**Sisian Municipality (Armenia)**
**One-pager on PV/Solar Projects**
**(Identification form for municipal project proposals on local generation of renewable energy[1])**

| 1. Information about municipality | |
|---|---|
| Name of municipality: | Sisian |
| Region / Oblast: | Syunik |
| Country: | Armenia |
| Number of citizens: | 16023 |
| City budget (most recent year): | 2017299.2 EURO 1079013000 AMD[2] |
| Website of municipality: | www.sisian.am |
| Member of CoM since: | 13.03.2018 |
| Date of SEAP/SECAP approval: | In finalization stage |
| Name of contact: | Lilit Harutyunyan |
| Position: | Senior Specialist of Financial, Economic and Social Development Division of the Municipality |
| Email: | Lilit.harutyunyan.79@mail.ru |
| Phone: | +374 91 617421 |

| 2. SEAP/SECAP Sector | Local electricity production from renewable sources: solar photovoltaic (PV) |
|---|---|

| 3. Description of an existing electrical/thermal energy supply system of a building/facility N1 | |
|---|---|
| **Parameter** | **Description** |
| Type of building (e.g. municipal, kindergarten, school, hospital, sport hall, house of culture, residential, tertiary, other, N/A*) | Municipal building |
| Name and address of building/facility, construction date | Cultural Center of Sisian after Hamo Sahyan, 44a Sisakan Street, Sisian, Syunik Region, RA, 1950 |
| Exact GPS coordinates of the site (if available) | 39°31'21.1"N 46°01'29.7"E |
| Electricity supply (national grid, local power producer, other?) | National grid |
| Feed-in tariff to grid (revenues per kWh), AMD/kWh | 22.49 |
| Capacity of transformer/available capacity of grid (in/out) | |
| Electricity metering system (Yes: individual meter, combined / other / No) | 2 individual two-tariff meters |
| Heating system (Yes: centralized, local boiler-house, individual gas-fired boiler, other / No) | Gas boiler |
| Primary energy for heating system: Natural gas, electricity, diesel, coal, wood, dung, etc. | Natural gas |
| Thermal energy metering system for heating (Yes/No) | No |
| Hot water supply (Yes: centralized, local gas-fired boiler, local electrical boiler, other / No) | Gas boiler (hot water is available only when the boiler is in operation under heating mode, i.e. November-April |

[1] The information provided with this form is for information purposes only. No rights can be exerted because of information provided with this form, nor can the municipality be held accountable for any mistakes or incorrect information provided within.
[2] Use the exchange rate of your national bank on the moment of filling in the form.

| | |
|---|---|
| | period. |
| Annual hot water consumption (liter/a or kWh/a) | |
| - *bathing* | |
| - *cleaning (laundry)* | |
| - *cooking* | |
| - *other (specify)* | |
| Days and hours of operation of building/facility (days/a and hours per day) | 300 day/a |
| Any peaks for hot water consumption? (specify period, e.g. a month) | November - April |
| Thermal energy metering system for hot water supply (Yes/No) | No |
| Primary energy for hot water supply system: natural gas, electricity, diesel, coal, wood, dung, etc. | Natural gas |
| Other information | |

** In case of construction of a new grid-tied PV power plant, that supplies electricity to a national grid.*

**4.1 Annual heating energy consumption and costs over the past 3 years**

| Year | Electricity consumption (MWh/a) | Annual electricity costs | | Natural gas consumption ($m^3$/a)[3] | Annual gas costs | |
|---|---|---|---|---|---|---|
| | | EUR | AMD | | EUR | AMD |
| 2018 | | | | 6,032 | 1,597 | 838,448 |
| 2017 | | | | 12,019 | 3,182.2 | 1,670,641 |
| 2016 | | | | 9,683 | 2,803.1 | 1471,609 |

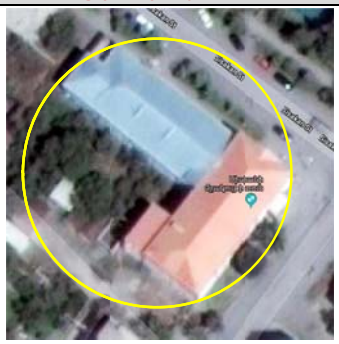
**4.2 Annual electricity consumption and costs over the past 3 years**

| Year | Electricity consumption (MWh/a) | Annual electricity costs | | Natural gas consumption ($m^3$/a) | Annual gas costs | |
|---|---|---|---|---|---|---|
| | | EUR | AMD | | EUR | AMD |
| 2018 | 10.005 | 855.4 | 449,077 | | | |
| 2017 | 9.561 | 821.5 | 431,299 | | | |
| 2016 | 10.641 | 967.9 | 508,166 | | | |

**Total energy consumption in the recent year**

| | | |
|---|---|---|
| **Total annual energy consumption** | **MWh/a** | 55.578 |
| **Total annual costs associated with energy consumption** | **Euro** | 1597 |
| | **AMD** | 838,448 |

**5. Photos showing pre-project situation and orientation of building/object/facility**



[3] For converting consumption of natural gas (and other energies/fuels) into MWh/year, use conversion data provided in SECAP Guide or national data.

