Rationale for a Demand Side Unit with a Maximum Export Capacity < 10MW

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1. Introduction

Mod_04_11 was presented at the Modification Committee Meeting on 1st February 2011. This modification proposes allowing a site to participate in the SEM as a Demand Side Unit if it has a Maximum Export Capacity (MEC) less than 10MW (the De Minimis Threshold). The Trading & Settlement Code (V8.0) currently states that a Demand Side Unit site shall not have an MEC.

However such industrial sites can offer demand reduction services through a combination of load reduction, running standby diesel generators, or running inactive Combined Heat and Power (CHP) plant. The load reduction could be achieved through switching off process plant such as refrigeration plant, large pumps or other large motors. Typically CHP plant would be on standby because of a reduced heat demand on site and therefore constitute generation capacity which can be made available to the system operator. This reduced heat demand on site could be either a seasonal or long term reduction.

These industrial sites have an MEC due to the ratio of the site heat load relative to their electrical load. An industrial site with a large heat load relative to the electrical load has the CHP unit sized to match the heat load and surplus electricity generated in the Combined Heat and Power unit is exported. The site activity will still have the characteristics of a demand site i.e. a weekly profile, highest demand at peak production, opportunities for load reduction etc.

2. Modification Proposal

The proposed change to section 5.151 of the Trading and Settlement Code is:

5.151 To qualify for registration as a Demand Side Unit, a Demand Site must meet and continue to meet each of the following criteria:

1. the Demand Site shall house a final customer or consumer;
2. the Demand Site shall have the technical and operational capability to deliver Demand Reduction in response to Dispatch Instructions from the System Operator in accordance with the relevant Grid Code or Distribution Code;
3. the Demand Site shall have appropriate equipment to permit real-time monitoring of delivery by the System Operator; and
4. the Demand Site shall have a Maximum Import Capacity and shall not have a Maximum Export Capacity greater than the De Minimis Threshold.

3. Worked Example

The examples below present the configuration of a typical DSU site and show that a site with an MEC < 10MW will have essentially the same type of operation as a site with MEC = 0 and therefore should not be excluded from participating as a DSU.

Example 1: Demand Side Unit with MEC = 0

Figure 1 below shows an industrial customer site with an MEC of zero operating as a DSU. This site has a load of 8MW, a 5MW CHP unit operating at full output resulting in a net site demand of 3MW. The supply for this site is settled through a supply contract with a licensed supplier in the normal manner.

This site offers a load reduction of 2MW which will be achieved by switching off refrigeration plant and switching on a standby diesel generator.

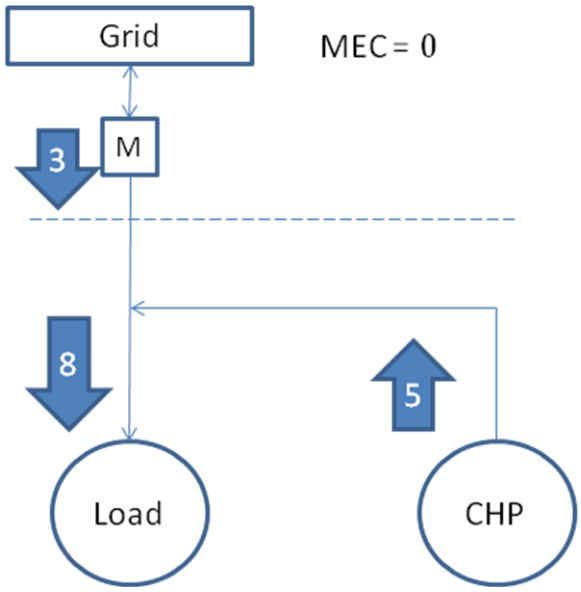

Figure 1 Import only DSU with 8MW load, 5MW CHP and grid demand 3MW

Figure 2 below shows the same site delivering the 2MW load reduction. The load has reduced from 8MW to 6MW. The CHP output remains unchanged at 5MW and therefore the site demand has reduced from 3MW to 1MW.

This type of unit is permitted to participate in the market under the current rules. The site does not require an MEC since the site demand is greater than the CHP output and therefore there will not be any export.

