***Objective: Enable Nodal Price Settlement for Single Site Flexible Loads registered as CLRs.***

**Why are we doing this?**

1. **Price Formation:** Flexible Loads are/can be price responsive. Market outcomes would be better if Flexible Loads response is part of price formation by registering as a Controllable Load Resource and actively participate in the energy and Ancillary Service (AS) markets with bids for energy and offers for AS. Otherwise, by passively responding to energy prices, Flexible Loads would be reacting to the prices coming out of the dispatch engine and such a response would not necessarily be desirable.
2. **Congestion Management:** Today even single site CLRs are dispatched using a Load Zone Shift Factor and settled using their Load Zone price (*CLR energy consumption assigned to an ESIID is settled at LZ price today*). Flexible Loads registered as CLRs participating in the energy and AS markets on a Load Zone basis will result in erroneous congestion management by SCED and would require out-of-market actions by ERCOT operator in some extreme cases. The better/appropriate way to manage congestion is to dispatch such Flexible Loads registered as CLRs using their local nodal shift factor and settle them at their local nodal price.
3. PUCT, as part of the Phase 1 of the Market Design Improvements has directed ERCOT to settle Demand Response at a Nodal price

**Tasks to meet/accomplish objective**

1. Define eligibility for single site Flexible Loads that want to register as CLRs (minimum dispatchable MW capacity as a criterion? Maximum Low Power Consumption- LPC?, etc.).
2. As a first step to meet the PUCT directive, have Flexible Loads register as a CLR and dispatch them at their local nodal shift factor and settle their energy consumption at their local Nodal price.
3. Such CLRs will each require a Resource Node to enable hedging (CRR, DAM). Depending on the penetration of such CLRs, there is a performance impact to CRR and DAM clearing engines that will need further analysis and mitigation effort.
4. Maximum allowable Ramp Up/Ramp Down requirements for Flexible Loads (irrespective of whether they are a CLR or not 🡨 is this an item for the Task Force on Flexible Loads?
5. Data Aggregation and Settlement calculations
	1. Accounting for T&D losses and UFE calculation and allocation
	2. Other changes (example : support nodal pricing for Demand Response CLRs)

**Other Issues (to be taken up by Flexible Load Task Force?):**

1. SOTSG settled at LZ price should NOT be allowed to co-locate with CLR settled at nodal price
2. Should the OUTL status for LR be redefined?
	1. Changes to outage approval process?
3. Is there a change required in the determination of Transmission Operator (TO) Firm Load Shed Obligation if a TO has a large penetration of Flexible Loads?

**Related ERCOT presentations**

1. [*https://www.ercot.com/files/docs/2021/01/20/Current\_State\_and\_Expectations\_for\_Various\_BTM\_Scenarios\_WMWG\_012521.docx*](https://www.ercot.com/files/docs/2021/01/20/Current_State_and_Expectations_for_Various_BTM_Scenarios_WMWG_012521.docx)
2. [*https://www.ercot.com/files/docs/2022/01/24/CMWG-%20Demand-Response-CLR-Nodal-Settlement-Discussion.pptx*](https://www.ercot.com/files/docs/2022/01/24/CMWG-%20Demand-Response-CLR-Nodal-Settlement-Discussion.pptx)

**Background: Current Setup for CLR co-located with GR:** Net Gen Site Settlement

GR settled at Nodal price if during a 15-minute Settlement Interval the metered net energy of the site is gen, CLR, Aux Load, Other Load settled at LZ price if the metered net energy of the site is load

1. Meter prices are Generation Base Point Weighted
2. With only POI meter(s); cannot co-locate CLR with ESR
	1. However, can co-locate with ESR provided there is additional meter measuring ESR charging load and ESR is not receiving WSL treatment
3. Full Resource Capacity cannot be offered into market for energy and AS 🡨 only excess
	1. For GR, only excess generation capacity after serving ALL the load behind POI (includes CLR)
	2. For CLR, only excess consumption capacity after entire available GR output capacity has been used to serve load behind POI (includes Aux, PUN, and portion of CLR load)
4. Coordination required between GR and CLR when offering into market 🡨 Is this appropriate? Market manipulation concerns when GR and CLR represented by different Decision-Making Entities (DMEs)?

GR is On-Line and has excess capacity after serving Aux, “other Load” and maximum rated consumption of CLR

GR HSL = Min(0,MaxRatedCap – Aux – other Load – CLRMaxRatedConsumption)

GR LSL = Max(0, MinRatedCap– Aux – other Load – CLRMaxRatedConsumption)

CLR status is OUTL as GR HSL > 0

If GR is On-Line, and its maximum rated capacity is less than the Aux,”other load” and maximum rated consumption of CLR

(This is condition where the entire on-line capacity of the GR does not cover the Aux, other load and maximum consumption capability of the CLR)

GR status is On-Line

GR HSL=0

GR LSL = 0

CLR has excess consumption capacity

CLR Status is On-line

CLR MPC = Min(0,MaxRatedConsumption – (GRMaxRatedCap-Aux-other Load))

