Feasibility Study for ‘Solari 5000+’

December 2022

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FEASIBILITY STUDY OF SOLARI 5000+ PROJECT	
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GENERAL INFORMATION ABOUT THE AUTHOR OF THE STUDY

The author of this Study is Netinvest Company from Belgrade, incorporated in 1992, engaged in the area of renewable energy sources over the last 10 years, which designed, constructed and connected to the grid the first solar power plants in Serbia in 2010.

The Company's personnel is interdisciplinary, around 80% being highly-qualified (university education- VII degree of qualification), mainly engineering professions such as electrical engineers, mechanical engineers, civil engineers and architects.

So far, Netinvest has implemented the following projects in Serbia, focused particularly on solar energy, with reference to the subject matter of this Study, in compliance with the contractual obligations:

- Implementation of the use of RES (solar energy) in the detailed regulation plan – the plan was adopted and the project was developed based on which the construction permit was obtained;

- The Preliminary Design including the feasibility study and supporting documents for solar power plant located at Petka in Kostolac, with installed capacity of 5 MW (contracting authority – the National Electric Power Utility of Serbia)

- The Final Design with the previous feasibility study for solar power plant located at Srednje kostolačko ostrvo, with installed capacity of 100 MW (contracting authority – the National Electric Power Utility of Serbia)

- Development of several projects of solar power plants in the region, with installed capacity exceeding 10 MW;

- Other numerous projects, studies and technical-economic analyses for small and large solar power plants, use of solar energy at the level of the facility, block of facilities or the municipality and assessment of the investment profitability (feasibility and viability studies).

Additional information about Netinvest LLC may be obtained via its official Internet page www.netinvest.rs. Attached is an extract from the Business Registration Agency of the Republic of Serbia.

0. TERMS OF REFERENCE

Facing the necessity of carrying out the quickest and the most efficient energy transition possible as well as the transition from fossil fuels to renewable energy sources in electricity generation and being aware of the fact that Montenegro has extraordinary potentials for electricity generation based on the PV effect principle, Elektroprivreda Crne Gore launches an initiative for the implementation of Solar 5000+ (70MW) Project : natural and legal entities.

This Project comprises:

1. Procurement of funds for Solari 5000+ (70MW) Project financing.
2. Preparation of technical solution, technical specifications and procurement of equipment for the project needs.
3. Installation of on-grid PV systems ranging between 10-1000kW capacity at structures owned by natural and legal entities.
4. 20% of subsidy for project financing secured by EPCG.

The Board of Directors has set up a **Working Group (**Decision number 10-0052064 dated November 9, 2022), the body that will be responsible for the project implementation and composed of representatives of the Government of Montenegro, ECO Fund, Faculty of electrical engineering, CEDIS, ESG and EPCG. Project Committee shall carry out the following activities:

a. Development of the Feasibility Study;

b. Development of the Conceptual technical solution;

c. Launch the Invitation to tender for securing Solari 5000+ (70 MW) Project funding. Given that European and World Banks earmark significant funds for financing of 'green projects', the Invitation to tender should be drafted so as to secure the maximum possible amount of grants. Maximum amount of the Loan would amount to € 70 M.

d. Financing, i.e. crediting of Solari 5000+ (70MW) Project should secure, to the extent possible, that the instalment of the loan for solar equipment covers the users' needs for active energy in high and low tariff on an annual level.

e. Do the check-up of technical specification for tendering procedure on procurement of equipment necessary for implementation of Solari 5000+ (70MW) Project.

f. Procure the necessary equipment – Public Invitation to Tender

g. Organize a strong and due media campaign animating the beneficiaries to participate in the project.

h. Public invitation for the citizens – beneficiaries (users) and legal entities who fulfil requirements defined in the Invitation.

i. Define the necessary procedures for preparation of technical documents and execution of works.

Maximum value of the Project equals to €70M while the total installed capacity equals to 70 MW.

One of basic elements of this Project is securing the financing mode where an instalment of a participant in the Project, i.e. natural or legal entity, pertaining to repayment of the installed equipment does not exceed costs they incurred for consumed electricity without taking into consideration engagement of the grid capacity (maxi graph) at customers where the power is measured.

While implementing the Project we have to take care of regional share of customers without jeopardizing the economic cost-effectiveness of the Project.

It is necessary to take into consideration as equal share of customers profiles as possible (taking care of kWh consumption they had so far), without jeopardizing technical features of PV systems and financial cost-effectiveness.

In order to implement the Project it is necessary to prepare Conceptual-technical Solution that will correspond to the basic ToR postulate.

It is necessary to carry out the Preliminary Design, including versatile input parameters, installed capacities of PVSP, equipment prices, number of solar irradiation hours, electricity prices at the market, interest rates for projects credited with and w/o subsidies.

While drafting the Conceptual technical solution and the final Preliminary Study it is necessary to set the PV system capacity sufficient for meeting the entire electricity need on an annual level. Furthermore, it is necessary to analyse the ratio between the approved connection power of the system and the power of the proposed PV system (in line with paragraph 1 Article 96 of the existing Energy Law) as well as available rooftop surface areas for erection of PV modules.

While determining the quantities and capacities of inverters to be used in Solari 5000+ (70MW) Project, it is necessary to secure flexibility in creating the specific technical solutions so as to dimension more precisely the generating capacity that meets the need of end user.

While deliberating the solar potential at the territory of Montenegro as well as density of population thereof for the needs of this Project, it is hereby suggested to have the following regional share in installation of the planned PV systems:

- 40% south – coastal side,
- 40% continent,
- 20% north.

Preliminary Design shall elaborate the share in distribution of substructure elements needed for assembly of PV modules, analysing thereby types of roofing at structures whose owners showed interest in PV systems.

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Milutin Đukanović

Chairman of the Board of directors

1. INTRODUCTION AND BACKGROUND

EPCG AD Nikšić / Montenegrin Electric Enterprise AD Niksic Elektroprivreda Crne Gore (hereinafter referred to as: EPCG), in accordance with its long-term goals, sustainability strategy and bilateral cooperation with the European Union (hereinafter referred to as: EU), as well as in order to reduce CO_2 emission, has initiated projects related to replacement and decrease in use of hazardous energy sources (coal in the first place). As one of the projects aimed at transitioning to the use of RES (renewable energy sources), having no harmful effects, EPCG aims to proceed with and offer to Montenegrin citizens the possibility to generate their own energy by installation of photovoltaic systems on rooftops and other suitable surfaces (the previously launched Solari [1] 3000+ Project caused very positive reactions by all the interested parties). Also, one of the factors for the transition to solar energy is the constant growth of electricity prices year after year, and according to predictions such trend will continue[2]; these are the reasons why every economy is obliged to conduct research on how to reach renewable and cheaper sources of electricity. Below we will analyse the different causal parameters that have a significant influence on the Decision to launch the Solari 5000+ Project.

One of the positive factors is the existence of numerous funds and agencies at the global level that are involved in stimulating development of RES, both through the loan lending and transfer of necessary know-how. Lending-related incentives are implemented through grants, subsidies, grace periods and favorable interest rates.

The system of transitioning to this type of energy supply is reflected in the fact that the entity which agrees to be installed PV systems will generate its own energy. The value of the investment for an individual entity is determined depending on the installed capacity of the panel. The total value of the investment is financed by EPCG by approving loans to entities. At the monthly

[1] Solari 3000+ Project is being implemented. All stakeholders: the entities, the Government of Montenegro and international associates acknowledged the project with positive reactions. More than 10.000 entities applied following the Public Invitation.

[2] The prices are explained in detail in the following chapters

level, the amount of the instalment for the entity will be approximately equal to the amount of the monthly bill (unless the entity wants larger instalment amount). After the loan repayment period, the entity has the possibility to buy additional energy from EPCG (if it consumes more than the volume installed) or the possibility to sell surplus energy to EPCG (if it consumes less than the volume installed) - the net effect of sales and purchase will amount to 0 at the annual level (netting is carried out each year in April). Also, entities are financed by EPCG at the same interest rate by which EPCG obtains funds from the financial institution.

The project provides various types of incentives for the economy, households and the international community:

1. Development of the economy when hiring contractors, which will increase the employment rate, given that this industry is underdeveloped – strong incentive was made via implementation of Solari 3000+ project, so the Project will continue to result in the sector development and employment sustainability

2. Acquiring more know-how about Green Energy and its positive effects. Increasing the share of RES within total electricity generation in Montenegro.

3. Positive effects onto the citizens and entities that, following expiry of the loan repayment period, receive significantly reduced electricity bills due to the fact that they generate energy by themselves (except in case of energy exchange due to the energy shortage or surplus, the settlement of which would be made once a year, in April, in the manner regulated by the Law on Amendments to the Energy Law, Art. 96)

4. There is no risk of a loss of energy source - the Sun is an inexhaustible source of energy.

5. EPCG exports/sells energy output on the stock exchange and generates additional income through higher stock exchange prices and lower cost prices - electricity volume that the entity previously consumed from EPCG is now generated by an entity itself, which is why EPCG has an "energy surplus" that it

can sell. This segment is of a significant importance having in mind increase in electricity prices in the last year, as well as predictions (which will be elaborated in the following pages).

6. Reduction of transmission losses - one of the significant negative items regarding EPCG operations due to the fact that electricity cannot be stored, and that the loss occurs whenever generation exceeds consumption, accurate predictability is not possible given the large number of end users, while on the other side the electric power system has to be able to withstand extreme consumption which can happen only at one particular moment in time.

7. Strengthening international relations through procurement of the project equipment as well as through financing of the project by the international institutions.

8. Fulfillment of the commitments undertaken by Montenegro in the area of pollution reduction, increase of the share of renewable energy sources in the overall Montenegro’s power system (defined by numerous directives and international agreements).

1.1 ELECTRICITY PRICES

As the price of electricity represents one of the important inputs for decision-making and consideration of the results obtained based on the analyses performed, we will present below the expected trends in prices, based on which we set the selling electricity price used in our Study.

Electricity price is significantly increasing compared with the previous years. The end of Covid pandemic resulted in recession of many economies which further led to high inflation. The below figure indicates inflation in October 2022, which is the highest in the last 10-15 years:

American inflation CPI	7.75 %	october 2022
English inflation CPI	9.61 %	october 2022
European inflation HICP	10.62 %	october 2022
German inflation CPI	10.39 %	october 2022
Japanese inflation CPI	3.80 %	october 2022
Chinese inflation CPI	2.17 %	october 2022

[3]**Figure 1 - Inflation on the global markets in October 2022**

General increase in consumer prices was followed by increase in prices of all energy generating products. Beside recession caused by Covid 19 pandemic, the impact of war between Russia and Ukraine, which started at the beginning of 2022, was also strong. Having in mind that Russia is a significant exporter of oil and other energy generating products on the global market, electricity prices on the market were considerably increased which brought about very unfavourable position of numerous states because of significantly higher electricity prices for their customers, while on the other side it proved necessity of electricity generating independence.

During the entire crisis, it turned out that owners, i.e. users of solar panels are in the most favourable position as they generate electricity by themselves, by means of the Sun, thus being independent of the market electricity prices. At this point of time, many countries have initiated rapid development of RES from solar and wind on the one side, while on the other side, there are even mandatory measures of energy saving imposed by the State, aimed at minimizing the need for import.