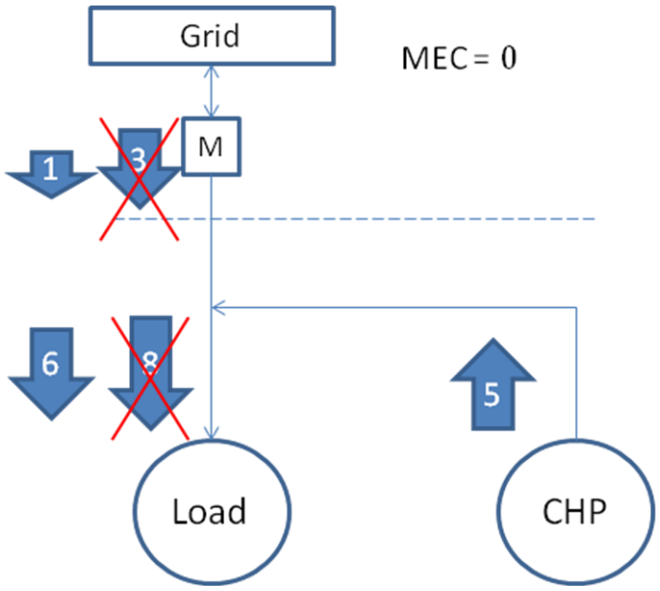

Figure 2 Import only DSU delivering 2MW load reduction

Example 2: Demand Side Unit with MEC = 3MW

Figure 3 below shows a site similar to that presented in Figure 1 above. This site also has a large heat load, and thus has a 5MW CHP unit, but in this case the site electrical load is 4MW. As a result when the CHP is at full output the site has net export of 1MW. The supply for this site is settled through a licensed supplier as in the previous example. The export from this site is also settled with a licensed supplier. The metered export quantity is deducted from the net demand for the Supplier Unit.

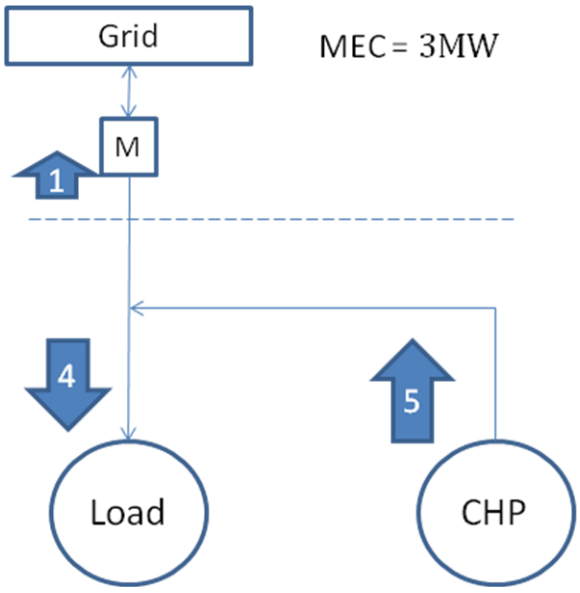

Figure 3 DSU site with MEC = 3MW

This site also has the capacity to offer 2MW load reduction (independently of the CHP generator) by reducing the site load from 4MW to 2MW. In this scenario the export quantity will increase from 1MW to 3MW. This is presented graphically in Figure 4 below.

