FICHTNER

The Green Loan Program, Women-led households and Enterprises

Yerevan, 25.03.2024

Promotion of Renewable Energies (Accompanying Measure) - Phase VI (GAF-RE)

Գերմանական համագործակցություն
DEUTSCHE ZUSAMMENARBEIT

KFW

GAF GERMAN ARMENIAN FUND ԳԵՐՄԱՆԱՀԱՅԿԱԿԱՆ ՀԻՄՆԱԴՐԱՄ

ENGINEERING CONSULTING

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Benefits of Net – Metering (Autonomous Energy Generation)

Individuals and businesses can install **up to 150 kW** solar power stations, produce electricity for internal consumption, and sell the surplus to the "Electric Networks of Armenia".

Autonomous Energy Generation through the Net-Metering Scheme provide the following opportunities to autonomous energy generators:

- **From May 1, 2022** the installed capacity of the autonomous power plant installations may not exceed the **150 kW** for both enterprises and physical persons. It used to be 500 kW for enterprises and 150 kW for physical persons.
- The current mechanisms for the implementation of flows of autonomous energy producers was improved **from May 2022**, enabling them **to produce, consume at various metering points** of the electricity system, to form groups, including residents and organizations.
- In case of an autonomous group (group of autonomous energy generator Individuals and/or legal entities), the total installed capacity of the autonomous power generators included in the group **may not exceed 1050 kW.**

Benefits of Net – Metering (Autonomous Energy Generation)

Payback period for the PV plant installation is provided in the table below:

Capacity	Cost for 1 kW	Total cost	Payback Period
Up to (kW)	(AMD)	(AMD)	(year)
5	330,000	1,650,000	4-5
10	290,000	2,900,000	3.5 - 4.5
50	270,000	13,500,000	3 - 5.5
150	260,000	39,000,000	3 - 4.5

Example: *The PV system with 25 kW installed capacity are assumed to generate approximately 37,500 kWh of electricity annually, reducing GHG emissions of approximately 15.7 t CO_2 into the atmosphere and electricity bills by about 1,800,000 AMD annually*

For financial calculator, please, apply to the link: https://www.abcfinance.am/

Benefits of Solar PV

By embracing Solar PV Technology, you are not only contributing to a greener planet but also unlocking a multitude of financial and practical advantages. Let's explore the numerous benefits of going solar:

- Significant Savings on Electricity Bills
- Income Generation Through Excess Energy
- Increased Property Value
- Reliability and Low Maintenance
- Energy Independence
- Reduced Carbon Footprint
- Long-Term Investment

Success Stories

Success story 1 – Safaryan Anush (household).

Lusakunq village, Gegharqunik region, 3.3 kW capacity roof-top PV station with total amount of AMD 1.4mln, 9.5%, maturity – 6 years.

The household became aware about the project from friends.

The final beneficiary is very happy with the loan, easily makes the repayments (monthly 22 000 AMD) with no overdue. Thanks to the PV station the final beneficiary has about AMD 10,000 monthly savings (no payments for the electricity). After two years of exploitation, she has received back annually about AMD 50,000-60,000 from the Electric Networks of Armenia.

Success Stories

Success story 2 – “Master Pharm” LLC, medical centre (woman owned business).

Vagharshapat city, Ararat region, 15.4 kW capacity roof-top PV station with total amount of AMD 6mln, 8.5%, maturity – 7 years.

The company became aware of the project from bank.

The company is quite satisfied with the loan and makes the repayments regularly with no overdue payments. Thanks to the PV station the final beneficiary has about 34% monthly savings (Annual electricity costs before PV station installation totalled to AMD 3.3mln, after PV station installation costs resulted to AMD 2.2mln, equalling an AMD 1.1mln savings).

Success Stories

Success Story 3 – Moscow Cinema, Yerevan City (Video)

A small-scale solar power plant was installed on the roof of Moscow Cinema. Today, this PV plant is helping this cinema reduce their energy bill by 30 to 35%.

Eligibility and Application Process

Installed capacity up to 149 kW

Will be assessed and financed directly by the Bank / GAF

Eligible companies are:

- privately owned, registered, and operating in Armenia,
- operating in compliance with national environmental, health, and safety legislation.

Furthermore, PEs applying for financing under the facility must meet the following general eligibility criteria:

- for existing businesses: a proven track record and sound credit history, including financial reporting in compliance with local accounting standards,
- for start-up energy projects: these will be judged based upon the customary technical and market due diligence as well as satisfactory financial projections,
- sound management and organizational structure,
- sound financial structure, including a sufficient security package for proposed borrowing.