Trend in electricity prices in the leading European economies is presented below, indicating significant rise in prices since the beginning of 2022, whereat the maximum was above 500 EUR/MW in September 2022:

[3] Inflation 2022, international inflation figures from 2022 (global-rates.com)

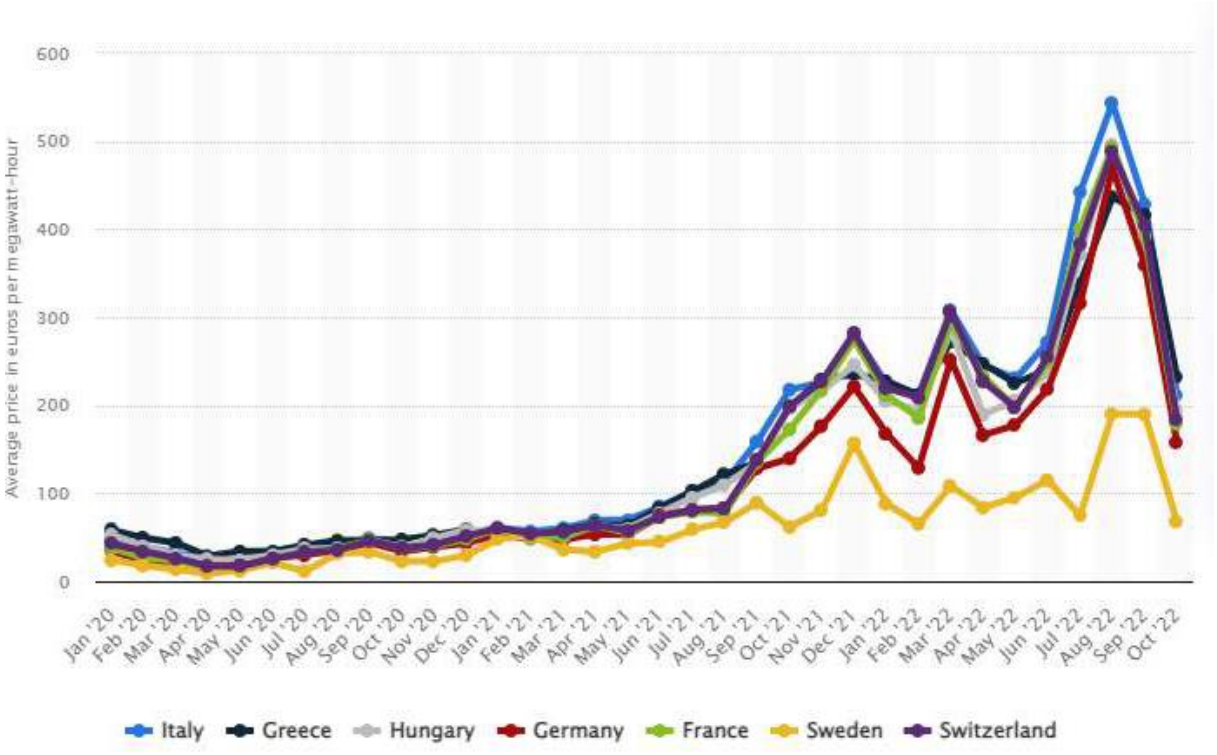

Figure 2 - Trend in electricity prices in the leading economies of Europe[4]

Given that Montenegro trades on the HUPX Hungarian Power Exchange, the prices on the concerned exchange during 2022 are presented below. Owing to unfavourable hydrological situation, Montenegro imported electricity via trading on the concerned exchange. Having in mind extremely high prices, EPCG could realize considerable revenues from electricity sale in the future on the account of a surplus generated as a result of implementation of Solari 5000+ project.

[4] EU:monthly electricity prices by country 2022/Statista

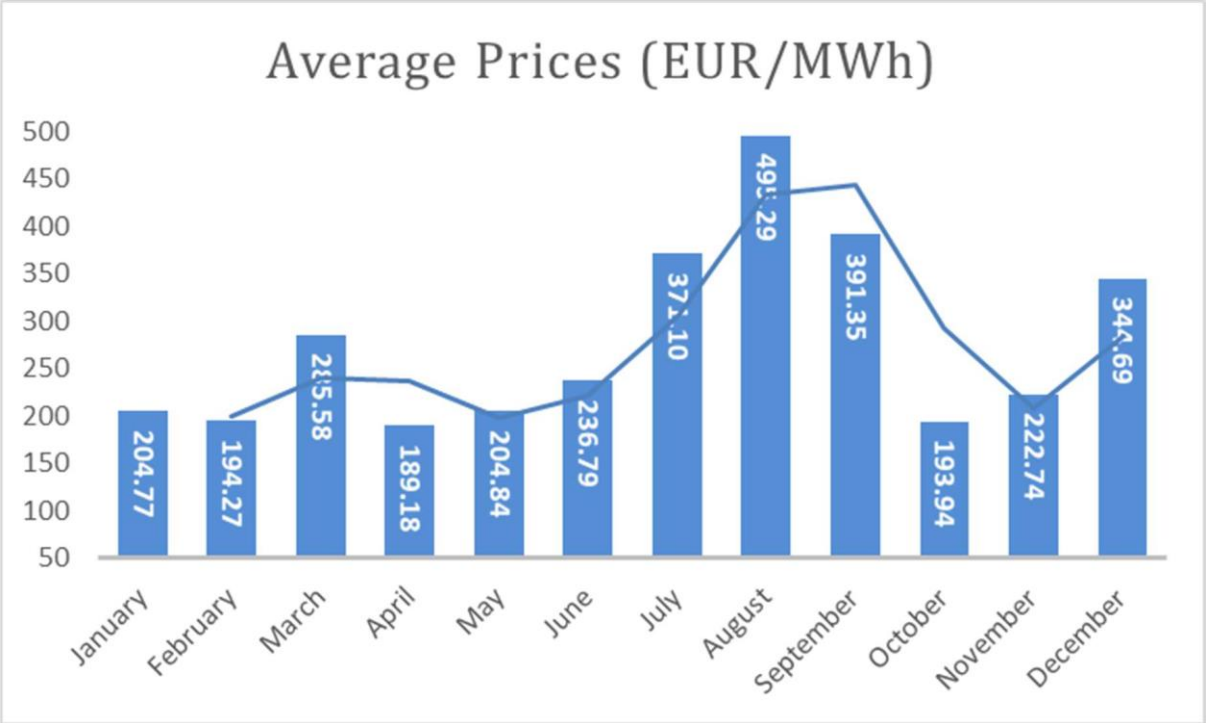

Figure 3 – Average electricity prices on HUPX power exchange in 2022[5]

With reference to the above statements regarding electricity prices, overview of expected prices in the furure is given below, so as to be able to use the relevant price in the remaining part of the Feasibility study, in which sale of electricity surplus represents a significant part of income. The figure below indicates varying of prices year after year of approximately 500 EUR/MW, while the minimum price is 140 EUR/MW for 2028.

A number of prices will be used in the Study depending on the year of observance[6], and based on the below prices we defined the prices to be used in the Study in the initial years of observance, as the prices are known to us[7]:

[5] Historical data - HUPX

[6] In the forthcoming years, electricity price is significantly high due to current market situation, while afterwards it decreases and gradually reaches 100 EUR/MW, which represents an expected long-term electricity price

[7] We used base electricity prices

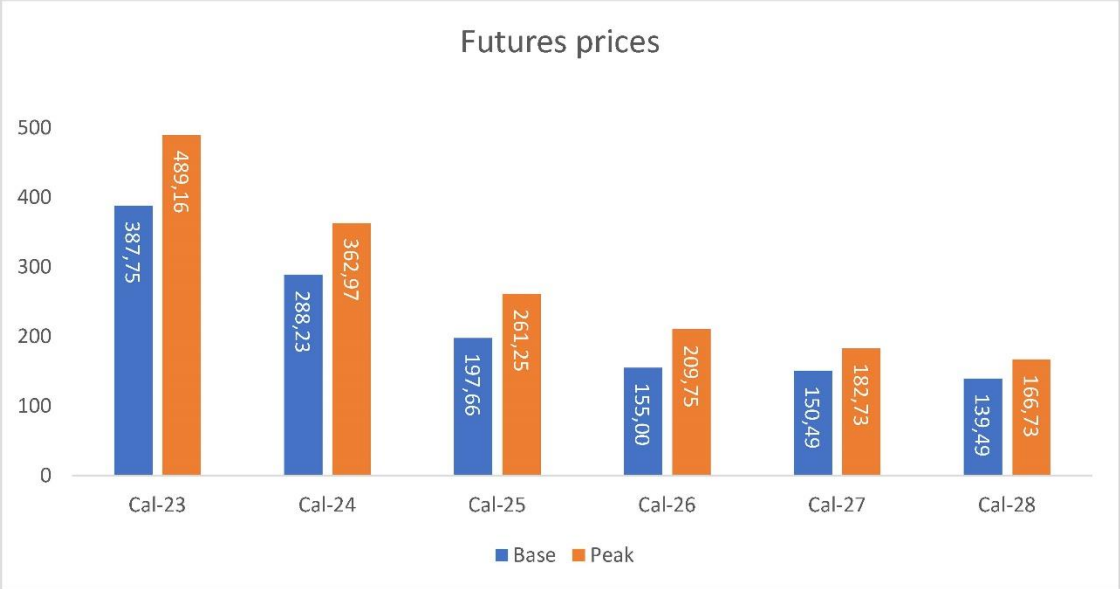

Figure 4 - Futures electricity prices[8]

As the previous figures indicated current prices and short-term predictions, the long-term predictions will be presented below on the basis of which we defined electricity prices by the end of the project lifetime (after 2028):

[8] Futures (eex.com)

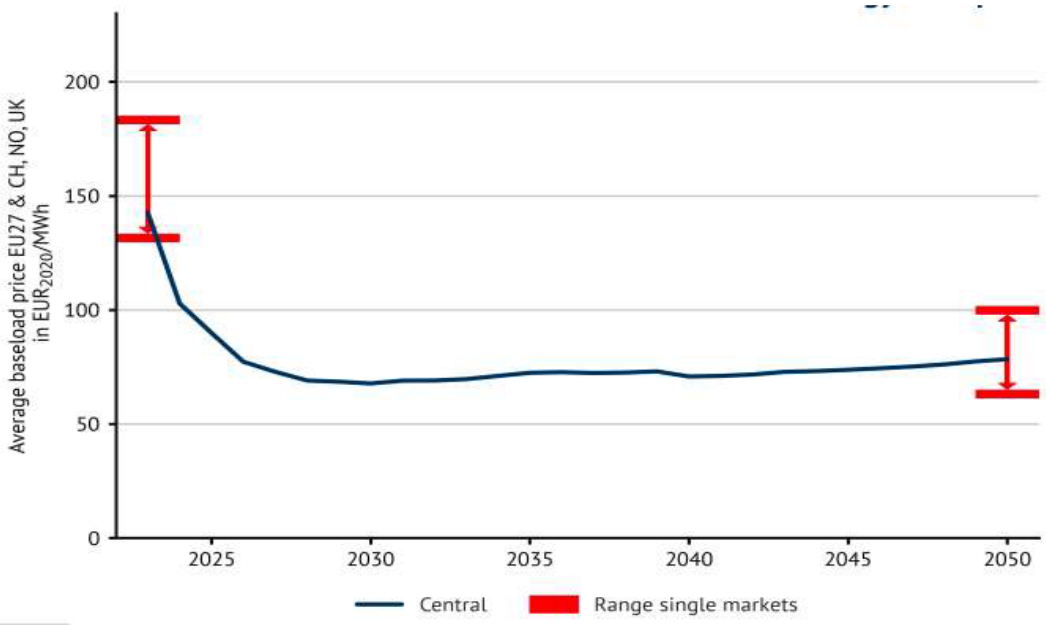

Figure 5 – Long-term electricity prices predictions[9]

Prices given for the period up to 2050 show that we can expect price stabilisation at the EU market after 2025. Forecasts were carried out by a German Consulting Agency [10] (Energy Brainpool) specialized in electricity matkets domain. In researches done for elelctricity prices up until 2050 was stated that wind-power plant and solar plants stake in generation would have a significant impact and that they were expected to lead towards stabilisation and lower electricity prices in future.

On the basis of the overall previous presentation of electricity prices on the market, we consider that the prices used for the purpose of the project financial justification, are justified.

[9] EU Energy Outlook 2050: How will the European electricity market develop over the next 30 years? | Energy Central

[10] Reference – Energy Brainpool

1.2 MARKET

In order to be familiar with the current state of Montenegro's power system, as well as the effect of Solari 5000+ (70MW) Project, we will present below the basic electricity sources and structure in Montenegro.

Below are the statistics related to the source of electricity in recent years (source: Statistical Office of Montenegro - Monstat):

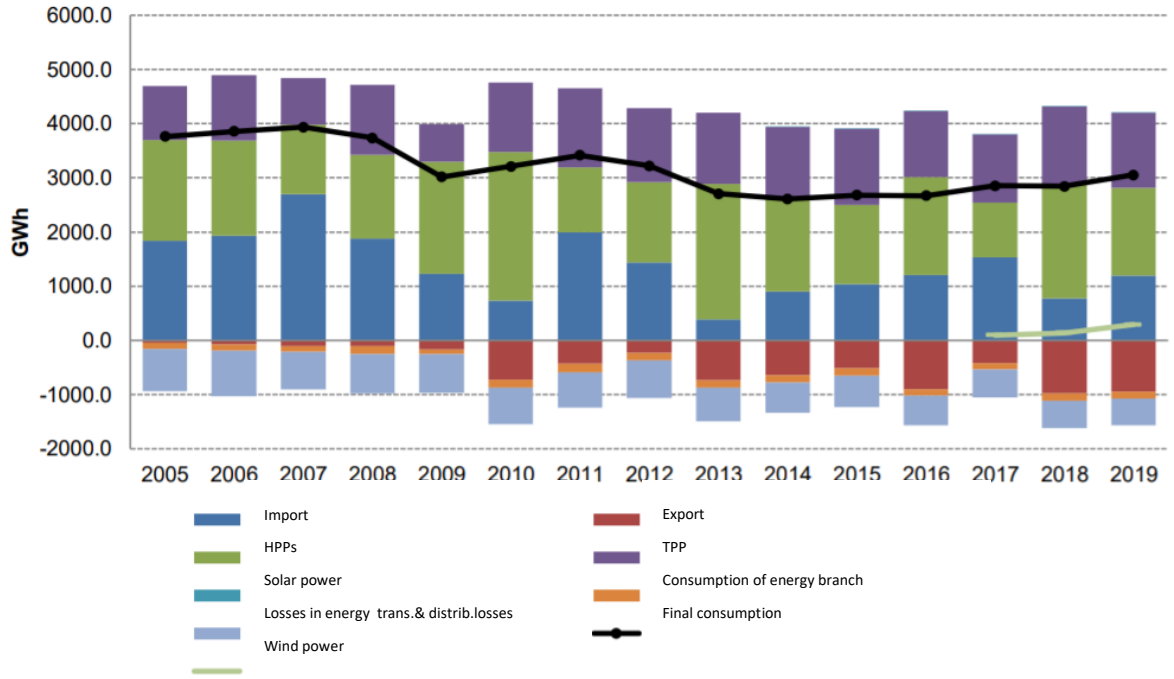

Figure 6 - Structure of electricity sources in Montenegro

According to the enclosed chart, supply of electricity using solar energy does not exist in Montenegro, i.e. it is negligible. We can also see that losses are considerably high (the Project will lead to reduction in losses), as well as the import during certain time of the year.

