BETTER POLICIES TO ACCELERATE THE CLEAN ENERGY TRANSITION

FOCUS ON NET-METERING



RES4AFRICA FOUNDATION

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RENEWABLE ENERGY SOLUTIONS FOR THE MEDITERRANEAN

Policy Brief No. 1

Better Policies to Accelerate the Clean Energy Transition

Focus on net-metering

Five recommendations to decision-makers to remove barriers preventing the full implementation of net-metering in Morocco, Tunisia, and Egypt and to increase the use of renewable energy systems for small and medium customers.

About the project

This Policy Brief is part of the project "Better Policies to Accelerate the Clean Energy Transition" which aims at supporting countries in the Southern and Eastern Mediterranean region to accelerate the green energy transition, by mapping existing legal and regulatory frameworks to identify barriers and provide policy recommendations.

The project is carried out by RES4Africa Foundation with the support of Enel Foundation as a knowledge partner.

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Published on May 2022

About this brief

Morocco, Tunisia, and Egypt have different socio-economic and energy landscapes but are aligned on the imperative of the green transition. The countries' national strategies indicate an ambitious commitment to transforming the energy sector, by opening the market to large and small-scale development in renewable energy. Small-scale photovoltaics (PV), particularly, is an opportunity to foster the decentralization of solar power. It is easy to deploy on rooftops for residents, small businesses, and farmers and it can help relieve the national grid. Tapping the small-scale PV potential can happen with the right mix of policies.

This brief focuses on net-metering as one of the possible mechanisms to boost small-scale PV installations in Morocco, Tunisia, and Egypt. It analyses several barriers hindering the full potential of the existing schemes and provides recommendations to unlock them. The brief also explores some innovative evolutions of net-metering from international experiences, such as net-billing, virtual net-metering, and gross-metering which could inspire further improvements of the mechanism in the countries at stake.

The brief is structured as follows:

I. Introduction
II. What is net-metering
III. Net-metering schemes in Morocco, Tunisia, and Egypt
IV. Five recommendations to unleash the potential of net-metering
V. Going beyond: virtual net-metering, net-billing and gross-metering

RES4Africa Foundation

Born in 2012, RES4Africa (Renewable Energy Solutions for Africa) is a Foundation that works in support of Africa's just energy transition to achieve the SDG7, ensuring access to affordable, reliable, sustainable, and modern energy for all. It functions as a bridge between Europe and Africa: gathering a network of members from all over the clean energy sector from both continents and high-level international partnerships, we ensure constant dialogue between the most relevant energy stakeholders willing to mobilize investments in clean energy technologies.

We envision the sustainable transformation of Africa's electricity systems to ensure reliable and affordable electricity access for all, enabling the continent to achieve its full, resilient, inclusive, and sustainable development.

We work towards creating favourable conditions for scaling up investments in clean energy technologies to accelerate Africa's just energy transition and transformation.

List of Acronyms

C&I	Commercial and Industrial
STEG	Tunisian Company of Electricity and Gas
PV	Photovoltaic
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IPP	Independent Power Producer
ONEE	National Office of Electricity and Drinking Water
NREA	New and Renewable Energy Authority
GEF	Global Environment Facility
EETC	Egyptian Electricity Transmission Company
MV	Medium Voltage
LV	Low Voltage
CAGR	Compound Annual Growth Rate
VNM	Virtual Net-Metering
NREA	The New and Renewable Energy Authority
UNDP	United Nations Development Program
ERA	Egyptian Electricity Utility and Consumer Protection Regulatory Agency
BESS	Battery Energy Support System

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1. Introduction

Morocco, Tunisia, and Egypt have different socio-economic and energy landscapes, but both energy importers and net exporters of oil and gas are aligned on the imperative of the green transition.

During COP26 in Glasgow, Morocco committed to achieving a 52% share of renewables in total power capacity by 2030, with an increase to 70% by 2040 and 80% by 2050. Those targets are in line with Morocco's previous plan envisaging 42% of renewable energy capacity installed by 2020. To achieve this goal, Morocco implemented policies, measures, and actions, including Law 13-09, which was amended by Law 58-15 with the introduction of net-metering, and Law 16-09 on self-production.

