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**MINISTARSTVO EKONOMIJE**

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**GOVERNMENT OF THE REPUBLIC OF MONTENEGRO**

**Ministry of Economy**

**STRATEGY FOR THE DEVELOPMENT OF  
SMALL HYDRO POWER PLANTS**

**Podgorica, March 2006**

## MAIN STRATEGIC AIMS

1) **Hydropower potential of small hydro power plants:** Overall technical hydropower potential of the small hydro power plants (abbrv. small HPPs) in the Republic of Montenegro (without the rivers of the Tara, the Čehotina and the Ibar) is calculated to approximately 800 -1000 GWh/year, while such potential as per studies is assessed to 231 MW and 644 GWh/year, in 70 locations. Since there are no many years waterflow measurements for the most of the considered waterflows, there is the need for the assessment of the potentials to be up-to-dated through innovation of the previously projected solutions and researches undertaken in all waterflows, as per determined schedule and established methodology, on the basis of qualitatively completed measurements, in consistency with all conditions of urban planning, water management, criteria for environmental protection, etc.

2) **Share of renewable energy resources in energy consumption:** Based on the signature of the Energy Community Treaty for South Eastern Europe (ECSEE Treaty), Republic of Montenegro has accepted, among the other matters, to implement *Acquis Communautaire* in the field of energy, ecology, competition and development of renewables. In details, under the plan for application of the Directive 2001/77/EC on promotion of electric power from renewables into the internal electric power market, the Republic of Montenegro should define strategic aim desired to be achieved through utilisation of the renewables, according to realistic assessments. Taking into account development of entire energy sector in the Republic of Montenegro, according to long term National Energy Strategy (its design is underway), it is assessed that the share of all renewables (not only small HPPs) in 2010/2015 can be achieved in the range of 3-5% out of total energy needs. It is calculated that the small HPPs generation can reach the share in the national electric power balance of approximately 2.5% in 2015.

3) **Realistic scope of new small HPPs until 2010/2015:** According to Reference scenario, in the period until 2010, it is predicted to construct certain number of small HPPs with total installed power of 5 MW, as well as to construct additional 15 MW in the appropriate number of sites in the period until 2015. It means, in the period of 10 years, it is predicted to increase installed capacities and production in small HPPs by 3 times in comparison with the status existing at the end of 2005. As per High scenario, in the period until 2010, it is predicted to construct small HPPs with total installed power of 10 MW, as well as to construct additional 20 MW in the appropriate number of sites in the period until 2015. In other words, in the period of 10 years, it is predicted to increase installed capacity and small HPPs' generation by more than 4 times in comparison with the current status.

4) **Share of installed power and generation from small HPPs in overall power/generation:** Share of power in 2015 will amount to 3.3% (for Reference scenario), respectively 4.4 % (for High scenario), under the assumption that there is no construction of other generation capacities. Generation share of all small HPPs in overall electric power generation (without value added to the Contract for HPP Piva) in 2015 will

amount to 2.5% (Reference scenario), respectively 4.2% (High scenario). If electric power import is also taken, possible small HPPs' generation share in satisfying needs for electric power in Montenegro in 2015 will vary in the range from 1.5 to 3%.

5) **Problem of small HPPs' integration into electric power system:** Due to small share of small HPPs in overall generation in the electric power system of Montenegro, their dispersive nature will not create any difficulties in comparison with other fluctuations occurring in supply and delivery, which the procedures for system's plants management have to cope with on daily basis. New small HPPs with the calculated power and generation, as specified above, can be integrated into electric power system of Montenegro without technical restrictions from the view of system plants management, if all standards for their connection to the network are met properly.

6) **Economic-financial analyses (EFA) for small HPPs (for Reference and High scenarios):** For the assumed reference purchase price in the market of 3.0 EURcent/kWh, incremental costs amount to 4.6 EURcent/kWh (i.e. the incentive providing minimum internal rate of return (IRR) of 8%). Price of generation of 7.6 EURcent/kWh is calculated as the average price (fixed) for twenty year period (techno-economic lifetime of the project).