In addition to the above, we can also notice large share of TPP Pljevlja, as well as significant CO_2 emission which will be reduced by greater installation of PV systems that generate electricity from renewable energy sources. Installation of photovoltaic modules will lower dependance on TPP Pljevlja, i.e. the

structure of electricity sources in Montenegro will have changed to the benefit of RES causing thereby reduction of CO2 emmissions. Given the volume of pollution by TPP Pljevlja the first source to suffer reduced electricity generation will be TPP Pljevlja up until all preconditions for winding down are met.

With this project (following implementation of Solari [11] 3000+) we would continue with the new type of electricity generation which, as a consequence, has no adverse effects on the nature and the environment, households and economy.

One of the market-related positive effects of the project is that PV systems are installed at pre-arranged consumers, depending on their consumption, which will result in reduction of network losses.

As for the users as end buyers of PV systems, and the solar energy capacities, it is evident that the market is huge and the capacity is unused. Based on the above we can see that majority of users have the possibility to install PV systems (provided that it is technically feasible), where construction/installation can be completed physically, in compliance with relevant technical requirements (this mainly refers to the area necessary for installation, as well as to the sufficient amount of global radiation which is very favourable in Montenegro[12]).

Objective of the Project is installation of PV systems with total installed capacity of 70 MW. It is planned for the installation to be carried out mainly with commercial entities whose demands exceed 30kW of installed capacity.

In order for a customer to apply for a loan by EPCG, the Public Tender will be launched, containg clear criteria for eligibility of customers for installation of a PV system, as well as for minimising potential risks (collection…).

It is also important to have in mind that it would not be profitable for an individual entity to install PV systems by itself, given that individual prices would be considerably higher (even 40%) in case of a retail procurement. In that regard, EPCG, as an intermediary, provided considerably favourable and profitable conditions for all customers.

[11] Solari 3000+ Project will result in installation of PV systems of about 26 MW

[12] Sunny hours are elaborated in the Addendum to the Study

The way EPCG sees the electricity market it could be said that EPCG has a monopoly given that it is the only electricity producer while on the other hand the end product (electricity) means goods needed by each individual, household and structure in order to implement their day-to-day activities and basic necessities. There is no exchange or other system by means of which electricity trading could be done but EPCG takes part at foreign exchanged by support of its daughter companies.

1.3 ENVIRONMENT

Given the global changes that have taken place in recent decades and their negative impact on the environment and quality of life, various organizations and unions have been established worldwide aimed at preserving the Earth and ensuring higher and healthier quality of life in terms of pollution and health. Alongside unions, associations and organizations, certain standards have been established to improve or solve some problems in this area.

Montenegro is one of the countries that joined such organizations and accordingly implemented various postulates and standards in its legislation that originate from various associations, unions and organizations, with the aim of preserving the environment and increasing quality of life. Montenegro became the member of the following organizations and signed the following agreements:

1) Accession to the Energy Community – November 3, 2006. Montenegro adopted the Law on Ratification of the Agreement between the European Community and the Republic of Montenegro on the Establishment of the Energy Community, which was signed in Athens on October 25, 2005. The main goal of this Law is to attract investments in order to ensure continuous, quality and optimal electricity supply, establishing integrated energy market by creating conditions for cross-border trading and integration with the EU market, improving competition and the environment using renewable energy sources.

2) Montenegro ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change - ratified on March 23, 2007, which focuses on the quantification of GHG emissions (greenhouse effect) and increase in efficiency.

3) Convention on Long-range Transboundary Movements of Pollutants and associated Protocols - the aim of the Convention is to limit and reduce air pollution as much as possible. Associated protocols: EMEP (long-term funding for monitoring and evaluation of a long-range air pollution transmission), Protocol on Heavy Metals (reduction of cadmium, lead and mercury emissions as a consequence of industry, fuel combustion and waste incineration), Protocol on POPs (reduction of dioxins, furans, polycyclic aromatic hydrocarbons and HCB), Gothenburg Protocol (setting the maximum national level for emission of certain pollutants).

4) The Vienna Convention and the Montreal Protocol - reducing emissions of substances that damage the ozone layer - the largest convention including 197 members.

5) The Sofia Declaration - introduction of CO2 emission taxes, stimulating renewable energy sources as well as gradual abolition of coal subsidies.

6) The Paris Agreement – aimed at preventing rise in temperature by reducing GHG emissions to the level of 3,667 kilotons.

The study above contains certain number of agreements and declarations with Montenegro being part of them. Anyway, the primary goal is reduction of pollution and improvement of the quality of life. Taking into account increasing number of various penalties for pollution as well as the tendency of the EU to exponentially increase the share of renewable electricity sources in the entire energy system, Montenegro has to set this goal as one of the main goals for development, economic growth and air quality improvement as well as for people’s health.

So far, the environmental protection in Montenegro has not been given much importance, except declaratively.

In order to fulfill commitments arising from the above mentioned international agreements in Montenegro, the following national regulations were adopted aimed at reducing emissions of pollutants:

- Law on Air Protection;
- Regulation on limit values for emissions of air pollutants from stationary sources;
- Regulation on maximum national emissions of certain pollutants.

Montenegro has not taken any significant, practical steps to ensure reduction of harmful gas emissions. It is only at the beginning of 2020 that the Environmental Protection Fund-Eco Fund[13] was established, whose main activity should be incitement and development of the projects which would contribute to preservation of the environment.

By recognizing the needs for environmental protection thus enabling healthy lifestyle, energy transition is one of the most important activities for implementation of these strategic goals.

Strong energy transition reflected in reduced use of harmful sources (fossil fuels - coal and oil in the first place) in electricity generation and their substitution with renewable energy sources make it possible to achieve, relatively quickly, a significant step forward in preserving the environment without endangering socio-economic stability of the society.

Montenegro has exceptional potentials for generation of electricity from renewable sources – water, as well as wind and solar.

[13] Provides subsidy of 20% for participants of the Project Solari 3000+

Being aware of the fact that if the projects that will enable generation of electricity from renewable sources are not launched immediately, and having in mind the present condition of TPP Pljevlja, condition of the transmission and distribution network, as well as the fact that Montenegro could face not only huge energy problems - the Ministry of Ecology, Spatial Planning and Urbanism, EPCG, the Ministry of Capital Investments and the Environmental Protection Fund-Eco Fund decided to launch an initiative for implementation of the Solari-3000 +, 500+ Project which is currently in progress, as well as Solari 5,000+[14] while the Project 10,000+ is planned to be implemented in the future period, having in mind immense interest of households in Montenegro in this Project (over 14,000 applied).

Given the problems that EPCG has been faced with, with reference to operation of TPP Pljevlja which has limited service life and, consequently, the need to replace electricity generation that carries risks for the environment with generation from renewable energy sources, EPCG's strategic commitment to promote electricity generation from renewable sources is easy to understand. This is in line with the objectives that, according to the European and international commitments, carbon-dioxide (CO_2) emissions in Montenegro should be reduced by at least 55% by 2030, while EU plans to complete the de-carbonization of energy systems by 2050, which is what Montenegro will strive for.

So far, CO_2 emissions from TPP Pljevlja represented more than half of CO_2 emissions in Montenegro and it generated almost 40% of the total electricity output generated in Montenegro. Taking into account EU Large Combustion Plant Directive, introduction of taxes on CO_2 emissions and the fact that continuation of TPP operation will be conditioned by significant investments, which will substantially increase electricity price and make generation unprofitable, EPCG is even more commited to participate significantly in Projects that promote generation of electricity from renewable energy sources. We can establish the business rule - the sooner we get new kilowatt hours from

[14] Solari 500+ and Solari 5,000+ are focused on large customers – commercial entities, while Solari 300+ and Solari 10,000+ are focused on households

renewable energy sources, the easier rehabilitation of TPP Pljevlja, with less socio-economic problems.

On April 20, 2021, the Secretariat of the Energy Community initiated the procedure for resolving disputes against Montenegro for violating the Large Combustion Plant Directive due to exceeding the number of allowed operating hours of TPP. Upon expiry of 20,000 operating hours, plants can remain in operation only if they meet (more stringent) standards of the Industrial Emissions Directive, which is not the case with TPP Pljevlja, as pointed out by the Secretariat of the Energy Community.

These problems related to exceeding allowed number of operating hours make the situation almost ultimate; any investment in renewable energy sources is more profitable than further insistence upon generation based on fossil fuels.

Furthermore, costs pertaining to connection of these small power plants to the grid would be negligible, what makes implementation of the entire project much easier. Also, the procedures for obtaining construction permits are almost formality.

Implementation of this Project must take into account the declared policy of the European Union and readiness of its financial institutions to approve favorable loans with the grants included, what would make this and other similar projects significantly cheaper and energy transition much faster and more efficient.

Implementation of this Project would create more favorable investment climate for investing in renewable energy sources, and the Project implementation could continue aimed at installing PV systems to all consumers who want it (including legal entities as well) and who meet the prescribed technical and financial requirements.

Given that Montenegro is not a member of the EU, it is not part of the CO_2 emissions trading system (ETS), which makes the price lower than the prices in the EU. The situation is the same in regional countries which also generate electricity from fossil fuels (mostly coal and lignite), because the price of CO_2 emission is not a component of the price. For this reason (in addition to the primary objective – pollution reduction), the Energy Community has instructed its non-EU Member States to internally regulate (charge) CO_2 emissions.

In the report "Carbon Pricing Design for the Energy Community" published in January 2021, the Energy Community clearly sets out the current situation, reasons, objectives and the way of forming prices for CO_2 emission. The pricing model should have a transition component, and the price would be certainly more favorable than in the case of trading on the EU market. The model is aimed not only at charging, but primarily at creating motivation to become oriented towards Green Energy.

In order to show positive effect that introduction of trade in permits had in the EU (the total number of permits decreases year after year), below is the following overview[15]:

[15] Carbon Pricing Design for the Energy Community – Study developed by Secretairat of the Energy Community, January 2021

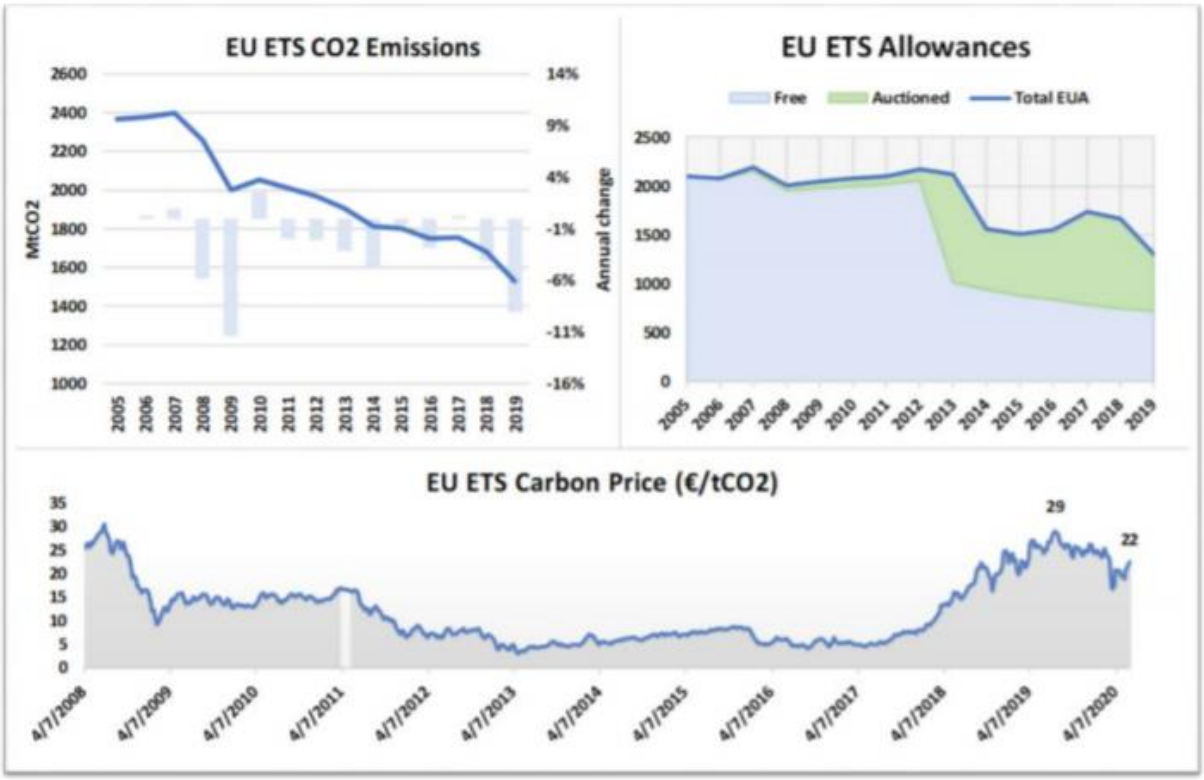

Figure 7 - Effects of introducing the market of trade in permits for CO_2

The above overview shows continuous decline in CO_2 emission in EU countries, which is a consequence of the growing orientation towards renewable energy sources and the shutdown of plants that operated by burning fossil fuels. On the other hand, we can see the continuous tendency to increase price of emission, which is an additional stimulus for the community's orientation towards Green Energy. The constant growth of emission price will cause the growth of electricity prices and, at some point, it will become insolvent and unprofitable form of electricity generation.