In Glasgow, Tunisia confirmed its energy strategy commitment to achieve 30% of the electricity production from renewable energies. Under the strategy, Tunisia seeks to achieve 3,815 MW of cumulative installed renewable energy capacity by 2030, of which 1,755 MW will come from wind and 1,510 MW from PV. The remaining 550 MW are expected to be sourced from concentrated solar power and biomass. To achieve these targets, Tunisia implemented different schemes: net-metering, net-billing, self-production, independent power production for domestic consumption, private concession by tender, and direct public investment by the Tunisian Company of Electricity and Gas (STEG).

In 2015, Egypt placed renewable energy sources at the heart of its Integrated Sustainable Energy Strategy. This was adopted along with the New Electricity Law, to drive sustainable socio-economic development and energy diversification. The Government launched various combinations of policies and flexible mechanisms to progressively liberalize the energy market, in particular a feed-in tariff, a net-metering scheme, and auctions. The strategy was updated in 2021 including significant steps with a vision toward 2040: abolishing the use of coal for electricity generation and replacing it with renewable sources. The Strategy sets a 20% share of renewable energy in the total electricity mix by 2022, 55% by 2035 (previously 42%), and 61% by 2040 (a new-entry target).

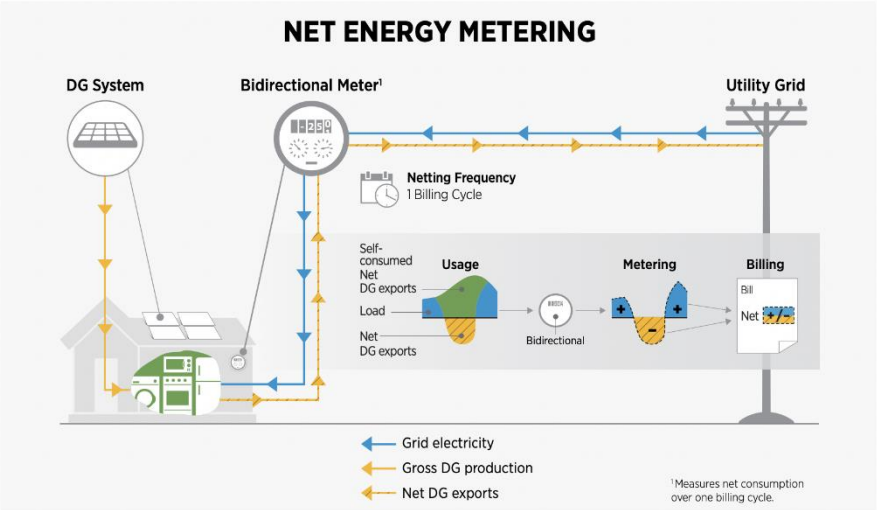
In this framework, the development of renewable energy capacity must rely not only on large-scale projects but also on small generation capacity for self-consumption. Among the possible mechanisms to incentivize self-consumption, net-metering is surely one of the most common and effective, as seen in Italy, Germany, India, among others. Although Morocco, Tunisia, and Egypt have introduced net-metering schemes, their application varies across countries. This policy brief will delve deeper into challenges, opportunities, and recommendations for wider adoption of net-metering.

2. What is net-metering

Renewable energies can be supported and incentivized through a plethora of policy measures including Renewable Portfolio Standards (RPS), tax credits, grants, loan programs, mandatory production or consumption, renewable energy certificates or credits, and special rates for purchasing electricity from certain types of renewable energy systems (feed-in-tariffs, feed-in-premium, auctions) and net-metering.

