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Zelena Energetska Zadruga

Business models, administrative requirements and financing sources for the development of integrated solar systems.

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Contents

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List of abbreviations

BM	Business model
BORZEN	Slovenian operator of the energy market
Electricity provider	Cro. Opskrbljivač električnom energijom (HEP, EON, GENI), Slo. Dobavitelj električne energije
ELES	Slovenian distribution system operator (Grid operator)
EPC	Engineering, procurement and construction company
ESCO	Energy Service Company
HEP ODS	Croatian distribution system operator (Grid operator)
HERA	Croatian Energy Regulatory Agency
HOPS	Croatian transmission system operator
HROTE	Croatian operator of energy market (cro. Hrvatski operator tržišta energije)
kW	Kilowatt (unit of power of solar generator or inverter)
PPA	Power Purchase Agreements
RES	Renewable energy source

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Main energy actors and their role in the energy market

BORZEN (SLO)

Slovenian distribution system operator (Grid operator) of energy market who has next roles:

Market Operator
As a Market Operator, BORZEN provides and enables the coordinated operation of the Slovenian electricity system providing energy services. BORZEN performs the tasks of managing the balance scheme, recording bilateral agreements, drawing up an indicative timetable, and balance settlement and financial settlement of transactions related to the aforementioned tasks.

Support Center
The Support Center operationally implements support schemes for the production of electricity from renewable sources and highly efficient cogeneration of heat and electricity. In this way, BORZEN supports environmental policy and raises public awareness.

Promotor of development of the energy market
Borzen is a promoter of the development of the Slovenian electricity market, its efficiency and market mechanisms following EU guidelines. By systematically regulating the Slovenian electricity industry and harmonizing Slovenian legislation with European legislation, BORZEN is significantly influencing the processes of integration of the Slovenian market in the EU single market.

ELES (SLO)

The basic activity of ELES is the safe and reliable operation of the electricity system of the Republic of Slovenia.

HEP ODS (CRO)

HEP ODS provides an electricity distribution service that includes access to and use of the network. HEP ODS is responsible for the quality of electricity supplied to all end customers and is the guarantor of a secure electricity supply. HEP ODS is responsible for the management, maintenance, construction and development of the distribution network and ensuring the long-term ability of the network to meet future network access requirements.

HOPS (CRO)

Croatian Transmission System Operator d.o.o. (HOPS), following the Electricity Market Act, is responsible for:

- management of the electricity system and transmission system of the Republic of Croatia with interconnected transmission systems, i.e. with the distribution system in the Republic of Croatia,
- development of the transmission network which ensures the long-term ability of the transmission network to meet reasonable requirements for the transmission of electricity with predefined operational safety,
- maintenance and construction of the transmission network and for partial provision of reactive electricity,
- execution of the connection of transmission network users and creation of technical conditions for connection of users according to the conditions prescribed by the laws governing the field of energy and regulation of energy activities and other regulations governing that area,
- reliability and availability of electricity supply systems and proper coordination of generation, transmission and distribution systems,
- balancing the system, according to market principles and the principles of transparency and impartiality,
- procurement of ancillary services in the transmission system according to the principles of transparency and impartiality and under regulated conditions until the establishment of the conditions of a functional electricity market.

HROTE (CRO)

HROTE performs the activity of organizing the electricity market and the gas market as a public service, under the supervision of the Croatian Energy Regulatory Agency (HERA). Also, the company's core activities are encouraging the production of electricity from renewable energy sources and cogeneration.

SODO (SLO)

The company SODO d.o.o performs the economic public service of the electricity distribution operator on the territory of the Republic of Slovenia. SODO does the planning of network development, construction, management and operation and maintenance, they ensure long-term network capacity that allows reasonable requirements for connection and access to the network, taking into account standards in the field of voltage quality and power supply. They perform the activities of the distribution system operator.

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1. Summary

The EU is still largely dependent on fossil fuels and it is on a path to change its energy mix to the locally available energy sources. With the decline of costs of technology, solar power plants are increasingly becoming the cheapest solution for electricity production in many regions globally. Solar installations are particularly interesting in Slovenia and Croatia as both countries have average to high solar irradiation levels on their territory.

Solar power plants are making fast progress in the renewable market of both countries as they are more and more commercially viable and have an upturn in national laws and regulations. Solar Adria project is involved in topics of capacity building of local decision-makers (private and public), and the development of tools for guiding investments in integrated solar systems of various stakeholders. This report is a stand-alone document developed to support the SOLAR ADRIA project and its stakeholders. Within this report, the authors aim to provide various actors with supporting knowledge of processes related to the installation of solar integrated systems and to stir the decision making in the process of the installation of solar integrated systems on the building/buildings they own or manage.

The report is written as a guide for readers to make a better-informed decisions when developing projects of integrated solar systems, in the process of choosing the right developers, as a basic informative pack for tracking the progress of project development.

The report aims to:

- Provide the descriptions of available business models readily available for integrated solar systems (for public and private stakeholders); with comparison between different models
- Provide a step-to-step guide for project development (including administrative steps)
- List currently applicable laws and regulations
- List available funding sources for different business models

Who are the end-users of our service?

- Private (citizens, companies)
- Public (municipalities)

Within this report you can find:

a) List of funding options
b) List of project development phases and administrative steps
c) List of relevant regulation on solar energy (technical only)
d) Tips and tricks in procedures

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What to expect when reading this report?

Chapter 1 – instructions on how to read this report, who are the readers of this report, and what should reader expect when reading this report

Chapter 2 – introduces the reader to main national goals that guide current and future legal framework and renewable market development

Chapter 3 – is for those who are beginners in solar, and for more experienced actors to adopt the logic when talking to the solar project developers, installers or other actors in the energy market

Chapter 4 – offers an overview of business models and what are the possibilities when installing solar systems

Chapter 5 – helps the reader to decide the right business model

Chapter 6 – will give an overview of the legal documents needed for the process of project development, for most readers the process, documentation and administrative steps are overwhelming and there is a need for proficiency in electrical and building laws

Chapter 7 – gives an overview of the relevant legal framework of both countries to have one place to look for additional information about solar energy

2. Introduction: The potential and plans for integrated solar energy in Croatia and Slovenia

Countries Slovenia and Croatia are a part of the EU and they have agreed on the same energy and climate goals. More specifically, both countries have adopted national laws according to the key legislation governing renewable energy; The Renewable Energy Directive, Directive (EU) 2018/2001 (RED II), on promoting the use of energy from renewable sources, which introduced the binding EU target of at least 32% renewable energy in total energy consumption by 2030. By looking toward the year 2050, Europe has set even more ambitious targets by achieving climate neutrality by 2050 and lowering greenhouse emissions by 55% by 2030. This package includes increasing renewable energy in total energy consumption from 32% to an ambitious goal of 40% (European Council, 2022). The ambitious policy is directed toward a competitive and safe European energy system that should provide a fair price of energy for all consumers, increase energy safety, reduce energy imports and create long-term employment.

The most significant strategic documents for RES development projects in both countries are National energy and climate plans that serve as a collective effort in reducing the climate change impacts in the energy sector.

Slovenian and Croatian National energy and Climate plan (NEPN) with 2030 targets are presented in the figure below:

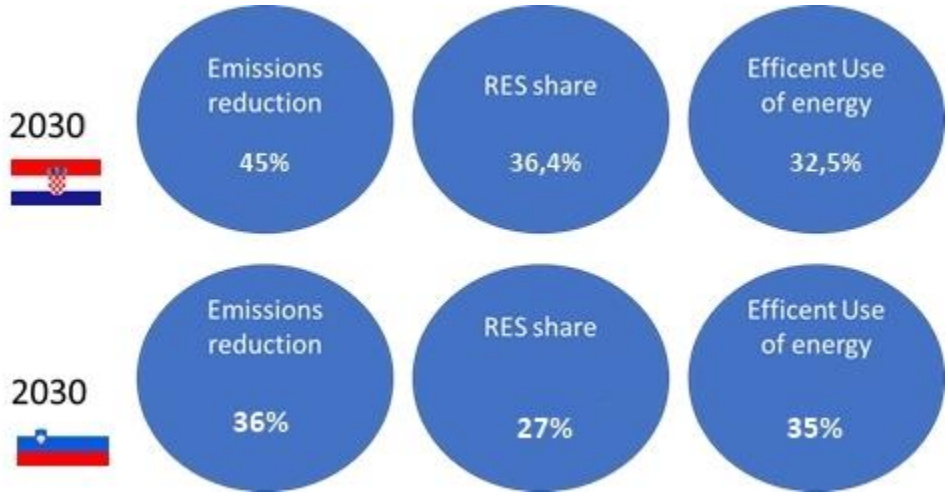

Figure 1 Targets of both countries on emission reduction, RES share and Energy efficiency (European Council , 2022)

Specifics of Croatia:

Although Croatia has a large share of renewable energy in its mix, solar energy takes only 0,4% of total energy production (while the EU average is 5%) (Vijeće predsjednika Republike Hrvatske za energetsku tranziciju, 2021). In an accelerated and moderate energy transition scenario it is estimated that about 350 MW of integrated solar powerplants needs to be installed by 2030 (Ministarstvo gospodarstva i održivog razvoja, 2020). The Solar Adria project is also one of the steps towards trends on integrated solar energy applications.

Specifics of Slovenia:

Slovenia has currently prepared a Comprehensive national energy and climate plan of the republic of Slovenia share goals for 2030 (with view on 2040). The goals in the plan are:

- production from renewable sources of energy 27%
- energy efficiency share 35%
- R&D in energy sector 3% BDP
- lowering the GHG emissions 36%

The fundamental purpose of energy policy is to ensure sustainable energy management, and this framework will therefore focus on three aspects of sustainability - climate acceptability, security of supply and competitiveness. All three aspects will have to be respected for a decision to be considered sustainable and therefore acceptable. The national strategy defines only general RES share with no specific goals for PV.

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3. Preliminary decision making – installing solar PV

3.1 Am I the right person to read this report?

By reading this report readers will get the idea, insights and knowledge to obtain the relevance while talking to the developers who will design and manage the project, install the solar PV on the roof, and with whom will the user enclose the contract.

There are two paths in PV project development:

a) developing the project by yourself
b) entrusting the project development to the experts

If you choose **a) developing the project by yourself, you:**

- take all the risks of managing the project
- choose the designer of solar PV, choose the installer, choose insurance, choose how you will maintain the power plant, and make the other choices
- will need solar proficiency, or knowledge on solar PV and experience sharing to oversee all project aspects and pitfalls: legal, technical, and business model/funding
- will pay less if you manage the whole process well; or pay a lot more if you managed it poorly (the life cycle of a solar project is 25 years +)
- could pay more if additional legal assistance is needed

If you choose **b) entrusting the project development to the experts, you** (*recommended by authors*):

- will pay a bit more for project development
- decide only on one company that has long term experience and it is trusted by other users (before that make research who are the best companies/consultants and what they offer)
- will have an assurance that the professional is leading the project
- don't need to collect a lot of fragmented knowledge in literature, laws, and other sources to manage the project, find relevant partners and actors, contracts, models, funding options, etc.

Later in this report, readers will be able to get an idea about the possibilities in the business models in the solar market, rough steps of project development of solar PV, and funding options. A report is compiled for both paths of project development (with help or without). Even if the reader chooses an expert help for project development it is important to choose the right one and have the basic knowledge to oversee the project development.

3.2 Is my building ready for integrated solar PV?

Every building is specific, they are built at different time, by different builders, with different techniques, and from various materials. Not all buildings are suitable for solar and sometimes changes need to be made for solar to be a constructive and electrical part of the building. No matter the user type; being a public body or private actor (household, company, family farm) building owner/manager can do a preliminary check of the preconditions to consider the installation of solar PV. Answering basic questions and having the right information can save the reader a lot of time talking to the solar PV project developers. They will be thankful if you managed to collect initial information to realize your solar project.

Considering that an integrated solar system will be attached to the roof it is a good idea to start checking the preliminary conditions of building the rooftop before starting the project and talking to the developers.

The tables bellow are made to ease the way of solar development and they are comprised of:

- questions
- information pack (offering information needed to make the decision)
- decision/answer
- expert help (explained if you need some)
- additional information (sometimes containing additional information or tips on certain steps)

In the figures bellow you can find the tables set in the form of decision tree. If all answers/decisions are in a green you can proceed to the next chapter. You will notice that you have questions and answers/decisions accompanied by an Information pack/explanation in the table.

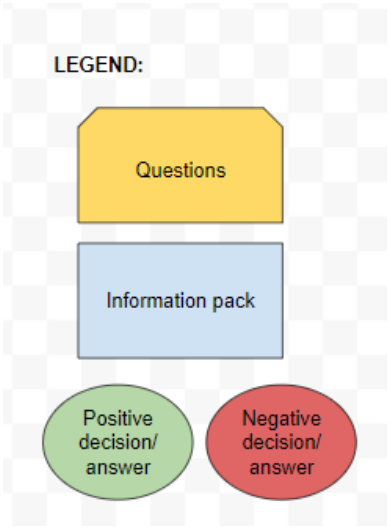

Figure 2. The legend (explanation of shapes in the scheme)

Table 1. Q1 – question 1

Ask yourself the following question:	Is my roof made of suitable materials?
Information pack	**Suitable materials** If the roof is made of suitable materials, it should support the installation of solar PV. Solar PV can even extend the life of the roof. Suitable materials are tiles, sheet metal/tin, concrete roofs, and sometimes green roofs. **Unsuitable materials** Unsuitable materials will break down if the power plant is installed on top of them (concrete and asbestos plates, thin stones), or in shorter period there is a need needs for replacement (shingles, older roofs, roofs with rotten or infested wooden construction).
Decision/Answer	My roof is made of suitable materials (positive) / My roof is made of unsuitable materials (negative)
Expert needed	If you aren't certain of rooftop materials you can take a picture of it and send it to experts, this information can be also found in the document "building project" that describes materials used, if available.
Next actions	If your roof is made of unsuitable materials and you plan to change the roof, change it to suitable materials to install the solar PV.
Additional information	Replacing the roof that already has solar PV on it will cause additional costs and the process needs to be carried out by experts to avoid damaging the solar PV installation.

