SMALL HYDROPWER PLANT DEVELOPMENT STRATEGY FOR MONTENEGRO

PROGRAM DOCUMENT

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MOTIVATION FOR THE SMALL HYDROPOWER PLANT DEVELOPMENT STRATEGY FOR MONTENEGRO

An essential component of the concept of sustainable development is more extensive use of renewable energy sources which are included in the national energy strategies in a way that the share of energy from renewables in total energy demand of a country is defined. Depending on this share, size, importance and impact of units using renewable energy sources on the electric power system are determined. Small hydropower plants in Montenegro represent renewable energy sources with remarkably high development potential. In order to encourage the use of small hydropower plants as renewable energy sources it is necessary to define concrete implementing measures for increasing their contribution to the total energy production. The first step in this direction is to define the Small Hydropower Plant Development Strategy and the accompanying Action Plan.

Energy production and consumption are significant agents of local and global pollution. Therefore, the energy sector development in Montenegro should be based on the energy production and consumption which would contribute to human health protection, biological and landscape diversity preservation and protection of quality environment in local, regional and global dimensions. The objectives of environmental protection are defined in accordance with this basic orientation. Bringing in accord economic-technological development and environment preservation is an imperative which derives from the Declaration on the Ecological State of Montenegro from 1991. With this Declaration, Montenegro commits itself that ecological considerations and environmental protection will loom large and will be given a priority in future development of Montenegro. In this context small hydropower plants as renewable energy should be developed pursuant to the goals of environmental protection.

In addition, Montenegro is an individual adhering party to the Memorandum of Understanding on the Energy Community for Southeast Europe of 2005 (Energy Community Treaty).. The objective of the Memorandum is to integrate (in energy related issues) the countries of the Southeast Europe, in a way that systemic reform efforts in the energy sector of individual countries contribute to opening of energy market on the basis of the model defined by the EU Directives regarding creation of common market of electricity and gas. The preamble of the Memorandum states that one of the objectives of all adhering parties is to improve the environmental conditions with regard to natural gas and electricity, energy efficiency, and renewable energy sources, which are integral parts of the EU energy policies. The Memorandum envisages the adopting of the European *acquis communautaire* in several fields, one of them being the environmental protection.

As for the international initiatives in environmental protection, the UN Framework Convention on Climate Change (hereinafter: the Convention) and the Kyoto Protocol as the accompanying act of the Convention have utmost importance. The signatory parties to the Convention are only the UN member states. Since Montenegro is currently a part of the State Union of Serbia and Montenegro its position in regard to the Convention and the Kyoto Protocol is determined by the position of the State Union. The State Union, under the then name of FR Yugoslavia, became a party to the Convention on 12 March 2001 which came into force 90 days later, on 10 June 2001. The State Union has not signed or ratified the Kyoto Protocol, although no specific commitment would derive from it in terms of greenhouse gas emission reduction because the State Union is not on the lists of countries in the Annex B to the Protocol.

The Energy Law ("Official Bulletin of Montenegro" 39/2003) defines the responsibilities of the Government of Montenegro in the energy sector in the way that the Government:

- sets out and implements the national energy policy and national energy strategy, long term and annul energy balances and energy balance implementation policy,
- ensures implementation of environmental protection measures,
- promotes and facilitates the investments in the energy sector, development of competitive environment and participation of the private players in the energy sector,
- defines policy and strategy in construction of new generating capacities and reconstruction of the existing ones and adopts the relevant procedures.

With a view to meet the obligations deriving from the Energy Law and other relevant regulations the Government, through its responsible ministries, is involved in:

- realisation of energy efficiency and energy sources conservation policy,
- promoting and providing advise about energy efficiency and rational energy use,
- developing and promoting supporting mechanisms for efficient energy use and renewable energy sources,
- promoting increased use of renewable energy sources in production in the domestic market,
- fund management for conservation and efficient use of energy.

The Ministry of Economy, as the Ministry responsible for energy shall:

- prepare and propose national energy policy, long term and annual energy balances and submit them to the Government for adoption,
- execute its obligations deriving from the Energy Law, from international agreements, membership in international organisations, from commitments regarding the electricity demand and supply and inspection supervision,
- consider the needs for natural gas transport, coal and oil derivatives transport together with the neighbouring countries and the possibilities of using available domestic energy resources,
- promote the use of emerging technologies in the energy sector, participation of the private sector in the energy sector of Montenegro as well as privatisation of state-owned energy undertakings or their parts, and the use of renewable energy sources.

Given the fact that only recently the activities on defining long term development plans of the energy sector were launched (based on the guidelines on energy policy adopted in April 2005) in the form of Energy Development Strategy for Montenegro which is expected to be finalised in the first half of 2006, it is necessary to complete and define the national energy strategy as soon as possible. This strategy would generally set out the goals of energy policy and measures to realise these goals. The Energy Sector Development Strategy for Montenegro is also necessary for meeting the international obligations in environmental protection as well as for adjusting to the EU rules in energy management, given the fact that one of the strategic goals of Montenegro is the EU membership. Thus, the Small Hydropower Plant Development Strategy should become an integral part of the Energy Sector Development Strategy for Montenegro, or a part of the overall energy sector development strategy which has its energy, economic, legislative, structural and institutional aspects. Following the adoption of the national energy strategy of the small hydropower plant development, it is necessary to develop the plan for its implementation. The solutions proposed in this program document are adjusted to the needs and specificities of Montenegro, and take into consideration the positive international experience.

Regarding the Small Hydropower Plant Development Strategy and the accompanying Action Plan the following aspects are defined:

- dynamics of construction of small hydropower plants is realistic and appropriate for Montenegro,
- influence of the adopted dynamics of small hydropower plant construction on the electric energy balance of Montenegro,
- total costs of construction/operation of new small hydropower plants,
- influence of construction of new small hydropower plants on electricity price for final customers,
- construction of small hydropower plants as a contribution to fulfilling international commitments (taken and expected ones).

PRESENT SITUATION, PRELIMINARY ACTIVITIES AND OBJECTIVE OF SMALL HYDROPOWER PLANT DEVELOPMENT PROGRAM FOR MONTENEGRO

Current development level of small hydropower plants

In order to get the proper picture of the influence of new small hydro construction on the Montenegro's electric power system it is necessary to analyse the present level of development and then to presume the construction of a certain number of small hydropower plants in the near future (e.g., for the 10 year period). Table 1 shows the installed capacity, net capacity, average production during the unit's lifetime, and realised and planned production in the existing small hydropower plants (sHP), hydropower plants (HP) and thermal power plants (TPP) in Montenegro.

Table 1 **Installed capacity of generation and electricity production in the electric power system of Montenegro**

	Installed capacity		Net capacity		Average generation realised		Realised in 2005		Plan for 2006	
	MW	%	MW	%	GWh	%	GWh	%	GWh	%
Existing sHP	9,0	1,0	9,0	1,1	21,4	0,9	22,9	0,8	21	0,8
HP	649,0	74,8	649,0	76,3	1 552,0	62,2	1818	66,6	1673	60,5
TPP	210,0	24,2	193,0	22,7	922,0	36,9	890	32,5	1073	38,7
Total production	868,0	100,0	851,0	100,0	2495,4	100,0	2730,9	100,0	2 767	100,0
Total available*					3795,9				3832	

* The 'Total available' category shows total available electricity in the electric power system of Montenegro given the electricity exchange agreement of the HP Piva with the system of Serbia (1065 GWh.

According to the Energy Law all hydropower plants below 10 MW of installed capacity are considered as small hydropower plants. The installed capacity of seven existing small hydropower plants amounts to 8.92 MW with average annual production of 21.4 GWh. Total installed capacity of the Montenegro's electric power system amounts to 868 MW, out of which the largest part belongs to two large units. The share of the existing small hydropower plants in total generating units' capacity is only 1.1 per cent, while the share of generation from small hydropower plants in total annual electric power sector's production, according to average values, is only 0.9 per cent. In his context, we should keep in mind the fact that

Montenegro meets about 1/3 of its total electricity needs by purchasing electricity from other systems which makes the contribution of small hydropower plants in covering total demand even lower. Two thirds of electricity is produced in large units and one third in the only thermal power plant in the system (coal-fired thermal power plant Pljevlja).

Table 2 shows the age structure of the existing small hydropower plants. Most units have been operating for more than 20 years, and over half of them are more than 40 years old. Only two small hydropower plants can be considered as relatively new (19 years). In the past 10 years there were no renovations of the units. In addition, Montenegro has no electric equipment and machinery production. All small hydropower plants are owned by the national electric power company EPCG AD Nikšic.

Table 2 Age structure of the existing small hydropower plants

Age	0-19 year	20-39 year	40-59 year	>60 year	Total
Number of sHP	2	1	3	1	**7**
Share of sHP in %	29	14	43	14	**100**

The company EPCG AD Nikšic supplies electricity to approximately 285 000 customers. Production from small hydropower plant, hydropower plants and thermal power plants is not sufficient to meet total electricity demand in Montenegro and significant quantity of electricity is imported from other systems. In 2005 domestic power plants produced total of 2730,9 GWh (without valuation of the HP Piva), and the deficit is covered by import – 1598 GWh. Production plan is 2767 GWh in 2006, and import plan is 1600 GWh in 2006.

Due to neglected construction of domestic generating capacities and increasing energy demand the import dependence is ever increasing. During the 1990-ties there was a significant fall in consumption but also, structural changes and changes in consumption characteristics occurred. In addition to a drop in industrial consumption, there was also an accelerated growth in distributive consumption. The final consumption in 1989 reached 2 095 GWh, but in 1994 it dropped to only 505 GWh. In 2005 direct customers reached the consumption levels from the end 1980-ties (2077 GWh), while the planned consumption for 2006 is 2107 GWh.

In the last 20 years distributive consumption has doubled. In 1985 it amounted to 1127 GWh, in 2005. it amounted 2287 GWh, while the plan for 2006 is set on 2336 GWh. At the same time the production remains at the same level: in 1985 the production was 2662 GWh, in 2005 it was 2730,9 GWh, and the planned production for 2006 is 2 767 GWh. The deficit of electricity in 1985 was 607,4 GWh, while in 2005 the expected deficit wais 1800 GWh (not including evaluation of HP Piva).

Because of constant consumption increase it is expected that in the coming years electricity import will be growing as long as there is no a large generation unit is constructed. At the same time it is necessary to provide more and more funds for electricity import because of the growing needs and electricity prices in the free market.

Preliminary investigation of potentials for small hydropower plant development

In the last few years increasingly intensive research in small hydropower plant development potentials has been conducted.