Given that, according to the above overview, charging CO_2 emission has led to significant positive effects, the measures introduced by the Energy Community for its non-EU Member States should also have the same positive effect.

The Energy Community has proposed CO_2 tax, which would correspond to the taxes existing in all countries:

In EUR	Heating oil (per lit)	Complementary excise tax (per lit)	Complementary tax expressed in CO2 (carbon tax)
ALBANIA	0.297	0.063€/lt	0.0056€/CO2e

BOSNIA & HERZEGOVINA	0.228	0.132€/lt	0.035€/CO2e
GEORGIA	0.158	0.202€/lt	0.053€/CO2e
KOSOVO*	0.150	0.210€/lt	0.056€/CO2e
MOLDOVA	0.143	0.210€/lt	0.056€/CO2e
MONTENEGRO	0.120	0.24€/lt	0.064€/CO2e
NORTH MACEDONIA	0.051	0.309€/lt	0.082€/CO2e
SERBIA	0.252	0.108€/lt	0.029€/CO2e
UKRAINE	N/A	N/A	N/A

Figure 8 - Recomended tax on CO2 - Secretariat of the Energy Community

The fossil fuel price projection was also made taking into account characteristics of each country:

EU-ETS in EUR/tnCO2	2015	2020	2025	2030	2035	2040
All CPs	7.50	12.00	26.50	32.00	53.00	80.00
Carbon Price EU ETS in Gradual Scenarios in EUR/tnCO2	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
BG	7.5	12	26.5	32	53	80
GR	7.5	24	26.5	32	53	80
RO	7.5	24	26.5	32	53	80
AL	0	0	26.5	32	53	80
BA	0	0	6.625	16	39.75	80
GE	0	0	26.5	32	53	80
KV	0	0	3.975	11.2	34.45	68
MD	0	0	26.5	32	53	80
ME	0	0	7.95	20.8	45.05	80
MK	0	0	7.95	20.8	45.05	80
RS	0	0	6.625	16	39.75	80
UA	0	0	6.625	16	39.75	80

Figure 9 - Expected development of CO_2 emission cost - Secretariat of the Energy Community

Here we can clearly see the expected increase in the price of CO_2 in all EU member states, as well as in those that are not. On the other hand, this is another confirmation regarding the necessity of orientation towards Green Energy because, in the near future, there will be a significant increase in the price of electricity generation from fossil fuels so it will be potentially unprofitable.

2. COST-EFFECTIVENESS OF THE PROJECT

The cost-effectiveness of a project of this kind is a bit of a specific character. First of all, there are several goals (impact on the economy of Montenegro, impact on households, as well as the impact on EPCG) and therefore it is not easy to analyze the cost-effectiveness.

One of the important characteristics that we should keep in mind during further analysis is that EPCG is an intermediary, more precisely EPCG does not lend resources to entities from its own sources, but from funds obtained from financial institutions. This is very important to understand, in order to properly perceive the different indicators and correlations between vario,us parameters.

The main goals of this Project are listed below:

1. Increasing the share of electricity obtained from solar sources as one of Montenegro's commitments to the EU.

2. A positive effect on the entity, which can produce its own electricity, and significantly reduce electricity bills, as well as protection against the expected increase in the electricity price.

3. As regards EPCG[16], besides the social goals related to increasing the share of Green Energy, EPCG will have a financial profit from this type of investment, as well as acquiring the necessary knowledge for further development of solar energy in Montenegro. Further to the financial profit, EPCG will develop and learn about various globally used technologies and methods related to the solar energy, which is extremely important in the long run, given the plans of EPCG to focus on renewable energy sources.

[16] Within EPCG, as a subsidy, a new subsidy Solar gradnja was founded in 2022, whose main activity is the installation of photovoltaic systems to the entities - the company deals with the entire process - from the obtainin of the necessary documentation and permits, to the commissioning.

Through this project, we assumed that there are three main participants and the overall analysis will be observed from all three angles, so that the justifiability and cost-effectiveness of the project would be confirmed and perceived:

1. **Entities/users** – they become a part of the project by consent taking into account all the positive effects to be experienced throughout many years - **from the standpoint of a entities, the project is cost-effective if they do not pay a monthly instalment that exceeds the average monthly bill and another positive effect is the chance to repay the borrowed funds in the shortest time possible.**

2. **Financial institutions** –further to interest income, a positive effect is that RES financing will make part of their portfolio, given that the green energy is in focus **– the project is profitable if the project's net present value, which reflects the project risks, is positive.**

3. **EPCG** –learning about new technology, increasing the RES share –**the project is profitable if the criteria of the financial institution (positive net cash flow) and of the entities are met; from the standpoint of EPCG, the net present value needs to be positive alongside the loan repayment period acceptable for the Management.**

It is also important to mention the decreasing of unemployment due to the engagement of the required workforce for the implementation of the project.[17]

[17] The employment increasing will be the topic therefore

2.1 ECONOMIC-FINANCIAL INDICATORS

The following financial indicators shall be observed through the analysis:

1. *Discounted cash flows* (Net Present Value) – shows the value of future cash flows at present. The project is considered as viable if the Net Present Value is above 0, i.e. positive. We will analyse both financial and economic cash flows. The difference is in the fact that the economic cash flows do not take into consideration the sources of financing, but reflect the self-sustainability of the project.

2. *Return on investment period* – shows the period upon which the invested money is going to be returned based on the economic cash flows. The project is deemed viable if it coincides with investors' expectations – most frequently, the aspect that is observed is whether the return period is shorter that the loan repayment period.

3. *Internal rate of return* (IRR) – shows the value of the rate of return that makes the economic net present value equal to 0 (cut-off point). Should the IRR be above the average weighted price of capital (that represents the expected rate of return to investors) the project is deemed viable.

4. *DSCR (Debt Service Coverage Ratio)* – the ratio which indicates debt coverage by the project inflows. It is expressed in the amount by which the inflows are higher than outflows based on debt thus providing additional safety to the financiers.

The economic and financial parameters have the same value given that all the effects are included, the difference is represented by the inflow and outflow of the loan of EPCG, which is not taken into consideration under the economic indicators, but is considered under the financial cash flows. In line with the above, the calculation shall be done and both methods presented. Also, the effects that may be only descriptively analysed are explained in detail further in the document.

2.2 PARAMETERS AND VARIABLES

Prior to observing the cost-effectiveness, some of the set assumptions and other parameters to be used in the analysis itself shall be clarified, in order to provide an all-encompassing picture and insight into all components of the project.

1. **Specific annual yield of electricity** [18] – this is both the basic and the most important parameter considering that the subject matter is solar energy. What needs to be stated is that a more conservative approach has been used, and the fact that different parts of Montenegro have different specific annual yield of electricity which depends on the intensity of sunshine, irradiation, slope and a number of other factors, has also been taken into account. Three regions were singled out: northern, central, and southern region. Depending on the specific annual yield of electricity, PV systems can produce different volumes of electricity. For example, should 50 kW PV systems be installed per one household in all three regions, different volumes of electricity will be generated in all of them. The southern region has the highest specific annual yield of electricity, while the northern region has the lowest:
    - Northern: 50 kW*1.571 specific annual yield of electricity = 78.550 kWh/kW
    - Central: 50 kW*1.637 units specific annual yield of electricity =81.820 kWh/kW
    - Southern: 50 kW*1.686 units specific annual yield of electricity =84.300 kWh/Kw

The above shows that the specific annual yield of electricity determines the capacity of the panel that should be installed by the entity, so i.e. a entity that consumes 81.000 kWh and it is located in the south can install a panel

[18] Detailed information on calculation is provided in the enclosure to the Study

of lesser capacity because it has more hours of sunshine, while the entity in the north should install a panel of higher installed capacity given the significantly lower specific annual yield of electricity throughout the year, all in order for the installed panels to produce a sufficient amount of electricity for the subject.

The impact of the region will be taken into account in the analysis by applying different percentages of participation from all regions in the total amount of installed power that we expect.

2. **Price of the overall installation and panels –**The analysis has been conducted and non-binding proposals from certain suppliers collected, which resulted in the prices used in the analysis. The prices comprise all the components starting from procurement to system commissioning and monitoring, which also includes all the necessary permits and other supporting documents which partly fall under competence of EPCG and ESG[19], partly require cooperation with external institutions providing certain certificates and permits[20]. Below are the price components per 1 kW:

[19] ESG Elektroprivreda Solar Gradnja – the business company founded as a subsidiary of EPCG (100 % ownership) at the beginning of the implementation of Solari 3000+ project. The main business activity of the company is the installation and commissioning of the equipment. The Company's founding was encompanied by creation of the Business plan in which the concept of ESG business activity was reviewed in detail.

[20] The price is included in the section - Other administrative costs.

1Kw	Summary	Price
1	PV modules	381
2	Inverters	79
3	Substructure of photovoltaic modules	64
4	Connection equipment	125
5	Electrical installation works	150
6	Other administrative costs	30
	Total without VAT included	829
	VAT	21%
	Total with VAT included	**1.003**

Figure 10 - Installation price components based on non-binding offers and experience through Solari 3000+

Given that the project is per 1kW, as well as the price – it is assumed a high level of flexibility to install individually required amount of installed power. The overall flexibility and price justification was confirmed through the Preliminary Technical design[21].

3. **Installed capacity –** The project is based on 70 MW of installed capacity coming from over 1.000 entities, where each individual entity installs a unique required power[22] and thus becomes a mini solar power plant. Depending on the installed capacity, this project also results in significantly in a significant reduction of technical losses in the transmission and distribution network.

4. **Entities' instalment –** this is the most important parameter from the standpoint of the entities. Given that the project is acceptable for the entity only if the instalment is equal to or lower than the average monthly bill, the loan repayment period extends with the higher installed capacity (the higher value credited by EPCG).
   The Study is grounded on the assumption that the entities shall pay instalments that are almost identical to the average electricity bill.

5. **Subsidies -** the mentioned subsidies refer to subsidies for entities, not EPCG. The Eco Fund provided a 20% subsidy for the Solari 3000+ project, while now EPCG will provide a 20% subsidy to the entities - this means

[21] Greener doo, November 2022 - made on the basis of the ToR sent by EPCG

[22] Due to the above, the price was formed per 1 Kw.

that EPCG is returning the entire amount of the loan, while entities are returning the amount minus the subsidy.

6. **Interest rate –** Through the project development and launch of the tender for project financing, we received bids based on which we concluded that the expected interest rate stands at 3% for a 10-year period, with a 2- year grace period.

7. **Generated volumes of electricity (kWh) -** This parameter is obtained through simulation of system's annual operation, by use of the professional software tool PV SOL 2021 premium [23] . The system generation has been analysed for several specific locations (north, central region, south) as well as for the different azimuth and altitude angles for the installation of PV modules. This data also provides the parameter – specific annual yield of electricity which is further used in the study through two different values (kWh/kW or kWh/kWp) depending on whether direct or alternate power of PV system is being analysed. The generated volume of electricity primarily shows the volume of electricity which EPCG will be able to sell on the market exchange, given that the same entities that consumed that electricity are now producing electricity with PV system.

8. **Technical department –**The plan is to set up a technical service of 5 employees in EPCG tasked with monitoring, reporting and executing interventions tied to solar panels. The service would be trained in line with the requirements of this type of engagement.

9. **Selling price -** represents the price of electricity at which EPCG will export/trade on the market exchange. The price that we will use in the analysis is different from year to year due to very large influences on the prices of electrical energy in the course of 2022. We have discussed trends in previous sections, and we will use prices previously presented and justified.

[23] Greener doo

10. **Purchase price –** represents the generation price of the given volume set by EPCG. This is a fixed amount of 0.045 €/kWh based on information obtained by EPCG engineers.