According to the International Energy Agency (IEA), net-metering is a type of contract that binds a self-generating customer, which is both a consumer and a producer, and his energy distributor. The customer consumes electricity produced by its own power plant in real-time and surplus is injected into the grid. Conversely, the customer purchases the electricity needed to match its consumption, when self-generated electricity is not sufficient or available. For each injected kWh, the consumer gets compensation in the form of credit and benefits from a reduced electricity bill.[1] The International Renewable Energy Agency (IRENA) defines the net-metering mechanism, as a system where the consumer is charged for the net electricity consumption from the grid after netting off the electricity injected by the same consumer into the grid.[2] There are two types of plants related to net-metering mechanisms: solar rooftops and utility-scale solar systems used for Direct Power Purchase Agreements(PPAs) between an Independent Power Purchaser (IPP) and a Commercial and Industrial (C&I) Customer.

Figure 1: Net-metering scheme[3]



Net-metering brings some economic, social, and environmental benefits. It **allows customers to have control over their electricity bills:** if during the day the electricity produced is more than the electricity consumed, net-metering schemes allow them to "use" that surplus at a later time and reduce electricity bills. Net-metering **protects the electricity grid by** reducing the strain on distribution systems, preventing losses in long-distance electricity transmission and distribution,

[1] IEA (2018), Net-metering and PV self-consumption in emerging countries.
[2] IRENA (2019), Net billing schemes: Innovation landscape brief.
[3] NREL (2017), Grid-Connected Distributed Generation: Compensation Mechanism Basics.

and reducing investment needs and costs for other consumers. This is possible by encouraging the generation near the point of consumption. Evidence shows that net-metering contributes to **creating new jobs, income, and investments**. This creates value for installers, electricians, and manufacturers. Finally, net-metering **contributes to climate mitigation efforts as** customers are incentivized to adopt renewable energy technologies, thus cutting CO2 emissions.

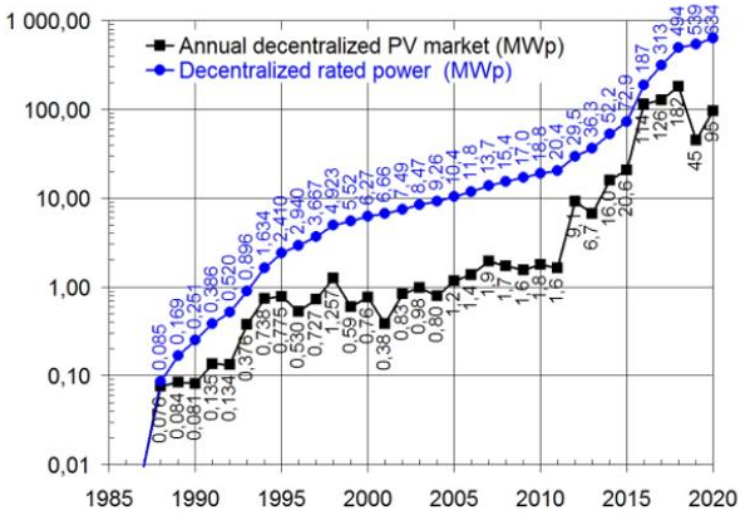
3. Net-metering schemes in Morocco, Tunisia, and Egypt

MOROCCO

Morocco is considered a regional forerunner for renewables deployment. Still, small-scale PV projects are at an embryonic stage (figure 2), despite the estimated potential by the National Office of Electricity and Drinking Water (ONEE) of 4.5GW for tertiary and residential sectors.

In 2015, Morocco approved Law 58-15 that amended the renewable energy law (13-09) by introducing a net-metering scheme for solar-PV and on-shore wind. However, only plants which are connected to the high voltage grid and supply 80% of the user's annual electricity needs may be eligible to participate. This confirms that net-metering is only available for large industrial players. As a result, in the past years, only a small number of large solar and wind projects have applied for the mechanism, preventing the uptake of small-scale PV projects. Despite those connected to the medium and low voltage being expected to be eligible at a later stage, the Government has not approved the implementing decrees yet.

Figure 2: Decentralised PV Capacity in Morocco[4]



In November 2021, the Moroccan Ministry of Renewable Energy and Sustainable Development presented Law 82.21 which updates the legislative and regulatory framework on self-generation.