The fundamental document in this regard is the extensive and comprehensive study "Guidelines for development and construction of small hydropower plants in Montenegro" from 2000. The study is an estimate of the hydropower potential for small hydropower plants in Montenegro. It also addresses the technical and legal issues and proposes the approach to planning small hydropower plant development and construction in Montenegro. Also, there is the publication entitled "Small hydropower plants in Montenegro" which deals with technical and economic characteristics of small hydropower plants. A large number of other papers were published in professional and scientific journals and proceedings.

According to the EPCG AD Nikšic, 17 per cent of total hydropower potential in Montenegro is already used (HP Perucica – 307 MW, 970 GWh; HP Piva – 342 MW, 870 GWh; small hydropower plants – 8.92 MW, 21 GWh). There are projects for 70 small hydropower plants with total capacity of 231 MW or 643 GWh per year. Locations of small hydropower plants in Montenegro are characterised by relatively low flows and high falls of water. For most of observed water flows, measurements have not been made, which affects the credibility of estimates. Only few locations were analysed more in depth.

The potential estimates must be updated on the basis of appropriate measurements which would be in accordance with environmental protection requirements.

The objective of the small hydropower plant development program

The promotion of renewable energy sources is placed high among the EU priorities and it has been declared in several strategic documents, firstly because of their ecological characteristics and then because of other benefits deriving from their use. In this regard the most important document is the Directive 2001/77/EC on the promotion of electricity production produced from renewable energy sources in the internal electricity market. The purpose of the Directive is to promote an increase of share of renewable energy sources in electricity generation in the internal market and to create a basis for the future common EU framework. The Directive sets out the target share of renewable energy sources in electricity generation as 22 per cent in 2010, almost twice as high in relation to 1997 level. The realised share in 2003 was 5.2 per cent. The recently signed Energy Community Treaty of 25 October 2005 will enable the creation of legislative framework for integrated energy market and implementation of the *acquis communautaire* in the energy field, ecology, competition and renewable energy sources. Pursuant to the Treaty, the implementation plan for the Directive 2001/77/EZ should be developed and submitted not later than the end of the first year from its coming into force.

Definition of the strategic goals to be accomplished by use of renewable energy sources is the first step in determining the minimum share of the renewable energy sources and regulation of requirements for their use. The projected (future) share of the renewable energy sources should be based on realistic estimates in order to oblige energy undertakings to accomplish these goals through carrying out the given assignments. Regardless of the wide public support, the ambitious goals are not translated in to stable growth of renewable energy sources use. The reasons to this lie either in the lack of renewable energy sources projects which would meet the projections or in the fact that the system as a whole is not well adjusted to the projected levels of renewable energy sources.

The concrete answer to the question what is a realistic share of renewable energy sources for Montenegro is not possible to give as longs as there is no concrete analysis of all renewable energy sources which carry any significant potential. In the meantime the analysis

of expected renewable energy sources' shares in ten new EU member countries can serve as initial estimate of the expected level and targets for Montenegro. The estimates are that the achievable share of all renewable energy sources (not only small hydro) in 2010/2015 could be in the range of 3 - 5 per cent of total energy needs. Based on an approximate analysis it is estimated that the generation from small hydropower plants in the national electric energy balance can reach the share of about 2.5 per cent in 2015. This target is feasible p roviding that necessary implementing regulations are adopted on an urgent basis.

DINAMYCS OF SMALL HYDROPOWER PLANT DEVELOPMENTIN MONTENEGRO

As the result of the bases for developing the Small Hydropower Plant Development Strategy for Montenegro, total of 70 potential locations for small hydropower plant construction were identified. Their total installed capacity amounts to 231.72 MW, and the expected annual electricity production amounts to 644 213 GWh. The exploitation of maximum capacity would reach 31.7 per cent or 2 780 hours per year. It is not realistic to expect that all identified locations will be developed due to various limitations related to environmental protection and lack of economic feasibility. The speed of development will primarily depend on licensing procedure and on creation of appropriate conditions such as: purchase price, grid connections, etc.

Below we give the analysis of two scenarios for small hydropower plant development in Montenegro – the referent scenario and the high scenario. it is presumed that all existing small hydropower plants will continue to operate (the issue of reconstruction is not considered here). Tables 3 and 4 show the assumed dynamics of small hydropower plant development until 2015, for the referent and high scenarios. It should be noted than in these calculations specific locations for small hydropower plants are not observed.

To referent scenario in the period until 2010 projects the construction of two small hydropower plants with combined installed capacity of 5 MW as well s the construction of the additional 15 MW in the appropriate locations in the period before 2015. In other words, in the 10 year period it is projected to increase the installed capacity and generation from small hydro by three times.

The high scenario projects the construction of three to four small hydropower plants until 2010. Their total installed capacity would be 10 MW and additional 20 MW in an adequate number of locations until 2015. In other words, in the 10 year period it is foreseen to increase the installed capacity and generation from small hydropower plants by more then 4 times.

Table 3 Referent scenario of small hydro development in Montenegro until 2015

Referent scenario	2005	2010	2015
Installed capacity [MW]			
Existing sHP	9	9	14
New sHP	0	5	15
Total sHP	9	14	29
Expected annual production [GWh]			
Existing sHP	21	21	35
New sHP	0	14	42
Total sHP	21	35	77

Table 4 High scenario of small hydro development in Montenegro until 2015.

High scenario	2005	2010	2015
Instal led capacity [MW]			
Existing sHP	9	9	19
New sHP	0	10	20
Total sHP	9	19	39
Expected annual production [GWh]			
Existing sHP	21	21	49
New sHP	0	28	56
Total sHP	21	49	105

Despite this definition of the development dynamics, the development of small hydropower plants has a limited impact on total power of generating capacities and electricity production in Montenegro. The contribution of installed capacity of all small hydropower plants to total installed capacity of the Montenegro's electric power system in 2015 would be 3.3 per cent (referent scenario), or 4.4 per cent (high scenario), assuming that there are no new constructions of other generating capacities. In case of increasing the overall generating capacities the contribution of small hydropower plants' installed capacity would be lower. The share of generation from small hydropower plants in total generation within the power system (evaluation of HP Piva not included) in 2015 would be 3 per cent (referent scenario), or 4.2 per cent (high scenario). Taking into account the evaluation of the HP Piva, the contributions of small hydropower plants to total production would be lower. In this case as well the assumption is that until 2015 no new large electricity sources will be constructed. In other words, taking into consideration the electricity import, a possible contribution of small hydropower plants in meeting the needs for electricity in Montenegro would be in range of 1.5-3 per cent.

Given the fact that new small hydropower plants will have a low share in total generating capacities of the power system of Montenegro, their dispersive character will not represent difficulties in comparison to other fluctuations which occur in supply and demand, and which must be addressed by the system operation procedures on a daily basis. Their impact will be especially low in relation to demand meeting issues and maintenance of system operation safety in case of outage of a large generating unit (TP Pljevlja of 193 MW is the largest generation unit in the power system of Montenegro). In other words, with the given assumptions, new small hydropower plants with the estimated level of capacity and generation can be integrated in the electric power system of Montenegro without occurrences of technical limitations from the point of view of system operation, providing of course that all grid connection requirements are met. The limitations will appear rather because of setting the amount of generation capacities of small hydropower plants from the point of view of socially acceptable costs. The final impact of small hydropower plants to total installed capacity and generation within the electric power system of Montenegro is low, especially if we take into account that in the coming period Montenegro will probably take on the construction of one large generation unit because of steady growth in electricity demand and import.

The described scenarios of small hydro development dynamics (referent and high scenario) indicate that, despite the fast growing and multiple increase of installed capacity of small hydropower plants, the final impact on the overall power and generation within the power system of Montenegro is still low. At the same time there is a question how realistic is the mentioned dynamics in the context of the system organisation, entire licensing process and

fulfilment of contractual arrangements (e.g., purchase agreement, grid connection costs, environmental protection issues, etc.).

ECONOMIC-FINANCIAL ANALYSIS OF SMALL HYDROPOWER PLANT DEVELOPMENT IN MONTENEGRO

Given the fact that locations of small hydropower plants are not defined beforehand or included in the all-inclusive database, some assumptions have been adopted as to initially determine the expected annual production and average selling price. The assumptions are in accordance with the scale of investments in the three considered units: HP Otilovici, HP Krupac, Hp Slano and HP Šavnik 2, whose investments range from 800 to 2400 EUR/kW (it is essential to point out that only for these three locations the usable data analysed to a satisfactory level were available, taking into account the age of these data). They are the following:

- buildings make 40 per cent and equipment make 60 per cent of total investments
- project realisation in two years with investing dynamics of 50 per cent in each year of the period,
- project to be completely financed through loans from financial institutions,
- 10 year credit period,
- interest rate of 6% per year,
- analysis is based on steady value for EUR for the whole calculation period,
- planned technical-economic lifetime is 20 years,
- electricity purchase price is set out at 0.030 EUR/kWh i.e. market price or the price that the small hydropower plant's owner would get from selling the electricity in the open market; incentive-free prices, (given the fact that there is not data on production price or market price of electricity from small hydropower plants in Montenegro, this amount je only presumed on the basis on the purchase price for renewable energy sources in Croatia at the level of 0.033 EUR/kWh, and for the needs of formulating implementation acts regarding renewable energy sources in Croatia.)
- marginal rate of capital accumulation is set to 8%,
- net present value coefficient is 1,
- profitability index is 1.
- maximum capacity used for 2 800 hours,
- average specific investment is 1 500 EUR/kW (equal for all units),
- facility operation based on 1 employee per MW.

Based on these presumed values the results of economic-financial analysis are given below in Table 5 (referent scenario) and Table 6 (high scenario). The incremental costs indicates an additional cost incurred by construction of a new small hydropower plant in relation to the situation before construction (i.e., incremental cost indicates financial incentives necessary for construction of new small hydropower plants in relation to the market price). Assuming the referent price of 3.0 EURcent/kWh, the incremental cost is 4.6 EURcent/kWh (i.e., production price from small hydropower plant deducted by referent price). The production price from small hydropower plant of 7,6 EURcent/kWh is calculated as average price for the 20 year period (technical and economic lifetime of a project).