Table 2. Q2 – question 2

Ask yourself the following question:	Does my roof have access to the sun during the day or is it mostly in the shadow?
Information pack	**Large objects:** Are there any large obstacles covering the roof area during the day (for example large buildings and large tree tops that are on the southern side of the roof can significantly lower the efficiency of the power plant if they cover the whole area)? **Small objects:** Small objects usually don't affect power production or they affect it in a small amount (examples can be objects on the roof or in front of the roof such as a chimney, street pools, antennas etc.).
Decision/Answer	There are no obstacles to the roof or there are only small ones (positive) / The roof is in the shadow all day long (negative)
Expert needed	If you are uncertain, you can take pictures from south to north of your roof/object with possible obstacles and ask solar project designers to assess whether there are any objects which could influence the efficiency of the power plant.
Next actions	-
Additional information	If you have a ground plan of a roof with small obstacles, it will help the designers with the sizing of solar PV; keep this document nearby if you have it.

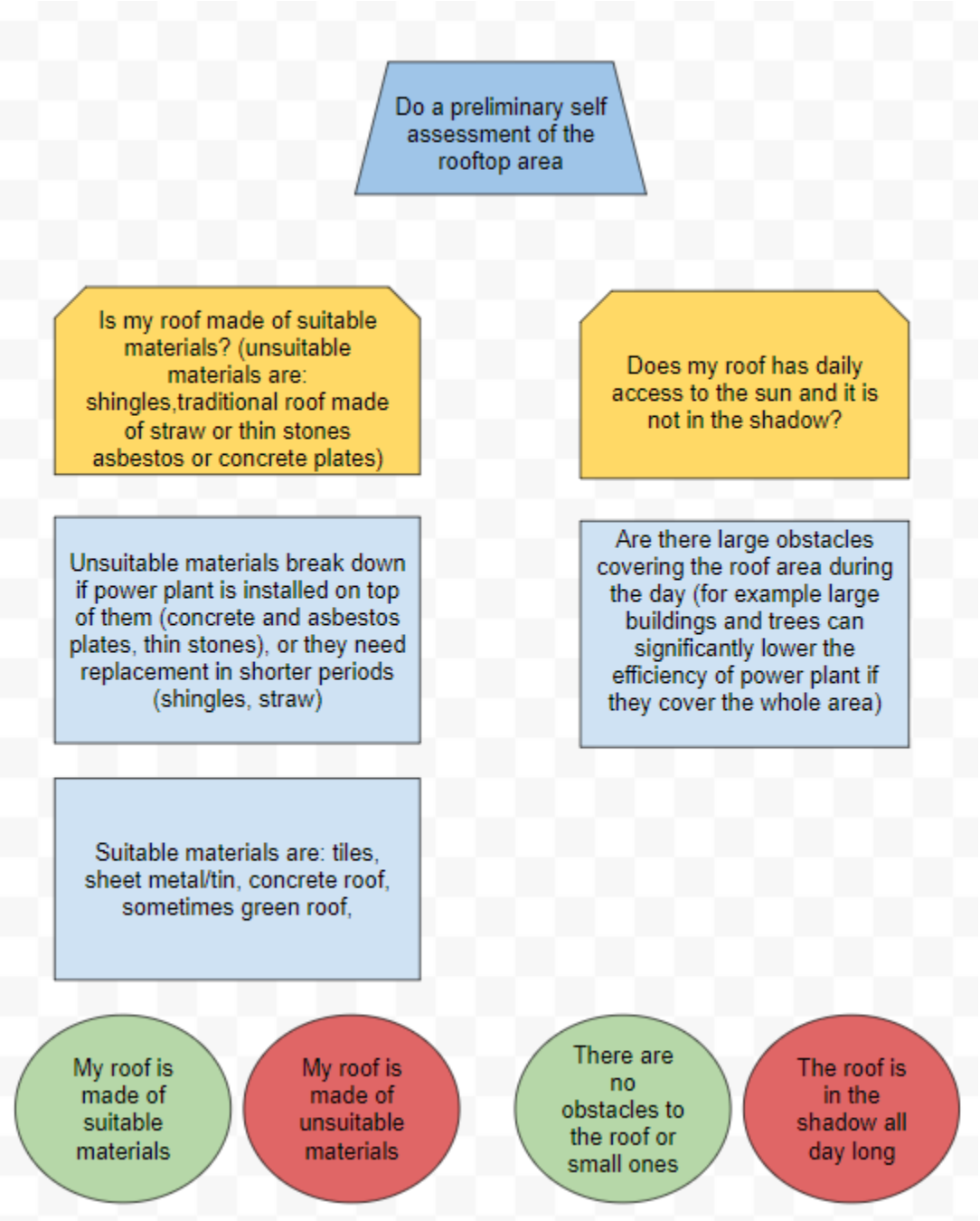

Figure 3. Preliminary self-assessment of the rooftop area (Q1 & Q2)

Table 3. Q3 – question 3

Ask yourself the following question:	Is the part of the roof that I plan to install PV on - turned to the **North**?
Information pack	If the available roof is turned to the **North (N)** you should avoid installing the solar PV, the yields are considerably lower than having it installed to other positions. Solar PV turned to the **South (S)** is the ideal position for installation since it is on the sunny side all day long. **East (E)** and **West (W)** are less ideal, but they can still harness solar energy.
Decision/Answer	My roof is turned to S, W or E (positive) / My roof is turned to N only (negative)
Expert needed	You can prepare the exact geolocation of your object or address to the project designer
Next actions	-
Additional information	We are in the Northern hemisphere and can harness most of the solar energy if we turn the solar panels to the South (to the sun), the sun is inclined looking from our position. You will notice that some parts of environment is always in the shadow; for example, moss in the nature is turned to the North to have less impact from the sun; while large plants/trees will lean and have more branches and leaves turned to the South to harness solar energy; same is with solar powerplants; to get the most of the sun it should be turned to the South. The orientation of the flat roof isn't important since you can direct the panels to the desired direction.

Table 4. Q4 – question 4

Ask yourself the following question:	Does my roof need a replacement, or is it older than 30 years?
Information pack	Most of the roofs need replacement after a period of 30 years or if they are in bad shape. These roofs are not suitable for solar PV installation.
Decision/Answer	My roof is in a good condition (positive) / I need a replacement (negative)
Expert needed	You can consult the expert with photos and the descriptions of a roof if your roof is suitable for installation.
Next actions	Check legal documentation
Additional information	If you have an older roof, take a picture of it (from outside, and inside – if inside construction shows damage from insects or water the roof should be replaced before installing solar). Some roofs can be eligible for installation of solar PV even if they are older than 30 years and are built from quality materials, and with the right techniques that prevented the degradation and ensured the durability.

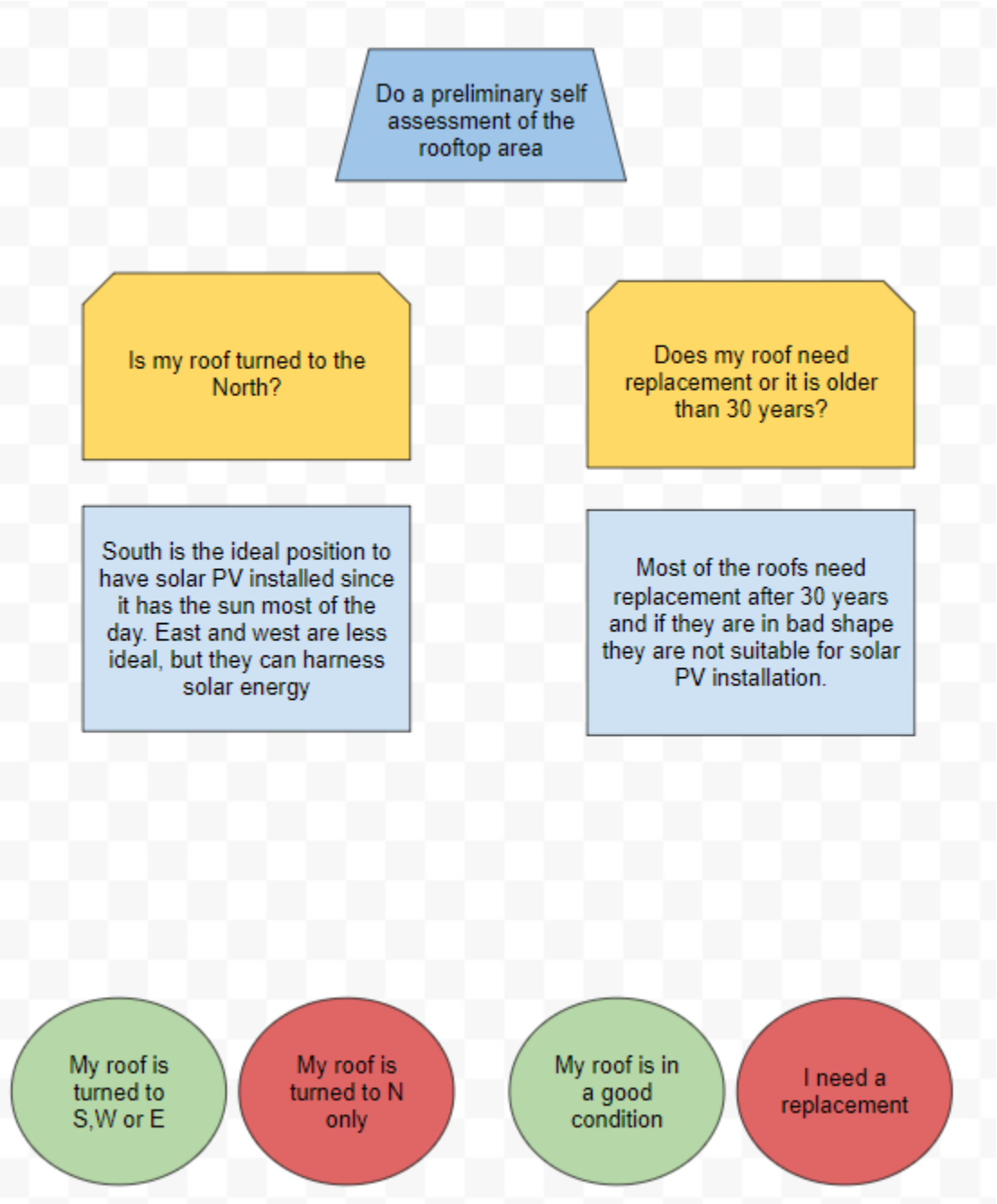

Figure 4. Preliminary self-assessment of the rooftop area (Q3 & Q4)

3.3 Do I have the legal preconditions to start a solar project?

There is documentation that will speed up the process of project development. The documentation can be roughly separated into the legal documentation of the building and the technical documentation about energy usage and electrical information. It is highly recommended that the building has basic documents on legality and that the building is at least one year fully operational and used to have predictable consumption on which the technical, legal, and economic analysis is made.

Table 5. Q1 – question 1

Ask yourself the following question:	Do I have legal documents to proceed?
Information pack	**Legal documentation of the building:** - the project of the object (building permit, electrical project, architect project…) - use permit - other legal entries and documents (land registry) **Technical documentation:** - monthly bills for at least the last 12 months or even more (to size the solar PV & for the developer to see what model you are in) - do you plan to have additional large appliances in the building (state power and how do you plan to use those appliances)? - (future consumption can be very important for solar PV, a good example is planning to install a heat pump or having an electric vehicle) - a contract that states how much power does your connection have (it will show the size of solar PV or the need to buy additional power for the connection of solar powerplant) **For multiapartment building:** - you should obtain the consent of the tenants, minimum of 50% is required
Decision/Answer	My building is legal and it has some documentation (positive answer)/ My building is in process of legalization (negative answer, but you can check with the developer for the rest of the documentation in the meantime)
Expert needed	An expert should check the documentation before developing the main electrical project
Next actions	-
Additional information	All documentation should be aligned, the owner on all documents should be the same and it is usually the prerequisite when obtaining the

	subsidies. Sometimes that isn't an excluding factor and it can depend on the model, funding option and county.

