HOW NET METERING OF ELECTRICITY WORKS

POWER THE FUTURE REGIONAL PROGRAM
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Up until now, the renewables has been built by energy developers and generating companies mainly with the help of Feed in Tariffs set by the Government or the Regulator through the bidding, auctions, government subsidies and other mechanisms.

We are now seeing something completely different:

Consumers themselves are looking for ways to become 100 percent renewable in the energy they use and are considering the use of alternative technologies and solutions addressing also the low-carbon challenge.

In this regard Net metering comes as a new concept that promises an environment friendly and power efficient electricity evaluation system. It is also enabling policy designed to foster private investment in renewable energy.

Net metering allows residential and commercial customers who generate their own electricity from renewables to feed electricity they do not use back into the grid.

This trend is reshaping how energy markets will function in the future.
Net metering originated in the USA at the beginning of the 80s, when the owners of small solar and wind power units desired to use the electricity generated at a time other than the time it was generated.

Minnesota, as one of the first states to answer the call of manufacturers, has, since 1983, offered all manufacturers up to 40 kW energy generating credit which they could transfer to the next billing period.

In 2000 this was amended to compensation at the average retail utility energy rate. This is the simplest and most general interpretation of net metering, and in addition allows small producers to sell electricity at the retail rate.

Net Metering now widely implemented in most of the USA, Europe, Canada and Australia and there are different mechanisms and instruments for enabling better environment for Net Metering.
**BASIC PRINCIPLE**

**Net Metering is a Way of Trading Electricity from Renewable Sources**

Net Metering is a billing system that credits small customers at the full electric price for any excess electricity they generate and sell to their local electric company via the grid from on-site small sources such as residential rooftop solar panels or wind units.

The basic principle is simple: The producer who is a customer at the same time has a renewable unit connected to his house (for example a photovoltaic power unit on the roof) and simultaneously is connected to the grid.

Customer uses both sources, so if the sun shines, house takes electricity from photovoltaics and if more power is needed for example during the night, it takes from the network. If they produce an excess the electricity is feed into the grid, "spinning the meter on the other way" this "performs a virtual storage using the grid".

In general, the electricity bill, which the customer pays is then calculated by the difference in its production and consumption for any given period.
BASIC PRINCIPLE

Technically it looks like the following:

1. Solar Panels convert Sunlight into Direct Current (DC) electricity
2. Inverter Converts DC electricity into AC electricity compatible with the home’s electrical system.
3. PV system is tied into the Home’s main electric panel.
4. Installed bi-directional meter which can measure current flowing in two directions.
5. Remains connected to distribution system. Any over production will flow on to Distribution System.
RELATED MECHANISMS

Gross Metering and Group Net Metering

Gross Metering

Gross metering systems have been set up to send all the power consumer unit generates to the grid. This means you pay for all the energy you use in your basement and receive a payment based on the feed-in tariff for the energy your system feeds back into the grid.

Group Net Metering

Group Net Metering allows for multiple persons or companies to participate in a shared renewable generation project that can be sized to meet their combined electricity needs.

Credits from the electricity generated are distributed to customers’ accounts and applied against customers’ electricity consumption in proportion to their ownership share, historic electricity use or other agreed upon terms.
BENEFITS AND COSTS

Net Metering is socially acceptable and above all effective

Costs:
- The cost of managing Net Metering.
- Capacity reserves and storages.
- Reduction in income for the energy companies that have infrastructure maintenance costs.

Benefits:
- Reduction of costs in the transmission and distribution system.
- Reduction of electricity losses in the grid.
- Saving of unused fossil fuels and reduction of CO$_2$ emissions.
- Development of renewable energy.
GOOD PRACTICES

Design Simplified yet Robust Interconnection Standards

All renewable energy projects need the legal authority to interconnect to the grid. While larger projects may involve engineering studies and in-depth consultation with utilities and regulatory entities, small renewable energy projects do not normally need to be held to the same complex standards, with aggregate net metering approaches as a possible exception.

Standardized interconnection policies are particularly important for distributed generation, as they ensure that all renewable electricity projects can connect to the grid if they meet certain technical requirements to ensure safety. The policies standardize connection procedures, technical requirements, and other issues. They also typically provide highly simplified and streamlined procedures and forms for small systems.
GOOD PRACTICIES

Set Appropriate Capacity Limits

Policymakers often set limits on the size of individual systems and on overall capacity allowed to be net-metered on the grid. Individual system limits based on on-site consumer loads rather than arbitrary caps expand the market to more applications.

System-wide capacity caps account for engineering limits for grid stability, but caps that are more restrictive reduce the market potential. Both of these limits can also take into account broader policy goals.