11. **Efficiency -** so far, practice has shown a 0.5% annual drop in efficiency of electricity generation by panels. From the standpoint of analysis, this means that EPCG will have lower volumes of electricity available for export year in year out.

12. **Exchange –** the expected net effect in the study equals 0.

- Generation exceeds consumption – in this case, EPCG should buy electricity surplus from the entities, which it sells further – this gives the entities an opportunity to make earnings;
- The entity has consumed more than it has generated, and in this case the entity receives a bill for the additionally consumed electricity distributed by EPCG.

As proposed, the settlement of surpluses and deficits for households is to be done once a year, as set forth under the Law on Amendments to Energy Law, Article 96, which foresees for the settlement of the balance to take place in April each year, and if the balance is positive, EPCG shall be required to settle liabilities towards the entity that produced more than it consumed (surplus sold to EPCG) within 30 days.

13. **Weighted average cost of capital (WACC) –** shows the cost of capital. The ground expectation of EPCG has been empirically set to 5% which is to be augmented by the interest rate so, from the said standpoint, the parameter is 8% considering that we take an interest rate of 3% for the loan that EPCG gets for the period of 10 years.

Based on the previously stated parameters and assumptions, the calculation of economic-financial indicators is to be carried out as follows.

Terms of Reference input parameters:

1. **Structure of installed capacity and generation output** by regions:

Region	Structure	Specific annual yield	Installed capacity kW	Electricity generation (kWh)
South	40%	1,686	28,000	47,208,000
Centre	40%	1,637	28,000	45,836,000
North	20%	1,571	14,000	21,994,000
Total	100%		70,000	115,038,000

Figure 11 - Structure of the installed capacity and electricity generation by regions

As can be seen from the above presentation:

- 40% of the total installed capacity of 28 MW will be located in the southern part of Montenegro which has the highest specific annual yield of electricity of 1,686 kWh per 1kW of the installed capacity, which results in electricity generation of 47 GWh;

- 40% of the total installed capacity of 28 MW will be located in the central part of Montenegro which has the specific annual yield of electricity of 1,637 kWh per 1kW of the installed capacity, which results in electricity generation of 46 GWh;

- 20% of the total installed capacity of 14 MW will be located in the northern part of Montenegro which has the lowest specific annual yield of electricity of 1,571 kWh per 1kW of the installed capacity, which results in electricity generation of 22 GWh.

The most favourable option certainly is to have as many installations as possible at locations with the highest specific annual yield of electricity but the Terms of Reference is based on reasonable expectations included in this segment. What also must be stated is that the specific annual yield of electricity per region has been calculated in relation to the actual data.

Taking into account the above structure, the total installed capacity shall stand at 70 MW which, given the presented specific annual yield of electricity, will result in the total of approximately 115,038.000 kWh generated from renewable energy sources. This volume of electricity represents the surplus of EPCG to be exported/sold.

Furthermore, it is important to state that certain negative effects may occur, including combustion of fossil fuels that some households used before. Pollution and the amount of pollutants will accordingly be decreased, which is also one of the goals of the overall project, so that Montenegro could meet certain EU requirements as well ascertain Directives signed with various world organisations.

2. Instalment paid by the entity - according to the Terms of Reference, the instalment paid by the entity is approximately equal to the average monthly bill paid by the entity.

3. Base prices of PV systems have been presented in detail, by components, in the previous section.

4. Selling price of electricity – this parameter has been used as a parameter generating income for EPCG:

Year	Price/MWh
2024	288.23
2025	197.66
2026	155.00
2027	150.49
2028	147.48
2029	144.53
2030	141.64
2031	138.81
2032	136.03
2033	133.31
2034	130.64
2035	128.03
2036	125.47

Year	Price/MWh
2037	122.96
2038	120.50
2039	118.09
2040	115.73
2041	113.42
2042	111.15
2043	108.92
2044	106.75
2045	104.61
2046	102.52
2047	100.47
2048	98.46

Figure 12 – electricity prices based on actual market price, short-term and long-term expectations

It is important to point out in this segment that we decided to have one scenario for the electricity selling price, out of the following two reasons:

1. Currently known and the most relevant prices are used as agreed with EPCG management. The concerned prices are the only reliable at the moment. The prices are currently justified and safe for a shorter period (in the next few years) having in mind that EPCG is currently trading with futures
2. We intend to avoid burdening of the Study with high number of scenarios as development of Solari 3000+ (5000+ is the continuation) has already indicated high profitability of the project even with considerably lower prices compared with those used herein, which are alligned with current market changes. In the Study for Solari 3000+, the price range of 50-100 EUR MWh was used and it turned out that the Project is more than profitable.

The selling prices represent the primary input for inflow from sale (export). Once the photovoltaic modules are installed, the volume of electricity which is now generated by the user for themselves, and that previously consumed electricity generated by EPCG, is becoming available for sale by EPCG, in thus enabling revenues for EPCG (after payment, the inflows as well).

5. Inflows from other activities – represent the inflows from reduction of losses in network as a result of photovoltaic systems implementation. More precisely, the very reduction of losses in network results in higher volume of electricity available for sale.

6. **Purchase price** of 0.045 €/kWh
7. **Compensation for** EPCG Solar Gradnja amounting to 10% of the electricity selling value representing the surplus due to installation of PV systems – the segment is represented within outflow;
8. 3% **interest rate**;
9. **Technical department –** costs of employees in charge of maintenance and providing answers to the users questions[24]
10. 10-year loan repayment by **EPCG**

[24] Employees carrying out installation of PV modules are employed in Solar gradnja. Following the project implementation and depending on the requirements identified over the course of the Project implementation, certain number of employees will be later in charge of maintenance

11. **Income tax –** income tax rate of 15% was used. The rate is progressive in Montenegro, while EPCG, according to its business operations and income, belongs to the group of taxation at the rate of 15%[25]

2.3 TERMS OF REFERENCE – INVESTMENT WITH 20% SUBSIDY

The Terms of Reference is reflected in combination of previously stated parameters for the purpose of analysing the profitability of the project. It is important to state that 20% subsidy is included and detailed overviews of values of various indicators are given below.

We will present two scenarios depending on whether the project is analysed for the maximum period of 25 years, which is also the lifetime of PV modules, or for the period of 20 years, in order to obtain higher certainty that the project is feasible in both cases.

Total investment amount - €70.2 million

€14 million subsidy

2.3.1 PROJECT ANALYSIS FOR THE PERIOD OF THE ENSUING 25 YEARS

Presentations and calculations of economic & financial parameters are given below:

Financial cash flow:

Financial cash flow	0	1	2	3	4	5	6	7	8	9
Cash inflow	**70,214,485**	**45,032,988**	**34,500,304**	**29,528,612**	**28,929,269**	**28,504,632**	**20,492,829**	**16,277,897**	**15,884,198**	**15,500,301**
Loan proceeds	70,214,485									
Instalment of entity		11,408,918	11,408,918	11,408,918	11,408,918	11,408,918	3,811,179	0	0	0
Sale (export)		33,157,403	22,624,719	17,653,027	17,053,684	16,629,047	16,214,984	15,811,231	15,417,531	15,033,635
Other proceeds from business activities		466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**70,214,485**	**14,024,531**	**11,528,369**	**20,222,201**	**20,060,635**	**19,940,255**	**18,682,829**	**17,955,940**	**17,883,220**	**17,772,934**

[25] Corporate Income Tax, aarticle 28, 17 January, 2022

Loan disbursements (annuity)		0	0		9,883,030	9,883,030	9,883,030	9,883,030	9,883,030	9,883,030
Equipment purchase and implementation	70,214,485									
Disbursement based on electricity generation		5,176,710	5,150,826	5,125,072	5,099,447	5,073,950	5,048,580	5,023,337	4,998,220	4,973,229
Disbursement for salaries of Technical Department		60,000	61,200	62,424	63,672	64,946	66,245	67,570	68,921	70,300
EPCG Solar		3,315,740	2,262,472	1,765,303	1,705,368	1,662,905	1,621,498	1,581,123	1,541,753	1,503,363
Income tax (15%)		5,472,081	4,053,871	3,386,372	3,309,117	3,255,425	2,063,476	1,440,880	1,391,295	1,343,011
Net financial cash flow	**0**	**31,008,457**	**22,971,935**	**9,306,411**	**8,868,634**	**8,564,377**	**1,810,000**	**-1,718,043**	**-1,999,023**	**-2,272,633**
Discounted cash flow	**0**	**28,711,534**	**19,694,732**	**7,387,729**	**6,518,711**	**5,828,771**	**1,140,607**	**-1,002,461**	**-1,080,010**	**-1,136,882**
DSCR				2.99x	2.93x	2.88x	2.07x	1.65x	1.61x	1.57x

Financial cash flow	10	11	12	13	14	15	16	17	18
Cash inflow	**15,125,964**	**14,760,947**	**14,405,020**	**14,057,955**	**13,719,532**	**13,389,535**	**13,067,756**	**12,753,989**	**12,448,034**
Loan proceeds									
Instalment of entity	0	0	0	0	0	0	0	0	0
Sale (export)	14,659,297	14,294,281	13,938,353	13,591,288	13,252,865	12,922,869	12,601,089	12,287,322	11,981,368
Other proceeds from business activities	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**17,665,023**	**7,676,403**	**7,573,078**	**7,471,965**	**7,373,013**	**7,276,170**	**7,181,387**	**7,088,618**	**6,997,813**
Loan disbursements (annuity)	9,883,030	0	0	0	0	0	0	0	0
Equipment purchase and implementation									
Disbursement based on electricity generation	4,948,363	4,923,621	4,899,003	4,874,508	4,850,136	4,825,885	4,801,756	4,777,747	4,753,858
Disbursement for salaries of Technical Department	71,706	73,140	74,602	76,095	77,616	79,169	80,752	82,367	84,014
EPCG Solar	1,465,930	1,429,428	1,393,835	1,359,129	1,325,286	1,292,287	1,260,109	1,228,732	1,198,137
Income tax (15%)	1,295,995	1,250,214	1,205,637	1,162,223	1,119,974	1,078,829	1,038,771	999,771	961,804
Net financial cash flow	-2,539,606	7,084,544	6,831,942	6,585,990	6,346,519	6,113,365	5,886,368	5,665,371	5,450,221
Discounted cash flow	-1,176,076	3,038,440	2,713,058	2,421,655	2,160,742	1,927,188	1,718,175	1,531,174	1,363,913
DSCR	1.53x								

Financial cash flow	19	20	21	22	23	24	25	Total
Cash inflow	**12,149,698**	**11,858,791**	**11,575,127**	**11,298,526**	**11,028,813**	**10,765,816**	**10,509,367**	**507,780,384**
Loan proceeds								70,214,485
Instalment of entity	0	0	0	0	0	0	0	60,855,771
Sale (export)	11,683,032	11,392,124	11,108,460	10,831,860	10,562,146	10,299,149	10,042,700	365,043,462
Other proceeds from business activities	466,667	466,667	466,667	466,667	466,667	466,667	466,667	11,666,667
Cash outflow	**6,908,928**	**6,821,919**	**6,736,742**	**6,653,354**	**6,571,714**	**6,491,783**	**6,413,521**	**351,226,831**
Loan disbursements (annuity)	0	0	0	0	0	0	0	79,064,242
Equipment purchase and implementation								70,214,485
Disbursement based on electricity generation	4,730,089	4,706,438	4,682,906	4,659,492	4,636,194	4,613,013	4,589,948	121,942,329
Disbursement for salaries of Technical Department	85,695	87,409	89,157	90,940	92,759	94,614	96,506	1,921,818
EPCG Solar	1,168,303	1,139,212	1,110,846	1,083,186	1,056,215	1,029,915	1,004,270	36,504,346

Income tax (15%)	924,842	888,860	853,833	819,756	786,547	754,241	722,796	41,579,611
Net financial cash flow	5,240,770	5,036,872	4,838,385	4,645,172	4,457,099	4,274,033	4,095,846	156,553,553
Discounted cash flow	1,214,350	1,080,652	961,173	854,435	759,112	674,012	598,067	87,902,799

Figure 13 - Financial cash flows and net present value

Financial net cash flow - €156 million

Discounted financial net cash flow (Net Present Value) - €88 million

As can be seen from the overview of the financial cash flows, the entities shall repay the loan to EPCG over the period of 5.5 years (instalment equal to the bill) while, conversely, EPCG repays the loan to the financial institution during 10-year period.

The project is profitable.