| 6. Available supporting documents (If necessary, provide links or attach copies of documents) |
|---|
| Reference to any available supporting documents like energy audits, feasibility studies, preliminary assessments, software simulations, etc.<br>Document / Source N1: _____ |

| 7. Description of renewable energy generation system to be implemented by the project | |
|---|---|
| **Parameter** | **Description** |
| **PHOTOVOLTAIC SYSTEM (PV)** | |
| Annual global horizontal irradiation (kWh/m$^2$) | 1,631 |
| Type of system (grid tied, battery based) | Grid tied |
| Total installed capacity of the system (DC peak power) (kW) | 7.81 |
| Expected annual production (kWh/a) | 10,565 |
| **PV Modules** | |
| Individual capacity of a PV module (wattage) | 355 |
| Type of PV module (mono-crystalline / poly-crystalline) | M-Si |
| Number of PV modules, pcs. | 22 |
| **Inverters** | |
| Type of inverters (grid tied, hybrid, stand-alone) | Grid tied |
| Rated input power of inverters (kW) | 8 |
| Number of inverters, pcs. | 1 |
| **Mounting structure** | |
| Orientation of the system (south, southeast, southwest, etc.) | South-East |
| Tilt angle (degree) | 25$^0$ |
| Material of bearing structure (aluminum, metal, galvanized) | Aluminum |
| System installation type (ground mounted, roof mounted, BIPV) | Roof mounted |
| System tracking option (none - fixed, single axis, dual axis) | Fixed |

Location of PV modules on the roof of the building

| 8. Energy efficiency measures and modernizations to be implemented within the project | | | | | | |
|---|---|---|---|---|---|---|
| **PV system components** | **Unit** | **Number of units** | **Indicative costs per unit (with VAT)[4]** | | **Subtotal costs** | |
| | | | **EUR** | **AMD** | **EUR** | **AMD** |
| PV module | Pieces | 22 | 160 | 84,000 | 3,524 | 1,850,000 |
| Inverters | kW and pieces | 8 kW, 1 | 990.5 | 520,000 | 990 | 520,000 |
| Mounting structure | Sets | 2 | 647.6 | 340,000 | 1,295 | 680,000 |
| Cabling | Meter | 300 | 1.1 | 600 | 343 | 180,000 |
| Transmission line | - | - | | | | |
| Battery | Pieces | 0 | | | | |
| Transformer | Pieces | 0 | | | | |
| Substation | - | 0 | | | | |
| Auxiliary equipment | - | | | | | |
| **TOTAL** | | | | | **6,152** | **3,230,000** |

| 9. Other costs | | |
|---|---|---|
| **Description** | **Indicative costs for PV** | |
| | **EUR** | **AMD** |
| Human resources | 200 | 105,000 |
| Structural survey (in case of roof mounted) | 295 | 155,000 |
| Geological survey (in case of ground mounted) | | |
| Technical design | 600 | 315,000 |
| State expertise | 99 | 52,000 |
| Site supervision (technical and author supervision) | 210 | 110,000 |
| Installation works (labor) | 295 | 155,000 |
| Land and license acquisition | | |
| Other (please specify) | 400 | 210,000 |
| **TOTAL** | **2099** | **1,102,000** |
| Annual operation and maintenance costs | 100 | 50,000 |

| 10. Grand total costs | PV system |
|---|---|
| Euro | **8,251** |
| AMD | **4,332,000** |

| 11. Expected results | PV system | |
|---|---|---|
| Annual renewable energy generation, MWh[5] | **10.565** | |
| Annual monetary savings, EUR/AMD | **905** | **475,214** |
| Annual $CO_2$ emission reduction[6], $tCO_2$ | **2.345** | |

[4] These are indicative costs based on the data from real implemented projects under the Covenant of Mayors – Demonstration Projects (CoM-DeP programme). However, municipalities are advised to contact suppliers/service providers to obtain more accurate information for their specific case.

[5] It is important that you fill in reasonable estimates of RE generation with consideration of energy consumption for own needs of the systems. Too optimistic forecasts for RE generation will raise questions about your trustworthiness as partner.

[6] For calculation of $CO_2$ emission reduction, please refer to national GHG emission factors (SECAP Guide).

| 12. Timetable of the project | |
|---|---|
| **Description of step** | **Indicative time needed (months)** |
| Recruitment/Mobilization of IPU | 0.5 |
| Structural survey of building<br>(drafting ToR, procurement of services, implementation, report) | 1 |
| Energy audit (drafting ToR, procurement of services, implementation, report) | 1 |
| Technical design (drafting ToR, procurement, implementation, report) | 1 |
| State expertise | 0.3 |
| Procurement | 1 |
| Works/site supervision (technical and author) | 1 |
| Final acceptance (including correction of defects) | 0.2 |
| Calculation of real savings (post intervention measurement & verification audit) | 6 |
| Total | **12** |

| 13. Other information |
|---|
| Within the framework of this proposal it is suggested to install a grid-ties PV system with an installed (peak) capacity of 7.81 kW on the roof of the cultural center of Sisian. The system consists of 22 PV modules with individual peak capacity of 355 W and will generate annually 10.5 MWh of electricity. The total cost of the project is about 10.600 Euro. |