# GUIDELINES FOR CRYPTO MINING FACILITIES THAT PARTICIPATE AS ECONOMIC DR IN THE ENERGY MARKETS

Effective for Load Reductions for economic DR in the energy market that start on February 1, 2026

The goal is to differentiate curtailment activity which is part of normal operations to save on the customer's retail electricity bill and curtailment activity only conducted because of revenue from the wholesale electricity market. It is expected, if hourly cost to mine > hourly mining revenue then the customer would likely not mine and therefore likely curtail electricity instead of losing money to mine. Since it is difficult to determine whether or not these facilities reduce load as part of normal operations to save on their electricity bill, PJM hourly settlements in the energy market will only be paid when hourly cost to mine < hourly mining revenue.

Curtailment Service Provider ("CSP") may not participate as Economic Demand Response ("DR") with crypto mining machines beyond their planned retirement date (determined independent from revenue received from PJM wholesale market) with the intention to prolong the life of the machine by not using the machine and collecting revenue from the PJM wholesale market. CSP should not participate in energy market with crypto mining machines that are older than 5 years from the date of release (e.g. if the date of release is 6/1/2021 then you can use it until 5/31/2026) unless approved by PJM. If hardware upgrades were done at the site – CSP may use the efficiency of the machine threshold in order to qualify for participation – CSP should not participate in energy market if the efficiency of the machine is >27 J/Th in 2026 (average efficiency of the machines in their 5$^{th}$ year of operation). CSP must be able to provide supporting information for machine efficiency upon request.

Estimated hourly crypto revenue may be based on a publicly available formula for crypto revenue calculation or internal source where the CSP provides support for the calculation. Revenue calculation must include site specific machine efficiency. Hourly revenue calculation should only include part of the load reduction attributed to mining machines and exclude the load reduction due to reduced cooling/heating needs. For example, if total reduction is 10MW, 2MW of which were due to avoided cooling needs, then hourly revenue should be calculated by multiplying $/MW revenue (calculated by applying mining revenue formula) by 8MW of the reduction that came from machine load and exclude 2 MW of the cooling load. If there is a one-time cost associated with each load reduction ("shutdown cost"), CSP may use shutdown cost field in Markets Gateway. If the site wants to include shutdown cost and participates in synch reserve market, CSP must go through formal shutdown cost approval process per Manual 15 Section 1.8.

Estimate hourly cost to mine should include avoided costs from the load reduction, specifically - total hourly electricity cost for the load reduction (including avoided cooling/heating). Estimated electricity cost includes supply and distribution charges as well as any other applicable energy based adders.

This guideline will evolve as there is more experience with these facilities in the market.

**Settlement Process**

In order to qualify for a PJM energy payment, the CSP should submit only settlement hours when hourly cost to mine is lower than hourly mining revenue. If some hours do not qualify for settlement, then CSP must notify PJM and PJM will remove such hours before the CSP submits the settlement.

If customer is on fixed retail rate, then non-hourly approach to calculate revenue is possible. Please reach out to PJM for more details.

If retail rate is block and index**,** then retail energy cost should be based on weighted average (see example 2 weighted avg rate calculation) of index and fixed rate plus other KWH charges from the bill.

One of the two settlement approaches described below can be applied for crypto mining facilities. CSP should select one of the methodologies based on the site specifics. If multi-tenant facility is qualified for both approaches below and CSP wants to switch methodologies, CSP can prospectively re-register the location with appropriate CBL.

1) Single tenant or Multi-tenant facility

Multi-tenant facility cannot select this approach if there are tenants that don't participate in PJM energy market and reduce their load for various reasons.

Hourly revenue should be based on the participating machine load. Machine load that does not participate (did not clear) should not be used in the revenue calculation.

Load reductions for an hour either qualify or do not qualify (see example 2 settlement qualification).

