Consultation Paper

Methodology on Calculation of Feed-In Tariffs for Photovoltaic Solar Energy

STATEMENT

This document has been prepared by ERO with the support of International Finance Corporation (IFC) which through the program Balkan Renewable Energy Program has engaged the consultants of Mercados and Exergia. This document has been prepared to receive the eventual comments by the stakeholders and it does not represent a decision of ERO and should not be interpreted as such.

Comments of stakeholders shall be sent with the following subject line
“Comments on Methodology of Photovoltaic-FV Feed-In Tariffs” until:

31 October 2014

To the ERO email address:
info@ero-ks.org

or the postal address:
Dervish Rozhaja Str. No. 12, 10000 Prishtina, Kosovë

31 October 2014
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1 INTRODUCTION

Energy Regulatory Office (ERO), in accordance with the competences and obligations defined in the Law on Energy Regulator, Law on Energy and Law on Electricity, has started public consultations on the level (price) of feed-in tariffs for solar energy (photovoltaic). In this document ERO has presented the methodology for the determining the feed-in tariffs and assessments of ERO on the feed-in tariffs for solar energy. During the preparation of this document, IFC has supported ERO in developing the model for the calculation of feed-in fees, as well as assisted ERO in gathering relevant data which were necessary for the calculation of feed-in tariffs.

The feed-in tariffs are among the key investing incentives for the production of electric energy from renewable sources, and are applied in many countries of the EU, U.S.A. and further. Tariffs set by ERO guarantee the potential investors that the amount of energy produced by PHV solar energy sources, will be purchased by the Public Electricity Supplier at a price that enables the return of investment and operational costs. Moreover, ERO in this document has proposed that the acquisition of electricity produced from renewable energy sources (RES) which is regulated by the Energy Purchase Agreement for a 10-year period to be extended to 12 years. The Energy Regulatory Office has reviewed and assessed the existing regulatory framework for the promotion of energy projects from solar sources (photovoltaic - PHV) in Kosovo. To enable a further development of renewable sources, the ERO, besides determining the level of feed-in tariff has reviewed the regulatory framework that deals with renewable energy, and more specifically, it has made preparations to open the review process for:

- Standard agreements for acquisition of energy, which will be suitable for all renewable energy technologies
- Actual network codes and agreements for connection to the network, to suggest the improvement of the actual system, as required, the drafting of an advanced connection agreement;
- Two main rules for the promotion of RESs: (1) Rule for the support of electric energy for which it has been issued the Origin Certificate and procedures for admission in the supportive scheme, and (2) Rule for the Creation of the System of Origin Certifications for electric energy produced from renewable sources.

Based on the Law on Energy Article 13/01, the Ministry of Economic Development (MED) is responsible for determining indicative targets for electricity produced from RESs. Based on these responsibilities MED has issued Administrative Instruction 01/2013, where it has determined the indicative targets. Moreover, MED has drafted the National Action Plan for Renewable Energy, where it determines the targets of energy generating capacities from Renewable Sources, which will be supported through feed-in tariffs until the year 2020. These targets are determined basing on various renewable sources and are presented in Table 1.
The Law on Electric Energy, Article 9/6 determines that ERO must draft and implement the methodology for the determination of feed-in tariffs for energy from Renewable Sources. ERO has determined the feed-in tariffs in the Decision V_359_2011, which are classified according to the various renewable sources and are as follows: 1. Hydro - WATER (<10MW)- 63.3 €/MWh, 2. Wind – 85 €/MWh, and 3. Biogas and biomass – 71.3 €/MWh.

Through this document, ERO opens the public consultations for the determination of feed-in tariffs for the production of energy from solar panels FV, basing on the responsibilities of ERO according to: Article 14.2 and Article 25 of the Law on Energy Regulator; Articles 10, 11, 13.4 and 17 of the Law on Energy No.03/L-184; Article 9 of the Law on Electric Energy No.03/L-201; Article 3 of the Rule on Principles of calculation of tariffs in the electric energy sector (Rule of tariffs); Administrative Instruction No. 06/2007 on Indicative Targets for the consumption of electric and thermic energy from Renewable energy Sources and coproduction; Rule for the creation of the System of Origin Certifications for Electric Energy Produced from Renewable Sources, Waste and the Coproduction combined with Heat, as a single Generating unit; Rule for the Support of Electric Energy for which it has been issued the Origin Certificate and Procedures for admission in the Supportive Scheme.

The report will be made public on the official website of ERO and all parties are invited to give their comments about the evaluations of ERO. The comments of stakeholders should be sent with the subject line "Comments on Determination of feed-in tariffs for PHV solar panels" until 31 October 2014, at 16:00, at the email address ero.pricing-tariffs@ero-ks.org or postal address Dervis Rozhaja Str. No. 12, 10000 Prishtina, Kosovo.
2 Principle of determination and calculation of feed-in tariff

After a thorough analysis of the ERO methods used internationally to determine the feed-in tariffs, ERO has decided to adopt the method of determining the feed-in tariffs based on the production cost. According to this method, the ERO has analysed the factors that affect the production cost of energy from PHV solar sources, which include:

- Investments for generators
- Other project-related costs,
- Operational and maintenance expenditures (O&M)
- Capital return rate
- Other potential incomes
- Financial restrictions which are usually applied by financial institutions
- Reimbursement level which can be determined basing on the expected amount of energy produced as well as the estimated life of the generator.