For example, if a net metering program is focused on deployment of small-scale residential PV, large-scale renewable energy projects could lead to the capacity cap being reached without meeting the broader policy goal of small-scale deployment.

Thus, policymakers may also consider a tiered policy based on project size or complexity, especially for smaller-scale PV generation.
GOOD PRACTICIES

Design Appropriate Billing Approaches

An effectively designed Net Metering policy will allow customers with a renewable energy power system to consume power from the grid as needed to meet their load and to send power back to the grid when they produce more than they need. Under this approach, the customer is billed only for the “net” electricity that is used within a billing cycle. If a customer provides more power to the grid than is used during a billing cycle, the “excess” power can be rolled over to the next billing cycle.

Customers can roll over excess credits for some period of time, often one year, at which point any remaining excess power will be reimbursed at a rate equal to or greater than the average wholesale rate of electricity.
Aggregate Net Metering allows for aggregation of metering across various separate systems or across various customers for a single system. Allowing flexibility in configuration of the location of generation and which customers it serves can use RE resources more efficiently.

Under this type of approach, community members and businesses can “subscribe” or purchase a certain amount of the power produced by RE in the community and thus receive credits on their utility bills for power produced.

Aggregation can expand the customer base for solar since it allows RE use by customers who cannot install their own system due to a poor resource, lack of available space, rental restrictions, or other reasons.
GOOD PRACTICIES

Ensure Inclusive Eligibility

If the goal is for Net Metering to support energy portfolio diversity, a broad range of clean energy technologies, including combined heat and power, can be considered for eligibility.

Net metering policies also provide more flexibility if all customer classes, including customers with third party owned systems, are eligible for participation.

Extending net metering policies to all utilities provides a more robust opportunity for the market to develop.
BILLING APPROACHES

Simple Solution

The particular form of net metering depends on the agreement between the customer (and also producer of electricity from their own unit), the electricity trader and local utility company.

If the monthly consumption is higher than the production of solar unit, the user will pay the standard electricity bill, minus the produced power.

If the monthly consumption is the same as the production of solar unit, the user won’t pay for electricity, but the connection fees, distribution fees etc. remain.

If the monthly production of solar unit is higher than consumption, the surplus is transferred as a credit to the next month, much like unused minutes with a standard mobile phone contract.
BILLING APPROACHES

**Complex Solutions**

A more complex situation arises with yearly surplus.

This is solved differently in different countries:

- Surplus is paid to the owner of the unit, but only to a certain limit (e.g. 25% of its annual consumption).

- Surplus remains with the distribution company. The owner of the unit won’t pay anything for the electricity, but doesn’t get anything extra until the end of the billing period.

- Surplus is transferred to the next period.
There are also many methods to fix the price of electricity produced from renewables.

For example:

**Wholesale market price**
the distribution company can record what the market price of electricity was at the time when the surplus was sent to the grid.

**Price avoided cost**
the unit owner saves energy costs by producing electricity for the utility companies, which produce power from conventional sources, and therefore the unit owner receives compensation to the amount of these costs.

**Price fixed by decree**
the local regulator provides a fixed price for surplus from Net Metering. This is a fixed purchase price.

**Standard retail price**
electricity is sent to the grid for the same price as if it was at the time purchased (according to the tariff during peak or off-peak). This charging method is called "time-of-use metering". 
## COUNTRY EXAMPLES

### Net Metering Practices in some EU countries

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COUNTRY EXAMPLES

Net Metering Practices in USA/CALIFORNIA

Eligibility: Any retail customer is eligible for Net Metering if generates at least some electricity using solar or wind energy or other qualified generating technologies on its premise.

Capacity Limits: Any systems sized to meet a customer's expected annual electricity needs with a minimum of 1kW and a maximum of 1MW capacity.

Interconnection: Customer should contact its utility and request an application for Net Metering. The utility outlines connection requirements for safely connecting generating system to the grid. Residential and small commercial system owners pay a one-time connection fee (includes installation of the meter) which varies between $130-$150 depending on utility customer connecting to.

Long a leader and trendsetter in its clean-energy goals, California took a giant step this year, becoming the first state to require all new homes to have solar power!!! The new requirement to take effect in two years. Nearly 16% of the state's electricity in 2017 came from solar.
Billing with Net Energy Metering: Utility reads customer’s meter monthly and customer receive a monthly statement indicating the net amount of electricity he consumed or exported to the utility grid during that billing period. If customer is a residential or small commercial customer, he have the option of paying the utility for his net consumption monthly, or settling his account on every 12 months.