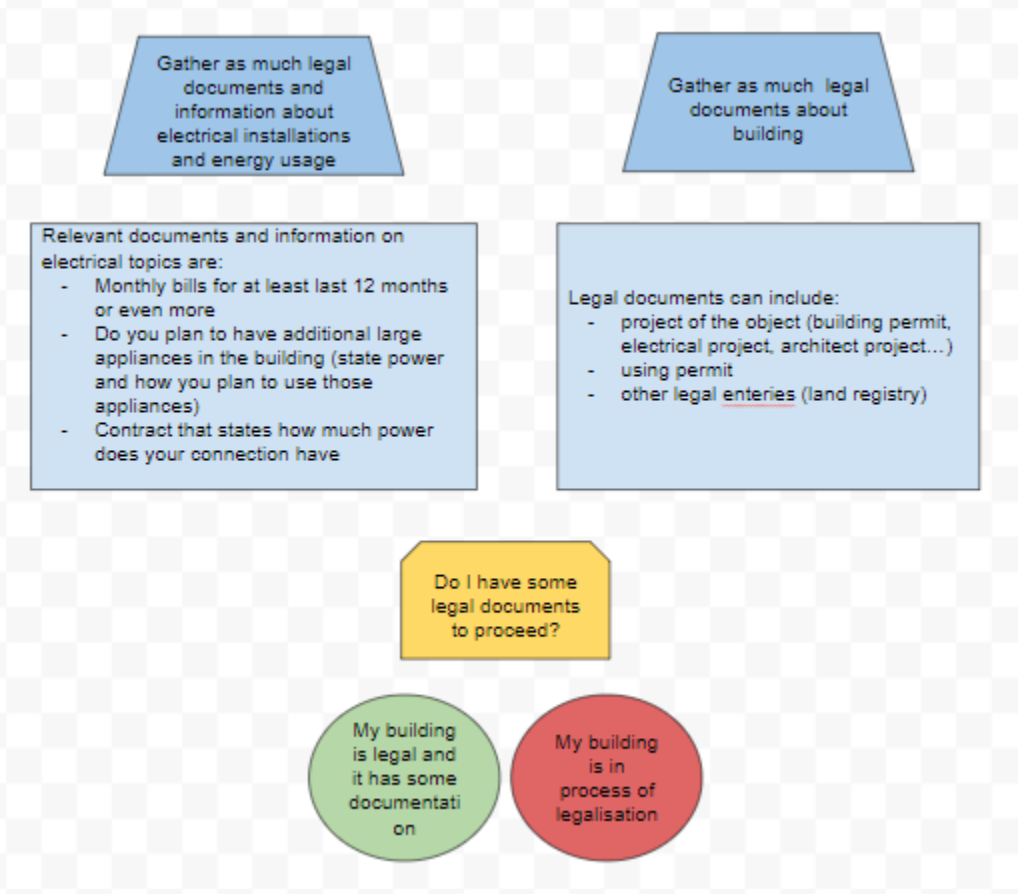

Figure 5. Legal documents needed to proceed (Q1)

Table 6. Q2 – question 2

Ask yourself the following question:	Are there any specific restrictions? - on the level of the municipality (for example municipal spatial plan or a cultural heritage zone) - does your building have any other restrictions that might prevent building the solar PV on top of it
Information pack	**Consult spatial plans and other existing municipal documentation** Consult spatial plans and existing documentation to see if you have a building that is a cultural heritage. Sometimes conservator office grants the installation of solar PV. **Check other documentation related to the roof that you have** Check if your roof has restrictions. An example can be energy efficiency renewal where contract building cannot be altered for a specific period of time. You can check with the contractor if changes are possible.
Decision/Answer	My building is not a cultural heritage (positive)/My building is a cultural heritage (negative) There are no additional restrictions (positive)/There are restrictions (negative, check with body who issues the restriction)
Expert needed	Cultural official or the contact point with the body that might issue a restriction
Next actions	-
Additional information	The best example of restrictions for building on top of the roof can be contracts if the building is altered by funds or work of an external actor and/or received the grant to do so. For example, in Croatia you should ask permission if you have renewed the building using a subsidy from the green fund. Another example can be that the roof is protected by the contract or it is a work of art and therefore cannot be altered. But the permission can be asked for and the supervising bodies will verify if you may proceed with project development.

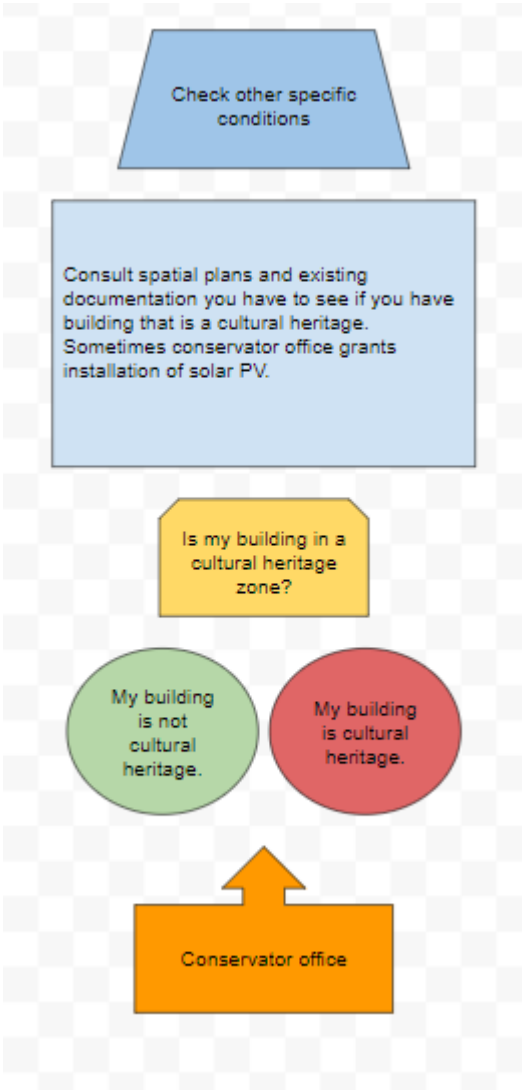

Figure 6. Specific restrictions: building in a cultural heritage zone (Q2)

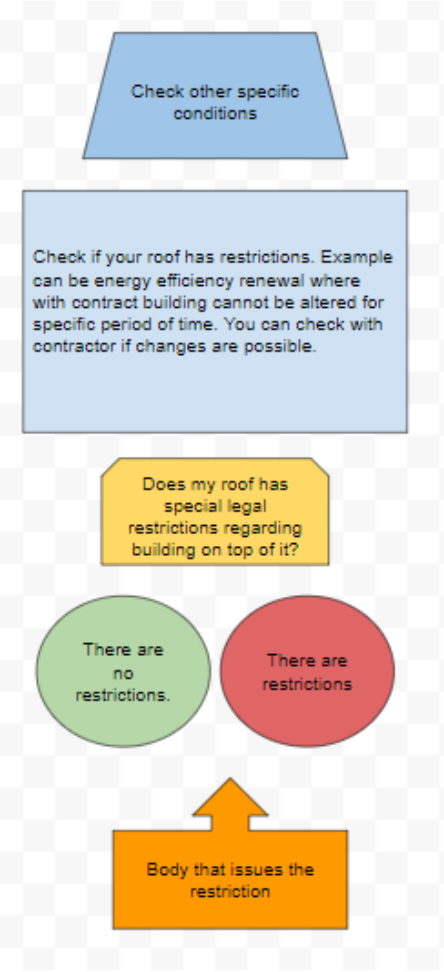

Figure 7. Specific restrictions: building has any other restrictions that might prevent the building the solar PV on top of it? (Q2)

3.4 Basics on choosing the project developer and the installer of solar system

If you are new to solar, choosing the right partner is one of the most important steps you can make in the project development. There are several aspects to look out for when choosing the partner for project implementation:

- how long is the partner on the market (are they a stable company that could live up to their warranty)

- what is the quality of the equipment (the durability, the certificates and tests they have made, and how well are the components put together)

- what is the warranty for each part of the solar powerplant (for panels aim for 12 years or more of warranty for the physical durability)

- ask around how are the users satisfied with their services

- what post installation services they offer (monitoring, maintenance, insurance etc.)

4. Applicable Business models in Croatia and Slovenia

This report will give an overview of three applicable business models for integrated solar systems in Croatia in Slovenia. Business models in each country are self-consumption, power purchase agreements, and premium model/feed-in tariff. This chapter describes each model, it shows what users are eligible for each model, what is the typical project size, and what are the pros and cons of each model. It also talks about funding options and how to use cheaper solar energy without having to invest in the solar PV (in some cases that is possible). The chapter will guide the readers on business models and what to look into when going through the project development stages.

In the previous chapter there was a preliminary phase of project development where the reader has collected the most relevant documentation for project development. Before considering the business models you should get an informative offer for solar powerplant if all preconditions from the previous chapter were met. The designers of the electrical project should give you the information on the size of powerplant (based on collected consumption bills and tariff model or size of the roof). When you will get an information on the size of the powerplant, designers can give you an estimate of the costs of installation, maintenance or other services they offer. You should know that quality systems cost between 1.000 – 2.000 EUR per kW of power. Smaller systems will be closer to 2.000 EUR/kW of investment and large systems will lean towards 1.000 EUR/kW (you should note that this is written in the period between 2018 – 2022 and the prices are now subjected to the change). If you don't have enough money for the solar PV that designers propose there are two options. First one is to ask the project developer to lower the size of the solar powerplant to your budgetary possibilities. Other possibility is to involve third party/parties to fund the project and become co-investor or full investor.

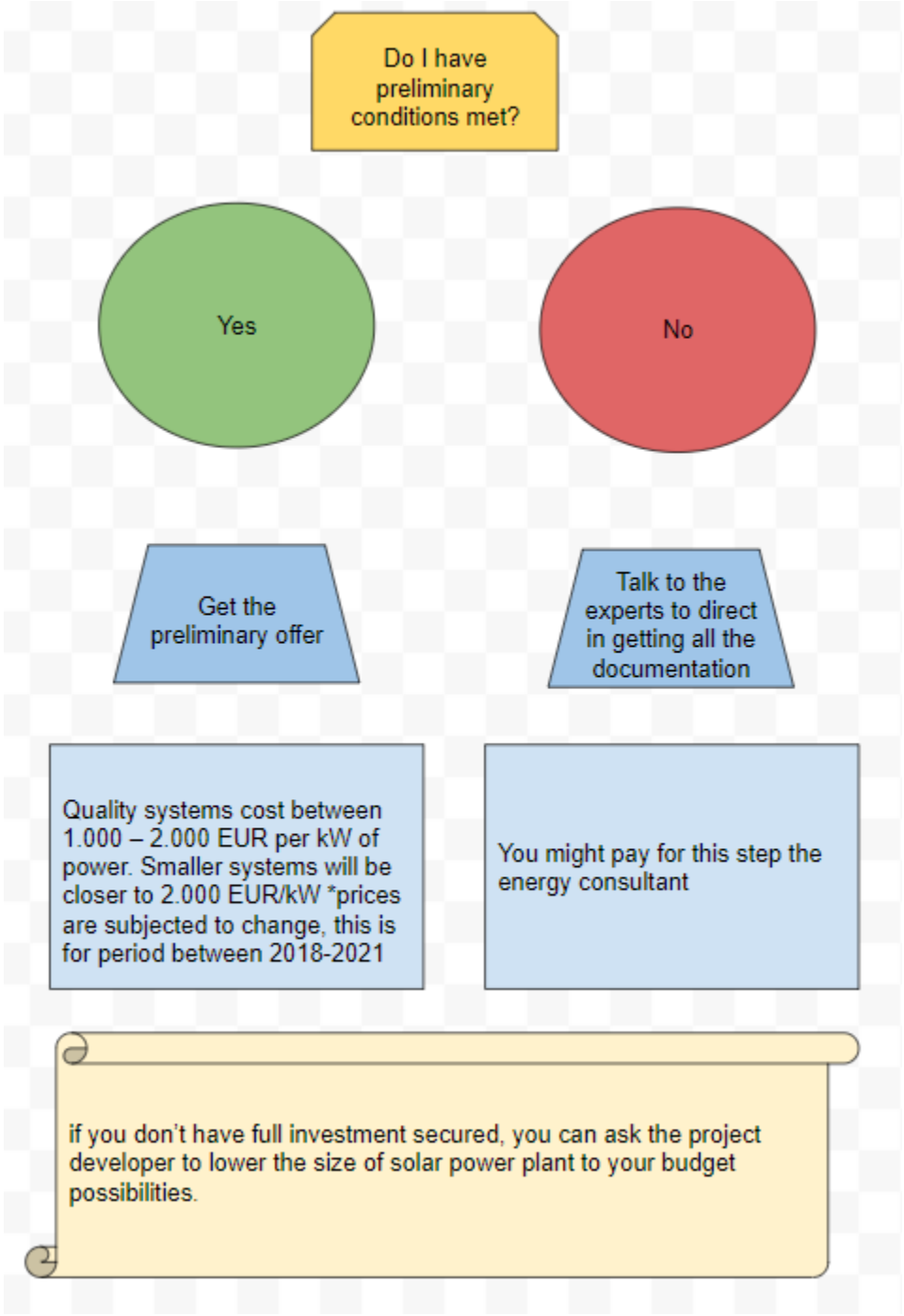

Figure 8. Next steps after the preliminary eligibility check

If you are the investor:

If you are the investor, you should obtain the full amount via your own funding or loan. If you are applying for subsidies, you should note that subsidies are in most cases reimbursed when you actually complete the installation of the power plant. If you are the investor two models are possible:

- self-consumption
- premium model/feed-in tariff

If the investor is a third party:

If you have a large roof area and/or large consumption you could look for companies that offer PPAs (power purchase agreements). Read through the whole chapter 4 for detailed information about your country.