CLR LPC = Max(0, MinRatedConsumption– (GRMaxRatedCap-Aux-other Load))

If GR status is Off-Line or OUT

 CLR status is On-Line

CLR MPC = MaxRatedConsumption

CLR LPC = MinRatedConsumption

M1

Other Load

GR

CLR

POI meter 1

Nodal meter price is GR BasePoint Weighted

Aux

Resource Node

**Nodal Settlements for CLR**

**Single site CLR**

1. Behind the Service Delivery Point (SDP) the only load is the CLR settled at a Nodal price. i.e. cannot co-mingle Load to be settled at Load Zone price with CLR Settled at Nodal price behind the POI meter.
2. If site has some other load (for example office load or aux load like a GR), is the energy consumption of that load required to be settled at load zone price and require a separate meter? If not, then what is the size of this other load that can co-mingle with CLR load and still have the whole site settled at nodal price?

M1

CLR

SDP meter 1 (ESIID)

Nodal meter price is CLR BasePoint Weighted

Resource Node

Other Load

**Nodal Settlement for co-located CLR**

**Option 1:** Use metering concepts for ESR. Additional meter on CLR, Injection to grid settled at nodal price, CLR always settled at nodal price, if site is net consumption over 15 min Settlement Interval, then Aux Load and Other Load settled at Load Zone Price

1. Compared to Option 2, this will involve **less** ERCOT systems changes
2. POI Meter price is Generation Base Point Weighted
3. Additional meter at CLR is priced using CLR Base Points as weights
4. Will work even if we there is an ESR behind the POI. Will require additional meter to measure ESR charging load.
	1. ESR behind POI NOT eligible for WSL treatment if there is other non-Aux load (or station load to support generation output) as there can be periods where ESR stored energy is not being returned to the ERCOT grid as measured at the POI but to serve CLR or other load behind the POI
5. Will work for sites with multiple points of interconnection (POI)
6. Resource capacity of GR and CLR can be offered into market for energy and AS without the need for coordination of offered capacities. The maximum GR offered capacity is the excess after self-serving Aux load and “other load”. SCED Base Point to GR will serve ERCOT load as well as CLR consumption. CLR offered capacity is the maximum rated consumption.
7. With this option, CLR consumption is always measured and settled.
8. CLR consumption is added as Gen to for net gen calculation

M1

Other Load

GR

CLR

Aux

M2

POI meter 1

Nodal meter price is GR BasePoint Weighted

meter 2

ESIID settles CLR consumption all the time

Nodal meter price is CLR BasePoint Weighted

GR HSL = Min(0,MaxRatedCap – Aux – other Load)

GR LSL = Max(0, MinRatedCap– Aux – other Load)

CLR MPC = MaxRatedConsumption

CLR LPC = MinRatedConsumption

Resource Node

**Option 2:** POI meters have two Nodal prices, a) weighted by the Net of all Basepoints (GR and CLR) if net is positive and b) weighted by the Net of all Basepoints (GR and CLR) if net is negative

1. Compared to Option 1, this will involve significant ERCOT systems changes
2. Additional meters not required
3. Entire site MUST be settled at nodal for injection and withdrawals (i.e; CLR, Aux Load and Other Load settled at Nodal price)
4. No netting of Generation channel and Load channel MWh meter reads
	1. Generation Channel MWh settled at the meter price (Nodal) that is computed using positive net of ALL base points (GR, and CLR)
	2. Load Channel MWh settled at the meter price (Nodal) that is computed using negative net of ALL base points (GR, and CLR)
5. Will work even if there is an ESR behind the POI with no need for an additional meter to measure ESR charging load
	1. However, ESR will NOT be eligible for WSL as there can be periods where ESR stored energy is not being returned to grid but serve the CLR or other load behind POI
6. Will ONLY work for sites with single point of interconnection (POI). For sites with multiple POI will need to use Option 1.
7. Resource capacity of GR and CLR can be offered into market for energy and AS without the need for coordination of offered capacities. The maximum GR offered capacity is the excess after self-serving Aux load and “other load”. SCED Base Point to GR will serve ERCOT load as well as CLR consumption. CLR offered capacity is the maximum rated consumption.
8. ERCOT not involved in the side settlements between GR and CLR. ERCOT only settles the net at the POI meter
9. RTMG (Bill determinant) is based on 15-minute average integrated NetMW telemetry of the GR instead of using POI meter reads and GSPLIT (Bill determinant).
	1. RTMG is used in settlement calculations (AS Imbalance, RUC, MRA, VSS, Emergency Switchable Generation, Securitization, etc.)

M1

Other Load

GR

CLR

Aux

POI meter 1

1. Nodal meter price for Gen Ch is weighted by Positive NET of GR and CLR Base Points
2. Nodal meter price for Load Ch is weighted by Negative NET of GR and CLR Base Points

CLR MPC = MaxRatedConsumption

CLR LPC = MinRatedConsumption

Resource Node

GR HSL = Min(0,MaxRatedCap – Aux – other Load)

GR LSL = Max(0, MinRatedCap– Aux – other Load)