied by the MW shortfall * the FPR during a maximum emergency event But if there are multiple non-performance events, penalties will only be assessed if they exceed the maximum shortfall in previous events and only for the additional non-performance. At worst, the PRD provider can forfeit the entire capacity payment plus an additional 20% or $20/MW-day more. There are no bonuses for over-performance	Modeled LDA Net CONE *365/30 multiplied by the MW shortfall under capacity performance. This charge can be assessed each time there is a shortfall in expected performance. There is a maximum penalty over the entire year of 1.5* Modeled LDA Net CONE * 365 If over-performing, bonus payments are possible but these are dependent upon the amount of non-performance penalties available for distribution.

Auction Accounting

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Accounting in Capacity Auction	Subtracted off the demand curve and accounting for the reduced level of reserves required from reducing demand by multiplying the Nominal Reduction Value by the Forecast Pool Requirement (FPR) For example, suppose the expected peak value is 100 MW, and the MESL is 70 MW to get a nominal reduction requirement of 30 MW. And this will be taken off at any capacity price above $0/MW-day. Suppose the FPR is 1.08. In this case 30 * 1.08=32.4 MW will be subtracted off the demand at every price along the demand curve.	A separate supply offer where the total supply is the committed reduction multiplied by the forecast pool requirement (FPR) to account for reduced need for reserves from the reduced demand. Suppose the desired reduction as a supply bid is 30 MW (it does not matter whether it is GLD or FSL type DR), and this will be supplied at any price above $0/MW-day. If the FPR is 1.08, then the actual supply of DR is 30* 1.08 which is 32.4 MW of supply that if cleared, the DR provider will get paid for.

Auction Settlement

Requirements	PRD Demand-side Participation	Demand Resource (DR) Supply -side Participation
Auction Settlement	PRD saves its Expected Peak Load less MESL multiplied by the FPR and then multiplied by the auction price. Continuing with the previous example, if the price in the auction is $100/MW-day, then the PRD provider saves $32.4 MW * $100/MW-day or $3240/day, but there is no direct payment made to PRD, it is only cost savings. As a load it will pay for its actual peal load which is its MESL multiplied by the capacity price alone as a single transaction.	Supply receives a payment equal to supply amount multiplied by the FPR. The load still pays its PLC for the payments made to capacity. Continuing the previous example, if the price is $100/MW-day, the DR provider gets paid for $100/MW-day multiplied by 32.4 MW which gives a daily revenue of $3240/day. As a load, it will still pay for its PLC (peak load) multiplied by the capacity price while also saving the cash flow it receives as a supply-side resource.

Thank you