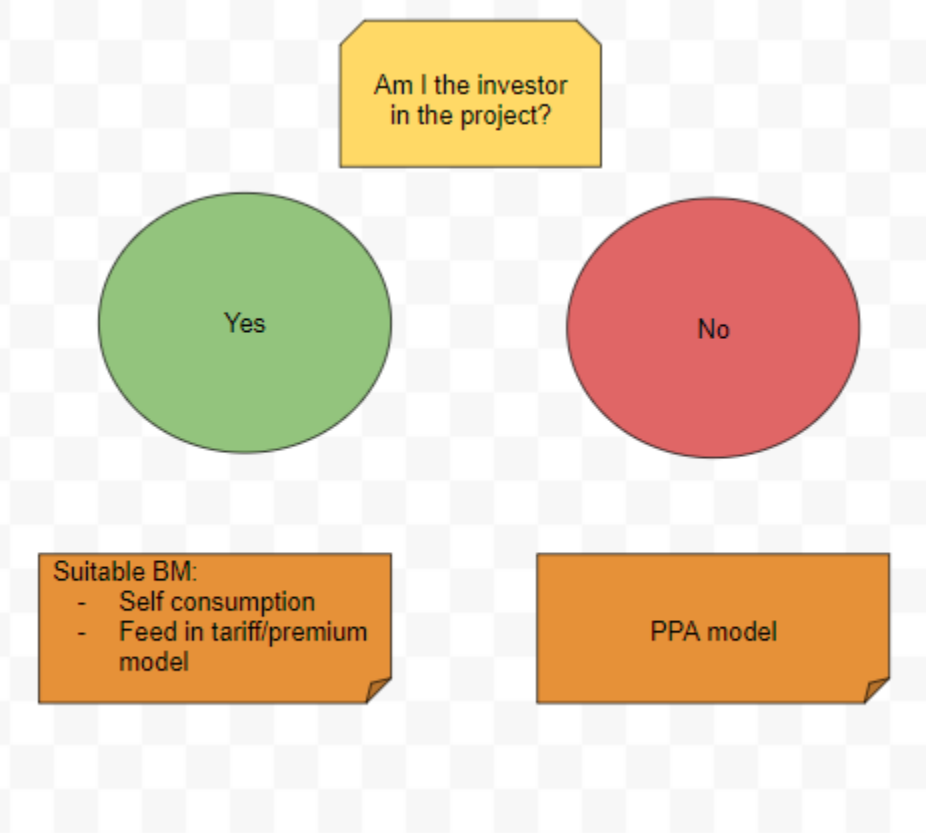

Figure 9. Deciding on investment options/first decision on

4.1 Self-consumption (subsidized)

General description of the business model

Self-consumption is profitable for consumers if the costs of locally produced renewable electricity is lower than retail electricity prices bought from the grid (energy + grid fee), and with rising energy prices and grid fees, this will become an even more viable model for all who have the capital to invest in integrated solar systems. Self-consumption model relies on solar PV being connected behind the meter. Produced solar energy is first consumed on the spot for self-consumption in the building, after that the excess energy is fed into the grid. The energy excess sent to the grid is defined as "difference". How this energy is treated will be defined in the contract between the supplier and prosumer (active consumer who buys energy from the grid, and at the same time produces energy).

To explain net-metering, users need to understand that energy is in real-time sent and taken from the grid if they have solar PV, and the grid acts as a "battery" in both countries. Most of the energy is produced in the time of the day when the sun radiation is abundant. On the other hand, consumption can happen at the same time (when energy is produced) or in other part of the day (that is the night period when the solar PV doesn't produce energy). Net-metering is most easily defined as an "agreement" between prosumer (consumers with power plants i.e. solar PV) and suppliers to have energy sent to the grid and then deducted from bills in form of energy.

Installation of integrated solar power plants for self-consumption with subsidies is a widespread model. In this model PV system is normally financed by either investment of user capital in combination with public financial support (subsidy) or by the full investment by the user without subsidies. Public financial support is designed to accelerate the use of solar technology and reduce the costs and emissions of existing buildings and households. Buildings use the power that is produced on their roofs to directly reduce their power bills (spending most of the energy that is produced on roofs for its own needs) while the excess energy is sent to the grid. The self-consumption model aims to have a maximum coverage of users' energy needs with minimum excess generation and impact on the grid. With rising electricity prices for all actors (public and private), this is an attractive model especially if it can be partly financed by subsidy (for more information check the funding list).

Note that, if you have a very small consumption the investment won't be as efficient as for larger consumer (you can expect longer periods of return). Longer periods of return can be expected if your annual consumption is lower than 3.000-4.000 kWh (or having designed solar system smaller than 3 kW). In case of Croatia with monthly accounting period it is good to have most of the consumption in summer months, and regarding the case of Slovenian framework is in better position with yearly accounting period. For very small solar powerplants investment returns can be from 12 and more years.

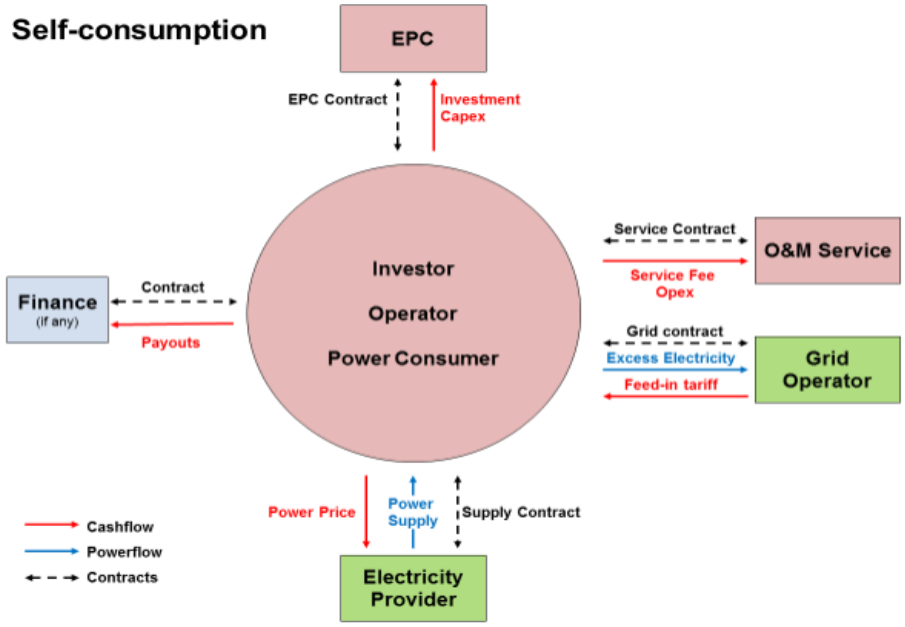

Figure 10. Self-consumption model and relevant actors (Dunlop & Roesch, 2016)

Short description of the schematic in Figure 10:

Simple self-consumption scheme

Building and operating solar power plant requires many sides to collaborate. The simplest model consists of the user of solar power plant/building owner (you) that is in the centre of the scheme (the one who is Investor/Operator/Power Consumer), then Grid Operator (who gives out consents to access the grid, takes the excess energy and is sometimes in charge of distributing feed-in tariffs or premiums) and Electricity provider who regulates its power prices, has a Supply Contract with the user (you) and he supplies him with energy.

Complex self-consumption scheme

A complex scheme includes additional actors in the process. If the user doesn't have the whole investment by himself more complex models can include Finance actors (banks, loans or some other form of funding, subsidies, etc.), Operation & Maintenance company (that will provide you with additional services, in most cases this is the same company that you have hired to develop your solar project) and/or Engineering, procurement and construction company (EPC) that is usually called upon for project management of complex projects (in most cases this is for bigger powerplants > 20 KW; larger public sector and medium to large companies).

Self-consumption - Croatian aspect:

There are two models at the time available for self-consumption:

I) **The user of self-consumption plant** (cro. *korisnik postrojenja za samoopskrbu*):

Details:

- accounting period is 1 month
- power (up to 20 kW)

What to look for:

- on monthly basis the energy produced is deducted from energy consumed (in kWh)
- your annual consumption shouldn't be lower than production (otherwise you will be moved to the model 2)
- if you overproduce on the monthly basis (the difference/excess production from consumption will be sold to the TSO with small compensation – energy, send to the grid is paid as bonus of 0,05 EUR/kWh on the next bill)

When talking to the project developer let him know that you want to have powerplant that is economically most effective. They should know that power plant shouldn't produce more on yearly basis and to avoid oversizing the plant to avoid overproducing in the summer months when production is abundant compared to consumption. Careful sizing should be made as compromise between production and consumption (optimal plant size) and optimal investment. Look for other customers who are satisfied with their project, developers, and exchange experience with them (precondition for having the conversation with them is that their power plant ran for one year or more, and if they tracked the financial indicators).

II) End customer with own production (cro. *krajnji kupac s vlastitom proizvodnjom*)

Details:

- accounting period is 15 min
- power (from 20 kW to 500 kW), or smaller power if yearly production exceeds consumption

What to look for:

- buildings that have stable daily oriented consumption
- your project designer should avoid designing the solar powerplant that would exceed monthly production from consumption (energy sent to the grid is paid even less)
- if most of the energy is not spent in the summertime (you should ask how will the system pay off)

Croatia has net metering only for the household model on monthly basis, and another model has accounting period in a more realistic period of a 15-minute period. The accounting period of one month is financially more rewarding since the energy can be produced when there is no consumption, and it is used from the grid afterwards (for example during the nighttime). But for the end customer with own production (model 2) accounting period needs to have a constant consumer/appliance that is active during the same time as a production from a solar PV system for the system to be financially viable (both building power need and solar production should match as much as possible). This is why schools are far less suitable for this model (they don't have lots of activity during the summertime when the solar PV is most effective), and they are in an accounting period of 15-min. Also, in 15-min model excess energy is sent to the grid by considerably lower price then user would "self-of consumption plant". The excess energy that is sent to the grid, is usually remunerated with a very low price or is even "given for free" to the system or retailers. The profitability of the self-consumption business model (BM) also depends on the net-metering accounting period, therefore careful sizing of the solar system is needed. If the self-consumption BM is designed correctly, it has a positive effect on the grid since most of the energy is consumed on the spot (building).

III) Emerging models:

**In the Croatian law these models are still pending the sub laws that would enable actors in energy market to exploit them*

Collective self-consumption (cro. skupina aktivnih kupaca)

More users from the model I) and II) behind the low voltage grid should have access to energy sharing within the defined area (not elaborated yet what defined area is in a new law, sub laws are pending).

Slovenian aspect: Collective self-consumption have access to energy sharing behind low-voltage grid.

Aggregating (cro. agregiranje)

Joining market aggregator or creating one to get better prices on the market and to offer energy services in the energy market.

Energy communities (cro. energetske zajednice građana)

Having a legal body to represent a group of citizens that can fully participate in the market activities.

Energy sharing (cro. dijeljenje energije)

Concept of sharing energy between two actors in the energy market.

Slovenian aspect: Possible in Slovenia withing self-consumption model

Relevant stakeholder for this process:

DSO – in Croatia that is HEP ODS that is responsible for granting permission to connect to the network.

Regulator of the energy market- in Croatia that is HROTE that supervises the TSO

Croatia – relevant links:
HEP ODS – all relevant information for producers (https://www.hep.hr/ods/proizvodjaci/23)

HEP ODS – all relevant information on self-consumption model (https://www.hep.hr/ods/korisnici/kupac-s-vlastitom-proizvodnjom/29)
HEP ODS – how to use the grid as producer (with example contracts Network usage agreement or cro. Ugovor o korištenju mreže za proizvođače) (https://www.hep.hr/ods/korisnici/kupac-s-vlastitom-proizvodnjom/29)

HEP ODS – list of all relevant laws and sublaws for producers (https://www.hep.hr/ods/zakoni-i-propisi-138/138)

HEP ODS- list of all relevant documents and forms to become the producer of energy (https://www.hep.hr/ods/obrasci-i-dokumenti/46)
HEP ODS – list of all relevant documents on standard and non-standard services (https://www.hep.hr/ods/korisnici/usluge-178/178)

Self-consumption - Slovenian aspect:

In Slovenia the self-consumption or 'Net metering' is defined with by *Decree on the self-supply of electricity from renewable energy sources* (Uradni list, 2019). It defines the self-consumption as production of electric energy from renewable energy sources for full or partial coverage of its own demand profile (individual self-consumption) or community demand profile in the case of a community self-consumption scheme. It defines the size and type of connection for in house (individual) level of self-consumption and the operation of the production unit and energy sharing in the community self-consumption structure.

In general, the self-consumer business models are based on interaction with the electricity grid in intervals where the consumer is producing at a higher or lower rate than he is consuming. From the economical point of view, the main income of the self-consumption is in the energy savings, so the first crucial step is the proper sizing of the production unit, and if the grid operator doesn't allow grid injection, the system is usually slightly under sized. The PV installations, as the most used type of renewable source, used in the self-consumption scheme are usually installed directly on the rooftop of the self-supplying object or existing additional auxiliary roof surfaces.

Slovenian model:

- the accounting period is one year (solar powerplants are even more affordable this way, and sizing is much easier)
- the maximum power of powerplant is 0,8 of connection power (calculations have to be made for large systems above 1MW)

The main benefit of self-consumption operation is:

- The production unit is connected to the existing point of common coupling, and one smart, bi-directional power meter is sufficient as opposed to the new PCC for generation units.
- Investments yields income in terms of energy cost savings, as you are obliged only to pay grid connection and other fees (in case of covering your yearly demand with your yearly production in whole amount)

The companies that provide the self-consumption energy service scheme offer the possibility of the PV installation based on the consumer energy profile and available rooftop surface. They provide the financing schemes for the end user, with return interval of the investment around 8 years. The end user, which are now saving due to self-produced energy, pay monthly rate of the loan and after the mentioned period, their production unit is generating profit while keeping them self-sufficient to a certain level. For the energy exchange or additional energy that gets supplied by the retailing company on a yearly level, a single tariff is applied.

Slovenia – relevant links:

SODO – relevant laws and sublaws with form for self-consumption and collective self-consumption (https://www.sodo.si/sl/za-dobavitelje/uredba-o-samooskrbi-z-elektricno-energijo-iz-ove-in-navodila)

SODO – relevant contracts (https://www.sodo.si/sl/za-dobavitelje/obrazci-perun-eis)

SODO - relevant laws (with focus on self-consumption) (https://www.sodo.si/sl/za-dobavitelje/uredba-o-samooskrbi-z-elektricno-energijo-iz-ove-in-navodila)

Similarities in Croatia & Slovenia:

For the individual household or self-consumer as an entity on its own, the production unit size for self-consumption purposes must not exceed 80% of the connection power for the Point of Common Coupling, this is a general rule that applies to all self-consumption business models.