Table 5 Results of analysis for referent scenario

Referent scenario		2010	2015
Total installed capacity of new sHP	MW	5	20
Generation	GWh	14	56
Production price from sHP (IRR = 8%)	EURcent/kWh	7,6	7,6
Total cost	mil. EUR	1,064	4,256
Incremental cost (necessary incentives)	mil EUR	0,644	2,576
Electricity final consumption*	GWh	3 969	4 244
Average selling price increase	EURcent/kWh	0,016	0,061

- - estimate

Table 6 Results of analysis for high scenario

Referent scenario		2010	2015
Total installed capacity of new sHP	MW	10	30
Annual generation	GWh	28	84
Production price from sHP (IRR = 8%)	EURcent/kWh	7,6	7,6
Total cost	mil. EUR	2,128	6,384
Incremental cost (necessary incentives)	mil EUR	1,288	3,864
Electricity final consumption*	GWh	3 969	4 244
Average selling price increase	EURcent/kWh	0,032	0,091

* - estimate

The referent scenario puts the incentives for construction of new 5 MW capacity in small hydropower plant in 2010 at the level of 644 000 €, i.e., 2,576 million € in 2015 for total of 20 MW in new small hydropower plants. Dividing the total amount of incentives by the expected electricity consumption in the future we obtain the expected average selling price increase. In this, the obtained increase is 0.016 EURcent/kWh (2010) and 0.061 EURcent/kWh (2015) respectively. The average calculation for electricity used by households in Montenegro falls in the range between 15€ and 30 €. Assuming the average selling price of electricity of 4.5 EURcent/kWh it gives the consumption ranging from 330 and 660 kWh/month, i.e., between 4 000 and 7 900 kWh/year. If the calculation includes the increase from construction of new small hydropower plants (under referent scenario) we obtain the expected incremental cost for electricity ranging from 0.63 to 1.27 EUR/y (in 2010), i.e., from 2.42 to 4.83 EUR/y (in 2015). The additional cost for new small hydropower plants has a very low influence on total incremental cost for electricity by average household – roughly 1.4 per cent.

The high scenario projects the incentives for construction of new 10 MW in small hydropower plants in 2010 to be 1, 288 million €, i.e., 3,864 million € in 2015 for total 30 MW of new small hydropower plants. Increase of average selling electricity price in this case is 0.032 EURcent/kWh (2010) and 0.091 EURcent/kWh (2015). If the calculation for an average household in Montenegro includes the electricity bill increase because of new constructions (under high scenario) we obtain the expected incremental cost for electricity ranging from 1.26 to 2.53 EUR/y (in 2010), i.e., from 3.60 to 7.21 EUR/y (in 2015). Incremental cost for small hydropower plants has a very low impact on increase of total electricity bill of an average household – roughly 2 per cent.

Incremental cost from small hydropower plant construction, distributed to a large number of customers, does not significantly influence electricity bills paid by end user. More massive influence on electricity bills in the future can be expected for other reasons, such as: rising fuel price and increasing electricity price on the open market, revoking incentives, harmonisation of the tariff system with actual operational costs, etc. However, on the other hand, some operational cost cuts can be expected (improving efficiency, reduction of technical and non-technical losses within the system).

It is important to note that the small hydropower plant construction (as well as construction of most of units using renewable energy sources) represents incremental costs in relation to the electricity generation from so called conventional energy sources (coal-fired and gas-fired thermal power plans, large hydropower plants, etc.). One of the reasons for higher costs of renewable energy sources use lies in the fact that the costs of conventional sources do not include external costs. The renewable energy sources have a minimum impact on environment if rules of environmental protection are applied properly. So, their development must be encouraged. Since one of principal pursuits of Montenegro is the accession to the EU, it is necessary to promote the development of small hydropower plants and other renewable energy sources by supporting the most cost efficient model of their construction.

The described result of the economic-financial analysis should be taken with some reserve because of poor availability of data on potential small hydropower plant locations, but they can serve as a good guidance in making decision about the dynamics of small hydro development in Montenegro.

LEGAL PROCEDURES, RESPONSIBLE AUTHORITIES AND DECISION MAKING PROCESS RELATIVE TO SMALL HYDROPOWER PLANT CONSTRUCTION IN MONTENEGRO

When presenting the legal framework for preparation and construction of small hydropower plant we carried out a thorough analysis of license issuing procedures – covering the whole range from concession awarding to the plant use permit. The existing legal framework directly concerning the small hydropower plant preparation and construction is made of regulations referring to energy sector, spatial planning and construction industry, property issues, water management, private investments in the public sector, environmental protection and company law. The normative concepts contained in the mentioned regulations, together with some legislator's interventions provide a proper basis for realisation of small hydropower plant construction projects. The entire authorisation process is divided in five phases. (Figure 1):

- **phase one** – includes documents and activities relative to the choice of location i.e., investigation, selection of location, design (preliminary technical design), pre-feasibility study, inclusion of location in the spatial and urban plans and its inclusion in the water management basis (estimated duration : 19 months);
- **phase two** – includes documents and activities relative to concession or BOT contract awarding (estimated duration: 12 months);
- **phase three** – includes documents and activities relative to preparation and obtaining the decision on location and building permits and other approvals and licenses and sorting out property issues (estimated duration : 17 months);
- **phase four** – includes documents and activities relative to construction, obtaining of use permit, water management permit, activity license and concession license or BOT privilege approval (estimated duration: 22 months);
- **phase five** – includes documents and activities relative to handover of small hydropower plants and registration as well as operation, supervision, control and maintenance of small hydropower plant during their lifetime.

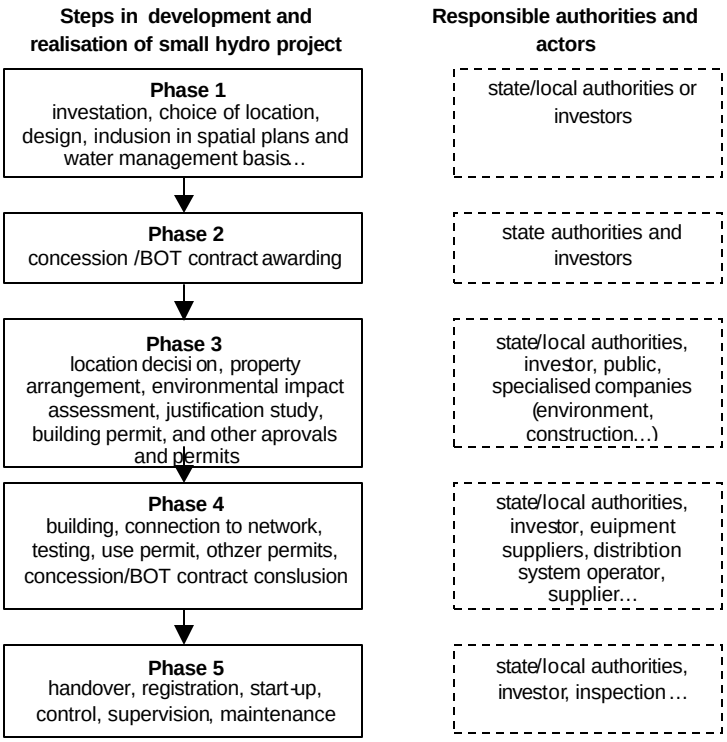

Figure 1 Phases in the process of development and execution of a small hydropower plant project in Montenegro

Key actors in this process are, in addition to investors and the Government of Montenegro, Ministry of Economy, Ministry of Agriculture, Forestry And Water Management, Energy Regulatory Agency, Ministry for Environmental Protection and Spatial Planning, EPCG AD Nikšic (network operator, supplier, and potential investor), and responsible local authorities.

It is estimated that the entire small hydropower plant construction authorisation process would take somewhat less than six years (minimum). This estimate assumes that there is a hydrological basis for location concerned, but there are no other required bases (geological basis, environmental data, etc.). This estimated duration of procedure includes the building period of 1 year. We should point out that this is only approximate and optimistic estimate, because in this phase it is not possible to envisage all bottlenecks and procedure related problems that might appear, and thus, the duration of some parts of the procedure was not specifically prescribed. Only the implementation of the pilot project will disclose all shortcomings and gaps in the procedure, and points to which the actions should focus in order to reduce the required time.

BARRIERS TO SMALL HYDROPOWER PLANT PROJECTS IN MONTENEGRO

The analysis of all issues concerning development and execution of small hydropower plant projects highlights a certain number of barriers. They primarily derive from gaps in laws and regulations, heavy-handed regulation of some issues, and under-regulations of other ones, lack of financial resources and lack of relevant information and coordination between responsible actors.

The main barriers to small hydropower plant development and construction in Montenegro are classified in several categories:

- political barriers:
  - the strategic targets of using renewable energy sources (i.e., target of their minimum share in total energy needs) and a minimum share of small hydro in meeting energy needs of Montenegro are not defined,
- legal and administrative barriers:
  - lack of implementing provisions regulating the purchase of electricity from small hydropower plants, i.e., provisions which in general regulate the support for renewable energy sources development,
  - complicated process of concession/BOT contract awarding – complexity of the Law on Participation of Private Sector in Public Services Provision ("Official Bulletin of Montenegro" 30/2002) is manifested in an intricate and time consuming procedure involving a large number of actors: Government of Montenegro, Council for Privatisation, Commission for Concessions and BOT arrangements, Ministry responsible for water management, Energy Regulatory Agency, Ministry of Economy as the responsible ministry, special organisational units within specific authorities – units for project evaluation, *ad-hoc* commissions for project assessment,
  - during the authorisation procedures (authorisation, permits, approval and other relevant acts obtaining) there is the problem of timeline of actions and applications for obtaining the required documents,
  - the Energy Law envisages the simplified procedures and simplified treatment for small hydropower plants. However, other laws do not distinguish between them and the other energy facilities in any way except in the issue of responsibility for location or building permits,
  - difference between small and large hydropower plants are not evaluated in terms of compulsory level and content of technical and other indispensable documentation as part of the preparation for building and building itself (recognition of specificity – special solutions),
  - the Energy Regulatory Agency has not defined simplified authorisation procedures for small hydropower plant construction and license issuing for electricity generation from small hydropower plant as foreseen under the Energy Law,
  - The Ministry of Economy has not established the pricing methodology for efficient connecting small hydropower plants to the network, or tariff system for electricity generation from renewable energy sources of below 10MW capacity. Thus, in this moment the purchase price of electricity is an unknown quantity,
  - Provisional Distribution Code is not accompanied by implementing documents such as Rules or Guidelines which would define specificities of individual

small hydropower plants. Also, the provisional character of the Code does not help creating a stable environment,

- regulatory provisions regarding sanctions for delays in connecting small hydropower plants to the network are not in place,
- detailed procedure of considering applications for connecting small hydropower plants to the network are not in place,

? organisational barriers:

- the organisation of purchasing electricity from small hydropower plants, scope of responsibility of various entities, rules and conditions for purchase are not set out,
- poor coordination between responsible entities,
- there is no central state entity or unit responsible for coordination and monitoring of the small hydropower plant development program,
- under the existing legislation the Ministry of Economy is, among others, technically responsible for the following tasks: servicing potential investors in terms of providing information in order to facilitate projects for electricity generation from small hydropower plants, with special emphasis on providing information on available locations, information on layout of potential locations for use of water flows, information on licenses, permits and authorisations, and details that can be essential for project realisation and coordination with other ministries, in order to facilitate and simplify the prescribed procedures and obligations, etc. – organisational and personnel underperformance.