Economic cash flows:

Economic cash flow	0	1	2	3	4	5	6	7	8	9
Cash inflow	**0**	**45,032,988**	**34,500,304**	**29,528,612**	**28,929,269**	**28,504,632**	**20,492,829**	**16,277,897**	**15,884,198**	**15,500,301**
Instalment of entity		11,408,918	11,408,918	11,408,918	11,408,918	11,408,918	3,811,179	0	0	0
Sale (export)		33,157,403	22,624,719	17,653,027	17,053,684	16,629,047	16,214,984	15,811,231	15,417,531	15,033,635
Other proceeds from business activities		466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**70,214,485**	**14,024,531**	**11,528,369**	**10,339,171**	**10,177,605**	**10,057,225**	**8,799,799**	**8,112,910**	**8,000,190**	**7,889,904**
Equipment purchase and implementation	70,214,485									
Disbursement based on electricity generation		5,176,710	5,150,826	5,125,072	5,099,447	5,073,950	5,048,580	5,023,337	4,998,220	4,973,229
Disbursement for salaries of Technical Department		60,000	61,200	62,424	63,672	64,946	66,245	67,570	68,921	70,300
EPCG Solar		3,315,740	2,262,472	1,765,303	1,705,368	1,662,905	1,621,498	1,581,123	1,541,753	1,503,363
Income tax (15%)		5,472,081	4,053,871	3,386,372	3,309,117	3,255,425	2,063,476	1,440,880	1,391,295	1,343,011
Net financial cash flow	-70,214,485	31,008,457	22,971,935	19,189,441	18,751,664	18,447,407	11,693,030	8,164,987	7,884,008	7,610,398
Discounted economic cash flow	-70,214,485	28,711,534	19,694,732	15,233,197	13,783,033	12,554,995	7,368,592	4,764,192	4,259,484	3,807,094

Economic cash flow	10	11	12	13	14	15	16	17	18
Cash inflow	**15,125,964**	**14,760,947**	**14,405,020**	**14,057,955**	**13,719,532**	**13,389,535**	**13,067,756**	**12,753,989**	**12,448,034**
Instalment of entity	0	0	0	0	0	0	0	0	0
Sale (export)	14,659,297	14,294,281	13,938,353	13,591,288	13,252,865	12,922,869	12,601,089	12,287,322	11,981,368
Other proceeds from business activities	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**7,781,993**	**7,676,403**	**7,573,078**	**7,471,965**	**7,373,013**	**7,276,170**	**7,181,387**	**7,088,618**	**6,997,813**
Equipment purchase and implementation									
Disbursement based on electricity generation	4,948,363	4,923,621	4,899,003	4,874,508	4,850,136	4,825,885	4,801,756	4,777,747	4,753,850

Disbursement for salaries of Technical Department	71,706	73,140	74,602	76,095	77,616	79,169	80,752	82,367	84,014
EPCG Solar	1,465,930	1,429,428	1,393,835	1,359,129	1,325,286	1,292,287	1,260,109	1,228,732	1,198,137
Income tax (15%)	1,295,995	1,250,214	1,205,637	1,162,233	1,119,974	1,078,829	1,038,771	999,771	961,804
Net financial cash flow	7,343,971	7,084,544	6,831,942	6,585,990	6,346,519	6,113,365	5,886,368	5,665,371	5,450,221
Discounted economic cash flow	3,401,679	3,038,440	2,713,058	2,421,655	2,160,742	1,927,188	1,718,175	1,531,174	1,363,913

Economic cash flow	19	20	21	22	23	24	25	Total
Cash inflow	**12,149,698**	**11,858,791**	**11,575,127**	**11,298,526**	**11,028,813**	**10,765,816**	**10,509,367**	**437,565,899**
Instalment of entity	0	0	0	0	0	0	0	60,855,771
Sale (export)	11,683,032	11,392,124	11,108,460	10,831,860	10,562,146	10,299,149	10,042,700	365,043,462
Other proceeds from business activities	466,667	466,667	466,667	466,667	466,667	466,667	466,667	11,666,667
Cash outflow	**6,908,928**	**6,821,919**	**6,736,742**	**6,653,354**	**6,571,714**	**6,491,783**	**6,413,521**	**272,162,589**
Equipment purchase and implementation								70,214,485
Disbursement based on electricity generation	4,730,089	4,706,438	4,682,906	4,659,492	4,636,194	4,613,013	4,589,948	121,942,329
Disbursement for salaries of Technical Department	85,695	87,409	89,157	90,940	92,759	94,614	96,506	1,921,818
EPCG Solar	1,168,303	1,139,212	1,110,846	1,083,186	1,056,215	1,029,915	1,004,270	36,504,346
Income tax (15%)	924,842	888,860	853,833	819,736	786,547	754,241	722,796	41,579,611
Net financial cash flow	5,240,770	5,036,872	4,838,385	4,645,172	4,457,099	4,274,033	4,095,846	165,403,310
Discounted economic cash flow	1,214,350	1,080,652	961,173	854,435	759,112	674,012	598,067	66,380,192

Figure 2- 14 - Economic Net Cash Flow and Net Present Value

Economic net cash flow - €165 million

Discounted economic net cash flow - €66 million

The difference between the economic and financial cash flow is in the fact that the economic cash flow does not consider the financing sources – it does not reognize inflows and outflows arising from the loan taken by EPCG, thus reflecting the self-sustainability of the project. Conversely, the financial cash flow considers also the sources of financing thus reflecting the net effects on EPCG's business operations given that the inflows and outflows tied to the loan will actually take place.

The project is profitable.

Economic return period – 4 years:

Year	Economic DNF	Cumulative
0	-70,214,485	-70,214,485
1	28,711,534	-41,502,951
2	19,694,732	-21,808,219
3	15,233,197	-6,575,022
4	13,783,033	7,208,010
5	12,554,995	19,763,006
6	7,368,592	27,131,598
7	4,764,192	31,895,790
8	4,259,484	36,155,274

Figure 15 - Calculation of Economic Return Period

The calculation has been made on grounds of the discounted economic cash flows which reflect a strict approach. The overview indicates that after 3.5 years the Project will have a positive cumulative cash flow.

The project is profitable.

Based on the above presentation: the integrated overview of the results is presented below:

Description:	Total	Acceptable
Economic cash flow	165,403,310	YES
Discounted economic net cash flow	66,380,192	YES
Financial cash flow	156,553,553	YES
Net Present Value	87,902,799	YES
Economic period of return	4 years	YES
IRR to ENCF	17%	YES
Debt service coverage ratio	1.5 - 3 times	YES
EPCG loan repayment period	10 years	YES
Loan repayment period of entities	5.5 years	YES
Total amount of investment	70,214,485	
Subsidy	14,042,897	

Figure 16 - Financial Indicators Results

Bearing in mind the previously given analysis and the fact that EPCG shall obtain a loan for a 10 year period, while entities will repay their loans in 5.5 years (as shown in the Financial Cash Flows), all economic and financial parameters meet the requirements for this project to be qualified as more than acceptable and profitable. The cash flows are signifiantly positive, return period (4 years) is significantly shorter that the loan repayment period, while the IRR exceeds the WACC. Debt coverage through inflows is significantly positive (DSCR), inflows are by 1.5 – 3 times higher than debt liabilities. As a

result it may be concluded that the project is quite profitable from the standpoints of entities, financial institution and EPCG.

2.3.2 PROJECT ANALYSIS FOR THE PERIOD OF THE ENSUING 20 YEARS

Presentations and calculations of economic & financial parameters are given below:

Financial cash flow:

Financial cash flow	0	1	2	3	4	5	6	7	8	9	10
Cash inflow	**70,214,485**	**45,032,988**	**34,500,304**	**29,528,642**	**28,909,269**	**28,504,632**	**20,492,829**	**16,277,897**	**15,884,198**	**15,500,301**	**15,125,964**
Loan proceeds	70,214,485										
Instalment of entity		11,408,918	11,408,918	11,408,918	11,408,918	11,408,918	3,811,179	0	0	0	0
Sale (export)		33,157,403	22,624,719	17,653,027	17,053,684	16,629,047	16,214,984	15,811,231	15,417,531	15,033,635	14,659,297
Other proceeds from business activities		466,667	466,667	466,67	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**70,214,485**	**14,024,531**	**11,528,369**	**20,222,201**	**20,060,635**	**19,940,255**	**18,682,829**	**17,995,940**	**17,883,220**	**17,772,934**	**17,665,023**
Loan disbursements (annuity)		0	0	9,883,030	9,883,030	9,883,030	9,883,030	9,883,030	9,883,030	9,883,030	9,883,030
Equipment purchase and implementation	70,214,485										
Disbursement based on electricity generation		5,176,710	5,150,826	5,125,072	5,099,447	5,073,950	5,048,580	5,023,337	4,998,220	4,973,229	4,948,363
Disbursement for salaries of Technical Department		60,000	61,200	62,424	63,672	64,946	66,245	67,570	68,921	70,300	71,706
EPCG Solar		3,315,740	2,262,472	1,765,303	1,705,368	1,662,905	1,621,498	1,581,123	1,541,753	1,503,363	1,465,930
Income tax (15%)		5,472,081	4,053,871	3,383,372	3,309,117	3,255,425	2,063,476	1,440,880	1,391,295	1,343,011	1,295,995
Net financial cash flow	0	31,008,457	22,971,935	9,306,411	8,868,634	8,564,377	1,810,000	-1,718,043	-1,999,023	-2,272,633	-2,539,060
Discounted cash flow	0	28,711,534	19,694,732	7,387,729	6,518,711	5,828,711	1,140,607	-1,002,461	-1,080,010	-1,136,882	-1,176,076
DSCR				**2.99x**	**2.93x**	**2.88x**	**2.07x**	**1.65x**	**1.61x**	**1.57x**	**1.53x**

Financial cash flow	11	12	13	14	15	16	17	18	19	20	Total
Cash inflow	**14,760,947**	**14,405,020**	**14,057,955**	**13,719,532**	**13,389,535**	**13,067,756**	**12,753,989**	**12,448,034**	**12,149,698**	**11,858,791**	**452,602,736**
Loan proceeds											70,214,485
Instalment of entity	0	0	0	0	0	0	0	0	0	0	60,855,771
Sale (export)	14,294,281	13,938,353	13,591,288	13,252,865	12,922,869	12,601,089	12,287,322	11,981,368	11,683,032	11,392,124	312,199,147
Other proceeds from business activities	466,67	466,67	466,67	466,67	466,67	466,67	466,67	466,67	466,67	466,67	9,333,333
Cash outflow	**7,676,403**	**7,573,078**	**7,471,965**	**7,373,013**	**7,276,170**	**7,181,387**	**7,088,618**	**6,997,813**	**6,908,928**	**6,821,919**	**318,359,717**
Loan disbursements (annuity)	0	0	0	0	0	0	0	0	0	0	79,064,242
Equipment purchase and implementation											70,214,485

Disbursement based on electricity generation	4,923,621	4,889,003	4,874,508	4,850,136	4,825,885	4,801,756	4,777,747	4,753,858	4,730,089	4,706,438	98,760,776
Disbursement for salaries of Technical Department	73,140	74,602	76,095	77,616	79,169	80,752	82,367	84,014	85,695	87,409	1,457,842
EPCG Solar	1,429,428	1,393,835	1,359,129	1,325,286	1,292,287	1,260,109	1,228,732	1,198,137	1,168,303	1,139,212	31,219,915
Income tax (15%)	1,250,214	1,205,637	1,162,233	1,119,974	1,078,829	1,038,771	999,771	961,804	924,842	888,860	37,642,458
Net financial cash flow	7,084,544	6,831,942	6,585,990	6,346,519	6,113,365	5,886,368	5,665,371	5,450,211	5,240,770	5,036,872	134,243,018
Discounted cash flow	3,038,440	2,713,058	2,421,655	2,160,742	1,927,188	1,718,175	1,531,174	1,363,913	1,214,350	1,080,652	84,055,999

Figure 17 - Financial cash flows and net present value

Financial net cash flow - €134 million

Discounted financial net cash flow (Net Present Value) - €84 million

As can be seen from the overview of the financial cash flows, the entities shall repay the loan to EPCG over the period of 5.5 years (instalment equal to the bill) while, conversely, EPCG repays the loan to the financial institution during 10-year period.

The project is profitable.