Applicability per user type (private/public)

The model is applicable and fairly easy to implement. But it depends on the user "size" since the accounting period isn't the same for households and larger private/ public building owners.

Typical project size

- **Commercial**

  30 kW – 1 MW (most of the powerplants are below 300 kW of power and in the lower range- below 50 kW of power)

- **Public buildings**

  50 kW – 500 kW (it can be higher depending on roof size and consumption)

- **Households**

  from 3 kW onwards (smaller systems aren't that profitable)

SWOT analysis

The objective of SWOT analysis is to show the pros and cons of all stated models to steer the decision-making process in this report. It will bring awareness about what different solar models can bring and what should the decision-makers look out for.

- The strengths of integrated solar will show what internal factors can help with overall national energy transition and what goals public and private actors can achieve.
- The weaknesses will show what internal factors have harmful effects on business development.
- Opportunities will show what external factors can help stakeholders achieve their goals.
- Threats will show what external factors can get in the way of achieving the goals of national renewable goals.

Table 8 SWOT analysis of self-consumption

Strengths (S)	**Weaknesses (W)**
The self-consumption model is well-tested Energy produced by individual prosumers can be used in future to stabilize the grid It provides investors with the stable price of energy that they get directly from their roof No complicated legal contracts and legal forms are needed No additional interventions are needed that could add costs (technical, financial, having a legal body, complex administration); it is one powerplant per one building with one user. But that will change soon, for example in for Slovenia many power plants are possible to be installed per several consumers for collective self-consumption (after low voltage grid) Suitable for all stakeholders (households, small to large businesses, public buildings) It is not an energy selling business and you don't need to register an energy generating business company, so you avoid commercial fees and other business-related costs	If no subsidies are present, it can have a relatively longer investment return period. Ranging from 7-15 years of return on investment in Croatia; the projects with subsidies take only 3-10 years to pay off If the system is not carefully sized it can lead to the reduction of effectiveness of investment (if more energy is produced than it is consumed poor financial results can be expected) For Croatia: Depends directly on the consumption of the building (for example schools usually have big roofs but they don't have summer consumption and for such buildings, this model is not viable); in Slovenia, energy sharing is possible if technical conditions are met
Opportunities (O)	**Threats (T)**
Rising energy prices and instability of the energy market might make this model more profitable Building solar is safe investment, since the savings in banks have low return rates compared to investments in solar There are not so many integrated solar systems in Croatia (it is a thriving market)	If the demand increases rapidly there are not enough solar installers to cover the market needs When there are subsidies available, prices can be raised by solar installers (for example during opening of the public tender of green funds)

New policies, laws and business models are inclined to provide additional benefits for buildings with solar systems (energy sharing, additional subsidies, etc.)	Poor development of the energy grid and lack of investments in the energy grid can slow down the uptake of solar systems in the grid The prices of materials and building prices are rising rapidly (the solar won't be cheap as for period to 2018)

4.2 Power Purchase Agreements (PPA)

General description of the business model

In the PPA model, third party (investor/project developer) is responsible for the entire process; they take the role of the project developer, invest in the project (with their capital or they find other funding options), and they are the owners of the solar system during the contract period (or even longer) while the building owner rents the roof to the third party (investor/project developer). PPA company (third party) places the panels on the roof of the building of the user and they sell the electricity to the user for an agreed amount (per kWh) during the period of time stated in the contract; but there are other models possible such as having the fixed annual rental fee (Frantzis, Grahan, Katofsky, & Swayer, 2008). The concept of long-term power purchase agreements (PPAs) applies to legal contracts that are concluded between two parties, one of which acts as a producer and seller of electrical energy while the other acts as a customer (in some cases energy is transferred directly to the grid). The forms of long-term electricity purchase contracts differ in taking into account the needs of the buyer, the seller, and the parties providing the funding. The described arrangement usually implies that the buyer is a large consumer of electricity, for example, large companies, utility companies and public enterprises (C40 Cities).

The PPA agreement/contract can happen in various forms:

- simplest PPA contract is about renting the roof from the building owner/user by PPA company, building the solar PV and then selling the energy to the grid directly to the grid and on the energy market via broker/traded completely independently from the user, by having separate meter; used in Slovenia
- more complex model is having PPA contract with building owner/user that buys all the energy from the PPA company; used in Croatia
- more complex models are expected in the future that could include new energy entities and other prosumers, some even have part of energy consumed at site, and the rest sold to the grid, combining first two models

The contract is determining who is the buyer, supplier, what are the amount, price, and deadline of energy supply. According to the rules of the electricity market of both countries, all consumers, as well as all generators, must have a contract for the sale of electricity fed into the public grid. It must be known who is purchasing the produced energy (buyer), where the quantities are acknowledged by the electricity operator. Energy can be sent to the owner of the building for self-consumption, or sent directly to the grid to be sold to the energy market (or both).

The project developer assesses the potential of a roof and collects data (energy prices, energy usage, and other legal documents) about a user (roof owner). They assess the technical and economic aspects of the project and present financial results to the potential end-user. Then the agreement is being made between the two parties for a certain period of time where the developer monitors the powerplant and reduces the power bills of the user or he sells the energy to the grid. PPA companies don’t need to be energy suppliers since their main goal is to earn by selling the energy produced by solar PV.

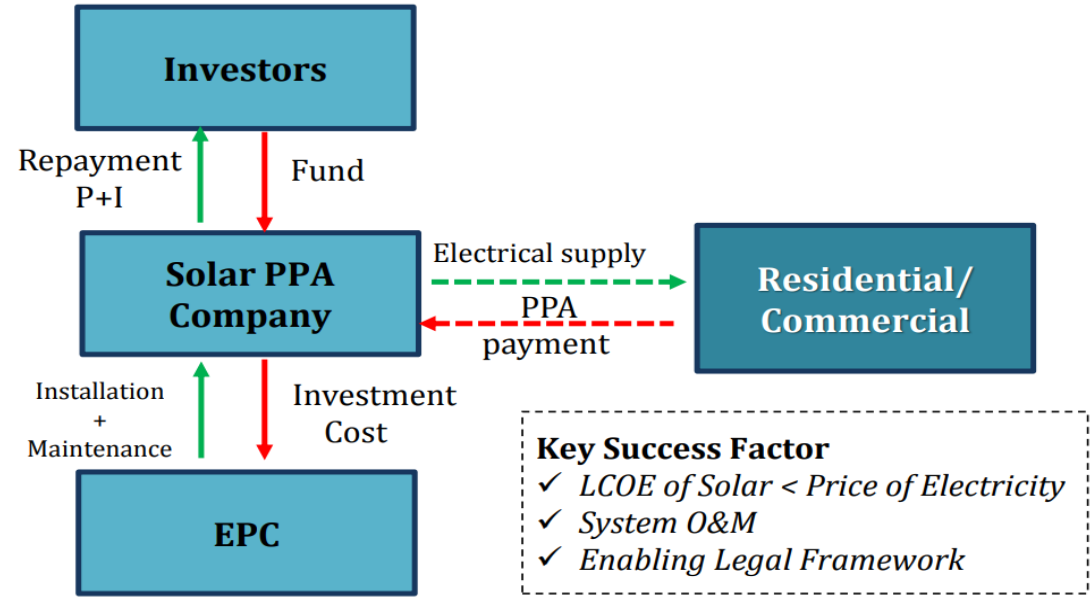

Figure 11. Structure of PPA model (Solarsense , 2022)

Figure 11. shows one of the conventional PPAs out there where Solar PPA company acts as a project developer that contracts Engineering, procurement and construction company (EPC) to build a solar PV system. Before that company collects money from the investors and it repays them in the contracted period. And with the Residential/Commercial (building owner) signs the PPA contract for energy supply.

Power Purchase Agreements (PPA) – Croatia

PPA is a contractual energy sales model. The PPA contract should be possible to implement with two types of third parties:

- an energy company that can provide PPA
- ESCO companies

The third party designs, finances, builds and maintains the power plant and sells electricity at the same or lower energy price compared to the price in the contract. After the contracted period, the solar power plant becomes the property of the PPA contract beneficiary. Only three PPAs were signed in Croatia:

- two with public bodies (two powerplants on public hospitals up to 500 kW of power)
- one with wind turbine

In Croatia PPA is contracted via contract for construction and electricity supply between public institutions and private contractors. Precondition for this contract can be high energy consumption of building. The model offers “energy savings” with energy that costs less than the energy that would normally be bought from the grid.

Power Purchase Agreements (PPA) – Slovenia

PPA model in Slovenia is widely used and the contract differs in two aspects. One aspect is how the contract works (where does the energy go – it can be partly self-consumed and/or sold to the grid). The other aspect is how the compensation for using the roof is defined. The model is based on leasing contract of the roof from the roof owner to the PPA company.

How the compensation for using the roof is defined:

- it can be predefined as the rental of the roof in a fixed amount (for example EUR/m2 rented); the energy in this case is fully sent to the grid and sold by company that issues PPA (but other arrangements can be made between the third party and the building owner)
- it can be defined as kWh that the PV plant will feed to the building owner on agreed period (this model can be separated into two groups 100% of user's usage – used in Croatia, or share of produced energy is for users' consumption, and the rest is sent to the grid

Applicability per user type (private/public)

The model is mostly applicable to commercial buildings since public tender can be too complex to implement (especially for smaller towns and municipalities). Project size isn't suitable for households in Croatia since in Croatia only PPAs are developed for self-consumption model and large consumers that are needed for the model; while in Slovenia any building with large roof has a potential for PPA contract-even households.

Typical project size

- **Commercial**

  1 MW and larger (Applicable for larger companies that use lots of electricity)

- **Public**

  0,5 MW and larger (Applicable only for very large public buildings - with daily energy consumption, such as hospitals, large utility companies, research centers, and similar -it is specific for Croatia since PPA is focused on self-consumption&small amount is sold to the grid, while in Slovenia energy is also sold directly to the grid since there are more companies who managed to produce such model

- **Households**

  Applicable if large roof is available.

SWOT analysis

Table 9 SWOT analysis of the PPA model

Strengths (S)	**Weaknesses (W)**
No need for own capital to install the powerplant Using green energy at almost no cost for the user of the contract No responsibility for the end-user of PPA (no maintenance, no insurance…) No energy risks in the contracted period for the end-user of PPA (predictable and fixed energy prices that are lower from energy bought from the grid) PPA is not considered debt and it is in a form of a utility bill; it has good financial treatment	Not so many examples in Croatia (not proven model yet); only three contracts signed so far, in Slovenia there are more examples If investing own capital the returns are higher (for example self-consumption model) The costumer must have a vision of what will they do with the powerplant when the contract period is over (if the contract states they will own the powerplant) The contracts can be legally complex (mostly large companies can afford to offer them to the users) Not many PPAs developed for public buildings, public tender can be complex for the public sector to issue (there is also a challenge of not having enough bidders when the tender is out) The contracts can connect various actors (end-users of energy, project developers, installation companies, insurance companies, maintenance companies and investors), more actors included mean a longer investment return period for PPA/or longer contract period for end-user Contract can be a long-term obligation 5-20 years
Opportunities (O)	**Threats (T)**
It is an alternative to using cheap renewable energy on the market for large consumers at small risks The model offers a stable power price for all parties (project developer & end-user)	Changes in regulation might push out PPA model if new more attractive models will be possible Requires a more favorable legal environment and regulation on EU level Not a widespread model, trust has to be built

Many large consumers still don't have a solar system	

4.3 Premium model/feed-in tariff

General description of the business model

Feed-in tariff model (FIT) was made to enable the penetration of renewable energy into the EU market providing producers of energy with the fixed buy-out prices of energy. Energy producers in the FIT system obtain purchase agreements with guaranteed buy-out prices and they weren't exposed to changing prices on the market. The state had concluded the agreement with the power plant operator to provide prices for specific producers over a certain period of time. Feed-in tariffs are now in the transition to a feed-in premium model that is more market-oriented.

Feed-in-premium (FIP) is a market-oriented system where chosen energy producers sell energy at market prices, and as an addition to that price, the premium is added, making the system more transparent and it pushes the producers to be more independent market players (Trstenjak, 2020).

Additional steps for the model:

- the investor needs to secure access to the grid and physical connection to the grid (with DSO)

For both models investor has to sign an Eco contract in both countries to sell the energy with guaranteed purchase price.

Croatia:

Croatian operator of energy market (HROTE) has an open public tender for allocation of market premium and guaranteed purchase price of electricity from renewable energy sources and high-efficiency cogeneration.

The premium model is variable and it is paid as the difference between produced energy and energy on the market. For example, if the market price gets higher the premium will be reduced. For now, there was one public tender on solar powerplants that provided a referent price of energy of 83 EUR per MW/h. The size of the power plant is regulated by the law.