Eligibility and Application Process

Installed capacity 150-500 kW

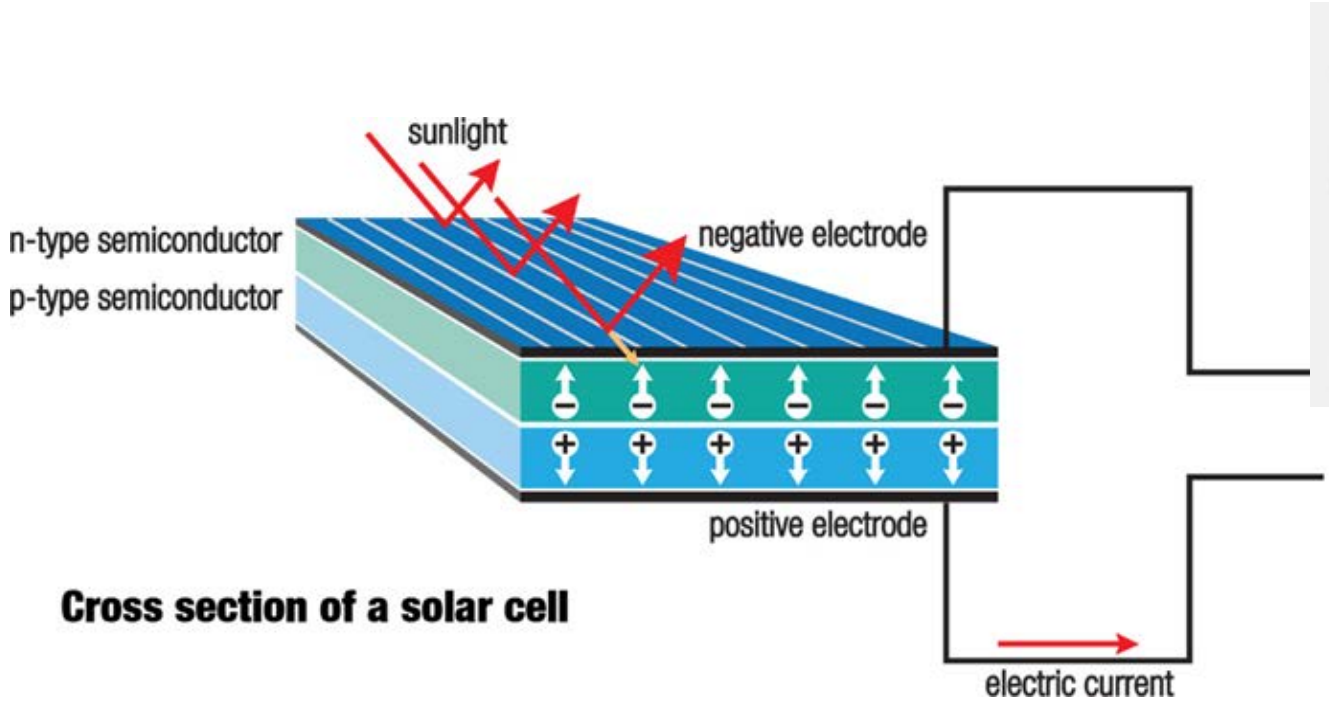
Technical specifications and proposals of PV stations shall be checked by the Project Consultant Fichtner GmbH & Co. KG and its sub-consultant Armenia Renewable Resources and Energy Efficiency Fund (the R2E2 Fund).

To this end, the Customer shall submit to the R2E2 Fund filled-in Questionnaire and documents specified in:

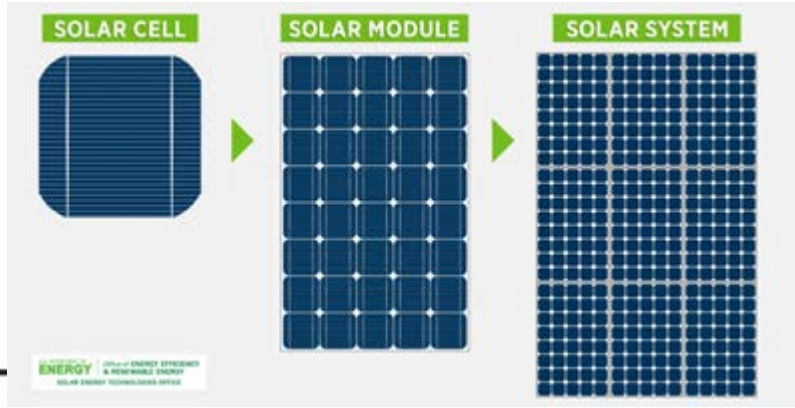
- Annex-1 – Technical Requirements and recommendations for the implementation of ground-mounted and rooftop PV systems for own consumption over 150 kW up to 500 kW
- Annex-2 – the same for systems up to 150 kW

How Solar PV Works: PV Cells

Solar power plants convert energy from the Sun into clean, renewable, reliable, and affordable electricity for your home or business.
The principle underlying this process is the photovoltaic effect i.e., a process of converting light into electricity through e.g., solar cells or photovoltaic (PV) cells.



