

Pseudo-Unit Model Registration Requirements

EDAC (SE-21) Design Working Group
May 7, 2009



The EDAC Pseudo-Unit model (PSU) represents a Combined Cycle Plant (CCP) with one or more Combustion Turbines (CT) and a single Steam Turbine (ST) as one, two or more PSUs, each comprised of a single CT and its associated portion of the ST capacity

- Market Participants using the PSU model in EDAC must register with the IESO:
 1. Physical **Resources**:
 - a. CT *generator*
 - b. ST *generator*

Note: For an existing Facility these resources are already registered

2. PSU Resource(s)

- The steps associated with registering these physical resources are the same as documented in [Facility Registration, Maintenance and Deregistration Procedure](#)
- The additional EDAC registration requirements for these resources are the same as presented in the EDAC (SE-21) Design Work Group session held on April 16, 2009
 - Reference: *IESO EDAC Portal, Stakeholder Engagement - “EDAC Facility Registration” document*
- **Physical resource aggregation of a CT and ST cannot be carried out if PSU model is used**

- Additional validation rules due to PSU model:
 - If the registered PSU maximum capacity is changed then the CT and/or ST registered maximum capacities must be revised to satisfy the following condition:

$$\text{PSU}_{\text{max_cap},x} = \text{CT}_{\text{max_cap},x} + s_x * \text{ST}_{\text{max_cap}}$$

where: $s_x = \text{ST}_{\text{max_cap}}$ share ; $X = \text{PSU}$ and CT index

- If the registered PSU profile or technical data elements are changed the appropriate CT and ST registration data must be revised accordingly, e.g.:
 - CT registered technical data elements, except for Dispatch Elapsed Time
 - ST MLP and MLP Limit

- The following type of data must be submitted for PSU registration:
 - Profile data
 - Technical data
 - Sharing data

To avoid undesirable commitment and schedule outcomes, it is recommended that all PSUs have the same technical and sharing data

- The PSU registration data will be reflected in EDAC for the purpose of:
 - validating *offers* and daily generator data submission
 - **committing and scheduling resources (e.g., calculation engine)**
 - undertaking *settlements*, e.g., DA-PCG

- Registration data will be captured using existing forms, where possible
 - Where new forms are required, the IESO will endeavour to provide electronic submission mechanisms
- Changes to registration data may be implemented within six business days and are subjected to IESO approval
 - Certain PSU technical and sharing data will be registered as baseline values that can be overwritten through daily generator data submissions in EDAC for consideration in the engine

- The purpose of PSU profile data is to register the PSU as **a unique Resource that will have its own name and ID**
- PSU profile data may include the following information¹:
 - General information
 - Market participant name and ID
 - Facility name
 - Resource information
 - Type of markets the resource intends to participate in, e.g., energy, operating reserve
 - Maximum capacity
 - Type of resource, e.g., dispatchable generator

¹The specific requirements for PSU profile data to be finalized as part of EDAC implementation phase

- The following information must be submitted as PSU technical data:
 - Minimum Loading Point (MLP) and MLP Limit
 - Minimum Generation Block Run Time (MGBRT) and MGBRT Limit
 - Minimum Generation Block Down Time (MGBDT)
 - Maximum # of Starts per Day²

²Due to new information regarding the inputs to the calculation engine the Maximum # of Starts per Day will be replaced with the Maximum # of Stops per Day

- EDAC calculation engine respects this parameter when determining unit commitment
- Can be submitted day-ahead for use in EDAC calculation engine for the next day
- Captured on new Form for PSU registration
- Will define the PSU first operating region

- Validation rules:
 - Must reflect the technical capability of the CT and associated portion of the ST:

$$\mathbf{PSU_MLP = CT_MLP + ST_MLP}$$

Where:

CT_MLP = the CT registered MLP

ST_MLP = the ST registered MLP corresponding to plant 1-on-1 configuration

- Number format xxx.x MW
- A single registered quantity for each PSU
- $0 < \text{MLP} \leq \text{Maximum PSU capability}$

- Represents the highest MLP that is required for anticipated, regularly encountered operating conditions (not all possible operating conditions)
- Used to validate daily submissions and can not be submitted day-ahead
 - an upper bound by which day ahead changes to MLP will be evaluated for approval
- There is no lower bound validation on MLP