7) **Impact of the small HPPs construction - illustration (Reference scenario):** As per EFA conditions mentioned in point 6:

a. incentives required for construction of new small HPPs: 5 MW in 2010 amount to 644 000 EUR, respectively 2.576 mill. EUR in 2015 for total 20 MW in new small HPPs;

b. increased sales prices: 0.016 EURcent/kWh (year 2010) and 0.061 EURcent/kWh (year 2015),

c. expected cost increase for electric power: from 0.63 to 1.27 EUR/year (in 2010), and from 2.42 to 4.83 EUR/year (in 2015),

d. additional costs for new small HPPs on the increased total electric power cost for an average household: approximately 1.4 % (very small).

**Impact of small HPPs construction – illustration (High scenario):**  
Under the EFA conditions referred to in point 6:

a. incentives required for construction of new small HPPs: 10 MW in 2010 amount to 1.288 mill. EUR, respectively 3.864 mill. EUR in 2015 for total 30 MW in new small HPPs;

b. increased sales prices: 0.032 EURcent/kWh (in 2010) and 0.091 EURcent/kWh (in 2015),

c. expected cost increase for electric power: from 1.26 to 2.53 EUR/year (in 2010) and from 3.60 to 7.21 EUR/year (in 2015),

d. additional costs for new small HPPs on the increased total electric power cost for an average household: approximately 2.0 % (very slight).

Additional costs for the construction of small HPPs distributed onto a large number of customers do not greatly affect the electric power costs to be borne by each end user.

8) **Legislative framework:** Existing legislative framework related to preparation and construction of small HPPs is composed of the regulations from the field of energy, urban planning and civil engineering, proprietary legal issues, water management, private investments into public sector, environmental protection and protection for the rights of business organisations. Norms contained in the mentioned regulations, with certain legislator's interventions, provide for realistic grounds to implement the projects for small HPPs construction.

9) **Process for implementation of prescribed procedures and key actors:** Process for implementation of prescribed procedures is divided into 5 stages. Key actors participating in the process itself are: Government of the Republic of Montenegro, Ministry of Economy, Ministry of Agriculture, Forestry and Water Management, Directorate for Waters, Hydro-meteorological Institution of Montenegro, Regulatory Energy Agency, Ministry of Environmental Protection and Urban Planning, Electric Power Company of Montenegro (EPCG) Nikšić (network operator, supplier) and authorized bodies from local governments.

10) **Barriers for development of small HPPs:** There are many such barriers: political, legal and administrative, organisational, financial and professional-technical.

11) **State involvement in the small HPPs development:** Due to non-existence of any reliable data, state involvement in development and research of energy potentials of renewables, thus also in small HPPs, is of general social and economical importance.

In details, State should:

a) organise system of necessary measurements and researches in the waterflows, as well as design the study and pre-project documentation as qualitative grounds for the decision of a potential investor to build a small HPP in a certain location. This means, to enable conclusion of concession agreement for explorations and preparation of documented grounds as per defined criteria;

b) predict also a possibility for initiative started by the investor to carry out preparation and exploration works;

c) as a final aim of preparation-exploration activities, to establish a registry for small HPPs at state level – geographical information system (GIS) (basic data about waterflows and systems for water supply, and technical rationale for potential located sites with all necessary characteristics, with urban-spacial restrictions, environmental protection and protection of cultural treasures);

d) start National Energy Programme for construction of small HPPs

which will organise the system how to research realistic, usable potentials, enable design of Master Plan for construction in medium term period, aggregate local plans for

construction of such facilities, implement facilities' construction, and also make preparations for the construction of others in future, and gather the specialized staff in this area. The aim of the National Energy Programme is to create conditions for entrepreneur activities and to eliminate all barriers in construction of small HPPs on the waterfalls and locations satisfying the criteria related to environmental protection, preservation of natural and cultural treasures, as well as necessary parameters for productivity and economy as per predicted conditions.

e) initiate pilot-programme for small HPPs to be financed by the state, or by the investors interested in testing the existing law procedures and recognition of additional barriers which cannot be detected by project simulation methods. Out of about 70 recognized, and other, possible sites for small HPPs in Montenegro, certain number of initial pilot-projects should be selected. The methodology approach to be applied on these sites is described in this document.