Payment for Net Surplus Generation: Customers that generate a net surplus of energy at the end of a twelve-month period can receive a payment for the energy under special utility tariffs.
COUNTRY EXAMPLES

Net Metering Practices in USA/CALIFORNIA

Additional and Future Pricing (Tariff) Options for Solar Systems:

Virtual Net Metering, which allows the electricity produced by a single solar installation to be credited toward multiple tenant accounts in a multifamily building without requiring the solar system to be physically connected to each tenant's meter. For now, this program is only available as a pilot program to multifamily affordable housing.

Additional and Future Pricing (Tariff) Options for Solar Systems:

Renewable Energy Self-Generation - Bill Credit Transfer, which enables solar customers transfer excess credits to another account. This works similar to net metering, but any production credits that normally would be received by the consumer can be transferred to another account.
COUNTRY EXAMPLES

Net Metering Practices in ARMENIA

Eligibility: Any industrial, commercial or residential customer is eligible for Net Metering if generates at least some electricity using a renewable source on its premise.

Capacity Limits: Any systems sized to meet a customer’s peak demand with a maximum capacity of 150KW, extended up to 500 KW until 2022.

Interconnection: Customer should contact its utility and request an application for Net Metering. The utility outlines connection requirements for safely connecting generating system to the grid. Residential and small commercial system owners pay a one-time connection fee for installation of an bidirectional meter, which is $22 for one phase connection and $122 for three phase connection. Connection fees cover about 50% of the investments, remaining part is covered through the tariffs. The installation should be done in 5 days.
COUNTRY EXAMPLES

Net Metering Practices in ARMENIA

Billing with Net Energy Metering: Billing is done yearly. Utility reads customer’s meter monthly and customer receive a monthly statement indicating the net amount of electricity he consumed or exported to the utility grid during that billing period. Net surplus is transferred to the next month.

Payment for Net Surplus Generation: Customers that generate a net surplus of energy at the end of a twelve-month period receives a payment with the half of the retail tariffs which is about the same with the wholesale price. There are no other options implemented yet.

Currently there are about 315 small scale solar units connected to the grid and about 85 applications under process. Customers mainly started expressing their interest in solar after significant drop off in installation prices in last two years. Also annual billing approved at the beginning of this year only.
COUNTRY EXAMPLES

Lessons learned from Armenia Net Metering development story

Strong Regulator:
It is important having a strong sectorial regulator, that can establish simple interconnection standards, appropriate billing approached and monitor how utility follows the period.

Taxation:
It is important having a relevant tax regulations in terms of VAT and Income tax, not qualifying Net Metering at least in case of the household customers as a business activity.

Strong Grid:
It is also important having a technically strong and stable grid, otherwise Net Metering can cause technical problems on both sides while rejecting electricity back to the grid.

By Armenian Energy Law Regulator is allowed to fine the regulated companies for violation of any regulations and rules in a range of 10.000-30.000 USD. If the Regulator qualifies the violation as a violation of license conditions then fine will be in range of 30.000-50.000 USD. If that is qualified as a violation of the Energy Law then the range is 50.000-80.000 USD.
COUNTRY EXAMPLES

Net Metering Practices in KAZAKSTAN

Eligibility: Any natural or legal entity connected to the grid is eligible for Net Metering if generates at least some electricity using a renewable source on its premise.

Capacity Limits: Any systems sized to meet a customer’s peak demand with a maximum capacity of 100KW.

Interconnection: Customer should contact its utility and submit an application with the list of requested documents for Net Metering. The utility outlines connection requirements for safely connecting generating system to the grid. All the connection costs, including for installation of an additional meter should be covered by the Customer. Each calendar year (45 days before) customer should sign a new contract with the utility presented the list requested documents again.
COUNTRY EXAMPLES

Net Metering Practices in KAZAKSTAN

Billing with Net Energy Metering: Billing is done on monthly basis only. Utility reads customer’s meter monthly and customer receive a monthly statement indicating the net amount of electricity he consumed or exported to the utility grid during that billing period. No transfer for net surplus.

Payment for Net Surplus Generation: Customers that generate a net surplus of energy in 30 days after the end of the month receives a payment with the retail tariffs. Same way customer pays for the additional consumption.

QUESTIONS FOR DISCUSSION:

(1) How many customers are connected to the grid now under the Net Metering scheme?
(2) What are the major challenges in your country for enabling a better environment for Net Metering?
WHAT NEEDS TO BE CHANGED

What would you like to change in your regulations for enabling a better environment for Net Metering

In Eligibility requirements

In Interconnection standards

In Capacity limits

In Billing approaches
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