Example 1. Hourly revenue calculation

| | A | B | C |
|---|---|---|---|
| 1 | Crypto mining machines on site | | |
| 2 | Type | MW capability | Revenue $/MWH |
| 3 | Machine_type_1 | 50 | $30 |
| 4 | Machine_type_2 | 30 | $60 |
| 5 | Machine_type_3 | 20 | $100 |
| 6 | | | |
| 7 | | | |
| 8 | CBL MW | 120 | |
| 9 | Metered load MW | 30 | |
| 10 | total reduction MW | 90 | |
| 11 | machine_type_1 reduced MW | 50 | |
| 12 | machine_type_2 reduced MW | 30 | |
| 13 | machine_type_3 reduced MW | - | did not clear |
| 14 | heating/cooling reduced MW | 10 | |
| 15 | Hourly revenue | $ 3,300 | =(B11*C3+B12*C4) |

Example 2. Weighted average retail rate calculation for block and index rate and settlement qualification criteria.

| | B | C | D |
|---|---|---|---|
| 15 | **Weighted avg electricity rate calculation** | | |
| 16 | CBL MW | 100 | |
| 17 | hedge MW | 40 | |
| 18 | index MW | 60 | =C16-C17 |
| 19 | reduction | 80 | |
| 20 | LMP | $ 50.00 | |
| 21 | fixed rate $/MWh | $ 40.00 | |
| 22 | other energy adders from the bill $/MWh | $ 15.00 | |
| 23 | weighted avg rate | $ 62.50 | =(MIN(C18,C19)*C20+MAX(0,(C19-C18))*C21)/C19+C22 |
| 24 | | | |
| 25 | **Settlement qualification** | | |
| 26 | total hourly revenue | $ 7,000 | Total revenue that can be earned from all participating (cleared) machines for the hour. Total revenue should not be based on total hourly load reduction MWs. It should be calculated based on MWs reduced by mining machines only. |
| 27 | customer baseline load (CBL) MW | 100 | |
| 28 | retail rate ($/MWH) | $ 62.50 | |
| 29 | hourly electricity cost | $ 6,250.00 | =C27*C28 |
| 30 | qualified for DR payment | **yes** | =IF(C29>C26,"no","yes") |

2) Multi-tenant facility where each tenant has a different revenue or retail electricity rate or a single tenant that's on a block and index where CSP can demonstrate that methodology 1 is not reasonably accurate.

Multi-tenant facility must select this approach if there are tenants on site that don't participate in PJM energy market and reduce their load for various reasons.

When there are multiple tenants (subloads) at the location (EDC account number) some of them may reduce load for PJM purposes and others as normal operations to reduce their electricity cost in the same hour. In such cases only part of the load reduction may qualify for DR compensation. Based on the current DR Hub configuration the only way to handle this type of scenario is to use Manual Customer Baseline ("CBL"). Below is a step by step process for multi-tenant facility for manually handling settlements in DR Hub.

1. CSP calculates reduction based on 3+2 CBL methodology – please see Manual 11 for the calculation. The CSP should manage the offer so that the registration will not clear for more than 48 continuous hours, unless Load Management has been deployed in the same zone, such that there are enough hours to calculate a new CBL based on current information. If Load Management is deployed (and the registration is only Economic DR) then the CSP can manage their offer in RT and if they are dispatched then the 48 hour event window limit on the 3+2 methodology is extended to the last hour of the Load Management deployment in the zone. If the registration is Load Management then the 48 hour limit on the 3 + 2 CBL will be automatically extended based on the Load Management dispatch. It is not intended that this methodology will be accurate for multiple days of load reductions where the load reductions are for 24 hours during the day. Note, the 3+2 CBL calculation will be based on the event and not limited to the day if an event spans more than 1 day.