? financial barriers:

- there are no mechanisms for covering incremental costs of electricity generation from small hydropower plants (funding and support sources),
- there are two types of water usage fees (water usage fee and concession fee),

? expertise-related and technical barriers:

- there are no reliable data on potential locations for small hydropower plants (hydro-meteorological data, geological data, data on environmental condition, etc.),
- insufficient accuracy and reliability of data which should enable to establish purchase price for electricity from small hydropower plants (avoided damages, local and global externalia, etc.),
- public is not properly informed about advantages/ benefits from and potential risks of small hydropower plant development, which results in negative attitudes regarding the preparation and execution of projects,
- there are no curricula and training programs on a permanent basis for small hydropower plant operators and distribution system operators to train them to carry out studies and execute practical tests in specific operational problems in small hydropower plants,
- there are no expert or engineering companies for design of small hydropower plants,
- there are no companies which produce equipment for small hydropower plants.

NECESSARY ACTIVITIES FOR PREPARATION OF SMALL HYDROPOWER PLANT DEVELOPMENT IN MONTENEGRO

In the framework of the Small Hydropower Plant Development Strategy for Montenegro all necessary activities for preparation of their development have been identified. This includes the considerations regarding possible solutions for the following issues:

- survey and definition of realistic and feasible potential for small hydropower plants (requirements for construction) - initiating the national energy program for small hydropower plant construction,
- model for electricity purchase from small hydropower plants (generally from units using renewable energy sources)
- adequate methodology for electricity pricing,
- connection of small hydropower plant to distribution network and relevant charges,
- influence of environmental protection regulations and influence of Kyoto Protocol provisions and mechanisms on potentials for small hydropower plant development in Montenegro,
- concession fees, water usage fees and land usage fees and supporting measures for small hydropower plant development,
- organisation model and activities of a central unit which would be responsible for coordinating development of small hydropower plants,
- models of public-private partnership suitable for realisation of small hydropower plants in the context of Montenegro situation and set targets.

Besides, in the framework of the preparation for Small Hydropower Plant Development Strategy, the measures for removing obstacles are proposed. They refer to changes in the current legal and implementing provisions in terms of simplifying procedures, more precise definition of responsibilities, opening space for investor initiative, enhancing staff capacities and adopting the envisaged implementing provisions. There is also the proposal for methodological approach in the framework of national energy program of small hydropower plant development. Procedures should be simplified but with as few changes of the current laws as possible in order to enable the soonest possible start of the pilot projects.

Below are described in more detail the necessary activities and proposed measures for their realisation.

Investigation of small hydro potential (focusing on environmental protection)

In attempts to evaluate and select several potential locations for the first pilot projects it was established (for a certain number of locations) that there were no relevant data which could be used for assessing the potential annual production. Thus, there are no basic assumptions for investment profitability analysis. Government's investment in research and development of the energy potential of renewable energy sources, and thus of small hydro, is highly important in social and economic terms.

The State must organise the waters measurement and investigation systems, and enable developing studies and preliminary layout documentation as a quality basis for potential investors' decision to undertake the construction of a small hydropower plant on a specific location. In this way the State will encourage the investors to make a decision on investment in small hydropower plant projects since an adequate analysis and sufficient data about potential location will be available.

Preparation and investigation activities (hydrologic surveys for several years, geological, ecological and other surveys) take long time and can make a sizable portion in a small hydropower plant investment. In other words, there is a risk that a relatively complex and costly investigation will show that a specific location is not economically feasible. The basic idea is that the State assumes the risk of investigations in as many locations as possible. In such a case the State can recover the invested means by selling the documentation on small hydropower plant locations. Besides, it should be foreseen that investor may start the preparation and investigations on his own initiative.

The final result of preparatory and investigation activities would be creation of the national cadastre of small hydropower plants. Although the term '' small hydropower plant cadastre'' primarily should refer to the existing units, it practice it is usually used to indicate the potential locations. This in this text we shall use it in the latter meaning. The cadastre contains the general data about water flows and water supply systems suitable for small hydro development as well as general technical solutions on potential locations with the findings about basic energy parameters and limitations regarding environment and cultural heritage protection. In this regard it is recommended to establish a commission which would define the impact on environment and cultural heritage and they would have an important role when technical solutions for small hydropower plant are concerned. We especially underline the principle that potential small hydropower plant locations in national parks should be completely excluded from consideration, and those locations which belong to areas with lower environmental protection should be subject to very strict criteria and supervision when development potentials are to be defined.

It is recommended to initiate the national energy program of small hydropower plant development in order to put in place a structure for facilitating small hydropower plant construction, systematic investigation of their potential and gather the experts of the field. The goal of the national energy program is to create the conditions for entrepreneurial activity and remove the obstacles in small hydro development on water flows and on locations which meet the environmental protection requirements, and preserve nature and cultural heritage.

As closely connected to investigating potentials for small hydropower plants it is recommended to start pilot projects which would be financed by the State. This would give a direct and concrete support to increasing small hydropower plant construction. This assumes that a certain number of locations would be selected and documentation for these locations up to the level of master project would be developed. As for potential locations that are already defined, it is necessary to determine their environmental protection compliance (to give preference to solutions that minimally change the environment) and define biological minimum, or ecologically acceptable flow, since most locations are analysed only basically. This means that all locations are subject to changes in terms of layout of planned infrastructural facilities for small hydropower plants or in terms of changing the water usage regime.

It is recommended to define, in the context of pilot projects elaborate technical solutions for a selected number of locations. Pilot locations must meet all requirements for inclusion in the spatial and water-management plans as well as those for obtaining location decisions. Also, the environmental impact study must be made. An additional result of pilot project activities is test of the existing legal procedures and identification of additional obstacles which can not be detected by project simulation methods. Out of about 70 potential locations in Montenegro a selection of 10-15 locations should be made where the methodological approach described below should be implemented.

Methodology for defining feasible small hydropower plants potential

The existing bases for small hydropower plant projects do not contain sufficient data for reliable definition of their potential in Montenegro given the fact that for a large number of water flows there are no long time measurements, or ecological characteristics of locations have not been surveyed. As a result the feasible technical solutions can not be defined.

In order to define conditions under which the construction of small hydropower plants is possible, we recommend implementation of such a methodological approach which will give the feasible potential for small hydropower plants. In brief, this approach consists of the following activities:

- Define potential locations,
- Generally define location's ecological acceptability
- Investigate the effect of international obligations in regard to boundary water flows,
- Detect the conflicts with the existing or potential users of the same space,
- Carry out measurements on water flows,
- Develop the cadastre of small hydropower plants (up to general technical solutions),
- Carry out general profitability analysis of the project,
- Include locations in spatial plans and water-management bases,
- Carry out field visits – designing,
- Adopt spatial planning limitations ,
- Adopt ecological limitations,
- Adopt limitations regarding cultural heritage protection,
- Adopt limitations regarding water availability,
- Carry our pre pre-feasibility studies,
- Define feasible projects,
- Develop conceptual design.

The initial activity of the proposed methodological procedure is to define potential locations suitable for small hydropower plant construction. Although this activity in Montenegro has already been carried out, the list of potential locations must be updated. Especially it should be found out if a plant can be installed in the existing or abandoned facilities on water flows.

After that it is possible to identify which environmental changes can be made on potential location or water flow, having in mind the defined and well examined opinions on protection level in individual areas and water flows of Montenegro – strategic environmental assessment (SEA). Projects (locations) which do not meet this requirement shall be excluded from further considerations and analysis. The environmental protection assessment is related to the Spatial Plan of Montenegro, and in the legal regulation context, it is related to the environmental legislation – Law on Environment and Law on Environmental Impact Assessment (the preparation of this law is underway).

The next step is to examine the influence of international agreements, obligations or limitations in using water resources. If the activities on a specific water flow result in unacceptable changes in the neighbouring country it is necessary to clarify the occurring interactions and adjust the project to the justified requests from other countries. If this adjustment is not possible the project in question should be abandoned.

The action that follows is to examine the presence of specific buildings on the potential locations, or, to verify if the production location is planned for any other purpose. If yes, it is necessary to investigate the possibility of multiple use of the water flow in the locations. If such multiple usage of the water flow is not possible these locations should be abandoned.

The described criteria and steps gave as a result the locations where the construction is generally possible and where conditions are in place for investing means in a detailed investigation. This will be made by installing measuring stations on potential water flows/ locations. This point should be especially insisted on because in Montenegro there are only few locations where systematic and long time survey of water flows was carried out.

Having in mind stochastic character of water flows, in order to obtain a good estimate of water flow fluctuations on a specific location, and thus of water availability for energy use, it is necessary to carry out flow measuring for several years. It is therefore, recommended to establish as soon as possible the measuring system on all water flows that bear any potential and where the construction is proved as possible. The other option is short term measurement exercise (1-2 hydrological years) and application of an approximate method of determining flow (e.g., correlation between flows and multi-annual flows of large water streams in an observed basin). However, because of markedly stochastic character of flows and the resulting high insecurity, this option should be adopted only exceptionally.

Collection of data on flows on production locations is followed by developing the cadastre of small hydropower plants. It is an exercise where the database is created with a kind of identity card of each project in form of general technical solution. This level of elaboration presumes that there is an economic feasibility analysis. This analysis shows which locations can be cost-effective i.e., which locations are solid candidates for construction. These locations are included in the spatial and urban plans and in the water-management basis.

The next step is to develop design which is done after field visits by design engineers and ecologic experts, cultural heritage experts, water management specialists as well as local community representatives and other interested parties who might be affected by the project (scientific and expert public, NGOs, local associations, etc.). In this way all relevant interested parties may get informed about the nature of the project. The remarks can be expressed and considered on the spot. The final result of this stage is the development of conceptual design. Below are described the activities preceding the conceptual design.

Special attention should be paid to the steps that follow the field visits: adoption of limitations regarding spatial planning, ecological concerns, cultural heritage, and water availability (biological minimum or ecologically acceptable flow). It is recommended to establish a commission for defining the conditions under which the construction is feasible. A special ad-hoc commission may be established for each particular type of limitations. Such commissions will give, based on actual situation on the field and after inquiry of general technical solution, their conclusions and guidelines on how to elaborate technical solution which will take into account all the limitations.

The previous stage assumes the analysis of requests from and influence on local community, local associations, and interest groups. It is very important to reach the consent of all relevant actors in a way that all of them recognise their benefits, both those coming out from the specific project and the initiative as a whole. The benefits from the small hydropower plant project are not single-valued – in addition to creating new jobs and contribution to $C0_2$, emission reduction, they bring the increasing environment awareness and technical culture at the local level and create better foundations for local development.