For Croatia the public tenders for feed-in tariff and premium model are periodical and steps with documentation is subjected to change from tender to tender, but here are the examples of tenders: - up to 500 kW (JAVNI POZIV ZA JAVNO PRIKUPLJANJE PONUDA S UVJETIMA ZA SUDJELOVANJE NA JAVNOM NATJEČAJU ZA POTICANJE PROIZVODNJE ELEKTRIČNE ENERGIJE IZ OBNOVLJIVIH IZVORA ENERGIJE I VISOKOUČINKOVITIH KOGENERACIJA TRŽIŠNOM PREMIJOM 1/2022 - https://www.menea.hr/hrote-objavio-javni-natjecaj-za-dodjelu-zajamcene-otkupne-cijene-i-dodjela-trzisne-premije-u-okviru-raspolozivih-kvota-za-poticanje-proizvodnje-elektricne-energije-iz-oie/)

- from 500 kW and higher (JAVNI POZIV ZA JAVNO PRIKUPLJANJE PONUDA S UVJETIMA ZA SUDJELOVANJE NA JAVNOM NATJEČAJU ZA POTICANJE PROIZVODNJE ELEKTRIČNE ENERGIJE IZ OBNOVLJIVIH IZVORA ENERGIJE I VISOKOUČINKOVITIH KOGENERACIJA TRŽIŠNOM PREMIJOM 1/2022 - https://mingor.gov.hr/vijesti/hrote-raspisao-javni-poziv-za-prikupljanje-ponuda-za-poticanje-proizvodnje-elektricne-energije-iz-oie/8704)

Important links:

HROTE (https://www.hrote.hr/)

HROTE: All Croatian laws related to energy (https://www.hrote.hr/podzakonski-akti#283)

HROTE: All Croatian sub-laws related to energy (https://www.hrote.hr/podzakonski-akti#283)

HROTE: Tendering for subventions for energy (https://www.hrote.hr/poticajne-cijene)

HROTE: Last tendering (https://www.hgk.hr/javni-natjecaj-za-dodjelu-trzisne-premije-i-zajamcene-otkupne-cijene-za-poticanje-proizvodnje-elektricne-energije-iz-obnovljivih-izvora-energije)

HROTE: All energy actors on electricity energy market (https://www.hrote.hr/trzisni-sudionici)

Slovenia:

Conventional tariff systems are in place also in Slovenia, the end-user can opt for a single tariff or two tariff billing option, the similar scheme applies to the small commercial users as well. With the installation of small distributed renewable sources that are producing and selling energy, two selling schemes were prepared for them. The Feed-in was a subsidy scheme for Renewable sources to advance the usage of renewable technologies for energy production. The Feed-in scheme is financed via charges on the grid fees on the electricity bill of all users of electricity in Slovenia.

The production unit owner can be included in **Guaranteed Purchase** support program of the National Support Centre, which has a balancing group for connected units and is selling the energy on the market. The second option would be **The Operating Premium**, where the producer is selling energy on the energy market while Support Centre only pays a difference between the full guaranteed purchase price and the market price. This is determined for the past year based on the market data.

The investor is entering the tender with the project, price and production that he foresees.

The contract on the inclusion of a production facility in the balance group of the support centre (Eco balance group) or the Eco contract is intended for new devices under construction that have not yet been connected to the network and for which the beneficiary has already decided to choose guaranteed purchase (power of the device up to 500 kW, reductions are planned in the future). The producer who requests the conclusion of such a contract is obliged to choose the guaranteed purchase for the first choice of the type of support.

The Eco contract replaces an open contract for the sale of electricity, so those who obtain the Eco contract may not enter into other market contracts. The issuance of the Eco contract enables the beneficiary to enter the balance group of the support center immediately at the start of operation, ie before obtaining the decision on granting support.

Electricity is paid at the reference market price set for the current year by the Energy Agency, reduced by 10 percent. The price changes every calendar year.

All legal-organizational forms are eligible for entry into the support scheme, both natural and legal persons who meet the following conditions (similar documents need to be obtained in Croatia to apply for HROTE tenders):

- appropriate registration of activities with AJPES (eg 35,119 Other electricity generation)
- obtained Declaration for a production plant from RES or CHP, issued by the Energy Agency
- decision on support issued by the Energy Agency on the basis of successful candidacy in the tender

Important links:

Borzen (https://www.borzen.si/sl/Domov/menu2/Center-za-podpore-proizvodnji-zelene-energije/Predstavitev-centra-za-podpore)

Sample of the contract (https://www.borzen.si/Portals/0/SL/CP/vzorci%20pogodb%20-%20vstop%20po%20razpisu.pdf)

Applicability per user type (private/public)

Typical project size

50kW to 500 kW (Public/medium-small private actors)

Will compete for the guaranteed purchase price by tendering for the most favorable offers of privileged electricity producers (more similar to feed in tariffs).

From 500 kW (Large/commercial)

Will compete for premiums by tendering the most favorable offers of privileged electricity producers.

SWOT analysis

Table 10 SWOT analysis of Feed-in-premium model

Strengths (S)	**Weaknesses (W)**
Great market tool for the development of solar projects (particularly larger ones) Model strives to push the developers toward more obligations with greater responsibility towards the grid managers (in the premium model they have to predict how much power they put into the grid) Investor has a safe fixed price of energy (or premium) for agreed period	Suitable only for larger systems Premium model is not implemented in Croatia (for larger projects); feed-in-premium is not yet in force for large projects (500 kW to larger)
Opportunities (O)	**Threats (T)**
Premium models are becoming more market-oriented funding models	This is not a long-term model it is only transitional to the maturity of the technology and/or to the point when the prices will become higher than offered by the premium/feed in

4.4 Additional business/funding models in the market

Cooperative model & crowdfunding

Energy cooperatives offer an alternative to large energy companies as a legal body and funding option where most of the profit is redistributed to the members of a cooperative. Cooperatives are based on principles of democratized leadership (1 member 1 vote) that makes them unique, all members have share of the cooperative and voting right, this way members fully participate in energy transition of EU. For example, a cooperative can participate in the energy market if it has many members with production units and sells the energy at higher prices than individuals could sell to the supplier. They can become the supplier as many EU examples show and the members can invest in other members solar PV acting as a funding alternative to banks if loans, subsidies or other funding options aren't available and prove to be more costly for the members. Besides funding from only members, crowdfunding can be used. Crowdfunding is a public call for investments via the internet to build the powerplants. Even if the citizens don't have the roof to install the solar powerplants they can invest in the powerplants on other buildings.

Organizations active in the field of crowdfunding (both loan-based crowdfunding):

- Slo. ZSES (has active projects open)
- Slo. Mojaelektrarna
- Cro. ZEZ (no new projects)

Energy community model

Energy community concept allows natural persons, public bodies and companies to fully participate on market of electrical energy and provide them with energy services such as energy sharing, production etc. It also provides legal form for participants on the market to have protection under legal body. The energy community concept hasn't fully transposed from EU directives to national laws of both countries to create enabling framework. Slovenia is a bit forward in concepts of energy communities with granular and experimental examples of energy communities (ZSES leaning toward concept of energy community and energy community Luče is one of the forward examples in the country). While Croatia is far behind with restrictive laws that would enable the founding of energy communities. Further legal developments and testing is needed for the concept to be replicable and usable for wider actors. Energy communities aim to accelerate the investments in renewable energy and to include wider public into the energy sector.

ESCO model

ESCO model is similar to the PPA where ESCO company "guarantees" that the user of energy service will reduce his expenditure on energy by using solar PV. The ESCO company is the investor in the power plant, and they maintain, insure and operate the power plant during the project period. They have the obligation of reporting the savings that occurred and if the goals aren't reached, they lower the price of energy service. These are long term contracts made for large consumers (usually large companies) where energy is self-consumed on the spot. The user of solar power plant gets to use green energy without having to invest in it.

5. Choosing the right model

5.1 Choosing the right business model

Table 11. Business models with main considerations when choosing the right one

	Self-consumption	Power purchase agreements	Premium model/feed-in tariff
Own capital needed	Y	N[1]	Y
Large consumption needed	Y/N[2]	Y/N[3]	N
Large rooftop area needed	N	Y	Y
Proven model	Y	Y/N[4]	Y
Complicated legal documentation	N[5]	Y/N	Y/N
Good economic return on investment	Y	Y/N[6]	Y/N[7]
Owners' responsibility for the system	Y	N	Y
Households	Y	Y/N[8]	N
Public bodies/buildings	Y	Y/N[9]	Y
Other (e.g SMEs)	Y	Y/N	Y/N

[1] In this model the investor is "third party" who invests and maintains the power plant
[2] Depends on the accounting period and national legislation (read chapter on self-consumption to find out more)
[3] Depends on the model of contract, energy produced can be used for self-consumption or it can be sold to the grid (or both)
[4] For Croatia PPA is still a novelty.
[5] If applying for subsidies documentation can be complicated and there is a need for an expert (consultant) to get better chances of obtaining the subsidy.
[6] There is no initial capital needed, but including many third parties to build and maintain the powerplant during the project life can have higher long-term costs than investing by own capital
[7] Current energy market is at its peak and it has highest historic prices what makes this model absolute in near feature if producer sells the energy in the market, but the model offers stable prices of energy for a long time
[8] If household has a large roof, it is possible to rent a roof for PPA
[9] Public procurement process/tendering can be complicated for smaller municipalities and hard to valorize. It can be difficult to create the criteria for public officers while issuing the public tender.

5.2 Choosing the right funding option

Table 12 Choosing the possible funding option for different actors

Beneficiary/funding option	Loan	Grant	PPA	ESCO	Crowdfunding (collective investment)	Cooperative model (collective investment)
Private persons (Households)	Y[10]	Y	N[11]	N[12]	N[13]	Y/N[14]
Micro and SME	Y	Y	Y/N[15]	Y/N[16]	Y[17]	Y/N[18]
Private and legal bodies in agriculture registry	Y	Y	Y/N	Y/N	Y[19]	Y/N[20]
Public sector	Y/N[21]	Y	Y/N[22]	Y/N[23]	Y/N[24]	N
Private large consumers with large roof	Y	Y	Y	Y	Y/N	Y

[10] Loan can reduce point of the return of investment
[11] Too small for this scheme
[12] Too small for this scheme
[13] There are some examples of this kind of investment, but it is not general in use
[14] No examples in Croatia, but there are some examples in Slovenia
[15] Depends on the size of consumption and/or roof
[16] Depends on the size of consumption and/or roof
[17] Can be used as a part of marketing strategy
[18] Cooperatives are not recognized as a good legal form for this
[19] There are no examples of crowdfunding, but it is possible if small family far has experience in marketing
[20] Cooperatives are not recognized as a good legal form for this
[21] They avoid loans since it is not positive political move (only if the loans have small interest rate)
[22] Not willing to do public procurement since it can be complex
[23] Not willing to do public procurement since it can be complex
[24] Not enough innovative companies offering the model to have public tender

5.3 List of funding options per country

Croatian aspect:

No.	Funding program	Type of funding source	**Beneficiary**	Available funding per project	Share of co-funding %
1.	ENNA Opskrba d.o.o. ERSTE banka (https://www.energianaturalis.hr/financiranje-s35)	Interest subvention on loan (rate 2,5 - 3,5%) including "turnkey" consulting service	**Private persons (Households)**	40.000 EUR	n/a
2.	Podravska Banka (https://www.poba.hr/poslovni-subjekti/kredit-za-financiranje-ugradnje-solarnih-kolektora/)	Interest subvention on loan (rate 3 - 3,1%)	**Small family farms (OPG), micro and SME**	5.000 to 200.000 EUR	n/a
3.	HBOR (Croatian bank for reconstruction and development) (https://hamagbicro.hr/financijski-instrumenti/kako-do-zajma/investicije/mali-zajam-za-ruralni-razvoj/)	Interest subvention on loan (rate 0,1 – 0,25%)	**Micro and SME, registered in Agriculture registry**	25.000,01 EUR to 100.000 EUR	
4.	Rural development program, Operation 4.1.3 Paying Agency for Agriculture, Fisheries and Rural Development, public call for funding (https://ruralnirazvoj.hr/natjecaj-za-tip-operacije-4-1-3-koristenje-obnovljivih-izvora-energije-4/)	Grant	**Private and legal entities registered in Agriculture registry**	5.000 to 1.000.000 EUR	50% - 70%
5.	Environmental Protection and Energy Efficiency Fund (FZOEU) public call for	Grant	**Private persons in family houses**	5.000 - 10.000 EUR	40% - 80% (depending on location – islands, mountain regions,

	funding (https://www.fzoeu.hr/hr/natjecaj/7539?nid=107)				areas of special state concern)
6.	Environmental Protection and Energy Efficiency Fund (FZOEU), public call for funding (https://www.fzoeu.hr/hr/natjecaj/7539?nid=107)	Grant	**Municipalities, counties, state administration bodies, public institutions, public companies**	66.150 EUR	40% - 80% (depending on location – islands, mountain regions, areas of special state concern)
7.	Zagreb county, public call for funding (https://www.zagrebacka-zupanija.hr/natjecaji/379/javni-natjecaj-za-prijavu-fizickih-osoba-za-sufina)	Grant	**Private persons in family houses**	2.645 EUR	50%

No.	Funding support mechanism	Type of support	Beneficiary
1.	Na sunčanoj strani service (https://www.nasuncanojstrani.hr/) Energy cooperative Island Krk Energy cooperative KLIK Energy cooperative Apsyrtides	Technical assistance for the development of PV powerplants Investment participation in PV projects, Education	**Private persons (Households**)
2.	REGEA (https://regea.org/regea-priprema-investicijski-val-u-suncane-elektrane/)	PVmax project, North West Croatia regional energy agency. (REGEA) Technical assistance for the development of PV powerplants (feasibility studies, financing options legal consulting)	**Legal entities (commercial or public building owners)**

Banks that issue loans:

Podravska bank

Erste bank

Main bodies that issue grants (*local municipalities can also act as support in the process of project development – funding the part of documentation or offering consulting services):

Ministry of Physical Planning, Construction and State Assets, EFRD (European fund for regional development), public call for project proposals

Ministry of economy and sustainable development, EFRD (European fund for regional development), public call for project proposals

HBOR (Croatian bank for reconstruction and development), small loan for rural development

HAMAG-BICRO (Croatian Agency for SMEs, Innovation and Investments)

