Marshalls Energy Company

Private Solar Generation Systems Policy and Regulation by Network Connected MEC Customers

1 PURPOSE

This policy and regulation are issued to inform stakeholders of the manner in which MEC will deal with the issue of customers or other entities that have or plan to install solar panels at their homes/facilities.

2 BACKGROUND

The current MEC Majuro distribution network is based on a radial design with outdated technology, making it highly susceptible to fluctuations and disturbances. Directly connecting various individual solar systems to this network without centralized management can lead to power instabilities, overloading, and potential damage to both the grid and end-user equipment.

The integration of variable renewable energy sources like solar panels requires sophisticated control mechanisms to manage power fluctuations and maintain grid stability. Systems not owned or operated by MEC may lack the necessary controls, posing risks to the safety and reliability of the Majuro grid infrastructure.

High penetration of renewables can lead to an overall reduction in short-circuit currents, potentially causing protection systems to malfunction. During periods of low demand, excess generation from distributed solar can cause reverse current flow, leading to operational challenges.

Additional technical information on renewable energy integration and strengthening of the distribution network is available in the “Integrated Resource and Resiliency Plan” (IRRP) for Marshalls Energy Company” as part of the Asian Development Bank Supplemental Management Operations Initiative.

3 CONNECTION OF SOLAR GENERATION TO THE MEC NETWORK

POLICY #1
NO SOLAR GENERATION, OTHER THAN THAT OPERATED OR CONTRACTED BY MEC, CAN EVACUATE POWER TO THE MAJURO GRID

4 CUSTOMERS OF MEC UTILIZING ON-SITE SOLAR GENERATION

As said above, solar generation is an intermittent source of supply, which must be supported by backup generation. In addition, MEC provides network facilities that support customers around the clock to meet their demand/load they place on the MEC system. To be equitable to all MEC consumers, those with on-site solar must pay for the backup generation and network services provided. Customers that have the financial means to invest in solar should not be subsidized by customers with limited financial resources who can only take advantage of MEC solar generation.

To compute an equitable backup capacity charge, MEC considered the actual fixed costs of generation and network facilities and the capacity factor of solar. The resulting backup charge is $0.02 per watt of installed solar capacity per month.

POLICY #2
MEC CUSTOMERS WITH INSTALLED SOLAR GENERATION THAT IS USED FOR THEIR OWN CONSUMPTION WILL BE ASSESSED A BACKUP CAPACITY CHARGE OF $0.02 PER INSTALLED WATT OF SOLAR CAPACITY PER MONTH. THIS WILL BE BILLED SEPARATELY FROM THEIR NORMAL ELECTRIC SERVICE ON A QUARTERLY BASIS IN ADVANCE AND PAYMENT IS DUE WITHIN 45 DAYS OF DELIVERY.

If a facility wants to self-generate and not be connected to the MEC network, they are free to do so. If they subsequently decide to connect to the MEC network, they will be assessed standard connection charges along with the monthly applicable tariff and the Backup Capacity Charge.

Implementation will begin in November 2024 with Government customers, in January 2025 for Commercial customers, and in March 2025 for Households.

The power system needs to limit the participation in the network of unmanaged solar PV, while allowing SHS (Small Home Solar), Commercial, and Emergency Backup systems to operate.

4.1 Governing Principle/ Regulation

Privately owned and operated solar generators and/or BESS (Battery Energy Storage Systems) can be allowed to connect behind the MEC customer (customer side of meter), provided certain conditions outlined herein are met.

a. Under no circumstances a private system can be connected on the utility side of the MEC customer meter.
b. MEC will not provide any compensation to the customer for any amount of energy inadvertently delivered to the grid by a Privately Owned system.
c. The Privately Owned and Operated system must be connected to the customer's private internal power distribution board, and the system and board must be compliant with the required protections scheme, as verified by MEC's inspection, prior to MEC's approval of energizing the solar system.

d. Customer must ensure complete insulation and protection of the MEC's meter from any power surges or disturbances of any kind coming from the customer's facilities.
e. Inverters' total harmonics shall not exceed 3%.
f. Solar system power factor (Pf) shall be 1 and customer's facilities shall not induce variations outside of 0.95 lagging or leading, regardless of load or demand.
g. Grounding or Earthing must be of TT or IT architecture[1].
h. All installations must be protected with a leak to earth as well as thermal breaker of adequate commercial amperage level.
i. MEC reserves the right to disconnect and suspend the service of any customer breaching these requirements, notwithstanding other applicable penalties as determined by MEC.