- Validation rules:
 - Must reflect the technical requirements of the anticipated, regularly encountered operating conditions of the CT and ST:

$$\text{PSU_MLP}_{\text{Limit}} = \text{CT_MLP}_{\text{Limit}} + \text{ST_MLP}_{\text{Limit}}$$

Where:

$\text{CT_MLP}_{\text{Limit}}$ = the CT registered MLP Limit

$\text{ST_MLP}_{\text{Limit}}$ = the ST registered MLP Limit

- Number format xxx.x MW
- A single registered quantity for each PSU
- $\text{MLP} \leq \text{MLP Limit} \leq \text{Maximum PSU capability}$

- Must be equal to the CT corresponding technical data elements
- EDAC calculation engine respects these parameters when determining schedules
- Can be submitted day-ahead for use in EDAC calculation engine for the next day
- Validation rules³
 - CT physical facility registration validation rules **for these technical data** must apply
 - MGBRT and MGBDT **limits** must be equal to CT corresponding registered limits. Same validation rules must apply.

³ Refer to IESO EDAC Portal, Stakeholder Engagement - “EDAC Facility Registration” document

- The following information must be submitted as PSU sharing data:
 - Designated CT
 - **Designated ST** and share of its maximum capacity
 - Operating regions
 - ST share to each operating region

- Defines the CT associated with the PSU
- CT maximum capability will be assigned to the PSU
- Captured on new Form for PSU registration
- Cannot be submitted day-ahead for use in EDAC calculation engine for the next day
- **One** CT must be associated only with one PSU

- **Defines the ST associated with the PSU**
- **The share** represents the portion of the ST maximum capacity assigned to the PSU
- Used in all translations and processing related to the CT and ST portion associated with the PSU
- Captured on new Form for PSU registration
- Can be submitted day-ahead for use in EDAC calculation engine for the next day

- Validation rules:
 - expressed as a percentage of ST maximum capability
 - single registered quantity for each PSU
 - the sum of ST shares to all PSUs at one facility must be 100%

- Predefined operating regions for the PSU
- Used in all translations and processing related to the CT and ST portion associated with the PSU
- Used in validation of PSU offers in EDAC
- Captured on new Form for PSU registration
- Can be submitted day-ahead for use in EDAC calculation engine for the next day

- Validation rules:
 - Minimum of two and maximum of three operating regions / PSU
 - First operating region (Lower Region) must represent the region between 0 and PSU MLP
 - Second operating region (Middle Region) must represent the region between PSU MLP and PSU capacity without ST share for power augmentation
 - Third operating region (Upper Region) must represent the region between upper bound of Middle Region and PSU maximum capacity
 - reflects the plant power augmentation capabilities
 - not required if the plant has no power augmentation capabilities

- Validation rules:
 - Number format xxx.x MW
 - The MW sum of all operating regions associated with one PSU must be equal to PSU maximum capacity
 - The PSU registered operating regions must be revised when:
 - registered CT_MLP or ST_MLP data are changed
 - registered CT and ST maximum capacity data are changed

- Represents a portion of the PSU operating region accredited to the ST contribution
- The CT share to the each operating region is not required to be registered
 - will be calculated as a function of the ST share for the same operating region, i.e., $1 - \text{ST share}$

- Validation rules:
 - a single share data for each operating region, total of three / PSU
 - can have different values for each region
 - expressed as a percentage
 - PSU Lower and Middle Regions:
$$0 \leq \text{ST Share} < 100\%$$
 - ST share for the Upper Region must be 0 or 100%

- Validation rules:
 - The MW sum of all ST shares to the PSU operating regions must be equal to the MW value of the maximum ST contribution share to the PSU
 - Similarly, the MW sum of all CT shares to the PSU operating regions must be equal to the MW of the maximum CT contribution to the PSU

Resource Type →	Physical Facility			Pseudo Unit	
Technical Data ↓	CT1	CT2	ST	PSU1	PSU2
Max Capacity	100	100	140	170	Same as PSU1
MLP	70	70	30	100	
MLP Limit	90	90	35	125	
MGBRT	6	6	6	6	
MGBRT Limit	8	8	8	8	
MGBDT	4	4	4	4	
Max # Starts	2	2	2	2	

Pseudo Unit →	PSU1		PSU2
Sharing Data ↓		MP Input	MW calculated
Designated CT		CT1	
ST Share of Max Capacity	s1	50%	70
Operating Regions	Lower	100	100
	Middle	50	50
	Upper	20	20
ST Share to each OpR	k1	30%	30
	k2	40%	20
	k3	100%	20