[4] IRESEN (2022), Presentation Prospect & Trend of Moroccan PV Market. Morocco: Driver of the solar energy regional Integration

The Law regulates the activity of self-generation of electrical energy for self-consumption, and, regardless of the source of production, the nature of the network, the level of voltage or capacity of the facility used. The Law gives the right for any individual or legal entity, public or private, to benefit from the status of self-producer, with some exceptions under the principle of neutrality.

The Law is not enforced yet, still, there are some limitations. For instance, the Law does not allow for the creation of partnerships to finance the project. The notion "*par ses propres moyens*" seems to be subject to strict interpretation. Moreover, the Law sets the limit of 10% of the electricity surplus to be sold to ONEE. This prevents owners from benefiting from revenues by selling electricity surplus.

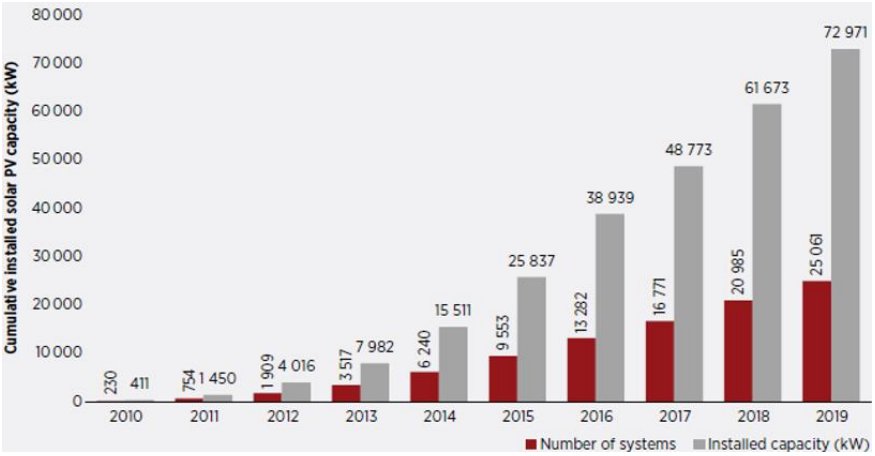
TUNISIA

Among North African countries, Tunisia has been a pioneer in adopting incentive mechanisms, which brought benefits to customers in different ways, by offering the possibility to save on energy bills and contributing to face upfront investment for the installation of PV systems. In 2010, Tunisia implemented an incentive scheme, the PROSOL ELEC Program to promote the implementation of PV installations connected to the low-voltage grid, mainly in the residential sector for self-consumption. Through PROSOL ELEC, consumers can install a PV plant whose size is "determined" by their annual electricity consumption. This ensures that the potential surplus injected into the grid is minimized.

Financing under the Programme is constituted by the purchaser's contribution, a state subsidy, and a bank loan (the bank is required to have signed an agreement with STEG). To promote low-voltage solar-PV self-consumption among residential, service, and industrial customers, Tunisia launched also the Solar Buildings Program which allows prosumers to access the Program without a bank loan: the only requirements are the ownership of the premises, a subscription to a low-voltage STEG contract, and - similarly to the other program - the installed capacity cannot exceed the one subscribed to STEG. Between 2011 and 2019, the number of self-consumption small-PV projects grew by almost 35 times (figure 3).

In 2020, Tunisia adopted a new regulation for net-metering, allowing renewable energy private producers to generate electricity for self-consumption and to sell the excess power produced to the power utility STEG. The new legislation envisaged for projects connected to low voltage grid gives the possibility to deduce the surplus of the production from the consumption of the following year. For installations connected to medium and high voltage grids, the surplus production can be sold to STEG to a maximum of 30% of the annual production (net-billing).