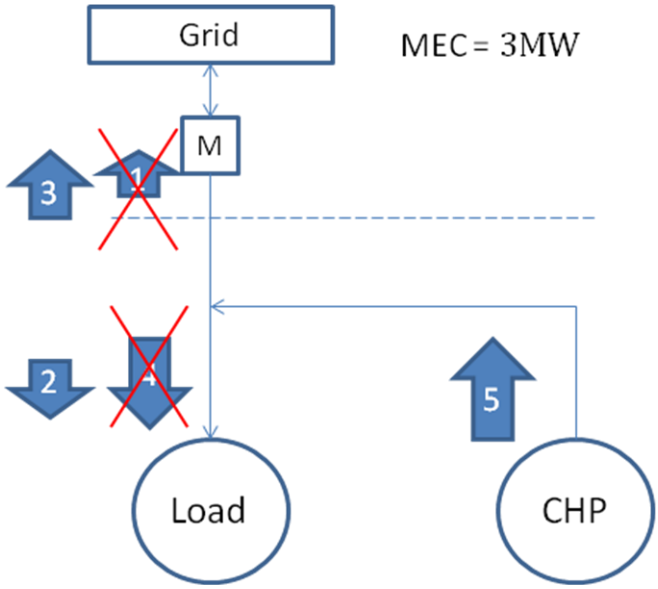

Figure 4 DSU with MEC 3MW offering 2MW load reduction to the system

This site is currently not permitted to operate in the market since it has a Maximum Export Capacity. The site has an export capacity because the electrical output of the CHP is greater than the site electrical load. The CHP is sized based on the site heat load. The proposed Mod_04_11 will make this type of DSU available to the system operator.

It is important to note that the Demand Side Unit will receive capacity payments for the net load reduction potential only and not the onsite generation capacity.

Example 3: DSU with Seasonal Load and MEC = 3MW

Figure 5 below presents a site which has a seasonal load due to a seasonal production cycle, such as a dairy processor. This site operates at its maximum capacity during summer months and therefore has a high electrical load and heat load during this period. Figure 5 below shows the summer time average site load of 8MW, CHP output of 5MW and a resultant average import of 3MW. In this example there is no load reduction potential during the summer months.

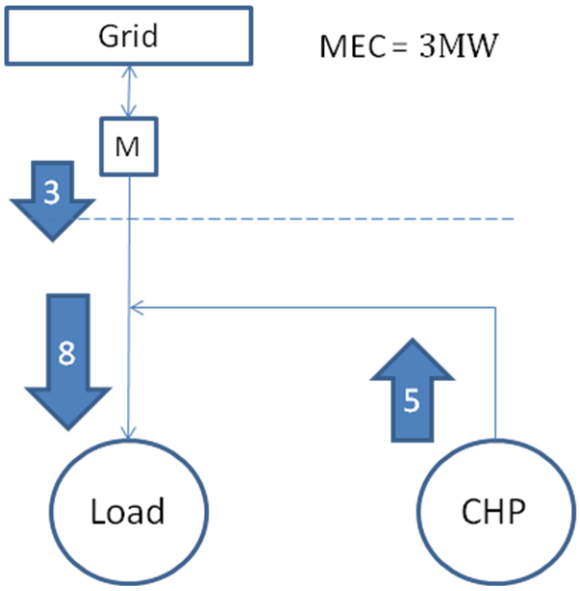

Figure 5 DSU with Seasonal Load - Summer Load, Reduction Availability = 0

The same site during the winter months is presented in Figure 6. During this period the average site electrical load is 2MW and since the site heat load has reduced to zero it is not economical to run the CHP. The resultant average site demand during this period is 2MW.

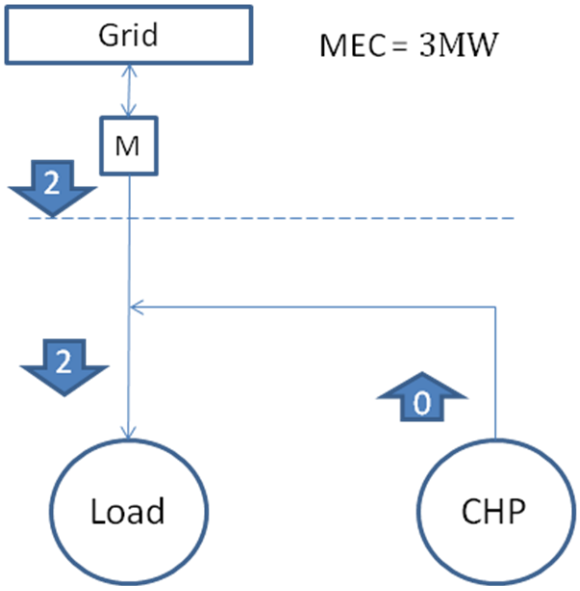

Figure 6 DSU with Seasonal Load - Winter Load, Reduction Availability = 5MW

During the Winter months, when the CHP is otherwise not utilised the site can offer the ability to reduce the site load from 2MW to -3MW (export) by running the 5MW CHP unit. This reduction is shown in Figure 7 below. The proposed Mod_04_11 will also make this type of DSU available to the system operator.