The determination of feed-in tariff means the assessment of the level of cash that the company must circulate within a certain period to cover the reasonable cost of energy production, including the cost of other services and the costs of connection to the transmission or distribution network, calculated for a period of time defined by a methodology, which allows a reasonable return on capital invested.

The following formula is applied for the determination of the required feed-in tariff:

$$-k_{\text{ostoinvestimin}} \sum_{n=0}^{m} \frac{(1+i)^n}{(1+i)^n} + \sum_{n=m+1}^{10} \frac{FIT \cdot \text{Energiidaljen} + OR_n + OPEX_n + OC_n \cdot Tatim_n}{(1+i)^n} = 0$$

where:

- FIT: -The required feed-in tariff for the referent renewable energy project (in €/MWh).
- CAPEX_n - Capital expenditure of investment cost per “n” years
- OPEX_n - Operational expenditure per “n” years
- Energy Output n - Energy Output per “n” years
- OR_n - Additional estimated incomes per “n” years
- OC_n - Other costs per “n” years
- $i$ (WACC real post tax) - Real weighted average cost of capital (WACC) after tax

2.1 Capital expenditure (Capex)

Because of the great support offered to the PHV solar energy sector by the governments of the respective countries, the development of this sector has taken rapid development strides recently.
This growth has led to the evolution of technology, and the respective reduction of cost. If we look at the price trends of PHV solar technology, we can conclude that prices will be subject to continuous decline in the coming years. The chart below shows the evolution of the sector by presenting the reduction of the investment cost per unit:

![Price trend of modules for the PHV solar energy system](chart.png)

ERO has collected data and has performed careful analysis to achieve a summary of capital costs for investment in PHV solar energy. More specifically, ERO has analysed and examined the following costs:

- **Cost of appliances:** Electronic appliances are often obtained (purchased) from a supplied, and may consist of one of the biggest expenditures for this kind of project.
  - FV panels
  - Preparation of site and installation – road access and connection to the transmission system or sub-stations.
  - Elements required for installation and construction of system;
  - Divider box and various electric elements;
  - Inverter, which converts PHV direct current (DC) to alternative current (AC);

- **Land use costs (if any):** this cost includes the acquisition of the land necessary for the installation of the energy system.

- **Transportation cost:** Reflects the transportation cost of the appliances from the supply centre to the workshop.

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Cost of installation works and connection to the network: This cost reflects the cost of manpower, including:

- Design engineering cost: these costs vary depending on whether the project is directly designed by the constructor, or external engineers are engaged.
  - Design of system
  - Structural design
  - Electrical design
  - Construction design
  - Tendering and contracting
  - Construction supervision
- The project development cost: includes licenses, permits and project management.
- Cost of connection to the network: energy line and connection.
- Taxes and Customs: the appliances of ERO are very likely to be imported from other countries; so the customs and excises should be defined, if any.
- Unpredictable: this position must be always included to cover unpredicted expenditure

Capital expenditures are the main factor for the determination of the feed-in tariffs for the energy produced from PHV solar systems. Their value for the installation of capacities according to the ERO estimations reaches the amount of € 1,219,447, whose values are listed in the following chart:

<table>
<thead>
<tr>
<th>Shpenzimet kapitale - CAPEX</th>
<th>Vlera e kostove në Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studimi i fizibilitetit</td>
<td>28,688 €</td>
</tr>
<tr>
<td>Zhvillimi</td>
<td>50,938 €</td>
</tr>
<tr>
<td>Projektimi</td>
<td>85,086 €</td>
</tr>
<tr>
<td>Pajisjet BRE (panelet diellore FV)</td>
<td>585,496 €</td>
</tr>
<tr>
<td>Baraspeshimi i sistemit[1]</td>
<td>469,239 €</td>
</tr>
<tr>
<td><strong>Gjithsej (€)</strong></td>
<td><strong>1,219,447 €</strong></td>
</tr>
<tr>
<td><strong>Gjithsej (€/kw)</strong></td>
<td><strong>1,273 €</strong></td>
</tr>
</tbody>
</table>

The chart below shows capital expenditures items presented based on the share of total capital expenditures, where the biggest part belongs to the PHV solar panels by a cost of € 585,496 or 48% of the total capital expenditures value, then come the system balancing expenditures by 39%, projecting 7%, development 4% and feasibility study by 2% of the total cost.
2.2 Operational (OPEX) and other expenditures

Unlike capital expenditures which constantly suffer decreases in PHV solar energy investments, operational expenditures and other recurrent expenditures depend on other parameters and we cannot say that there is a downward trend in expenditures. Some of the most important elements of operation and maintenance, are described below:

- Preventive maintenance: cleaning, inspection of energy generation system, etc.
- Remedial/reactive maintenance: monitoring/actions in the field, repairing, etc.
- Condition based maintenance: replacement of equipment.
- others:
  - Land lease: if any
  - Unpredictable

Estimated additional income OR$_n$ (Other Revenues), if any, (in €) for renewable energy project reference $j$ in year $n$, which may include other income as assessed by ERO.