12) **Engagement of local communities in development of small HPPs:**

Local communities should be given greater importance, responsibility and competence in fulfillment of long term strategic national aims and directed towards rational and productive energy utilization of huge hydro potentials from small waterflows in the Republic of Montenegro.

13) **Methodology for determination of realistically achievable small HPPs' potential:** The suggested approach is composed of (16) activities: (1) to define potential locations, i.e. sites, (2) to define generally ecologically acceptable sites, (3) to analyse the impacts of international obligations onto near border waterflows, (4) to detect conflicts with existing or possible users of the same locations, (5) to establish measurements on the waterflows, (6) to make a registry for small HPPs – GIS for small HPPs (at the level of general technical solution), (7) to undertake basic analyses for project repayability, (8) to incorporate the sites into the urban plans and water management plans and programmes, (9) to undertake field surveys – projecting, (10) to adopt urban-plan restrictions, (11) to adopt ecological restrictions, (12) to adopt limitations related to protection of cultural treasures, (13) to adopt restrictions related to water availability, (14) to conduct analysis of the previous feasibility study for the project, (15) to define realistically feasible projects, and (16) to elaborate scheme projects.

14) **Model for electric power purchase from small HPPs:** International experience shows that a system of guaranteed fixed prices and system of fixed incentives (i.e. some of *Feed-In Tariff* models) give best results. Main features of this model are :

- simplified administration, application and control of system of incentives,
- creation of more positive investment ambience.

Model of guaranteed fixed prices (incentives) is assessed to be suitable for application in Montenegro, and therefore it is recommended to be introduced due to substantial contribution to the encouragement for the investments in renewables as primary goal.

Therefore, it should:

a) establish stable purchase system, define purchase price and conditions of purchase (competence of the Ministry of Economy) which will be specified in PPA (*Power Purchase Agreement*),

b) introduce system to purchase electric power at minimum guaranteed price (*eng. Feed-in Tariffs*) which will be proposed by the Ministry of Economy and adopted by the Regulatory Energy Agency,

c) guarantee stability of purchase price and secure purchase for the time period defined in advance (for example, minimum 10 years, provided that it does not violate market principles, according to the assessment by Regulatory Energy Agency),

d) put electric power purchase under the competence of supplier (within the structure of EPCG Nikšić),

e) provide for investment security, which is often the element being more important than the extent of purchase price, regardless the fact that the purchase security is regulated in Energy Law,

f) define methodology for determination of purchase price for electric power produced in small HPPs.

15) **Methodology for determination of purchase price for electric power from small HPPs:** Purchase price is the combined price of so called "basic price" (average production price) of electric power in the system and additional incentive, in order to secure sufficiently high economic cost efficiency for renewable energy projects, and thus attract the investors. Determination for the extent of the incentive is based on the value added to avoided costs for production of electric power from the plants on fossil fuels.

16) **Determination of purchase price for first small HPPs pilot-projects:** Until all elements required for application of the proposed methodology from the preceding point are gathered, purchase prices of electric power for small HPPs can be determined as per principle of „regulated profit”, under the assumption to have money flows and acceptable rates or times for return for typical projects – representatives of each technological group (e.g. internal rate of return of 8-10%, period for return 10 years). Definition of detailed implementation and the way how to conduct monitoring is under the competence of Regulatory Energy Agency of the Republic of Montenegro.

17) **Problems related to connection of small HPPs onto distribution network:** There is the need to set forth technically feasible and economically acceptable measures for efficient connection of small HPPs onto the network. These measures include: (1) establishment of the boundary of competence over the property and installed equipment in accordance with the ownership and proprietary fees, (2) definition of technical requirements for the equipment, (3) prescribing payments which have to be made by the investor in order to compensate the costs occurred due to new connection, (4) definition of responsibility for payment of connection costs, and (5) definition of inter obligations between the investor and the distribution system operator.

18) **Other measures for small HPPs connection onto the network:**

- Provisional Distribution Code should define the financial funds required for connection and utilisation of the network for small HPPs (< 10 MW). It is also necessary to develop more detailed procedure for considering the requests for connection to the distribution network.