4.1.1 Solar Home Systems (SHS).

a. Solar Home Systems (SHS) are allowed to be connected on the customer side of the MEC meter subject to Governing Principles above.
b. The solar home systems may be exempt from Backup Capacity Charge if the installed capacity does not exceed 120 W AC.
c. The maximum capacity of a solar home system must not exceed 120 W AC of total power measured at the connection point in the customer's private internal distribution board.
d. The system must include a Battery Energy Storage System (BESS) from which all energy of the system will be dispatched, a hybrid inverter to charge/discharge the BESS, or equivalent arrangement, and the solar array.

4.1.2 Commercial and Industrial Solar Systems.

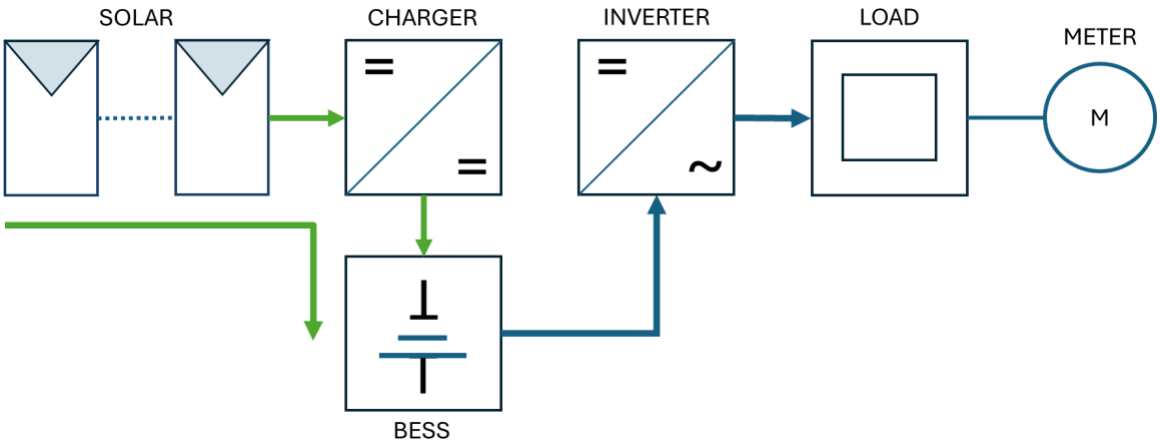
a. Solar systems with an installed capacity above 120 W AC (SHS) are allowed to connect behind (customer side of) the MEC meter to the customer's internal power distribution infrastructure, provided the installed solar capacity, does not exceed 100% of the contracted customer load measured at the connection point, and the entire installation complies with the above Governing Principles. All such solar systems must include 2-hour BESS capacity at a minimum[2], from which all energy of the customer's load will be dispatched (see Figure 1).

b. If the solar output exceed 100% of the contracted customer load, it must exclusively serve the customer's load behind the meter, therefore the inverter must have a dynamic derating capability, which will automatically and no less than 60 times per second, adjust the output not to exceed the customer's instantaneous load subject to limit of 100% of customer's contracted load.

[1] In TT systems, the star point is also connected to earth through a low impedance, but the exposed conductive parts of the electrical installation are earthed independently from the system earthing. In IT systems, however, all active parts are insulated from earth or connected to earth through a high impedance.
[2] For example, a one-kilowatt solar PV system must include 2 kilowatt-hours BESS system.

c. All inverters must be equipped with "Zero-Export" functionality with programmable limits, and an "ON-OFF" actuator is not allowed to serve this function.
d. The inverters and all electrical and electronic equipment used behind the meter must comply with all applicable IEC & IEEE standards.
e. The proposed technical solutions must be applicable within the US or EU power management principles, consistent with MEC's network.
f. Equipment selection is of paramount importance and only internationally recognized high quality[3] equipment will be approved by MEC.
g. Flow dynamic study on the power management system is mandatory for large scale facilities as determined by MEC.
h. The system is allowed to absorb energy from the MEC network to supplement the level of charge of the BESS units, while this absorption will not exceed 25% of the contracted back up capacity.
i. MEC's final inspection and approval along with a signed Backup Capacity Charge contract are required prior to connecting any solar system or BESS behind the meter.

Figure 1. Energy Flow Schematic



APPROVED By:

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Chief Executive Officer Chairman of the Board

Date:

[3] Examples of manufacturers with suitable quality equipment include: SMA, Fronius, Kaco, Solar-Edge, Outback, Tesla, ABB, Enphase, Power Electronics.