2. If any of the non-participating tenants have a load drop due to normal operations (peak shaving including ramping down/up hours, maintenance, weather conditions, etc.) after the start of the event for the participating tenant, then CSP must subtract that load drop from total calculated reduction in step 1.
3. CSP works with tenants to identify the tenant load, load reduction, block and index.
   To find the reduction for each tenant, CSP must use one of the following 2 approaches: (1) use submetered data from each tenant and apply methodology from step 1 above, or (2) distribute reduction to each tenant up to the tenant's cleared MWs accounting for step 2 above if applicable.
   If there is an overperformance (reduction is higher than cleared MWs) it should be distributed in following ways:
   a) In case where submetered data is used – allocate according to the data to each tenant;
   b) In case where no submetered data is available and all subloads participate at the site – allocate proportionally amongst all participating tenants based on their cleared MWs;
   c) In case where no submetered data is available and there are non-participating subloads at the site – overperformance should not be included in the qualified reduction.
4. CSP calculates hourly cost to mine for reduced MWs for each tenant (see calculation guidance in example 2).
5. CSP calculates total qualified reduction which equals to the sum of all tenant reductions that have hourly cost to mine < hourly mining revenue (see calculation guidance in example 1 and 3).
6. CSP calculates Manual CBL values which equal to actual load plus calculated in step 5 reduction.
7. CSP enters hourly load and CBL values calculated in step 6 into Manual CBL template (https://pjm.com/-/media/etools/dr-hub/economic-energy-manual-example.ashx) and uploads to DR Hub. Note – the Manual CBL will reflect the actual load reductions that qualify.

Example 3. Calculate total qualified reduction with multiple tenants and block and index rate (this example is the guidance for the customer - do not need to provide tenant details to PJM)

| | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|
| 13 | | Load MW | Block MW | Index MW | Customer distributed total reduction between clients | Total hourly retail cost for reduced load | Hourly revenue for reduced MWs | Qualified reduction |
| 14 | 1 subload | 10 | 5 | 5 | 5 | $ 280.50 | $ 288 | 5 |
| 15 | 2 subload | 20 | 15 | 5 | 14 | $ 867.70 | $ 805 | 0 |
| 16 | 3 subload | 10 | 0 | 10 | 1 | $ 40.00 | $ 58 | 1 |
| 17 | **total** | **40** | **20** | **20** | **20** | | | **6** |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | LMP | fixed rate $/MWH | other MWH adders from the bill $/MWH | hourly water cost | hourly O&M cost | Houlry revenue | | |
| 22 | $ 40 | $ 50 | $ 15 | $ 10 | $ 1 | $ 2,300 | | |

Note, see example 1 for hourly revenue calculation for each subload (tenant).

| | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|
| 13 | | Load MW | Block MW | Index MW | Customer distributed total reduction between clients | Total hourly retail cost for reduced load | Hourly revenue for reduced MWs | Qualified reduction |
| 14 | 1 subload | 10 | 5 | =C14-D14 | 5 | =(MIN(E14,F14)*B$22+MAX(0,(F14-E14))*C$22)+D22*F14+(E22+F22)*F14/C14 | =G$22*F14/C$17 | =IF(G14<H14,F14,0) |
| 15 | 2 subload | 20 | 15 | =C15-D15 | 14 | =(MIN(E15,F15)*B$22+MAX(0,(F15-E15))*C$22)+D22*F15+(E22+F22)*F15/C15 | =G$22*F15/C$17 | =IF(G15<H15,F15,0) |
| 16 | 3 subload | 10 | 0 | =C16-D16 | 1 | =(MIN(E16,F16)*B$22+MAX(0,(F16-E16))*C$22)+D24*F16+(E24+F24)*F16/C16 | =G$22*F16/C$17 | =IF(G16<H16,F16,0) |
| 17 | **total** | **=SUM(C14:C16)** | **=SUM(D14:D16)** | **=SUM(E14:E16)** | **=SUM(F14:F16)** | | | **=SUM(I14:I16)** |

If any CBL method other than Manual CBL described above is used and there is a load increase of greater or equal to 25% of the registered load or a new tenant is added to the site, CSP must notify PJM.

For both options, CSP shall verify they only submitted settlements for load reductions that were not done for normal operations (e.g.: manage their electricity cost) and submit estimated hourly mining revenue and hourly cost to mine support information in the requested format. CSP bears full responsibility for any issues with the customer and PJM will refer any questionable activity to IMM and/or FERC Office of Enforcement as needed. Settlement hours may only be submitted for the portion of the load done for PJM and not done as part of normal operations.