- Regulatory Energy Agency of the Republic of Montenegro should supplement the Regulations on tariffs for electric power from the power plants having the power less than 10 MW, which will also regulate the issue related to payment for the connection.

- Standard connection conditions should define the finances for connection as per the principle of «shallow» investments.

- Non-standard connection conditions should allow for the third parties to invest into construction of infra-structure needed in the network.

- The methodology for determination of connection fee should be prescribed, and the connection fee should be defined, which will cover actual connection costs based on standard unit prices for line, transformer and relevant equipment.

- It is necessary to adjust the fees for utilisation of system services of electric power system in order to encourage construction of small HPPs.

19) **Charges for water utilisation and concession fee:** There are two charges predicted for water utilisation in Montenegro for the purpose of electric power production (the charge for water utilization and concession fee). Such approach is not in consistency with the practice in EU member states, and therefore new law solutions will propose simplified approach in determination of the extent of the fee amount.

20) **Prescribed procedures for construction of small HPPs:** Law on participation of private sector in providing public services, respectively Decree passed under this Law (Decree on the way and conditions for the award of concession for utilisation of water for drinking purposes, also for agriculture, industry, communal needs and similar purposes) have been successfully applied in the field of commercial water utilisation, while their application in the field of construction of new energy facilities is facing difficulties.

As procedures for adoption of new laws on waters and involvement of private sector in providing public services is underway, there will be certain corrections in this approach and simplification of procedures and transfer of authorisations onto operative bodies, all with the aim to encourage the construction and create simplified procedures.

21) **Advantages and benefits of Kyoto Protocol for the Republic of Montenegro (in the context of small HPPS):** FR Yugoslavia ratified Framework Convention (UNFCCC) in 1997, and State Union of Serbia and Montenegro officially became the member of Convention in 2001, through succession arrangement, but Kyoto Protocol has not been ratified so far, although it does not imply any concrete obligation in the context of reduction of gas emission. Through the association to Kyoto Protocol (without any additional obligations), Serbia and Montenegro can achieve certain benefits.

Projects for small HPPs construction certainly belong to the group of potential CDM projects due to pretty small gas emissions with green house effect arising from such projects.

Finances for CDM projects, apart from common capital resources, can be provided also from other funds, for example from: European Investment Bank (EIB), World Bank (WB) and German Development Bank (KfW).

Establishment of transparent legislative and institutional framework has the crucial importance for the realization of small HPPs projects within CDM mechanisms, as a positive signal, but also as a secure warrant to the potential investors, removing all barriers in the process of small HPPs construction.

22) **Organisation of the programme for development of small HPPs:** In accordance with predicted obligations and the activities of the Ministry competent for energy field, under Energy Law, it is necessary to organise Central Unit for small HPPs (abbr. CUsHPPs) with the task to conduct entire coordination of the activities related to the small HPPs development programme in the Republic of Montenegro. The final goal resulting from formation and activities of the CUsHPPs is to establish "*one-stop-shop*" agency, wherein the investor/entrepreneur can be provided with all relevant information in one place and, through this CUsHPPs, procure all relevant approvals required for the realization of small HPPs project. This is the way how to provide funds to finance a part of costs for the work of the CUsHPPs outside budgetary resources.

Within the CUsHPPs' scope of work, it should initiate the programmes for exploration works at potential sites for small HPPs through tenders, as well as start to organise the pilot-projects for small HPPs, and initiate the elaboration of Master Plan for construction, as well as organise the design of local plans. Additionally, CUsHPPs is competent to provide information, transparent work and monitoring in realization of National Programme and Development Strategy for small HPPs.

23) **Investment incentives for small HPPs construction:** In Montenegro, it is suggested (i) to establish optimum system to encourage investments through credits with favourable repayment conditions, and (ii) to provide state guarantees, e.g. as per model:

- subsidising a portion of interest – after the investor is granted a commercial bank credit, the portion of interest is subsidised, which is equal to the difference between the interest rate gained by the interested investor and the interest rate which will make the project cost effective and acceptable for the investor. Prior to this, the Government of the Republic of Montenegro and Regulatory Energy Agency have to adopt general criteria for «cost effectiveness» of the small HPPs project (e.g. IRR, the time for the return of investment, concession conditions, etc).