Figure 3: Self-consumption small-PV installed capacity in Tunisia 2011-2019[5]



EGYPT

Since 2017, Egypt has promoted small-scale PV projects through the Egypt-PV project. The project is developed in collaboration between the New and Renewable Energy Authority (NREA) - the electricity regulator in Egypt - and the National Project Grid, and funded by the Global Environment Facility (GEF), with the support of UNDP. More than 160 pilot PV projects were implemented in different sectors, including industrial, commercial, residential, educational, and public, contributing to an overall energy savings of 14.8 GWh, with some sectors achieving a 75% of savings.

In April 2020, the Egyptian Electricity Utility and Consumer Protection Regulatory Agency (EgyptERA) issued Decree no. 2 of 2020 which sets the new rules for net-metering. The Decree became effective in May 2020 introducing some important changes.

Eligible plants for net-metering schemes are solar plants that must be installed within the boundaries of the customer's premises. They can be solar rooftop or ground-mounted. Moreover, the capacity of solar plants may not exceed the maximum load of the owner during the previous year. This has been established to avoid any abuse of the net-metering system in case consumers would install solar plants that covered 100% of the electricity needs without buying anything from the transmission company. To this end, the maximum capacity of a plant owned by one customer should not exceed 25MW in aggregate or 20MW per project.

Under the net-metering regime, the entire generated surplus can be sold to a distribution company. The surplus electricity is remunerated at a fixed Feed-in-Tariff calculated according to the recent purchase price contracted between the Egyptian Electricity Transmission Company (EETC) and a solar energy producer. The payment for the electricity injected into the grid is made on an annual basis. The scheme allows the participation of a third-party that develops and fully owns the plant with the final purpose of selling the generated electricity to the end-user.

The Decree also defined some limits. The aggregate capacity of installing solar plants under the net-metering across the country should not exceed 300MW. In 2020, there were only 75MW licensed by EgyptERA. The remaining 225MW were divided into 125MW for capacity less or equal to 500KW and 100MW for capacity more

[5] IRENA (2021), The Republic of Tunisia, Renewable Readiness Assessment.

than 500KW and up to 20MW. The billing system for net-metering envisages that payments should be made on an annual basis, after setting off the consumer's consumption at the end of June each year. EgyptERA is the authority that balances the charge to be paid by the consumer as a cost for combining RE into the grid according to its voltage.

4. Five recommendations to unleash the potential of net-metering

This section builds on the barriers identified following the analysis of net-metering schemes in Morocco, Tunisia, and Egypt and proposes five recommendations to unleash the small-PV capacity in those countries.

Grant access to the medium and low-voltage grid

As shown by Tunisia and Egypt cases, opening the access to net-metering to Medium voltage (MV) and Low Voltage (LV) customers is key to ensuring fair and sustained development of RE capacities.

A clear regulatory framework for the net-metering

Deploying net-metering at large scale necessitates a clear regulatory framework. Primary and secondary legislations need to be in place. The wheeling fees need to be understandable, transparent, and replicable.

Launch a National Programme to support small PV capacity coupled with financial support to accompany net-metering

Consumers are often reluctant - or do not have the means - to pay for the high upfront cost required to install small-scale solar systems. At the same time, small businesses and households often have limited access to financial support.

Although the cost of PV systems has drastically declined, countries should design a national programme coupled with effective financial support to kickstart a wide deployment of small-scale PV. This can be done by deciding on the small PV targets to be achieved, and launching knowledge-based campaigns to increase awareness of the programme, who can access it and what are the conditions. Also, it can be done by involving private and public institutions in providing affordable loans and guarantees, standardizing loan applications, their appraisal and assessment processes, and simplifying the rules of sectoral lending programs, as in the case of Tunisia.

Remove limits on electricity surplus sales

Through the net-metering schemes, self-consumers can sell the electricity surplus as a way to make some profit. However, in Morocco, the limit of surplus to be sold is 10%. Allowing residents, services, and small companies to sell electricity would stimulate the large-scale deployment of small PV capacity. This in turn would enable the transition away from fossil fuels and contribute to meeting the renewable targets set in the country's strategy.