After adopting the mentioned limitations the pre-feasibility of the project is analysed. The pre-feasibility analysis should give a list of feasible projects as a result. In this phase as well, one part of projects shall be eliminated because they can not comply with certain limitations and because of too high investment costs caused by some limitations.

For locations which meet the feasibility criteria the conceptual design shall be made. The conceptual design is a prerequisite for all further activities related to construction preparation (regarding the spatial planning, building and legal regulations, the procedure continues in activities referring to location decision, environmental impact assessment, etc.).

This procedure shall define the requirements applicable for a specific location only. The final result of the proposed methodology is the list of projects which take into consideration all substantiated requirements: ecological criteria, economic feasibility and general social acceptability. In other words, the final selection contains feasible and viable projects.

Small hydropower plants built in water supply systems introduce a particular specificity. Water supply systems can have a substantial electricity generation potential. In such cases it is recommended to apply a methodological approach more simplified than the one used for small hydropower plant on water flows. In these cases it is necessary to:

- identify potential locations,
- study if there is possibility for aggregate installation,
- create cadastre of small hydropower plants at level of general preliminary design,
- carry out general profitability analysis,
- draft design.

In the simplified methodological approach the initial step in definition of small hydropower plant potential in water supply systems is to identify location in systems where kinetic energy of water is reduced, i.e., locations where there problems of higher falls and excessive pressure. In most cases, falls of several meters disqualify location from further considerations in the very beginning of technical analysis and after examining the current situation because such locations require large-size turbines. It is assumed that the cost of turbine and its installation would exceed the financial gains from the electricity production. More accurate assumptions may be given after a more detailed inquiry of the system.

Following the identification of potential locations it is necessary to define feasible technical solutions. The water supply system infrastructure is most often built in some typical design solutions (piping, water chambers, and other installations). Thus, the typization of turbines and generators can be considered. In cooperation with experts in particular fields (as explained in the previous text regarding the conditions on natural water flows) eventual environmental impact of and possible limitations to small hydropower plants during construction and operation shall be considered.

After defining potential annual production and possible limitations due to ecological and other requirements (which also have a financial implications) financial feasibility is examined. The final result is the definition of actually usable potential.

This simplified methodology is applied in case that aggregates can fit in the existing facilities and pipes, i.e., there is no need for reconstruction of a facility or installations. If the installation of aggregates is not possible in the existing proportions of a facility and pipes the same approach which is applied for location in natural water flows should be implemented.

Model for electricity purchase from small hydropower plants

The renewable energy sources are still not competitive in relation to fossil fuels, if the prices of technologies using fossil fuels do not include the cost of environmental protection. Due to this some kind of supporting mechanism should be introduced in order to promote the renewable energy sources.

The two basic supporting mechanisms for electricity production from renewable energy sources are the following:

- Quota-based approach – a responsible authority (most often the Government) sets out the quantity (quote) of production from renewable energy sources which must be fulfilled in one year. The price for individual renewable energy sources is formed on the market. This model can be realised in two ways, i.e., through:
  - Tendering system,
  - Tradable Green Certificates,
- Feed-in approach – producers using renewable energy sources receive fixed guaranteed price or fixed guaranteed incentives during a given period of time. It is the electricity buyers or tax payers who cover the incremental cost of electricity.

Besides these two models, there are other mechanisms as well, like investment or tax incentives. Also, it is important to mention the introduction of ecological fees as one of the instruments for so called internalisation of external costs.

Regardless of the character of incentives, be it on the investment side or final product (generated kWh) side, the international experience shows that the fixed price systems or fixed incentive systems (i.e., some of the *feed-in tariff* models) yield the best results. The guaranteed prices/ incentives model is suitable for undeveloped electricity markets. The main characteristic of this model are:

- Simple administration, implementation and control of incentive systems,
- Creation of positive investment climate.

The guaranteed fixed price /incentive model is considered to be adequate for the conditions in Montenegro. Hence, it is recommended to introduce it because it strongly encourages investments in renewable energy sources, which is a primary goal here. The cost efficiency, as the next essential objective, may be obtained by use of other models as well (tradable green certificates, etc.) but then we should take into account the risks of introducing advanced and insufficiently tested models, as well as preliminary activities required for their implementation.

In order to encourage investors in Montenegro to invest in renewable energy sources projects and thus, increase their share in the energy balance, it is necessary to put in place such supporting system which will increase the purchase price as to cover the incremental costs of production. Purchase price of electricity from a small hydropower plant should logically be compared to minimum purchase price from an equivalent unit using fossil fuels (the new block in thermal power plant Pljevlja), including the internalisation of external costs. The incentives can be provided from the special charges used for renewable energy sources development and included in the electricity bills or through higher fees for network use. In other words, promotion of renewable energy sources development implies increasing price/cost for end users.

Therefore, the following steps should be undertaken:

- establish a stable purchase system, define purchase price and conditions (under the Ministry of Economy) which will be specified in the Power Purchase Agreements,
- introduce the electricity purchase system based on feed-in tariffs. The system would be proposed by the Ministry of Economy and adopted by the Energy Regulatory Agency,
- guarantee the stability of purchase price and purchase security through a period of time defined beforehand (e.g., 10 year minimum providing that it does not undermine market principles in the view of the energy regulator),
- place the electricity purchase under the supplier's responsibility (a part of EPCG AD Nikšic),
- guarantee security of purchase which represents the basic condition for investment security and stable planning horizon, even in the conditions of well developed energy market, and even more so in undeveloped markets,
- guarantee security of investing which represents a more important element than the purchase price level as such, regardless of the fact that the purchase security is regulated by the Energy Law (legally guaranteed purchase security is indeed a significant but not and indispensable or essential condition for renewable energy sources promotion, if a proper purchase model and necessary implementing regulations are not in place.),
- establish methodology for calculation of electricity purchase price from small hydropower plants.

Methodology for setting purchase price of electricity from small hydropower plants

The basis for methodology for setting purchase price is the average market price for electricity in the system. Since it s not possible to calculate this data, the average production price of electricity in the system can be used as a basis. Due to higher production price from renewable energy sources (in case of most technologies) the incentives should be added to the basic price (average market or average production price) in order to ensure economic profitability of the renewable energy sources projects and in order to attract investors.

It is recommended to introduce the methodology for determining incentives which is based on valorisation of avoided costs in electricity generated from units using fossil fuels. It consists of four steps:

- **Step one** – determine the so called production curve for small hydropower plants (and renewable energy sources in general),
- **Step two** – determine incremental costs deriving from non-availability of some small hydropower plants,
- **Step three** – determine avoided external costs (externalia) which occur because of replacement of conventional sources by small hydropower plants (renewable energy sources in general),
- **Step four** – determine economically justified share of small hydropower plants (renewable energy sources in general) by comparison with conventional power plants, analyse cost and benefits and set out tariffs.

The recommended methodology enables to determine actual values of renewable energy for electric power systems and for environment. The basic shortcoming of this methodology is that it requires that a certain number of inputs must be known , but by their nature they are not easily translatable in to financial values. However, they affect the final result. Because of this, the methodology is mainly used for determining minimum share of renewable energy sources.

For the purpose of the first small hydropower plant pilot projects, and until all necessary elements for implementation of the proposed methodology are gathered, electricity purchase prices for individual renewable energy sources, such as small hydropower plants, can be determined by regulated profit principle, with assumption of cash flow and acceptable rate or period of return for projects which are typical for specific technological groups (e.g., internal rate or return 8-10%, period of return 10 years).

It is not recommended to establish the average sale as a basis for setting purchase price for electricity from renewable energy sources on the open energy market, because all energy players (producer, transmission and distribution operator, and supplier) must compensate themselves for their services from the price for kWh. Also, special services are financed from the price for kWh (e.g., Regulator's activity, market operator, etc.) This approach would not bring good results for Montenegro given the course of electricity market opening in this country. In addition, the level of average sale price most often is not high enough for producers using renewable energy sources, i.e., for making the projects profitable, which is the basic prerequisite for investments in renewable energy sources.

Connecting small hydropower plants to the distribution network

In order to preserve the security of the electric power system operation it is necessary to establish reasonable and economically acceptable requirements for connecting small hydropower plants in various designs to the power network. The efficient connection of small hydropower plants requires the following actions:

- establish or clearly define scope of responsibilities over assets and equipment to be install in order to carry out connection,
- set up technical requirements regarding equipment in order to ensure system security and general level of service quality, as well as for potential needs for enhancing distribution systems because of new connections,
- regulate payments investor must make for compensation of costs incurred by new connection,
- define responsibilities for connection costs payments (how much, payment method and to whom),
- set the boundary between what is paid by investors, and what is financed by distribution system operator and what is compensated by all users connected to the network.

The detailed compulsory technical rules, regarding the network connection, are given in the Provisional Distribution Code (2005) and they refer to all types of small generating units (<10 MW) regardless of their primary energy source and technology. Funds that must be allocated for connection and use of network are not set out for power plants of below 10 MW in construction.

The Provisional Distribution Code by its content belongs to the normative technical documents and does not represent an obstacle for connecting small hydropower plants. However, it would be necessary to specifically and separately define specificities of some types of dispersive generation units in separate documents (e.g., Rules or Recommendations). The specificities would include detailed descriptions of much more

articles on general provisions, issuance of special requirements and electric power approvals, network connection, influence on network, protection, metering system, supervision over small unit operation, electrical schemes, forms and methods of calculation.

Based on the Provisional Distribution Code (2005), the connection procedure may take 30 days at maximum from the time of application for low voltage network and 60 days for medium voltage network. However, a more detailed procedure should be developed for considering application for connection to the distribution network in a way similar to that established for connection to the transmission network (Provisional Grid Code, 2005). In this way it would be easier for responsible distribution system operator to consider a large number of applications on the basis of a defined procedure for application considering and keeping a waiting list at the same time.

It is necessary to introduce a program for permanent education and training of distribution system operator given the fact that technical aspects of network connections and network operation largely depend on processes and technologies used in small hydropower plants. The distribution system operator should be trained and equipped for various analyses and test measurements by use of appropriate software and equipment. Al this requires financial funds to be earmarked within the investment and development plans.

Development and construction of small hydropower plants is much facilitated by stronger involvement of the Regulator through supervision in the connection process in order to avoid unjustified delays in issuance of approvals for connection and to sanction their occurrence. In this view it is necessary that legislator defines penalties as to enable to assess if the delays are justified or not.