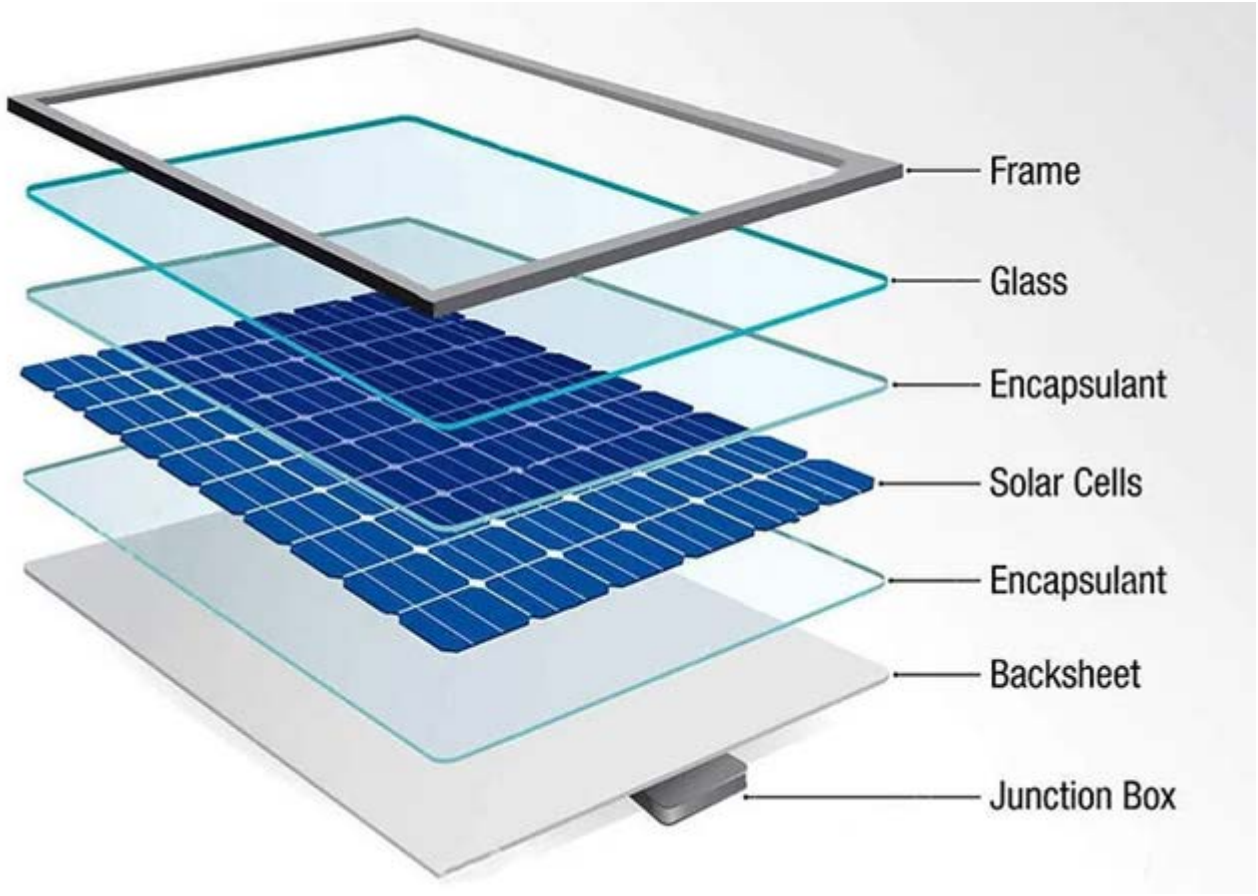
Cross section of a solar cell



Source: www.visualcapitalist.com

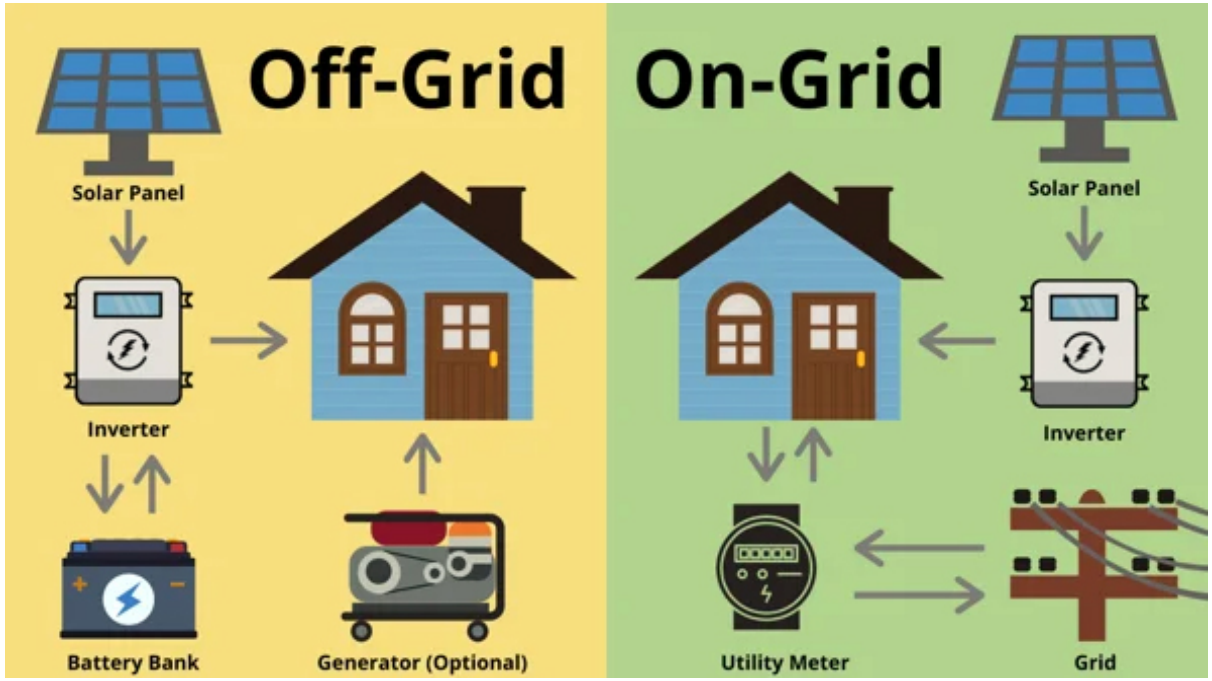
How Solar PV Works: PV Panels

Solar panels contain photovoltaic cells that convert sunlight into electricity. Traditional solar panel modules have a transparent top side that has an arrangement of solar cells that produce the electricity and a bottom side that is mostly made of an opaque polymer back sheet to which a junction box is attached.



Source: www.solarkobo.com

How Solar PV Works: Roof-Top and Ground-Mounted PV Systems



Source: https://www.paradisesolarenergy.com/

Installation challenges and lessons learnt

Insights into Fichtner's site inspection

Installation challenges and lessons learnt

Civil

Failure to design a site drainage can cause **erosion problems** to the following areas:

- foundations
- roads
- embankments

Due to the uncontrolled drainage, washed out concrete pile foundations can be observed at project site.

Installation challenges and lessons learnt

Mechanical

Issue	Impact	Example
Corrosion ▪ PV structure posts should be **hot-dip galvanized** according to Industry Standard DIN EN ISO 1461 (75+ µm zinc coating) ▪ If not galvanized, posts must have an excellent anti corrosive paint ▪ For sheet metal that cannot be hot-dip galvanized, alternative coating systems like Magnelis® or PosMAC are available	▪ Reduced material strength and lifespan ▪ Risk of structure failure and collapse/sagging of PV array	  

Installation challenges and lessons learnt

Electrical

- Too **shallow cable laying** in trenches
- Trench depth not according to technical design (90 to 105 cm); actual cable depth observed at site 30-45 cm
- Cable trenches not cleared from **rock** and **debris**

Impacts

- Risk of cable scratch and **Isolation failure**
- Cable heat dissipation not according to design > affects the current carrying capacity

Installation challenges and lessons learnt

Electrical

Issue

- DC string cable laying without **edge protection**
- Conduit end is open without proper **sealing**
- Fill factor!

Impact

- Cable isolation scratch – **isolation fault**
- Water or pest ingress
- Current carrying capacity

Installation challenges and lessons learnt

Electrical

- Connection not according to industry practice – ohmic losses, **overheating**
- Substandard cable installation work – **risk of short circuit**
- Junction box should be installed with suitable height above ground – **risk of water ingress**

Installation challenges and lessons learnt

Electrical

For indoor installation:

- All exposed busbars require a **shield** or plexi glass cover
- **Warning signage** to be applied on shield

For outdoor installation:

- **Barrier** should be provided to protect cables against accidental touch or being caught by under passing workers.

Contact

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