- providing guarantees– guarantee is issued to the investor who is given the credit by domestic and/or foreign banks, thus reducing the risk for credit approval and credit costs to be on the investor's side.

24) **Model of public-private partnership:** Public-private partnership (PPP) covers cooperation between the public authorities and private sector, with the aim to

satisfy certain public needs in the wide sense (financing, construction, rehabilitation, management, maintenance, servicing). Public and private sector join the resources and expertous knowledge in order to satisfy ceratin needs, through appropriate distribution of resources, risks and rewards. PPP also means that private sector participates not only in project realization, but also in decision making process. PPP model is applicable for both existing and new facilities. In the application of PPP model, the attention should be paid to the fulfilment of the general conditions:

- to secure market freedom and equal treatment for all participants in tender procedures and competition,
- to protect public interest and optimize the project value,
- to assess the most efficient type of PPP model for each project.

25) **Selection of the best PPP model:** Under Energy Law and Law on participation of private sector in providing public services, several modes how to perform public activity in relation to the type of contract are predicted (contract on rent, contract on management, concession and BOT). The types of contracts appropriate for the implementation of small HPPs projects are concession or combined concession/BOT.

26) **Institutional competence for granting concessions:** Competence to grant concession for water utilisation (and for production of electric power) is on the Ministry of Agriculture, Forestry and Water Management. Since with respect to small HPPs, this is a specific way how waters are utilised which is closely connected with energy sector, it is necessary that the Ministry of Economy (as the Ministry competent for energy), within the process of concession granting for small HPPs, undertake all previous preparatory activities in order to create conditions for announcement of tender, and to conduct tender procedure as well.

27) **Approaches in concession granting:** Law on participation of private sector in providing public services predicts that the concession is granted through public tender. Also some simplified procedure for concessions should be introduced, in order to accelerate this procedure – the request by the investor. In the implementation of small HPPs projects, two approaches should be available:

- free initiative by the investor,
- initiative by the state and local communities (to issue tender).

It should allow for free investor's initiative in such a manner that the investor can initiate the request for approval of the concession for small HPPs at a certain site, as well as start research and other works required for the implementation of small HPPs projects. Such approach is consistent with the second EU Directive on internal electricity market (Dir. 2003/54/EC).

28) **Re-investing profit from small HPPs operation:** In tender documentation, the engagement of domestic companies and/or products in a certain percentage should be encouraged, taking into account European regulations for the first refusal rights to domestic business undertakings in relation to the foreign owned companies. Further, tender documentation can also contain joint development of small HPPs projects and accompanying activities and/or infra-structural facilities (e.g. tourism,

catering, recreation, rehabilitation and development of local infra-structure, etc.), respectively bind the investors to relevant investments for the needs of the development of local community.

29) **Incentives to domestic entrepreneurs and local communities:** With respect to project implementation, it is necessary to foresee also concrete encouraging measures, such as financial and tax facilitations, non-repayable state resources, favourable credits, construction of ancillary infra-structure and services provided by the state, etc. This is a matter of essential importance in case when the investor is local community, which mostly has neither sufficient funds, nor any warranty enabling it to implement the project by itself.

30) **Revitalisation of the existing small HPPs:** As the existing small hydro power plants have been operating for a long period of time (some of them longer than 40 years), the increasing problems present in their operation with growing tendency, as well as the age of the equipemnt, indicate that it cannot be expected from these plants to be operational to the high extent, or to be available or secure in operation. Therefore, adequate actions and activities have to be undertaken with the purpose to revitalize, modernize or reconstruct these facilities. This document accepted the standpoint that those measures will be covered through privatisation process for these facilities.

31) **Action Plan:** On the basis of the previously completed activities (as per conclusions from points 1 – 30), a preliminary Action Plan has been designed, with the aim to create the most favourable ambience for development of small HPPs projects in Montenegro. The applied Action Plan will regulate, in the shortest possible time period, the system for utilisation of the small HPPs' potentials in Montenegro on entrepreneur basis, especially with respect to purchase (incentivated prices, the time for purchase), carriers of obligations related to purchase, and mechanisms encouraging the utilisation of small HPPs.