Other costs OC$_n$ (Other Cost), if any (in €) for renewable energy project reference $j$ in year $n$. Estimated additional costs may include imbalance costs or other costs as assessed by ERO.

Energy output$_n$: estimated generation of electricity, net losses and own consumption (in MWh) for renewable energy project reference in year $n$. This occurs because of energy generation and energy injection in the network. This element consists of:

- Capacity
- Load factor predicted by site-specific conditions (hours of sunshine)
- Efficiency of installed equipment for energy generation.

Taxation$_n$: applicable taxes and charges (in €) for renewable energy project reference $j$ in year $n$. 
$n$: number of years in which the renewable energy project reference will receive feed-in tariff as defined in the methodology.

$m$: number of years of construction.

$i$: is the real post tax WACC.

ERO determines the WACC-un in accordance with applicable law, expressed in real terms after tax. The formula for WACC is as follows:

$$WACC = a \times C_E + \left(1 - a\right) \times C_D \times \left(1 - t\right)$$

where,

- $C_E$ – is capital cost.
- $C_D$ – debt cost.
- $a$ – is the rapport of capital on total assets.
- $t$ – is corporate profit tax.

**Depreciation costs:** will be calculated in a linear form as a function of the economic life of the assets and regulated asset base.

ERO, after analyzing all economic data and parameters of Kosovo, as well as using the assistance of the consultancy, has managed to determine operational expenditures and other recurrent expenditures of operating the PHV solar system.

In this regard, operational and recurrent one-year expenditures reach the amount of € 193,711.58, which includes the expenditures of the network connection, operational and maintenance expenditures, FIT charges and imbalance expenditures, presented in the table below:

<table>
<thead>
<tr>
<th>OPEX dhe shpenzimet tjera</th>
<th>Vlera e kostove në Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shpenzimet Operative dhe të mirëmbajtjes</td>
<td>23,950.00 €</td>
</tr>
<tr>
<td>Shpenzimet e kyes në rrjet</td>
<td>30,000.00 €</td>
</tr>
<tr>
<td>Ngarkesa shtesë për FIT</td>
<td>14,370.00 €</td>
</tr>
<tr>
<td>Shpenzimet e debalancit</td>
<td>20,116.58 €</td>
</tr>
<tr>
<td>Shpenzimet e zhvlerësimit</td>
<td>105,275.00 €</td>
</tr>
<tr>
<td>Gjithsej (C)</td>
<td><strong>193,711.58 €</strong></td>
</tr>
</tbody>
</table>

The chart below shows operational and other recurrent expenditures based on the percentage share of total expenditures, where most the biggest part belongs to Depreciation Expenditures by 54%, Network connection expenditures by 16%, operational and maintenance expenditures by 12%, imbalance expenditures by 10% of the expenditures and additional charges of FIT by 8%.
Inflation will be permitted only for the purpose of feed-in tariff indexing. Under the applicable legislation, ERO determines the rate of inflation based on consumer price index of domestic industrial production (Capital goods NACE Rev2), or the harmonized index of consumer prices (HICP) all units for the Eurozone” published by EUROSTAT.

3  ERO Proposals

Tariff proposed by ERO for PHV Solar Energy is 136.4 €/MWh.

The level of feed-in tariffs for PHV Solar Energy is shown in chart 4.2.1 compared to several other countries. The chart shows that ERO proposes for Kosovo an average tariff which is a key incentive for potential investors in this sector.
The table below shows some of the regional countries, as well as two of the countries with the highest development of the PHV solar energy sector in Europe.

**Comment**: What about Albania? If the price is higher than in Kosovo, include Albania too. In Bosnia and Herzegovina the price is quite high so instead of Greece you can include Bosnia and Herzegovina

<table>
<thead>
<tr>
<th>Vend</th>
<th>&lt;1000 kW (€/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gjermania</td>
<td>170</td>
</tr>
<tr>
<td>Italia</td>
<td>140</td>
</tr>
<tr>
<td>Serbia</td>
<td>163</td>
</tr>
<tr>
<td>Greqia</td>
<td>120</td>
</tr>
<tr>
<td>Mali I Zi</td>
<td>150</td>
</tr>
<tr>
<td>Kosova</td>
<td>136</td>
</tr>
</tbody>
</table>

*Table 4.2.1 – level of feed-in tariffs for PHV Solar Energy*

Unlike the decision in force regarding the feed-in tariffs, ERO considers that a long-term (12 years) Power Purchase Agreement (PPA) guaranteed by feed-in tariffs for PHV solar energy (136.4 €/MWh) will be more appropriate factors for the development of PHV solar energy market in Kosovo. **ERO will also publish secondary legislation modified to reflect the extension of the PPA from 10 to 12 years for feed-in tariffs from PHV solar sources.**