Given the network tariffs in Montenegro, the Energy Regulatory Agency issued the Rules for electricity tariffs (2005) which do not determine the price for electricity generated from units below 10 MW in construction. Therefore, it is necessary to:

- amend the Rules or to formulate the new ones for power plants below 10 MW in construction, with a view to regulate the payment for connection,
- define financial funds for connection on the basis of "shallow" investments if the requirements for connecting small hydropower plants to the network are regular ones,
- in case of out-of-regular connection requirements, enable to third parties to invest in necessary infrastructure if distribution system operator is not able to approve connection due to insufficient network capacity,
- regulate methodology of establishing connection fees and establish the connection fees which should cover the actual costs of connection on the basis of regular unit prices for line, transformer, and switching device,
- avoid charges for the use of the system (as well as charges for transmission, charges for auxiliary services, charges for distorting competition, capacity-based tariffs, charges relative to power flow to higher voltage levels) in order to promote small hydropower plant construction,
- connection fees should be used for financing the creation of technical conditions within the network, and the construction of connection as such should be paid for from the connection fees,
- connection fee should include necessary investment and technical documentation, cost of property arrangements on the public area, cost of road use, cost of license for connection construction, construction works incl. material and equipment, electric installation works, incl. material and equipment, equipment for measuring points, investigations and network connections.

Connection fees should cover actual costs of connection including the equipment for measuring points and actual costs of creating technical conditions in the network to feed in electricity, including actual costs of protective equipment installation which protects the network from the return influence. It is recommended that technical requirements of connection small hydropower plants to the network should be set out by distribution system operator based on a study on optimal technical arrangement of the connection, which would be his responsibility. The cost of the study should be a part of the connection charge as in this way it is possible to establish the costs of connecting small hydropower plant to the network.

Water usage fees and concession fee

When water usage fees are concerned it was noticed that in Montenegro there are two types of fees for using water for electricity production (one based on the Law on Waters and the other based the Law on Private Sector's Participation in Public Services Provision). Such an approach is not in line with the practice of the most of the EU member states, where in principle there is only one fee of administrative character which does not have any significant influence on small hydropower plant projects.

Given the fact that Montenegro wants to promote the electricity production from small hydropower plants there is no substantiate reason for existence of both water usage fees. Namely, the application of two fees means that electricity from small hydropower plants will be more expensive. It is *de facto* extra "taxation" of subsidised energy source, which will only make electricity from small hydropower plants less competitive in comparison conventional plants using fossil fuels.

Thus, it is estimated that one fee is sufficient, so that it will not significantly affect the economic efficiency of the project. The exact amount of the fee should be calculated on the basis of simulations on a concrete case of a small hydropower plant where other inputs are known (investment, production, etc.)

Given the fact that the water usage fee is clearly defined in the Law on Waters, and that concession fee is only mentioned but not fully clarified, the 'Decree on ways and conditions for concession awarding for using water for drinking, agriculture, industry, municipal needs, and similar purposes' proposes to the legislator to exempt small hydropower plants from paying concession fee, or to adopt a single fee system. In this way Montenegro would have the system which would be in compliance with the systems of the European countries. In addition, it is recommended to consider the system of different fee amounts for run-of-river and reservoir hydropower plant, since there are fundamental differences in size of land needed for infrastructure facilities.

Authorisation process

The Law on Private Sector Participation in Public Services Provision, or the Decree adopted on the basis of this law ('Decree on ways and conditions for concession awarding for using water for drinking, agriculture, industry, municipal needs, and similar purposes' – Official Bulletin of Montenegro 32/2003) are successfully implemented in commercial use of water use while the construction of new energy facilities the implementation is faced with some obstacles.

This is why the introduction of some changes in the above mentioned acts and a more active involvement of experts from the Ministry of Economy and the Energy Regulatory Agency, although at this point they are not formally responsible for calling for and administration of water concession tenders.

The duration of the entire process of small hydropower plant realisation, from investigations (assuming that hydrologic bases exist) up to start-up commercial operation is estimated to a

little less than 6 years (minimum period). The time from the moment of initiating the process for concession/BOT contract awarding (the basic document) until the issuance of final license is estimated to less than two and a half years which is a very good result by international standards.

Advantages and benefits of adopting the Kyoto Protocol provisions for Montenegro in regard to small hydropower plant development

Problem of climate changes caused by increasing concentration of greenhouse gases is considered to be the most serious global risk for the environment in the 21st century because of mean global air temperature increase. This is why the UN member states in 1992 adopted the Framework Convention on Climate Changes. Through this document the developed countries, which in the past most contributed to increased concentration of greenhouse gases, committed themselves to restrain its rise. In 1997 the activities were extended by adopting the Kyoto Protocol, which states the commitments of reducing the greenhouse gas emissions taken by the developed countries and the countries with economies in transition (countries of Annex I). The Protocol came into force on 16 February 2005 after Russia had ratified it.

Serbia and Montenegro (under the then name FR Yugoslavia) signed the Framework Convention in 2001. However, the State Union of Serbia and Montenegro has not signed or ratified the Kyoto Protocol as yet although no concrete obligations derive from it for them in sense of reduction of greenhouse gas emissions. Also, Serbia and Montenegro has not yet prepared its first national report on climate changes (which is mandatory under the Convention), although the country enjoys expert and financial support from the UN. Namely, the Framework Convention defines the so called financial mechanism to support projects aiming at mitigating climate changes and their effects. This mechanism is run by the *Global Environmental Facility Fund* through independent financing or co-financing of projects with more that 250 million US dollars a year.

Kyoto Protocol does not imply any additional obligations for the states which are not listed in the Annex I and Serbia and Montenegro can even draw some benefits from it. This decision should be implemented at the level of the State Union given the fact that only states which are members of the UN have the right to sign the Protocol.

The first national report on climate changes should be drafted and it is possible to request the financial and expert assistance for this purpose from the GEF Fund.

Adopting the Kyoto Protocol is a prerequisite for the ongoing or planned integration processes. It primarily refers to the accession to the EU because Kyoto Protocol is one of the conditions that the EU imposes to any aspiring candidate. The other integration process in which Montenegro is included individually is the establishing of the Energy Community of Southeast Europe whose members are committed to „endeavour to adopt the Kyoto Protocol". In this issue there is a dilemma because Montenegro can not adopt the Protocol individually, without Serbia.

In the framework of the Kyoto Protocol, the so called flexible mechanisms are defined with a view to minimise costs of emission reduction at global level. Each country of the Annex I, besides its own emission quota, may additionally acquire emission permits through flexible mechanisms. There are three such mechanisms: Joint Implementation (JI), Clean Development Mechanism (CDM) and Emission Trading (ET). In the frame of joint implementation mechanism emission permits can be obtained through realisation of projects which reduce emissions in other countries of the Annex I. In the framework of CDM mechanisms the Annex I countries realise such projects in the countries not listed in the Annex I (most often developing countries), while in the framework of emission trading mechanism the Annex I countries are allowed to trade emission quota units among each other.

In its efforts to reduce greenhouse gas emissions the European Union set up in 2005 the EU Emission Trading Scheme (EU ETS) which represents the world largest CO_2 emission trading among the companies. The system enables the companies to use emission credits as well which derive from flexible mechanism of the Kyoto Protocol (JI and CDM projects), for meeting their obligations within the scheme. In this way a kind of incentive is created for investment in projects which reduce emissions in other states, especially in the developing countries. In here, for the states like Serbia and Montenegro, which do not have emission limits defined, the CDM projects are of utmost interest. This applies regardless of how the relations between Serbia and Montenegro shall be arranged in the future, because there is no sings that any of the countries could change its status in the context of the Kyoto Protocol, namely that any other them could fall in the group of the countries whose emissions are limited.

It is expected that the establishment of the ETS system and its linking to the CDM projects will result in significant rise in demand for such projects. The investment decision will also be affected by the factors such as regulatory certainty, credit availability and price of the projects themselves. The small hydropower plant construction projects undoubtedly fall in the group of potentially CDM projects due to very low greenhouse gas emissions from such facilities. The additional desirability of such way of emission reduction is the fact that the price of emission certificates on the European market increased to over 20 EUR/tCO_2.

Funding of the CDM projects, besides the regular sources of capital and commercial credits, can be provided from the special funds. They are established specifically for these purposes by some of the words largest development banks. The funds manly cumulate the financial means of individual entities and use them for financing promising projects. Such banks are European Investment Bank (EIB), World Bank (WB) and the German KfW Bankgruppe.

After creation of the initial assumptions for realisation of the CDM projects it will be necessary to, in order to implement the CDM mechanisms on small hydropower plant development projects, identify and elaborate the most promising projects in a way to comply with the methodology of the CDM Executive Board This is an essential requirement for investor to receive the certificated emission units as they require approval from the Executive Board. The procedures and methodology for evaluation of small projects (up to 15 MW capacity) are simplified which practically refers to all small hydropower plant projects in Montenegro which already have some project documentation.

In order to successfully present the potential projects to the interested partners, it is necessary to establish the communication with potential partners and financial institutions which are involved in this field. Investors, of course, prefer such projects in the environments which are relatively risk-free. The risk exist that after undertaking a CDM project the planned emission units are not effectuated, especially in the countries with inadequate legislative and institutional environment, and such countries are quite a few outside the Annex I list. Therefore, establishment of a transparent legal and institutional framework for small hydropower plant projects is of utmost importance not only as a positive signal but also as a certain guarantee to potential investors. It removes the potential obstacles in the process of small hydropower plant development.

Organisation of small hydropower plant development programs

The issues involved in the process of small hydropower plant development are very complex and are regulated by several laws and provisions. Some parts of this process fall under the responsibility of different State authorities and some require further elaboration and clarifications. Given the way the process and responsibilities are divided among the State and local government authorities there is a need to consolidate and guide the small hydropower plant projects through a single and all-inclusive procedure.

The existing legal framework recognises the need for a stronger and faster development of renewable energy sources projects, but it is necessary to integrate the relevant procedures and make them simpler with a view to attract investors and business operators. The practice of the European countries shows that integration of these processes usually requires a special body (centre, department, agency or some other form of organisation) with a precisely defined role, scopes of activity, tasks, structure and funding.

The position of such a body in relation to other players in the process must be clearly determined as to make the new structure really efficient so that it would not be a bottleneck and/or an overlapping activity. The basic role of this body is to coordinate the activities, promote and attract businesses and investors. In addition to the organisational structure special attention should be paid to building human resources and informatics capacities, where recruiting and formation of appropriate staff is a critical element.

Given the development potential and importance of small hydropower plants for Montenegro, as a first step after starting the national energy program of small hydropower plant construction, it is essential to set up a special body for support to the entire process of small hydropower plant development in the form of Central Unit for Small Hydropower Plants in Montenegro (CJmHE). Moreover, it is possible to view the issues concerned in a broader context of renewable energy sources. The potential of all renewable energy sources in Montenegro is also significant so it would be appropriate to consider the establishing of a special body which would be responsible for renewable energy sources. It could be done as early as this stage of affairs. This body would be closely connected to or integrated in the Montenegro's Central Unit for Energy Efficiency (CJEE), in a way to become a common body for renewable energy sources and energy efficiency.