In this regard, much can be learned from Brazil. After a timid response in 2012, Brazil redesigned its net-metering scheme without imposing a limit on selling the excess electricity to the grid for bill credits. With its generous net-metering program, Brazil achieved 2 GW of renewable energy capacity in 2019.[6] In Mexico, the electricity surplus is stored for up to 12 months in a virtual energy bank, then paid to the customer. Thanks to the mechanism, Mexico reached 1.8 GW of

[6] IEA (2020), Renewables: Solar PV.

installed distributed PV in 2021, with a Compound annual growth rate (CAGR) of 31% in the last five years.

Removing the limits on surplus sales needs to be accompanied by careful considerations for the grid flexibility. Re-injecting the surplus in the grid might cause in principle frequency disruptions (as well as an excess amount of power in the case of systems strongly based on solar). This can be ensured by introducing smart grids and batteries energy storage systems (BESS) among other measures.

Apply user-friendly administrative procedures

Having long permitting procedures for installations and no periodic revisions of the net-metering schemes weaken the effectiveness of the measure. With a strong political will to achieve decarbonization targets, it is possible to set up efficient and user-friendly procedures for people willing to join the net-metering program. Brazil has reduced administrative barriers to make deployment of small-scale PV capacity by addressing technical and administrative aspects and providing training to apply user-friendly administrative procedures.

5. Going beyond: virtual net-metering, net-billing, and gross-metering

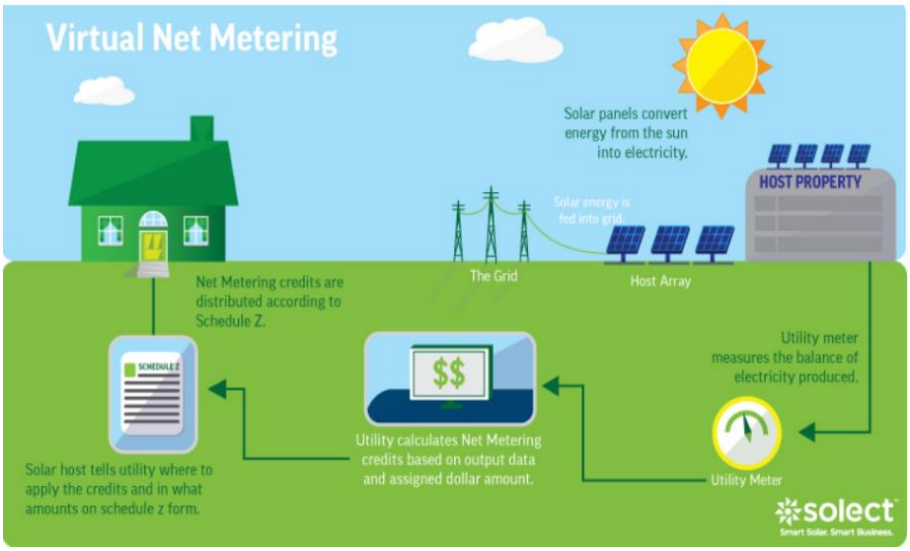
Virtual net-metering

Under net-metering, excess solar power generated by a system can be delivered to the utility grid and used to meet the electricity needs of other customers nearby. Producers are credited for the value of the power and can use that credit to offset any power they purchase from the grid when their solar system is not generating enough to meet their needs, reducing their electricity bills. Some countries went beyond this traditional concept with programs like virtual net-metering (VNM) that expand access to multi-tenant buildings or clear the way for community shared solar arrangements by allowing to receive credit for a designated portion of the power produced by an off-site or shared system.

Brazil and Australia introduced VNM in 2015, while Greece in 2016 allowed the setting up of solar installations away from the place of actual power consumption to consumer categories including schools, universities, and farmers. Virtual net-metering has allowed low-income communities to have access to solar energy while avoiding significant hardware and installation costs and lowering the total cost of the system. Under VNM, third-party ownership of shared renewable energy systems is promoted under a subscription method to facilitate participation.