Economic cash flows:

Economic cash flow	0	1	2	3	4	5	6	7	8	9	10
Cash inflow	**0**	**45,032,988**	**34,500,304**	**29,528,612**	**28,929,269**	**28,504,632**	**20,492,829**	**16,277,897**	**15,884,198**	**15,500,301**	**15,125,964**
Instalment of entity		11,408,918	11,408,918	11,408,918	11,408,918	11,408,918	3,811,179	0	0	0	0
Sale (export)		33,157,403	22,624,719	17,653,027	17,053,684	16,629,047	16,214,984	15,811,231	15,417,531	15,033,635	14,659,297
Other proceeds from business activities		466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667
Cash outflow	**70,214,485**	**14,024,531**	**11,528,369**	**10,339,171**	**10,177,605**	**10,057,225**	**8,799,799**	**8,112,910**	**8,000,190**	**7,889,904**	**7,781,993**
Equipment purchase and implementation	70,214,485										
Disbursement based on electricity generation		5,176,710	5,150,826	5,125,072	5,099,447	5,073,950	5,048,580	5,023,337	4,998,220	4,973,229	4,948,363
Disbursement for salaries of Technical Department		60,000	61,200	62,424	63,672	64,946	66,245	67,570	68,921	70,300	71,706
EPCG Solar		3,315,740	2,262,472	1,765,303	1,705,368	1,662,905	1,621,498	1,581,123	1,541,753	1,503,363	1,465,930
Income tax (15%)		5,472,081	4,053,871	3,386,372	3,309,117	3,255,425	2,063,476	1,440,880	1,391,295	1,343,011	1,295,995

Net financial cash flow	-70,214,485	31,008,457	22,971,935	19,179,441	18,751,664	18,447,407	11,693,030	8,164,987	7,884,008	7,610,398	7,343,971
Discounted economic cash flow	-70,214,485	28,711,534	19,694,732	15,233,197	13,783,033	12,554,995	7,368,592	4,764,192	4,259,484	3,807,094	3,401,679

Economic cash flow	11	12	13	14	15	16	17	18	19	20	Total
Cash inflow	**14,760,947**	**14,405,020**	**14,057,955**	**13,719,532**	**13,389,535**	**13,067,756**	**12,753,989**	**12,448,034**	**12,149,698**	**11,858,791**	**382,388,251**
Instalment of entity	0	0	0	0	0	0	0	0	0	0	60,855,771
Sale (export)	14,294,281	13,398,353	13,591,288	13,252,865	12,922,869	12,601,089	12,287,322	11,981,368	11,683,032	11,392,124	312,199,147
Other proceeds from business activities	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	466,667	9,333,333
Cash outflow	**7,676,403**	**7,573,078**	**7,471,965**	**7,373,013**	**7,276,170**	**7,181,387**	**7,088,618**	**6,997,813**	**6,908,928**	**6,821,919**	**239,295,476**
Equipment purchase and implementation											70,214,485
Disbursement based on electricity generation	4,923,621	4,899,003	4,874,508	4,850,136	4,825,885	4,801,756	4,777,747	4,753,858	4,730,089	4,706,438	98,760,776
Disbursement for salaries of Technical Department	73,140	74,602	76,095	77,616	79,169	80,752	82,367	84,014	85,695	87,409	1,457,842
EPCG Solar	1,429,428	1,393,835	1,359,129	1,325,286	1,292,287	1,260,109	1,228,732	1,198,137	1,168,303	1,139,212	31,219,915
Income tax (15%)	1,250,214	1,205,637	1,162,233	1,119,974	1,078,829	1,038,771	999,771	961,804	924,842	888,860	37,642,458
Net financial cash flow	7,084,544	6,831,942	6,585,990	6,346,519	6,113,365	5,886,368	5,665,371	5,450,221	5,240,770	5,036,872	143,092,775
Discounted economic cash flow	3,038,440	2,713,058	2,421,655	2,160,742	1,927,188	1,718,175	1,531,174	1,363,913	1,214,350	1,080,652	62,533,392

Figure 2- 18 - Economic Net Cash Flow and Net Present Value

Economic net cash flow - €143 million

Discounted economic net cash flow - €63 million

The difference between the economic and financial cash flow is in the fact that the economic cash flow does not consider the financing sources – it does not reognize inflows and outflows arising from the loan taken by EPCG, thus reflecting the self-sustainability of the project. Conversely, the financial cash flow considers also the sources of financing thus reflecting the net effects on EPCG's business operations given that the inflows and outflows tied to the loan will actually take place.

The project is profitable.

Economic return period – 4 years:

Year	Economic DNF	Cumulative
0	-70,214,485	-70,214,485
1	28,711,534	-41,502,951
2	19,694,732	-21,808,219
3	15,233,197	-6,575,022
4	**13,783,033**	**7,208,010**
5	12,554,995	19,763,006
6	7,368,592	27,131,598
7	4,764,192	31,895,790
8	4,259,484	36,155,274

Figure 19 - Calculation of Economic Return Period

The calculation has been made on grounds of the discounted economic cash flows which reflect a strict approach.

The project is profitable.

Based on the above presentation: the integrated overview of the results is presented below:

Description:	Total	Acceptable
Economic cash flow	143,092,775	YES
Discounted economic net cash flow	62,533,392	YES
Financial cash flow	134,243,018	YES
Net Present Value	84,055,999	YES
Economic period of return	4 years	YES
IRR to ENCF	17%	YES
Debt service coverage ratio	1.5 - 3 times	YES
EPCG loan repayment period	10 years	YES
Loan repayment period of entities	5.5 years	YES
Total amount of investment	70,214,485	
Subsidy	14,042,897	

Figure 20 - Financial **Indicators Results**

Bearing in mind the previously given analysis and the fact that EPCG shall obtain a loan for a 10 year period, while entities will repay their loans in 5.5 years (as shown in the Financial Cash Flows), all economic and financial parameters meet the requirements for this project to be qualified as more than acceptable and profitable. The cash flows are signifiantly positive, return period (4 years) is significantly shorter that the loan repayment period, while the IRR exceeds the WACC. Debt coverage through inflows is significantly

positive (DSCR), inflows are by 1.5 – 3 times higher than debt liabilities. As a result it may be concluded that the project is quite profitable from the standpoints of entities, financial institution and EPCG.

2.4 CONCLUSION OF TERMS OF REFERENCES

Upon conducted financial analysis, having in mind the overall project, the following conclusions could be defined:

1. The Project is profitable from the point of view of both scenarios.
2. This investment is acceptable for EPCG having in mind that the investment return period is less than 10 years.
3. This project is acceptable for users given that the monthly instalment amount is equal to the average monthly bill amount (which would also be paid by entities in case no PV systems are installed), while installation of PV systems, following the repayment, would result in negligable amount of electricity bills, and entities themselves generate electricity thus protecting themselves from the potential future price increase[26].

One should bear in mind significant positive cash flows which are to be generated by EPCG and which will be used for financing certain costs (higher absolute interest amount towards financial institutions compared with absolute amounts paid by entities, having in mind that they repay loan funds for a shorter period), so in such a way entities won't bear any additional costs. The project is sustainable and profitable so that it can finance certain components by itself.

[26] Taking into account the present trend of rising prices, it is higly likely that prices will continue to increase, which also supports the need of individuls to protect themselves from increase in prices.

3 ENTITIES ASPECT

Entities represent one of this project’s key elements, which is why the overall project will be analysed herein from the aspect of entities.

This project is important for entities because they purchase photovoltaic systems via loan granted by EPCG and repay it through monthly instalments. During the period of repayment entities receive no electricity bills, only repay their loan instalment, as they start generating their own electricity since the moment of photovoltaic systems commissioning. Once the last instalment is repaid, entities have no further obligations regarding this project or making payments to EPCG, with the exception of cases concerning exchange of electricity surplus and deficit (this has been elaborated in the previous chapters), which is expected to be negligible at the annual level.

First of all, the key issue for the entities refers to identifying positive effect that entities can have in order for them to decide whether they like to take part in the project. The positive effects for entities are as follows:

1. Long-term reduction of electricity bills – this is the primary positive effect for the entities, bearing in mind that upon repayment of photovoltaic systems, entities will generate their own electricity.
2. Instalment for loan from EPCG will be equal to average monthly bill, which amount would be paid by the entity in the future even if it wasn’t part of the project because in that case it would consume electricity from EPCG; the only difference is that payment under this project would be limited until the loan is fully repaid
3. Use of renewable energy source which doesn’t produce hazardous substances or pollutes the environment, therefore, the surrounding of the entity will be healthier and cleaner
4. A positive effect implying protection against the expected increase in electricity prices in the future, which has been elaborated in the previous

chapters of the Study – the instalment will remain the same in case of change in electricity price

5. Organization of procurement, delivery and installation of the system, as well as logistic support provided by EPCG, while users will submit the request and minimum number of administrative procedures
6. The interest at which entities get the funds is equal to the interest which EPCG obtains from the financial institution
7. Difference in higher cost of interest paid by EPCG (interest for 10-year loan of EPCG is in the absolute amount higher than the interest to be collected by EPCG from the entities as the entities repay the loan early) will be at direct expense of EPCG, further compensated by EPCG from the revenue from sale of electricity “surplus“ on the power exchange.
8. Entities are subsidized by EPCG with 20%, which means that they repay 20% less than the purchase amount.

Considering the previously stated, it may be concluded that the most important issue for an entity refers to the amount of instalment and the time period within which payment is effected. **The previous analysis indicated that users would effect repayment in the following 5-6 years on average.**

As the priority is for monthly cost of the entities not to be higher upon installation of photovoltaic systems, repayment period depends exclusively on the investment value. Since EPCG performs procurement of huge quantities, the position of entities is immediately more favourable because the price is lower due to huge quantities.

When implementation of the Project begins, a separate calculation shall be carried out for each entity which applies for it. On the basis of historical data, EPCG calculates average monthly bill. In that way, the acceptable instalment for the entity is obtained (unless the entity expresses the willingness to pay higher instalment amount). After the mentioned step, value of a photovoltaic system is being compared with the instalment and the period for which the Contract will be signed is obtained.

Based on the overall project analysis from the aspect of an entity, it may be concluded that there are no negative implications for the entities and that the

project has been primarily designed so that the entities can also benefit in a long run from installation of their photovoltaic systems.

4 BENEFITS FOR EPCG AND MONTENEGRO FROM THE EMPLOYMENT ASPECT

Solari 3000+ Project represents the most important project implemented by EPCG. In addition to all the benefits we considered in this Study, one of the very important factors is increase in a number of employees. In order to ensure implementation of photovoltaic systems EPCG established the company Solar gradnja, related party of EPCG, which employs people tasked with the asssignements mentioned herein. Given that the project is implemented throughout the entire Montenegro, there has been an additional need for workforce in many Montenegrin towns. The number of employees is also one of the most important factors for the project implementation period, which is why we will demonstrate present possibilities and additionl options. It is important to mention that this does not impact the amount of cost/investment; this project only impacts the time period neccessary to implement all photovoltaic systems.

One employee can install 1 kW in one day – this is a key input for us in this segment. This information is valid taking into account it was created based on actual performance of employees currently implementing photovoltaic systems under Solari 3000+ project.

Considering the present number of employees, it amounts to 477 employees, of which there are 400 fitters and 77 employees are technical, engineering and adminstrative staff. Should the same employees implement 70,000 kW under Solari 5000+, it would take 8 months of effective work to complete the implementation.

Regarding the following factors:

- Global energy crisis
- Increase in electricity prices

- Solari 3000+ implementation is in progress; therefore it would be neccessary to wait until installation related to the previous project is completed

We may conclude that employment of additional workforce is needed so that each interested party could benefit as soon as possible.

Depending on how efficient we can be to complete the implementation, below is the required number of employees, according to the implementation period we want:

Number of employed fitters	400	500	600	700	800
Number of kW	70,000	70,000	70,000	70,000	70,000
Project implementation period (months)	8	7	6	5	4
No. of employees performing administrative activities	477	596	716	835	954

Figure 1 – Number of employees required

EPCG will select optimum number of the newly hired employees, based on expected results of the project implementation and the period needed for the implementation of previous steps (release of the Invitation to Tender etc.).

The number of 800 employees is the optimum number observed from any perspective, because this way results in the most efficient and fastest implementation and benefits would be visible as soon as possible.

5 IDENTIFIED RISKS

During development of the Feasibility Study and through the very process of getting to understand the overall system of solar energy, as well as the manner of the project implementation, the following risks and the potential solutions have been identified:

Risks and suggestions for mitigation thereof:

1. Risk of instalment collection from entities

2. Risk that an entity could withdraw from use of photovoltaic systems in the loan repayment period

3. Equipment insurance

4. Consumption of considerably higher electricity volume compared with that generated by installed panels

The Risk Matrix is given as follows:

Risk type	*Consequences/probability*	*Mitigation*
Collection risk	Negligible	YES
Withdrawing risk	Negligible	YES
Insurance	Negligible	YES
Consumption increase	Negligible	YES

Low probability
Moderate probability
High probability

Figure 21 - **Matrix of identified risks**

The colour stands for the risk probability, while the risk magnitude is written in the Matrix. As it may be seen, all identified risks have negligible financial impact, primarily because they may occur in small number of households so these are about mainly low probability risks, all of them having the mitigation plan, which is elaborated hereafter.

5.1 RISK OF INSTALMENT COLLECTION FROM THE USER

As in each sort of business operations, both with commercial entities and the households, there is always risk from collection of receivables. This type of risk is not specific exclusively for this type of projects, but it also exists in case of other energy sources (TPP, HPP). The Energy Law envisages disconnection, i.e. suspension of electricity delivery to the end customer in case the customer fails to fulfill its liabilities in line with the contract (electricity bill). Of course, disconnection itself is preceded by warning and notice thereof. Once the liabilities are settled, the end customer is being reconnected to the grid.

In line with the previously stated, we consider the risk might be mitigated as follows:

1) The possibility of disconnection during use of photovoltaic systems is to be defined in the same manner as for supply by EPCG. In this particular sense, we got positive reply by CEDIS that remote disconnection is possible.