Role and scope of the Central Unit for Small Hydropower Plants derive from the Energy Law provisions defining the role of the ministry responsible for energy (Ministry of Economy) in regard to small hydropower plants (i.e., regarding renewable energy sources in general) Central Unit would function as a national centre for small hydropower plants ("*one stop shop*" or "*fast track*") through:

- Coordination of activities in realisation of small hydropower plant projects though cooperation with competent State and local authorities, academic institutions, financial institutions, environmental organisations and other entities and organisations,
- Capacity building in local government units, natural and legal persons for realisation of small hydropower plant projects,
- Promoting small hydropower plant projects and education of target groups with emphasis on environmental protection and sustainable development,
- International cooperation, know-how exchange, activities in international associations for small hydropower plants and relevant organisations (involved in environmental protection and renewable energy sources, etc.).

Role and scope of the Central Unit for small Hydropower Plants would be realised through its activities which are generally determined by the Energy Law, energy policy and by other relevant provisions and acts. In this sense the Central Unit represents the first step of implementing in practice the provisions of the Energy Law and the obligations of the Government of Montenegro and responsibilities of ministries, especially with regard to renewable energy sources

It is proposed to focus the Central Unit's activity to addressing a certain number of actual and precise issues which require fast and efficient solutions in order to facilitate the smooth realisation of the projects.

In the first years the Central Unit should focus on:

- simplifying the project realisation procedures ,
- realisation of pilot projects for reconstruction of old and construction of new small hydropower plants,
- development of the information systems,
- organising measurement exercise and collection of hydro meteorological bases for future small hydropower plant projects,
- organisation of collecting geological bases,
- promoting small hydropower plant projects and education of staff.

The activities of the Central Unit should encompass the following:

- coordination of activities in small hydropower plant development in the country via cooperation with state and local government, educational and other public institutions,
- setting up a clear and publicly available small hydropower plant development policy as to avoid coincidence, position abuse, and case-by-case solutions, i.e., establishing legal and administrative framework which would be equal for all projects,
- analysis, identification and proposition of administrative procedures for simplifying and acceleration of small hydropower plant development,
- formulation, amending, and proposing the legal acts and other provisions in cooperation with relevant state and local authorities,
- development of informatics as support for small hydropower plant projects development (creating cadastre of locations suitable for small hydropower plants, geographic information system for small hydropower plants, statistics and cooperation with statistic agencies),
- considering environmental protection issues, social needs and economic effects of small hydropower plants,
- organisation of measuring and collecting data on flows on potential locations for small hydropower plants in cooperation with responsible institutions and interested parties,
- organisation of exploring and gathering the geological data on potential locations for small hydropower plants cooperation with responsible institutions and interested parties,
- consulting role for all interested parties, in particular for entrepreneurs, investors, local community and financial institutions,
- market research (equipment, "green energy", etc.),
- promotion of small hydropower plant projects and education of local population in particular about potentials and benefits of these projects and multi-purpose projects,
- establishing criteria for comparison of energy options and individual small hydropower plant projects (according to IHA guidelines),
- estimate of complex influence of individual small hydropower plant project on environment (nature, local community, public health) and project's viability (economic viability, environmental impact, social impacts),
- promotion of Environmental Management System and introduction of environmental protection norms (ISO 14001),

- promotion and setting up of the green certificate issuance system (i.e., certificate on whether production from small hydropower plants is in compliance with environmental protection principles) and initiative for establishing "green energy" market,
- courses and training for entrepreneurs, investors, and financial institutions,
- cooperation with companies producing equipment for small hydropower plant, with design engineers and other interesting parties in the process of project development and realisation,
- Invitation for tenders (e.g., for flow measuring, conceptual designs, concessions, BOT projects, etc) in cooperation with other responsible institutions,
- fund raising, distribution and promotion of financial plans for small hydropower plant projects in cooperation with other institutions,
- participation in international cooperation programs and expertise and information exchange with similar bodies in other countries, international organisations and associations involved in small hydropower plant and renewable energy sources development,
- organisation of expert conferences on development and realisation of small hydropower plant projects,
- encouraging use of state-of-the-art technologies and experience by permanent transfer of expertise, support to joint ventures in equipment production, establishing good business practices,
- support to implementation of energy policy and cooperation in energy sector reform,
- definition of procedures for protection of commercially sensitive information.

It is recommended that, as a final step in setting and performance of the Central Unit, that a "*one-stop-shop*" be established, where investor/business will be able to receive all relevant information and through the Unit obtain necessary paperwork for small hydropower plant construction. In his way, it s possible to get some extra-budgetary revenues for partly financing the Central Unit's expenses. The Strategy preparatory document proposes the details for Central Unit's organisation, financing and communication with other entities in the energy sector. It is essential to underline that the Central Unit is not meant to be an entity for realisation of the small hydropower plant projects, and its purpose is not construction and financing of small hydropower plants, but as the focal point for the coordination of all activities required for project realisation, education, and promotion through working together with all actors in the project realisation process..

In the framework of the Central Unit's activities programs should be started for investigation of potential locations for small hydropower plants on the basis of public tenders, and to organise the realisation of one or two projects of constructing new or reconstruction an existing small hydropower plant. The hydrological risk (lack of security in production at the annual level) can not be avoided but its level can be foreseen as well as its impact on small hydropower plant business performance. For this purpose reliable measurements of hydro-meteorological parameters and of other characteristics of the dam site are needed as they are indispensable for construction. It is necessary to organise the collection of such data through cooperation between the Central Unit and responsible institutions and interested parties. The data collection model can be worked out through a public tender, but it is necessary to open the space for private sector's initiative.

Investment support for small hydropower plant construction

One of the major obstacles faced by the investors in small hydropower plants is how to find a favourable source of financing. Since small hydropower plants generate significant social net benefits when strict ecological norms are complied with, it is a national interest to support the investments in such projects.

The support in the construction stage can be performed in the following ways:

- **Government's investment subsidies** covering a part or whole amount of investment needed for small hydropower plant project. Subsidies may be granted in these forms:
  - direct subsidies from the State budget,
  - Government's guarantees,
  - tax exemptions and tax relief,
  - direct government's capital investments.
- **Soft loans** – this scheme can be very useful (both for investor and for the legislator) in a way that in the process of loan approval the project is checked for its ecological, technical and economic characteristics. Favourable terms of soft loans may refer to lower interest rates, loose insurance mechanisms, longer grace period etc.
- **Tax charges on used energy** – surtax is applied in a way that electric power company pays to electricity producers from small hydropower plants the amount of money equivalent to the tax paid for used energy. In this way the energy obtained from the conventional sources becomes relatively more expensive which in an impetus to electricity production from small hydropower plants.

Proposal for Montenegro is to create an optimum investment supporting system which would include soft loans and government's guarantees. Other methods are more demanding in performance and give less result.

The soft loans and government's guarantees programs can be carried out through the Central Unit, i.e., its Department for legal and economic affairs and public relations. Due to its scope of activity relative to small hydropower plants this Department would be best qualified to assess the quality of each project. After a positive assessment, the project would be taken over by the Department for economic affairs of the Unit as to find the most favourable source of financing:

- **Partial interest rate subsidies** – when the investor receives the commercial bank loans, the Central Unit subsidises the amount of interest rate which is equal to difference between the payable interest rate and the interest rate that would make the project cost efficient and acceptable for investor. The Central Unit has the role to make a connection between interested investors and domestic and foreign financial institutions interested in small hydropower plants, and they include development funds, international financial institutions and local authorities (such measure should be preceded by adopting cost efficiency criteria by the Government of Montenegro and the Regulatory agency).
- **Guarantees** – guarantee is issued to investor who takes the loan from domestic or foreign banks. It is presumed that the Central Unit scrutinises in-depth each application for co-financing and supports only those which it finds economically viable.

How to choose the public-private partnership model

Public-private partnership (PPP) presumes the cooperation between public authorities and private sector with the aim to meet some public needs in broad range activities (financing, construction, reconstruction, operation, maintenance, service provision). Public and private sector put together their resources and expertise in order to fulfil a certain public need through appropriate sharing resources, risks and rewards. PPP model presumes that private sector does not participate only in project realisation but also in the decision-making process. PPP model is applicable both for the existing facilities and for the new ones. In PPP model the attention should be paid to make sure that the following conditions are in place:

- Ensure free market and fair competition,
- Protect the public interest and maximise the project value (value for money),
- Find the most efficient type of PPP model for each project.

The Energy Law determines that power sector activities are carried out as public services. The Law on Participation of Private Sector in Public Services Provision foresees several ways of performing public activities depending on a form of contract (lease agreement, operating agreement, and concession and BOT contract).

The concession or combination of concession and BOT agreement are the most suitable contractual forms for small hydropower plant projects. The concession and BOT agreement are awarded for 30 years maximum or for the period needed for investment return. Both in case of concession and BOT mode the projects bearer is obliged to ensure investment funds, i.e., the public sector is not responsible and public resources (such as state budget, cities' or municipal budgets) are not engaged although public sources may represent a kind of support in form of various exemptions and benefits (e.g., tax exemptions, import relief, co-financing of interest rates on commercial loans, various public levies relief, non-repayable grants for project onset and investigations, etc.

The choice of the most suitable PPP model depends on characteristics of the project and on general public attitude towards the PPP models. In the selection of the optimal PPP model for each individual project it is necessary to estimate the needs, view the distribution of risks between public and private sector, decide which parts of the project shall be realised through the PPP model, establish the approximate price and values of the project and define basic arrangement between the contractual parties. The basic references affecting the choice of the PPP model fit for small hydropower plant projects are the following:

- Lack of public resources for financing such projects; certain co-financing capacities may appear after establishing the Fund for environmental protection or some similar Fund which would collect funds from charges paid by polluters. The main goal of the public sector is to attract private investors,
- Unwillingness of the public sector to accept high risk in small hydropower plant projects. Since every PPP model (except for full scale privatisation) puts certain risk on the public sector as well, the Government will have to take some risk but with efforts to prevent that the risk does not effectuate in practice as to protect the public goods. In a specific case of small hydropower plant, that can be the guarantee for premium payment for produced electricity. I small hydropower plant is realised as a BOT project this obligation of the government is already defined in the Law on Participation of Private Sector in Public Services Provision (Article 125),
- There must be a concession for use of water resources,
- concession is awarded only through public tender,

- it is desirable to enable more open access to construction of small hydropower plants i.e. to leave the initiative to investors. Presently all initiatives come from public authorities (public invitation),
- all services related to power sector are public services and the forms of participation of the private sector are defined in the Law on Participation of Private Sector in Public Services Provision,
- it is necessary to realise as soon as possible 1-2 projects in order to set up a clear and well proven procedure. In this regard, there is no time for massive changes of the present legal framework, except to fill in the gaps (e.g., network connection costs, electricity purchase price, responsibilities over concession awarding for small hydropower plants, etc.),
- in the realisation there will be the problem of lack of expert staff who have experience in PPP model implementation (concession and BOT model, developing tendering documentation, best bidder selection criteria, who will have property right over facilities during and after concession/BOT agreement, etc.),
- how the complexity of the model affects the possibility of participation of local entrepreneurs, investors and local communities in the realisation of the small hydropower plants. The analysis of spatial layout of small water flows in Montenegro, gives the conclusion that a large number of potential locations for small hydropower plants is located in the rural areas. Small hydropower plants might become the motor of development in the regions they are situated, and this is a priority interest of these regions. It is necessary to foresee a special treatment for facilities in all these areas (financial and tax relieves, non-repayable government's funds, soft loans, development of auxiliary infrastructure, and service provision by the state, etc.). Attracting foreign investors is a positive intention but it is necessary to ensure that the revenue from small hydropower plants be reinvested in Montenegro.