For VNM to happen, it is necessary to reframe existing policies to accommodate off-site generation and aggregation of load, and clarity of administrative limits for credit allocation is essential. The policy should address supplementary components of the program design, including marketing and consumer interface, facility maintenance, and dispute resolution process. The role of regulators in VNM is pivotal in determining the parameters such as the minimum and maximum size of the system and the minimum load requirement at the site of generation. The regulator should determine if under the VNM a market for net-metering should be created to provide credits for the excess energy fed into the grid and should decide the role of utilities in VNM systems.

Figure 4: Virtual net-metering scheme[7]



Net-billing

Net-billing is a scheme that incentivizes a more efficient and dynamic interaction between prosumers and the grid. Differently from net-metering, it is a market-based compensation mechanism, as prosumer compensation is based on the actual market value of the energy consumed or injected into the grid. From an algebraic point of view, a net-metering scheme is equivalent to selling the surplus at a retail price, including network, transmission, and distribution charges. With net-billing, on the other hand, the surplus is sold at a wholesale price excluding network, transmission, and distribution charges (Figure 5).

Different versions of the net-billing scheme have been implemented in several countries, such as Indonesia, Italy, Mexico, Portugal, and the United States of America, after the first successful deployment of small-scale PV technologies. For instance, in New York a formula was set to compensate for the injection of renewable electricity from prosumers, combining the wholesale price with other elements of distributed generation that benefit the grid. In Italy, the net-billing scheme calculates the value of the excess electricity fed into the grid at wholesale price, and this value can be either used as a credit for subsequent consumption periods or paid back to the consumer.

Net-billing represents a cost-reflective mechanism that assures a sustainable and more stable mechanism that avoids oversupply and distorted price signals. According to IRENA, to enable the adoption of net-billing schemes, a method must be developed to send the right price signals to prosumers. In addition, it is also important to take into account that in Southern and Eastern Mediterranean countries net-billing will need to consider the average cost of electricity production as a wholesale market is missing. Appropriate mechanisms to recover network costs need to be in place. Enabling infrastructure, such as advanced metering, is required to accelerate the adoption and functioning of net-billing schemes, as it is consumer awareness, empowerment, and engagement.

[7] Solect Energy at https://solect.com/net-metering-101/

Figure 5: Net-billing scheme[8]

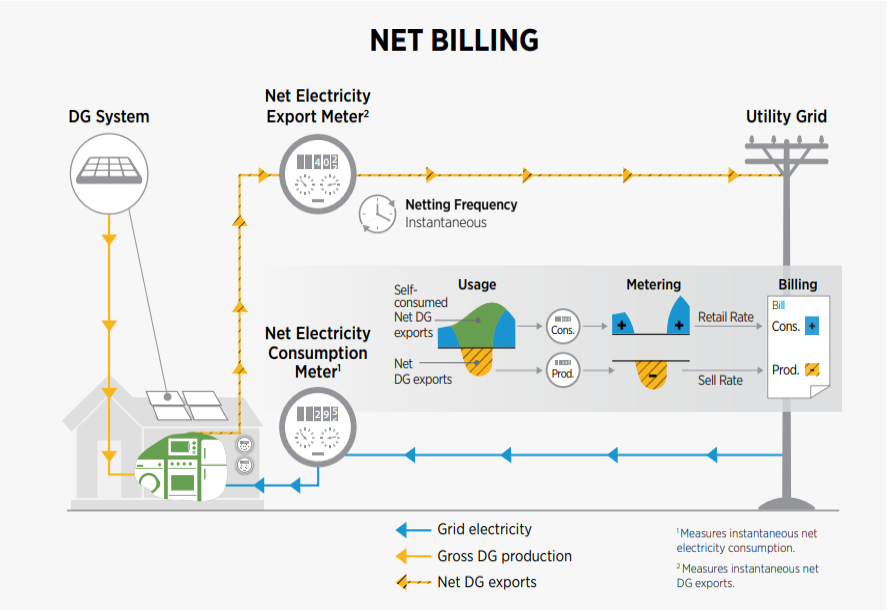
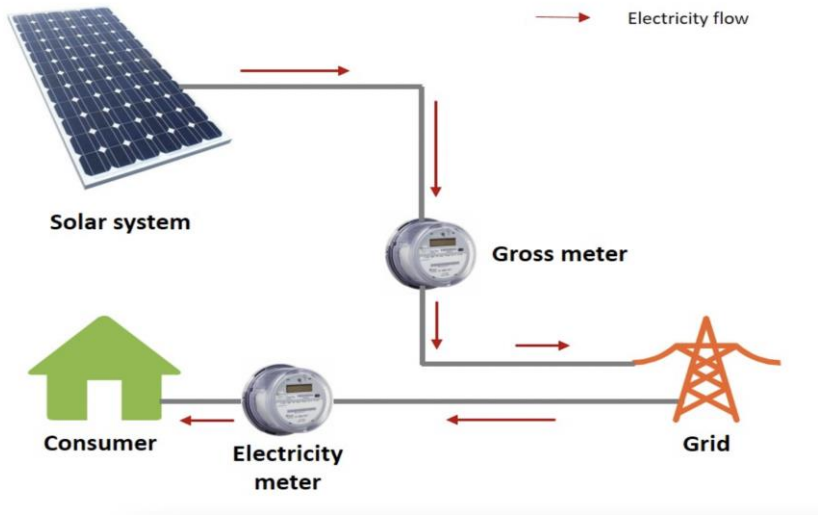