ESIF micro and small loans

Energy and climate change program (ECC), EEA Grants

Environmental Protection and Energy Efficiency Fund (FZOEU), public call for funding

List of ESCO companies in Croatia (https://www.enu.hr/ee-u-hrvatskoj/tko-je-tko-ee-rh/pruzatelji-energetske-usluge/)

Energy companies that offer PPA as a service:

- REGEA
- EON
- ENNA Solar

Slovenian aspect:

No.	Funding program	Type of funding source	**Beneficiary**	Available funding per project	Share of co-funding %
1.	Ekosklad (https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/mikro-soncne-elektrarne/mikro-soncne-elektrarne-subvencija-297) (https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/mikro-soncne-elektrarne/mikro-soncne-elektrarne-subvencija-414)	Subsidy	Citizens/public bodies	n/a	30%
2.	Ekosklad (https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/male-soncne-vetrne-in-vodne-elektrarne)	Loan	Citizens/public bodies	Credit for Independent investments Interest rate three-month EURIBOR +1.3% Repayment period maximum 10 years	n/a
3.	Ministry of Economic Development and Technology (https://razpis.eu/	Grant	Processing industry	micro-enterprises up to a maximum of EUR 1,500,000 in public support,	30%

	razpisi/7-javni-razpis-za-podukrep-4-2-podpora-za-nalozbe-v-pridelovalno-ali-predelovalno-industrijo/)			small businesses up to a maximum of € 3,000,000 in support, medium and large companies up to a maximum of 5,000,000 euros of support.	
4.	Public Agency of the Republic of Slovenia (https://razpis.eu/razpisi/javni-razpis-za-spodbujanje-velikih-investicij/)	Grant	Companies	1.000.000 do 12.000.000 EUR v predelovalni dejavnosti od 500.000 do 3.000.000 EUR v storitveni dejavnosti od 500.000 do 2.000.000 EUR v razvojno-raziskovalni dejavnosti	15-50%
5.	Ministry of Infrastructure	Grant	Copmanies	The minimum investment amount is EUR 100,000 without VAT.	Up to 20%
6.	GEN-I	Installment payment	Self-consumption	n/a	n/a
7.	Sonce energija	Roof rental	Any	n/a	n/a
8.	ZSES	Roof rental	Any	n/a	n/a
9.	Energeko	Roof rental	Any	n/a	n/a

The list of banks that issue green loans (terms of loans can be found here: https://www.zps.si/osebne-finance-sp-1406526635/krediti/11057-financiranje-energijske-prenove-doma-kako-zelena-so-posojila-bank):

- SPERBANK
- BKS Bank AG
- Delavska hranilnica
- Deželna banka Slovenije
- NLB

- Sparkasse

Main bodies that issue grants (*local municipalities can also act as support in the process of project development – funding the part of documentation or offering consulting services):

Ministry of Economic Development and Technology (slo. Ministrstvo za Ekonomski Razvoj in Tehnologijo)

Ministry of Infrastructure (slo. Ministrstvo za Infrastrukturu)

Ministry of Agriculture, Forestry and Food (slo. Ministrstvo za kmetijstvo, gozdarstvo in prehrano)

Ministry of the Environment and Spatial Planning (slo. Ministrstvo za okolje in prostor)

Eco fund (slo. Eko sklad)

The list of ESCO companies in Slovenia: (https://www.energetika-portal.si/podrocja/energetika/energetska-prenova-javnih-stavb/esco-ponudniki/)

Energy companies that offer PPA as a service:

- ZSES
- GEN-I
- Interenergo
- Resalta

6. Administrative and technical checklist for installing the integrated solar systems

After deciding if solar is right for you and when you choose the business models you should review the preliminary steps and check if you have all legal documentation. If you apply for subsidies ask for expert help (project developer or consultant) since they do this kind of work professionally. A good prerequisite that you have legal and technical documentation with one entity/owner on all documents to avoid unnecessary and long administrative procedures that could stop you from end goal – getting solar.

For all business models it is important to arrange access to the network and physical connection to the network. These steps confirm if the power plant is suitable for grid integration.

Project development phases can be separated into the following basic segments:

1. Deciding to build the powerplant
2. Obtaining the permits to build the powerplant
3. Building the powerplant and connecting it to the grid
4. Monitoring and post building services

List of steps & documentation:

Croatia:

Legal steps with lists of documentation (https://www.hep.hr/ods/UserDocsImages/dokumenti/Javne_rasprave/2018-02/prijedlog_pravila_o_prikljucenju.pdf)

All documents needed to connect to the grid (https://www.hep.hr/ods/ostalo/obrasci-i-dokumenti/obrasci-i-dokumenti-vezani-uz-prikljucenje-na-mrezu/700)

Slovenia:

- example of connecting process in Maribor (https://www.elektro-maribor.si/za-uporabnike/priklju%C4%8Devanje/)

- example of connecting process in Celje (https://www.elektro-celje.si/si/pomoc/proces-prikljucitve)ž

- process of connecting the powerplants up to 10 MW (https://www.ece.si/app/uploads/2018/08/SONDO-2011-Priloga-5.pdf)

- if you want to know more (energy players on Slovenian market: https://www.lexology.com/library/detail.aspx?g=b3111e42-5b5d-405d-81a9-8be2473c05e8)

- If you want to know more (energy players on Croatian market: https://cms.law/en/int/expert-guides/cms-expert-guide-to-electricity/croatia)

6.1 Deciding to build the powerplant

➢ Obtaining location information with project developer

Description: this step includes checking the preliminary conditions & collecting the documentation for the main electrical project, checking the legality of the building (the investor has to prepare user permit, building permit, and land registry entry), provide a yearly consumption profile (preferably bills for the last 12 months or more are used to predict the size of the solar power system), the investor should have information on connection power (stated in energy consent), a type of connection to the grid. Slovenian document about spatial data (slo. Vloga za izdaju mnenja k prostrskim aktom) determines guidelines if additional documentation is needed for solar PV to be built.

Parties needed: Investor, public body that issues the permits connected to the building, distributor of energy (slo)

Additional information: this is valid for integrated solar powerplants on the roof (they should be as big as building to avoid obtaining additional building permits and use permits)

Documents:
Cro. document not existing; but it is important to collect all building information
Slo. Vloga za izdajo smernic k prostorskim aktom (has information about building, location and details about power and number of buildings) (example: https://www.elektro-celje.si/si/pomoc/proces-prikljucitve/smernice-k-opn-oppn-ali-pup)
Slo. Vloga za izdaju mnenja k prostorskim aktom (https://www.elektro-celje.si/si/pomoc/proces-prikljucitve/smernice-k-opn-oppn-ali-pup)

➢ Obtaining conceptual project and prefeasibility study

Description: Here the building owner should get preliminary information on the investment size and production profile. Conceptual project can be used to start the conversation with company for electricity distribution for further steps. In Croatia if the connection power needed is >500 kW there is a need for network analysis, and for powerplants less than 500 kW the conditions are checked and additional document might be needed (EOTRP).

Parties needed: Company for electricity distribution, project developer to design the conceptual project

Additional information: Cro. static elaborate needed

Document:

Conceptual project (hrv/slo idejna zasnova, idejni projekt, studija izvedivosti/študija izvedljivosti)

➢ Obtaining an opinion on the possibility of connecting to the network

Description: preliminary step for obtaining energy consent; for Croatia there is a need to check If the connection is simple or complex.

Parties needed: Company for electricity distribution

Documents:
Cro. Request to check the possibility of connecting a household with its own production (needed in Croatia, for household model – up to 20 kW); additional document for households
Cro. Complex connection has to have EOTRP document (Elaborate of Optimal Technical Solution for Grid Connection) paid and developed (document that checks the preconditions for the connection to the grid); if connection is simple there is no need for additional documents and calculations
Slo. Enotna vloga za izdaju projektnih pogojev
Slo. Enotna vloga za izdajo soglasja za priključitev proizvodne naprave EE/naprave za individualno samooskrbo/naprave za skupnostno samooskrbo

➢ Development of the main project

Description: Main project specifies technical aspects of power plant and it offers overview needed for distributor of electricity to gain basic understanding what kind of production unit is planned, and based on that they can assess how it will affect the grid.

Parties needed: Project designer

Documents:
Cro. Proof of legal interest (cro. dokaz pravnog interesa)
Cro. Main project (cro. glavni projetk)
Slo. Main project (slo. glavni projekt)

➢ Obtaining energy permit

Description: The ministry gives consent for performing activities in the energy market

Parties needed: The ministry for energetics (slo. Ministrstvo za infrastrukturo)

Additional information: *Cro. Energetsko odobrenje; in Croatia energy consent can be obtained after signing the connection contract in step 6.2

Cro. Energetsko odobrenje
Cro. Registar projekata i postrojenja za korištenje obnovljivih izvora energije i kogeneracije te povlaštenih proizvođača

Additional information: larger producers (from 10 MW need to obtain energy permit)

➢ Construction decision

Description: Investor decision based on information on powerplant size, expenses and legal obstacles

Parties needed: Investor/building owner

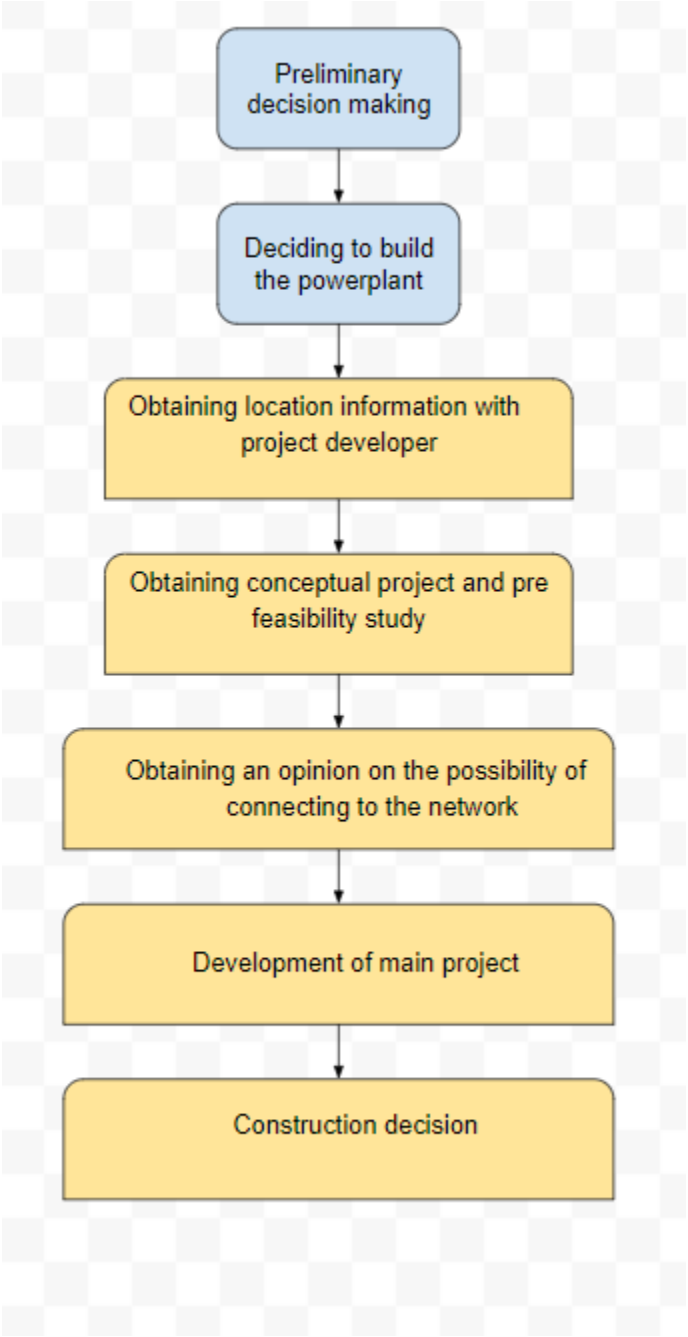

Figure 12. Decision to build the powerplant & sub-steps

6.2 Obtaining the permits to build the powerplant

➢ Obtaining building permit (usually not needed for integrated solar systems)

Description: Building permit will be needed in specific cases (PV is larger than the building)

Parties needed: Investor/building owner

Cro. If the construction is classified as simple building; construction permit isn't needed
Slo. up to 1MW of integrated solar power plant building permit isn't needed (check additional conditions): http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED8015

➢ Distribution company consent to the main electrical project

Description: Confirmation is made to see if the main project is made up to standards and it contains the information how it will affect the grid.

Parties needed: Distribution energy company

Documents:
Cro. Potvrda glavnog projekta
slo. Enotna vloga za izdajo mnenja k projektu alisoglasja h gradnji

➢ Consent for the access to the land in question

Description: this document allows actors to build the connection and powerplant to third party

Parties needed: Building owner

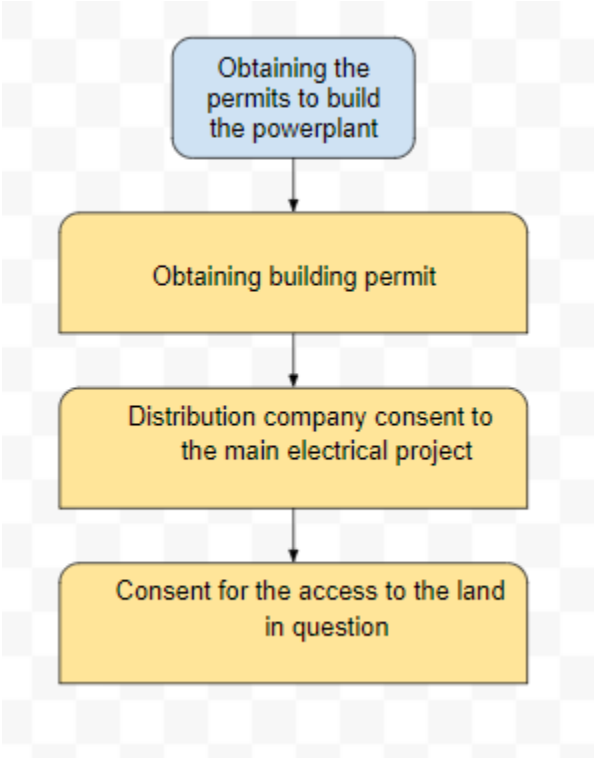

Figure 13. Obtaining permits & sub-steps

6.3 Building the powerplant and connection to the grid

➢ Preparation of tender documentation and selection of the contractor

Description: This is particularly important for public bodies, but it is also important when applying for subsidies, or feed-in or premium models (since the process is made via tendering process); this step can go even in earlier stage (if the public body isn't the one who is developing the project).