In case of small hydropower plants (industrial category) the activities and responsibilities in awarding concession for water usage lie under the Ministry of Agriculture, Forestry and Water Management. Since the use of water in small hydropower plants is specific and closely connected with the energy sector the proposal to the Ministry of Economy (as responsible for energy) is to be involved in awarding concessions for small hydropower plants. It is possible that the ministry responsible for water management continues to award concessions in cooperation with the expert department of the Ministry of Economy (Central Unit for small hydropower plants). Cooperation and responsibilities should be set between these two ministries by amending the Law on Participation of Private Sector in Public Services Provision and 'Decree on ways and conditions for concession awarding for using water for drinking, agriculture, industry, municipal needs, and similar purposes'.

The Law envisages that concession is awarded through a public tender. In other words, project can not be realised prior to public invitation to bidders, pre-qualification procedure and selection of best bidder. In order to expedite this procedure, in addition to public tender, a more simple way of concession awarding can be applied – on investor's application. It is proposed to enable two approaches in realisation of small hydropower plants:

- investor's free initiative,
- Government's or local community's initiative (tendering).

The free initiative should be enabled in the way that the investor may file the application for concession for a small hydropower plant on a production location, as well as start investigation and other operations needed for project realisation. This approach is in accordance with the second EU Directive concerning internal market of electricity. This approach requires the definition of the framework for investor performance which is mostly in place already (legal regulation regarding construction, spatial organisation, use of waters, environmental protection, concession awarding requirements, etc.), but it must be finalised

(purchase prices, purchase model, investors incentives, etc). The timeline for works by stages (the earliest onset, the latest finalisation), penalties for non-compliance, information availability, etc., should be defined. In this way the transparency of procedure would be ensured as well as the fair treatment of all concession applicants. In addition, it will enable the private investors and business operators to make the first step in the process of small hydropower plant projects, so that they do not have to wait for calls for tender from the public authorities.

Given the initiative of the Government, the first question to be tackled is in which stage of the realisation the tender should be called for and what its subject is – investigation, design or construction? Public sector (State) in this case takes a certain risk in the sense that it should invest some resources while the return is expected (through project realisation) only in the later stages. In case of Montenegro insecurity is evident since none of 70 locations has reliable basis which will offer private investor a confidence to take the risk and start small hydropower plant construction. Having in mind financial capacity of the State it is proposed that a certain number of initial locations are selected from the total of 70. They would make 10-15 pilot projects with the most prospective for realisation. For these locations tendering documentation should be developed for investigation and design up to conceptual design stage. Exceptionally for the needs of a faster realisation of the national energy program, one or two locations can be singled out as economically most promising ones and realised on the basis of the accelerated procedure. Hence, the State should invest in location development (through tendering), and bring locations to the final stage either by its own means (budgetary funds, development funds, and development programs) or through tenders. At the same time it should establish a program of permanent investigation of all locations and create the cadastre of small hydropower plants. After completion of procedure for initial locations, the next group of pilot project can be determined. They would be subject to the same procedure.

Reinvesting income from small hydropower plant business

Reinvesting income from small hydropower plant operation in the economy of Montenegro is a much broader issue than just the small hydropower plant development strategy and it cuts across the whole legal and economic system. If this system is efficient and provides opportunities for further investing, then the investments will take place. According to the law a foreign investor may choose freely what to do with the profit earned and may take it out from the country. Also, the fact is that Montenegro has not significant industry of products which could be placed in small hydropower plants (generators, turbines, etc). However, domestic businesses may take part in construction works, equipment production and supply, construction equipment supply, informatics equipment supply, production and supply of some minor machinery parts of installations, etc. Domestic companies are interested in this business but the investor in small hydropower plant is basically not bound when choosing suppliers for products and services for small hydropower plant construction.

This is why it is suggested that the tendering documentation should require the participation of domestic companies and/or products in a certain percentage. The guideline should be found in the European rules regarding giving preference to domestic companies over those in foreign ownership. Besides, it should be regarded at what extent this approach is feasible in practice (i.e., are there companies capable to provide needed products and services) and at what extent such an obligation would be acceptable to foreign investors. Also, the tendering documentation may define the joint development of small hydropower plants and accompanying activities and/or infrastructure facilities (e.g., tourism, catering, leisure industries, reconstruction and development of local infrastructure, etc.), or to bind investors to certain investments in local community.

Incentives for domestic businesses and local communities

There is a special issue of encouraging small domestic private investors and/or local communities to invest in small hydropower plants. In this segment it is, first of all, necessary to promote small hydropower plant projects and educate entrepreneurs and local community about small hydropower plant development potential. Given the fact that procedure of small hydropower plant development and construction requires specific knowledge from various fields (electrical engineering, environmental protection, law, finance, etc.) responsible authorities must provide the assistance in expertise (one of the major activities of the Central Unit for small hydropower plants).

In the project realisation it is necessary to foresee the concrete incentives, such as financial and tax relieves, non-repayable funds, soft loans, construction of auxiliary infrastructure and state-provided services, etc. This is especially important in case hat investor is a local community which usually does not have enough funds and guarantees to realise the projects on its own. However, there are information that local communities were historically interested in small hydropower plant potential development and that they financed some surveys with their own funds.

ACTION PLAN

On the basis of the activities elaborated above, it is proposed to develop an Action Plan with the aim to create the most favourable environment for development of small hydropower plants in Montenegro. Following the Action Plan would enable to regulate the system of using small hydropower plant potential in Montenegro on commercial basis in less possible time especially in terms of purchase (incentive prices, purchase duration, who has the obligation to purchase electricity from small hydropower plant, fund raising mechanism for supporting use of small hydropower plants and renewable energy sources in general).

Based on the described Activity Plan (Table 7 below) it is estimated that the first project can commence the construction in two and half to three years at earliest. The activities are given by their priorities. The column Deadline states the estimated time in which it is necessary to finalise a specific activity, starting from an arbitrarily set initial point. The proposed timeline is considered as very optimistic.

Table 7. Action plan for establishing national small hydropower plant development program in Montenegro

Deadline	Activity	Responsible authority
-	? Identify current situation	-
3 months	? Propose and adopt development strategy for small hydro power plants ? Make decision on strategic goal of policy of using renewable energy sources for electricity production in he next 10 years. ? 3-5% target is feasible (large HP not included). ? Set out referent and high scenario of small hydropower plant development in the context of set goals. ? Initiate national energy program of small hydro development. ? Establish Central Unit as a state-based focal body for coordination of development program in accordance with described proposal for organisation, responsibilities and activities (within MoE).	Government
6.months	? Work out of implementation plan based on development strategy for small hydro power plant ? Start investigations on some selected locations – pilot projects. Choose location according to described procedure. Investigations through tendering (in present stage). ? Establish permanent investigation of locations for small hydro ? Amending the Law on Private Sector's Participation in Public Services Provision in view of small hydro development: remove needs pre-qualification, reduce number of deciding authorities in evaluation process, introduce right of investor to initiate concession awarding process – concession awarding on request. ? New and amended "Water Decree" to regulate ways and conditions for using water in small hydropower plants	Government Ministry of Economy
6 months to 9 months	? Amend "Water Decree" to set out obligations of experts of MoE and Energy Regulatory agency in view of participation in preparation and administration of tendering and selection of concession holder in cooperation with formal decision maker. ? Decision on awarding concession for units below 1 MW is to be made by state authority for water management (this amendment should be introduced in the Law on Private Sector's Participation in Public Services Provision). ? Concession awarding decision for units below 1 MW to be made by Montenegro Government (this amendment should be introduced in the Law on Private Sector's Participation in Public Services Provision). ? Enable investor to make on his own initiative all preparatory works (investigations, measuring, and concession study) and starts the concession awarding procedure. ? Revoke concession fee since there is a water usage fee i.e., introduce a single fee approach.	Government Ministry of Economy Ministry Of Agriculture, Forestry And Water Management

1 – 1 ½ year	? Develop and adopt implementing provisions under the Energy Law in accordance with given responsibilities. ? Adopt criteria for issuing authorisation for new generating capacities and reconstruction of old ones. ? Adopt provision defining simplified criteria for authorisation procedure for small hydropower plants construction. ? Adopt provision defining simplified licensing procedure for electricity production from small hydropower plants. ? Adopt provision defining methodology of setting purchase price for electricity from small hydropower plants and purchase price level (feed-in system). ? Adopt provision defining methodology of setting price for connecting small hydropower plants to the distribution network. ? Adopt provision defining roles of energy undertakings in purchase of electricity from small hydropower plants (natural take in, purchase, finance, incentive criteria). ? Adopt provision defining incentives for investments in small hydropower plants	Ministry of Economy Energy Regulatory Agency
2 years	? Start initiative for adopting Kyoto Protocol together with Serbia (1 year). ? Draft the first national report on climate changes (1½ year). ? Select several locations for small hydropower plants (2-3) and analyse them using UNFCCC methodology for CDM projects. ? Establish cooperation with financial institutions and partners in implementation of SDM projects.	Government Responsible ministries
2 ½ do 3 years	? Start the construction of 1-2 selected small hydropower plants (pilot projects – new units or reconstruction of old ones)	Government Ministry of Economy
permanently	? Monitor implementation and introduce additional measures if appropriate. ? Permanently investigate and collect data as to provide input parameters for use of methodology for setting minimum share and setting purchase price for renewable energy sources. ? Outline and implement feasible policy in renewable energy sources based on actual data.	Government Responsible institutions