Figure 6: Gross-metering scheme[9]



Gross-metering

In gross-metering, total electricity generated by the solar system is injected into the grid, and consumers import electricity from the grid for consumption. The utility pays the customer a fixed charge for the solar energy produced from the solar power plant (figure 6).

Most customers might consider net-metering a better option because of the low tariff decided by utilities for gross-metering. However, several countries applied gross-metering, among which India and Vietnam, with remarkable results.

[8] NREL (2017), Grid-Connected Distributed Generation: Compensation Mechanism Basics.
[9] CEEW Center For Energy Finance at https://cef.ceew.in/masterclass/explains/difference-between-gross-metering-and-net-metering

After introducing gross-metering with loads above 10KW, India grew from about 623 MW in 2015 to about 5.9 GW by June 2020.[10] In the case of Vietnam, net-metering made it difficult for tax agencies to calculate taxes and caused delays for Electricity of Vietnam in the signature of power purchase agreements, so the country switched to gross-metering in 2019. This wide policy flexibility, adapted to the local context and pursuing industry development, allowed Vietnam's rooftop solar installations to reach 9.3 GW compared to 378 MW in 2015.[11]

[10] India Solar Rooftop Map.

[11] Nam do, et al., 2021.

Bibliography

ANME, PROSOL Residentiel
C4 Cities Finance Facilities (2020), The Solar PV revolution in Brazil: How cities can take advantage
ENERDATA (2020), Tunisia adopts new regulatory framework for renewable net metering
ESI (2020), Net metering gaining favour throughout Middle East and Africa
IEA (2018), Net metering and PV self-consumption in emerging countries
IEA, Morocco Net-metering Legislation (Law n58/15)
IRENA (2021), The Republic of Tunisia, Renewable Readiness Assessment
IRENA (2019), Net Billing Schemes: Innovation Landscape Brief
Lexology (2020), Outlook for renewable energy IPP in Egypt
Nam Do, et al. (2021), Vietnam's solar and wind power success: Policy implications for the other ASEAN countries, Energy for Sustainable Development
NREL (2017), Grid-Connected Distributed Generation: Compensation Mechanism Basics
PV magazine (2019), Morocco's medium voltage PV market will open this year
PV magazine (2020), Tunisia introduces new rules for self-consumption, net metering
RES4Africa Foundation, AFRY and Cluster Solaire (2022), Small-scale PV capacity: is Morocco ready?
Riad&Riad, New Net Metering Rules in Egypt
Solar Energy Industry Association, Net metering



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