Parties needed: Investor/building owner

➢ Submission of an application and obtaining consent for the connection of a production facility to the electricity distribution network (energy consent)

Description: Holds terms and conditions of connecting to the grid.

Parties needed: Grid operator (SODO, HEP ODS)

Slo. Enotna vloga za izdajo pogodbe o priključitvi
Slo. Izjava o lastništvu električnega priključka
Cro. Ugovor o priključenju

➢ Obtaining energy consent

Description: In Croatia the energy consent is needed to go further with the process of development of the project it is needed to check if grid has capacity to connect the powerplant

Parties needed: Company for electricity distribution

Additional information:

Cro. Elektroenergetska suglasnost

➢ Creating execution project

Description: Contains the plan for installation.

Parties needed: Project developer

Documentation:
Cro. Izvedbeni projekt

➢ Construction of a production plant and construction of a connection to the electricity network

Description: Building the powerplant and electrical works on the building.

Parties needed: Solar installer and official electrical installer to build a connection.

Documentation:
Slo. Obavestilo o pričetku del na elektroenergetskih napravih
Slo. Izjava o ustreznosti priključka in opravljenem pregledu izgradnje priključka

➢ Conclusion of a network connection contract

Description: It holds the terms and conditions of connecting to the grid.

Parties needed: Grid operator (SODO, HEP ODS)

➢ Preparation of the project of performed works and operating instructions

Description: Concluding the market contracts or self-consumption contract.

Parties needed: investor, project developer

- Concluding a contract for the purchase and sale of electricity (market contract) or Eco contract or selfconsumption contcracts

Description: Concluding the market contracts to sell the energy or self-consumption contract

Parties needed: BORZEN, HROTE, distributer… other

Slo. Pogodba o dobavi električne energije
Slo. Pogodba o prodaji proizvedene električne energije

- Submitting an application and reviewing the fulfillment of the conditions for connection

Description: Checking if agreed conditions are met

Parties needed: company for electricity distribution

Cro. Zahtjev o početku korištenja mreže
Slo. Vloga za priključitev in uporabo sistema
Slo. Izjava za samooskrbo
Slo. Izjava za začasno priključitev objekta za potrebe pregleda in preskušanja električne inštalacije
Slo. Naročilnica za števec električne energije

- Concluding a contract for the use of the system (grid usage agreement)

Description: Inspection of the connection to the grid

Parties needed: company for electricity distribution

Documents:
Cro. Ugovor o korištenju mreže
Slo. Pogodba o dostopu do distribucijskega omrežja

- Technical / inspection

Description: Inspection of the connection to the grid

Parties needed: Company for electricity distribution

Documents:
Cro. Završno izvješće HEP ODS-a
Cro. Zapis o prijenosu elektrane
Slo. Izvještaj o pregledu mjernog mjesta
Slo. Izjava o privremenom priključenju objekta za potrebe pregleda i ispitivanja elektroinstalacija
Slo. Izvješće o zaštitnim postavkama u proizvodnom pogonu, spremištu električne energije i punionici za električna vozila

- Obtaining a use permit (only for those production facilities for which a building permit is required)

Description: physical connection to the grid

Parties needed: body for administrative affairs of construction

Documents:
Cro./Slo. Uporabna dozvola

- Connection to the distribution network

Description: physical connection to the grid

Parties needed: company for electricity distribution

Documents:
Cro. Dozvola za trajni pogon
Slo. Izjava za začasno priključitev objekta za potrebe pregleda in preskušanja električne inštalacije

Slo. Poročilo o nastavitvah zaščit v proizvodni napravi, hranilniku električne energije in polnilnici električnih vozil

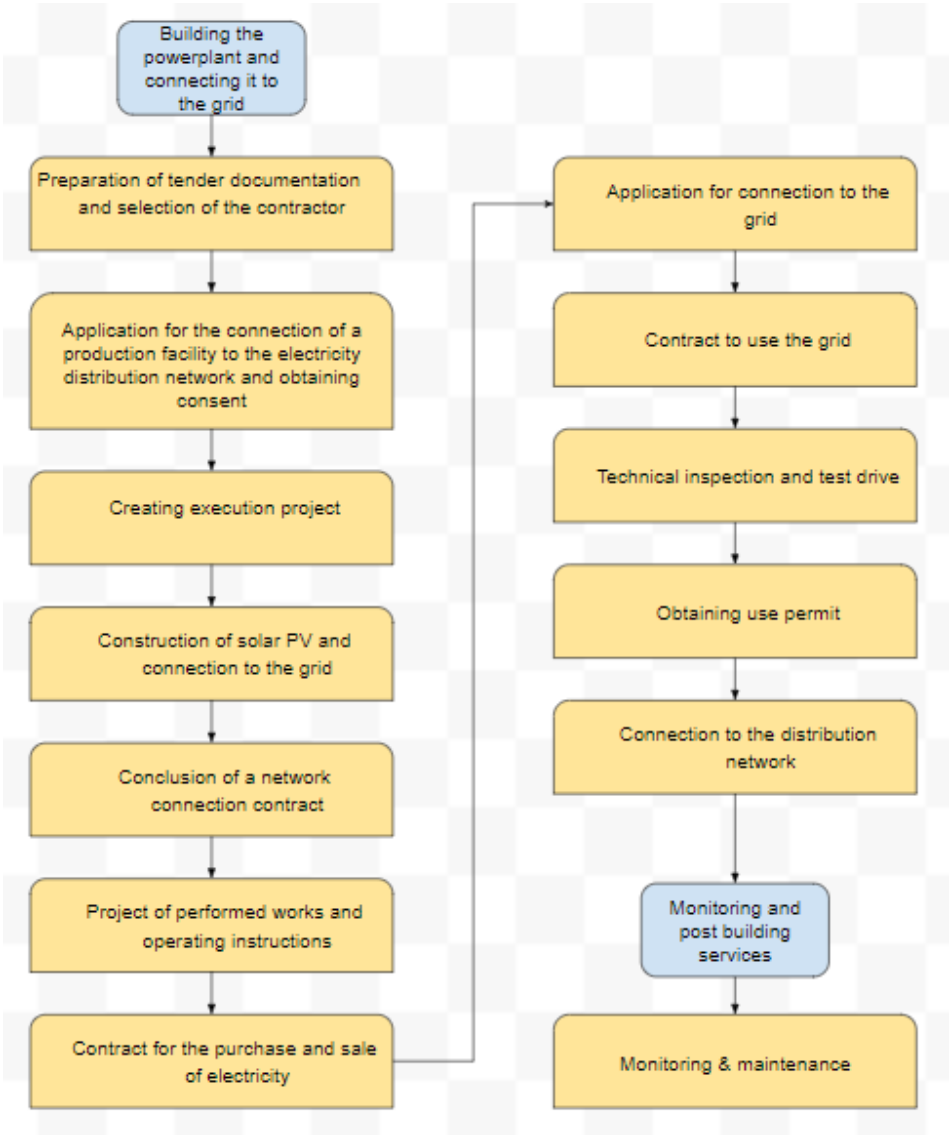

Figure 14. Building the power plant and connection with post building steps

6.4 Monitoring and post building services

By deciding the project developer/installer you will have an access to the additional services such as (in chapter 3.4 basics on choosing the project developer and installer):

- adding new services to your system to make it more economically feasible
- compliance with warranty if some part of the system needs to be replaced
- monitoring
- maintenance (cleaning)
- checking the system
- system inspection

7. Overview of regulation

Overview of regulation contains most important laws that end-users and buyers of solar integrated systems could find interesting when deciding what kind of investment they want to start.

7.1 Croatia

Regulation on the Mandatory Content of the Conceptual Project (cro. Pravilnik o obveznom sadržaju idejnog projekta NN 118/2019)

Regulation on the use of renewable energy sources and cogeneration (cro. Pravilnik o korištenju obnovljivih izvora energije i kogeneracije NN 88/2012-2015)

Energy Law (cro. Zakon o energiji NN 120/12, 14/14, 95/15, 102/15, 68/18)

The Electricity Market Law (cro. Zakon o tržištu električne energije NN 22/13, 95/15, 102/15, 68/18, 111/2021)

Assize on Issuing Energy Consent and Determining the Conditions and Deadlines for Connecting to the Electric Power Grid (cro. Uredbe o izdavanju energetskih suglasnosti i utvrđivanju uvjeta i rokova priključenja na elektroenergetsku mrežu NN 7/2018)

Regulations for Connecting to the Distributed Grid (cro. Pravila o priključenja na distribucijsku mrežu NN 22/13, 102/15, 68/18 i 52/19)

General Conditions for Using the Grid and Supply of the Electricity (Opći uvjeti za korištenje mreže i opskrbu električnom energijom NN 22/13, 102/15 i 68/18)

Methodology for determining the fee for connecting to the power grid of new network users and for increasing the power of existing network users (cro. Metodologija utvrđivanja naknade za priključenje na elektroenergetsku mrežu novih korisnika mreže i za povećanje snage postojećih korisnika mreže NN 51/2017)

Decision on the amount of fee for connecting to the power grid and for increasing the connection power (cro. Odluka o iznosu naknade za priključenje na elektroenergetsku mrežu i za povećanje priključne snage, NN 52/06)

Network Distribution Policy (cro. Mrežna pravila distribucijskog sustava NN 74/2018)

Price list of non-standard services of HEP ODS (cro. Cjenik nestandardnih usluga HEP ODS)

The Regulation on the Compensation for Connecting to the Power Grid and the Increase of Connection Power (cro. Pravilnik o naknadi za priključenje na elektroenergetsku mrežu i povećanje priključne snage NN 28/06).

Ordinance on acquiring the status of a preferred electricity producer (cro. Pravilnik o stjecanju statusa povlaštenog proizvođača električne energije NN 88/2012)

Tariff system for the production of electricity from renewable energy sources and cogeneration (cro. Tarifni sustav za proizvodnju električne energije iz obnovljivih izvora energije i kogeneracije NN 133/2013)

Law on Renewable Energy Sources and High Efficiency Cogeneration (cro. Zakon o obnovljivim izvorima energije i visokoučinkovitoj kogeneraciji NN 138/21)

Regulation on quotas for enchouraging electricity production from renewable energy and high performace cogenerations (cro. Uredba o kvotama za poticanje proizvodnje električne energije iz obnovljivih izvora energije i visokoučinkovitih kogeneracija (100/15, 123/16, 131/17 i 111/18)

7.2. Slovenia

Renewable Energy Fostering Act (slo. Zakon o spodbujanju rabe obnovljivih virov energije - Uradni list RS, št. 121/21)

Energy law (slo. Energetski zakon (EZ-1) (Uradni list RS, št. 60/19 - uradno prečiščeno besedilo, 65/20, 158/20 – ZURE in 121/21 – ZSROVE)

Electricity Supply Act (slo. Zakon o oskrbi z električno energijo (ZOEE) (Uradni list RS, št. 172/21)

Rules for the operation of the Support Center (slo. Pravila za delovanje Centra za podpore (Uradni list RS, št. 88/16)

System operating instructions for the electricity distribution network (slo. Sistemska obratovalna navodila za distribucijsko omrežje električne energije (SONDO) (Uradni list RS, št. 41/11, 17/14 – EZ-1 in 7/21)

Energy Efficiency Law (slo. Zakon o učinkoviti rabi energije (Uradni list RS, št. 158/20)

Decree on support for electricity produced from renewable energy sources and in cogeneration of heat and electricity with high efficiency (slo. Uredba o podporah elektriki, proizvedeni iz obnovljivih virov energije in v soproizvodnji toplote in elektrike z visokim izkoristkom (Uradni list RS, št. 74/16, 74/20 in 121/21 – ZSROVE)

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Decree on the issuance of declarations for production facilities and certificates of origin of electricity (slo. Uredba o izdaji deklaracij za proizvodne naprave in potrdil o izvoru električne energije (Uradni list RS, št. 182/20 in 121/21 – ZSROVE)

Decree on mandatory measurements at generating installations receiving guarantees of origin and support for electricity produced (Uredba o obveznih meritvah na proizvodnih napravah, ki prejemajo za proizvedeno električno energijo potrdila o izvoru in podpore (Uradni list RS, št. 21/09, 33/10, 45/12, 17/14 - EZ-1 in 121/21 – ZSROVE)

Decree on determining the amount of electricity produced in cogeneration of heat and electricity with high efficiency and determining the efficiency of biomass conversion (Uradni list RS, št. 37/09, 17/14 - EZ-1 in 158/20 – ZURE)

Decree on the method of determining and calculating contributions for the provision of support for the production of electricity in high-efficiency cogeneration and from renewable energy (Uradni list RS, št. 184/21 – ZSROVE)

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