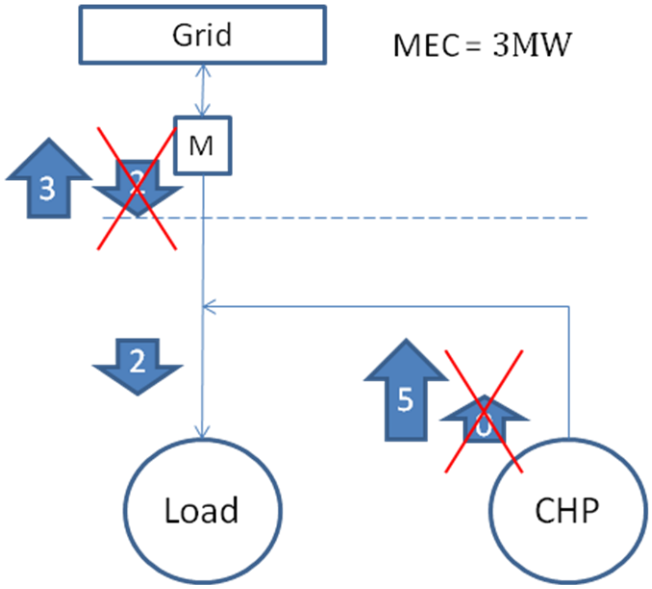

Figure 7 DSU with Seasonal Load - Winter Load with 5MW reduction

4. Value to SEM

The load reduction of 2MW presented in Example 1 and Example 2 above offers the same benefit to the market whether it is from the site with an MEC of zero or the site with an MEC of 3MW. Figure 8 below shows the profile of the load reduction for each example.

