Residential solar bahrain

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Bahrain has kicked off a tender to award a 20-year contract to a local or international company to build, operate and transfer (BOT) and maintain a grid-connected solar project with a minimum capacity of 72 MW in the Southern of Bahrain [1]. There is over 250 MW in planning or execution, to be delivered by 2025.

The second PV installation was made on a sponsored building at Awali in 2014 by Bapco, refer to references [6,7]. There are 36 PV panels on the roof of this building, each having 240 Wp, so the total installed power is 8.64 kW. The panels" orientation is 225° from the north and has a tilt angle of 25° although the latitude of Bahrain is 26.138°N and latitude 50.88° E. The total area of PV panels on the roof is about 60 m2.

Subsequently, the first large PV installation in Bahrain (5 MW) was in 2014 [8–11]. This PV installation is located at Princess Sabeeka Park in the city of Awali (26.1° N, 50.6° E). The minimum and maximum values of the monthly average daily global solar radiation in Awali were 4.00 kWh/m2 and 4.79 kWh/m2 in January and July in 2015, respectively [3].

In February 2016, Tatweer Petroleum company, Bahrain, installed a 1 MW solar PV, ground installation, connected to the electricity grid of Tatweer to provide enough electricity to meet the total energy requirements of the company"s headquarters in the region [12]. Later on, on 30th December 2019, Tatweer Petroleum installed another ground 3 MW Solar PV generating more than 5400 MWh per year which is equivalent to the energy used by 300 Bahraini homes, bringing the company"s use of renewable energy to 6% [13].

Nearly 46 MW of solar PV installation are either executed or planned to be in operation by 2024 in Bahrain [14]; Y& K Company is the contractor of nearly 18 MW PV solar projects.

As part of Bahrain vision 2030 and part of its worldwide commitment to have a renewable energy share of 10% by 2035 which is explained in detail in [15,16], as well as its endeavor to have zero emission by 2060 [17], the government had sponsored the installation of 10 PV domestic houses rooftop, each 7.8 kW, feed to the national grid [18].

Bahrain had installed 10 domestic houses, each with 7.8 kWp − PV system on the roof at different locations in Bahrain to evaluate the spatial, social and financial effect. Unfortunately, only 4 houses were monitored carefully by Almoayyed Solar Company (ASC) which is a division of Almoayyed International Group specializing in Energy Service and Energy Auditing for improving overall energy performance of

Commercial, Industrial and Residential sectors. All of these four houses were handled and managed by ASC.

3- DC SPD box: It is a DC surge protective device to protect the DC electric system from surge. Also, it allows replacement of the protective metal oxide varistor (MOV), i.e., a voltage dependent device which has an electrical behavior similar to back-to-back Zener diodes. This ensures convenience and reduced cost [19].

4- PV array junction box: It also referred to as PV combiner boxes. It collects DC power from the 7.8 PV strings with blocking diodes on each string for protecting panels from reverse current flow. The collected power is then transferred to the inverter to be converted into AC [19].

Figure 3 illustrates the 4 components of PV electronic systems in all four houses and Figure 4 shows the electric connections of the system. Such system is made to all protype domestic 7.8 kW Solar PV in Bahrain. It is planned to charge each household about BD 3500 (USD 9300) for the whole system.

Figure 6 shows the actual layout of the roof from top of the PV panels (top right). The pictures belong to House #4–which was the first to operate partially by solar PV.