2) During launching of tender for users to be using this type of electricity supply, it should be required that the customer has been regularly settling electricity bills within certain previous period (for example, in the last three

years), which would bear the minimum risk that their liabilities regarding instalment for photovoltaic systems won’t be settled.
Out of the abovementioned, it may be assessed that this type of risk will not considerably influence the very project’s profitability, as well as that methods for the risk mitigation are standard ones without requiring additional investments, but being defined through tender procedure and contract.

5.2 RISK THAT A USER WILL WITHDRAW FROM USE OF PV SYSTEMS IN THE LOAN REPAYMENT PERIOD

The risk of withdrawing has been identified having in mind the fact that the equipment won’t be owned by EPCG at any moment. The risk exists if a user, taking part in the project, decides to withdraw from this type of electricity supply in the loan repayment period. The panels have already been installed and put into operation, and the contract with EPCG has also been signed.
As a suggestion for this risk mitigation, conditions should be defined (for example, panel to be early repaid), having in mind that EPCG is crediting the user, conditions would be similar as in case of being credited by the bank – for example, what would happen if you buy a car through the bank loan? It is impossible to simply withdraw without a sort of compensation.
Users can also be suggested to sell the panels with assistance of EPCG, whereby another type of market would be encouraged which currently doesn’t exist in Montenegro. Panel value would be certainly lower than the purchase price, taking into account that this is about a fast-growing technology.
In this way, EPCG would be protected against losses on the one hand and on the other hand the users’ responsibility would be implied, as user will get informed about all details and possibilities during the project presentation. In line with the previously stated, we consider in this way the potential loss would be reduced to the minimum.

5.3 EQUIPMENT INSURANCE

The item of equipment insurance has not been identified as a risk but more as an option having in mind that it is about an asset.
From this aspect we consider the risk is minimum because supplier is obliged to provide guarantee for the assets being sold, as well as in case of purchase of any other equipment type.
In order to minimize the risk, we incorporated costs of insurance per installed capacity unit (included in the price components) thus ensuring undisturbed progress, implementation and operation of photovoltaic systems. In the Invitation to tender are defined vendor-related conditions referring to different guarantees and insurance covering the operation and status of equipment.

5.4 CONSUMPTION OF CONSIDERABLY HIGHER ELECTRICITY VOLUME COMPARED WITH THAT GENERATED BY INSTALLED PANELS

Upon analysing of the overall project and its effects, as well as whole electricity market, we have identified the risk that at certain point of time user will start consuming considerably higher electricity volume compared with the one that may be generated by the installed equipment. This risk is realistic considering the global trend of electricity consumption increase, which is expected to occur also at our territory, particularly having in mind technology improvement and development (such as electrical cars, different household appliances), as well as the very automation process of all the possible needs and actions, both in the household and outside it.

From the aspect of the project, we consider this risk is possible to bi mitigated as follows:

1) By precise defining of installed panel capacity per individual user, taking into consideration both their historical consumption and the future plans (whether the user intends to purchase property or asset which may result in

considerable consumption increase). In this manner, if equipment of higher capacity is installed with the user, it will have additional revenues from sale of electricity surplus until the moment of purchase of equipment/property which contributes to considerably higher consumption.

2) Defining by contract procurement of additional equipment if user consecutively starts to consume considerably higher electricity volume and if it is estimated as their new future consumption.

3) Defining by contract that in case the user doesn't want additional equipment, electricity deficit may be compensated by consumption of electricity generated by EPCG, which would be collected via regular electricity bills.

Conventional risks and their correlation with the Project are as follows:

- Demand risk: doesn't exist as it is about electricity without which no user could carry out the everyday activities, while installation of PV systems has no negative effects which could lead to insufficient number of users to be a part of the project. Aside from previously mentioned, the research in and current situation at the wholesale market additionaly boost demand and bring in the limelite all positive Project effects.
- Financing risk: as this is about a green energy project, which is rapidly-growing field in the whole world, the risk is irrelevant.
- Procurement risk: doesn't exist because we plan to establish quality and long-lasting cooperation with the world's major photovoltaic system manufacturers.

We have herein explained the character of risks and methods for mitigation thereof. From our point of view, this is not a type of risk that could influence the profitability and continuation of implementing this project.

Having in mind that we presented the Study and considering the results of Solari 3,000+ Study (5,000+ represents the continuation) which contains significant number of scenarios, and that we also explained the potential risks, below we will clarify correlation between certain inputs and results of the Studies, so that we can be sure that the project is profitable:

1. **Change in interest rate -** in case of an increase in interest rate approved to EPCG by the financial institution, it will cause increase in interest rate

at which EPCG provides loan to the beneficiary **- based on the previously mentioned we can conclude that there is no risk.**

2. **Increase in price of PV systems** - in case of an increase in prices, the required investment amount will also be increased, which will result in a longer loan repayment period (beneficiaries will have fixed instalment approximately equal to the amount of an average monthly bill); however, financial parameters will still be positive because EPCG acts as a mediator. It is also possible to modify the number of beneficiaries to whom PV systems will be sold, and this will result in reduction in some inflows and outflows, but the net ratio will remain the same.

3. **Change in electricity selling price** - we used available prices in this Study, and the impact and the result obtained using different price were presented in the previous 3000+ Study, which included much lower prices than those used herein (which comply with the present situation on the market and forecasting), and the Project is also very profitable. The price of electricity cannot crucially impact the decision as to whether the project was initiated or not, because the Project relates to RES and Montenegro signed various protocols in this area that we previously discussed, by which Montenegro is required to reduce its emission of hazardous gasses and particles in order to continue making progress on its path to European integration. In addition to the above mentioned, the price of electricity may impact the return period. It is also important to mention that the selling price of electricity impacts the entire EPCG and Montenegro's economy, therefore the selling price on the domestic market is regulated by the Regulatory Agency – it is also modified in compliance with the proposals and possibilities, depending on the world market prices. We can see from the above mentioned that there is no significant risk which may impact the decision on launching the Project.

4. **Decrease in electricity generation -** this type of risk does not represent the risk only for PV systems but for EPCG, as well. This type of risk is definitely probable and it is minimized and neutralized exactly via this kind of projects, more precisely diversification of electricity sources. The overall infrastructure for electricity generation is timely and properly maintained by EPCG, thus there is no risk which may lead to considerable

apparent effects. Decrease in generation regularly occurs from the aspect of hydrological situation in certain period having in mind importance of hydro power plants in Montenegro, but EPCG faces these risks during its regular business operations, managing it in the most optimum manner possible at the concerned moment (import in case of decrease in generation but not in consumption); however, this is also mitigated exactly through implementation of Solari 5000+ and other projects related to solar energy. Out of the mentioned, it may be concluded that Solari 5000+ has a significant benefit particularly in this segment. For example, Montenegro has deficit in the summer months due to bad hydrological situation, while in that period the highest generation by PV systems may be expected because generation is the highest in that period, thus resulting in direct positive effect, which is exactly the objective of EPCG – reducing dependence. On the other side, in case of decrease in consumption and surplus in generation, the export becomes possible when negative import effects are financially compensated. The used data about generation are in line with the Preliminary Technical Design and the conservative approach is applied in order to avoid overestimation.

Based on the previously stated, it is not necessary to carry out sensitivity analysis according to risks, because potential effects are negligibly low while on the other hand the project is profitable and has significantly high cash flows and is of importance for users, EPCG and Montenegro.

6 FEASIBILITY STUDY CONCLUSION

Upon analysis of all the financial parameters, flexibility, as well as positive impact and other non-financial aspects of this project on all the participants, we find no arguments that are against this project implementation.

Positive effects are numerous and range from financial aspects for entities, economy and EPCG on the one hand up to expectations of the international community aimed at reduction of hazardous gases emission and increased use

of renewable energy sources on the other hand. This is very important to be noted considering the tendency of increase in fossil fuels prices, pollution permits at the global level and the global, previously elaborated, situation in deficit in electricity. On the other hand the project implementation would cause Montenegro to become a solar energy leader in the Balkans with numerous additional possibilities in terms of implementation of diferrent Projects with other regional countries and aimed at hazardous gasses reduction and RES stake increase.

The project itself will encourage development of different business branches at the territory of Montenegro over the future course of the project (for example: maintenance, mediation, sale of panels).

On the other hand, we have identified four risks, elaborated them and provided suggestions for mitigation of each individual risk. Upon risk analysis, we have come to the conclusion that the risks’ relevance is not such significant so as to influence the profitability, development and implementation of this project.

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ADDENDUM

1. SOLAR ELECTRICITY GENERATION

Each region at the territory of Montenegro has certain number of sunshine hours per annum, depending on the position, which radiation, temperature and other parameters are dependent on, by means of which Specific annual electricity yields are obtained. Photovoltaic systems function by absorbing solar energy and transforming it into electricity which is consumed by each individual. The amount of electricity to be generated by photovoltaic system depends on the panel capacity. For that aspect, we have put in the analysis the option with panel capacity of 5 kW (which is an average for a single entity), which is able to generate about 7.5 kWh of electricity per one hour of operation.

Panel value is defined as price of installation per 1 kW multiplied by number of kW being installed (a number of scenarios are considered in our study). Different panel prices depend on different suppliers, as well as technical panel specifications. End supplier will be selected via tender procedure.

2. SOLAR ENERGY POTENTIAL

This criterion is defined as an annual global solar radiation on a horizontal surface (GHZ) expressed in kWh/m^2/day. The maximum value for Montenegro ranges from 4.39 hWh/m^2/day in the area surrounding Ulcinj to the minimum value of 3.60 kWh/m^2/day in the north, given that the favourable limit value of 4.00 kWh/m^2/day represents 37% of the total area of the state of Montenegro.

Annual global radiation in Montenegro:

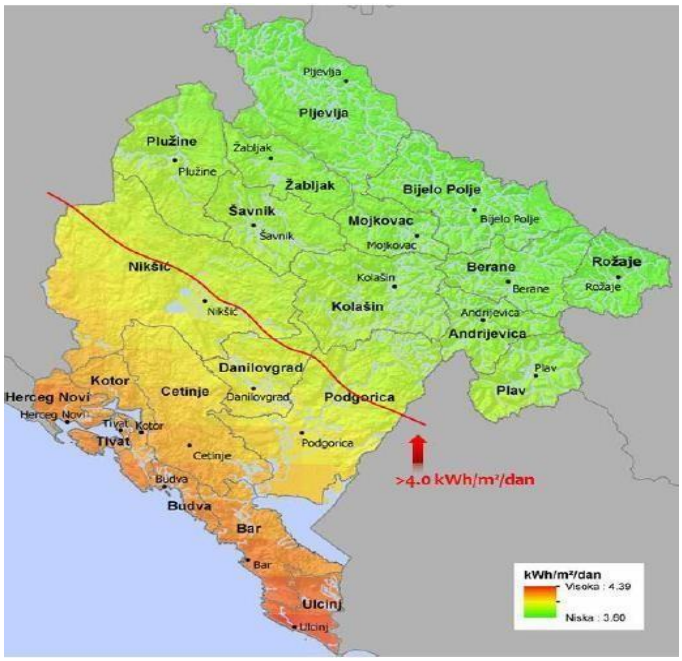

Figure 22 - Annual global radiation in Montenegro

Intensity of solar radiation in Montenegro, particularly in its coastal and central region, is among the strongest in Europe, where solar radiation amount can be compared to the one in Southern Italy or Greece. Having in mind the abovementioned, Montenegro has shown great potential for introduction of the system for solar energy exploitation, given that the number of solar radiation hours (insolation) amounts to more than 2,000 hours on an annual level for major part of Montenegro, i.e. more than 2,500 hours along the coast, annually. The number of sunny days and hours in one year is the most important parameter used to determine the suitable site. PVGIS was used to assess electricity generation due to insufficiently investigated solar radiation potential in Montenegro, and data obtained were compared to theoretically expected generation based on internationally acknowledged models.

Conversion of solar energy into electricity is done using PV systems. A PV system primarily supplies customers, while the surplus of generated electricity is delivered to the distribution network. The main parts/elements of the concerned solar power plant are the following:

- PV systems,
- prefabricated substructure for the needs of solar panels installation,
- inverters

- DC cable distribution, AC distribution cabinet, AC cable distribution, cable racks,
- communication cables with coupling equipment, supervision/monitoring system in the plant,
- lightning protection, potential redistribution system and earthing system,
- cable to be used for connection to the grid and cable connection box containing space for the meter.

It is important to point out that conversion of solar energy into electricity results in DC (direct voltage) whereat it should be transformed into AC (alternating voltage). In this case, the source will be connected to the distribution grid – the so-called ‘on-grid’ system.

Pursuant to Article 96 of the Energy Law, the system has been considered as a power plant to exchange power at the point of connection. This system is defined as an ‘on-grid’ photovoltaic system which distributes the entire electricity generation to the grid, while consumers in the facility are supplied by the grid.