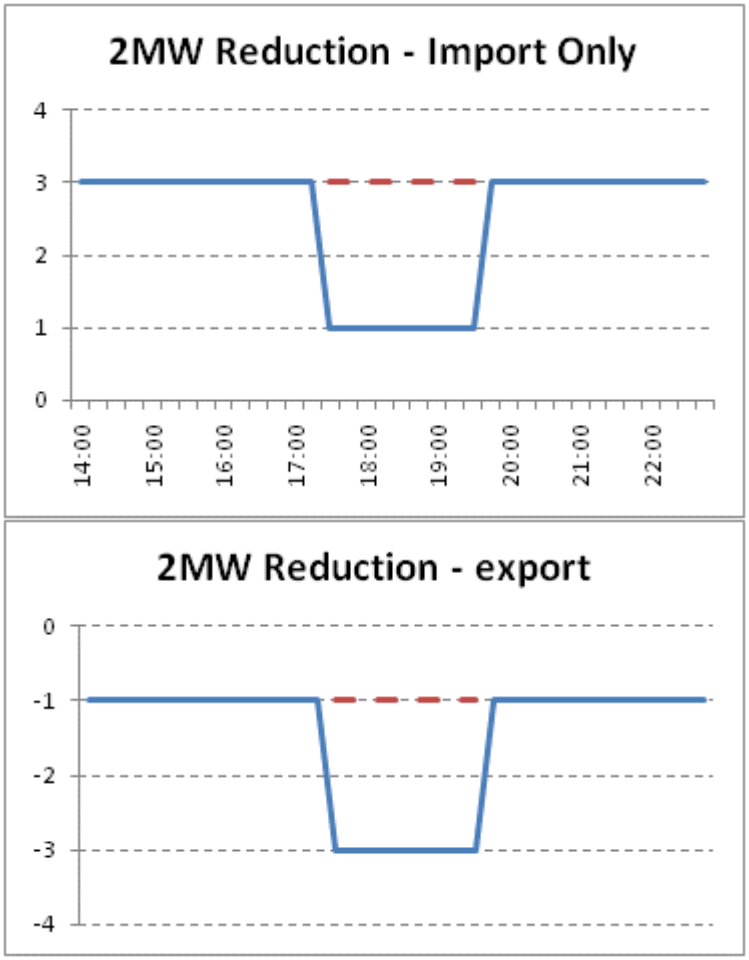

Figure 8 Load Reduction Profile for site with MEC = 0 and MEC = 3MW

In the case of the site with MEC = 0MW the load reduction has the effect of reducing the Supplier Unit net demand in the SEM. In the case of the site with an MEC = 3MW the increase in export quantity is deducted from the net demand for the Supplier Unit. This has the same effect of reducing the Supplier Unit demand in the SEM.

Energy and Capacity Payments

In both cases the site receives a capacity payment for the 2MW reduction capacity, when declared available.

When a DSU is dispatched the site reduces its load and thus benefits through reduced demand charges. The site has avoided the SMP + Capacity charges that would have been

associated with the import. This avoided cost covers the cost of delivering the load reduction. Similarly a DSU which has export will recover the cost of delivering the load reduction through increased export revenue when dispatched. The SMP and Capacity payment to all DSUs is set to zero when the unit is dispatched. These existing processes continue to function appropriately are not affected by Mod_04_11.

5. AGU as an alternative

A site that has an MEC will have a generator onsite. Such a site could install a meter on the output from the generator and participate in the market as an Aggregated Generator Unit (AGU). However it is not practical for the sites presented in this report to participate as an AGU for the following reasons:

- AGU does not capture the load reduction potential
- AGU gross settlement results in excessive import costs
- AGU must have firm access

AGU does not capture the load reduction potential

Having a meter on the CHP unit in the example presented in Figure 4 above would not capture the load reduction potential. The load reduction takes place independent of the CHP generator.

Gross settlement results in excessive import costs

Participating as an AGU is more suited to standby diesel generators since the units are normally off. A CHP unit which runs for 9 months of the year due to a heat load on site is providing value to the site through the efficient cogeneration of heat and power. The electricity produced provides value by offseting import from the grid. If the heat load is seasonal and it is not economical to run the CHP for the remaining 3 months of the year the CHP generator will remain off but would be available to run. If this unit was configured as an AGU gross settlement results in all the generator output being exported and the site demand being imported. The value of offsetting the imports for 9 months when running is greater than the increased revenue due to capacity payments for availability during the remaining 3 months. Thus the AGU model does not attract the generation capacity of such a CHP unit into the market.

AGU must have firm access

If a site has a 5MW CHP not running but available to run it could reduce the load by 5MW. Figure 7 above presents an example of a site that could reduce its load from a demand of 2MW to export of 3MW (demand of -3MW). If operating as an AGU the 5MW capacity is dependent on a site load of greater than 2 MW and therefore would not be considered firm capacity.

6. Conclusion

Modification Proposal Mod_04_11 will encourage greater participation of Large Energy Users in the wholesale market as Demand Side Units. This modification will further code objectives #2, #4 and #7 as it:

- Facilitates the efficient, economic and coordinated operation, administration and development of the SEM
- Promotes competition in the SEM
- Promotes the long-term interests of consumers of electricity

Furthermore Mod_04_11 addresses a specific barrier indentified in the ***Demand Side Vision for 2020*** Consultation Paper[1]. Section 4.2.6.1, Barriers to Realisation of 2020 Demand Side Vision (page 73) of the consultation paper states:

"Another specific barrier arising from the Trading and Settlement Code is that DSUs may not be located on a site with a non-zero export capacity. This precludes most sites with on-site generation from offering any flexible loads as part of a DSU. Sites with Demand Side Units are also required to have costly real-time monitoring equipment."

Mod_04_11 will increase the potential number of DSU sites available to the market. This will also enable aggregation of a sufficient number of sites to overcome cost issues which were also identified in the Demand Side Vision paper as barriers in relation to Industrial Scale Demand Side Response.

[1] Single Electricity Market "Demand Side Vision for 2020" Consultation Paper, 17th August 2010, SEM-10-052