UNDP-GEF

Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro

Summary of Achievements and Lessons Learned Report

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Table of Contents

Cover page photo credits:

- Left: Tara River Canyon (www.montenegro.travel/en/2734/northern-region/nature-and-public-areas/canyons/tara-river-canyon)
- Top Right: Alipasini Izvori (www.montenegro.travel/en/8473/northern-region/plav/nature-and-public-areas/rivers-fresh-water-springs/ali-pashas-springs)
- Bottom Right: National Park Prokletije (www.montenegro.travel/en/7884/northern-region/plav/nature-and-public-areas/national-parks/national-park-prokletije)

Abbreviations

CGES	Crnogorski elektroprenosni system, transmission system operator
COTE	Crnogorski operator trzista, market operator
DG	Distributed generation
EE	Energy efficiency
EPA	Environmental Protection Agency of Montenegro
EPCG	Elektroprivreda Crne Gore, national electric power company
ERA	Energy Regulatory Agency
EU	European Union
GEF	Global Environment Facility
GWh	Gigawatt hour
IEA	International Energy Agency
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
KAP	Kombinat Aluminijuma Podgorica (The Aluminum Plant Podgorica)
kW	kilowatt
kWh	kilowatt hour
LEP	Local Energy Plan
Mini-HPP	Mini-hydropower plant
MW	Megawatt
MWh	Megawatt hour
OECD	Organisation for Economic Cooperation and Development
PPA	Power purchase agreement
RE	Renewable energy
SHPP	Small Hydropower Plant
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive Summary

As a part of the cooperation between the United Nations Development Programme (UNDP), Global Environment Facility (GEF), and Montenegrin Ministry of Economy, UNDP initiated a support programme to help realize the government's goal of creating 15-20 MW of new small hydropower generating capacity by 2012 to help meet the country's sustainable energy target. This Project, entitled **Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro**, works in collaboration with key stakeholders in the public and private sectors to build a favorable legal, regulatory, and market environment to promote Montenegro's abundant small hydropower potential for grid-connected electricity generation.

As laid out in the 2007 Energy Development Strategy of Montenegro of 2025, objectives and mechanisms were identified to ensure the continued supply of safe, competitive, and environmentally sustainable energy services. To satisfy the Energy Development Strategy target of RE sources occupying a 20% share of primary energy consumption, small hydropower and a diverse portfolio of other renewable energy (RE) sources require significant scaling up. The recently established Oct. 2012 national target of 33% of energy from renewable sources by 2020 set by the Energy Community provides additional incentive to achieve RE development goals.

RE use has become increasingly mainstream. In 2011, new investments in RE increased 17% from 2010 and renewables represented 16.7% of global final energy consumption (3.3% of consumption was hydropower)[1]. The promotion of small hydropower in Montenegro has had strong domestic political support for many of the same reasons renewables have seen a global rise in new investment. Small hydropower offers added energy security, diversifying generation portfolios and better enabling the national grid to handle a rising demand and mitigate energy deficits. In addition, small hydropower plant (SHPP) operations do not emit greenhouse gas emissions that cause climate change, reduce reliance on fossil fuels and energy imports that minimizes vulnerability to fuel price volatility, fossil fuel subsidy rollbacks make RE prices more cost competitive, and SHPP are an environmentally friendly technology.

This report represents the final summary document, discussing the achievements and lessons learned during the Project's implementation from 2008 to 2013. In the interests of replicating successes and avoiding pitfalls, this analysis provides valuable input for other states wishing to

stimulate, mainstream, and commercialize the RE markets based on real world experiences encountered in the field. The main outputs of the Project are:

1. Establishment of attractive and competitive business terms and conditions for developers and investors, including the Feed-in-Tariff;
2. Streamlined and simplified application procedures for independent power producers (IPP);
3. Collection of three years of hydrologic data for use by small hydropower investors; and
4. Collaborating with and providing training to the Ministry of Economy's new Energy Efficiency (EE) / RE Unit to build capacity on SHPP concession.

As a direct result of Project activities, the government issued 13 concessions for SHPP construction with 10 construction permits pending for new SHPP and wind farms, and one SHPP was built with five more anticipated by the end of the year. These accomplishments indicate the re-engineered tendering and concession process and supportive legal framework put in place through this Project is functioning well, and the small hydropower sector in Montenegro is opening up for developers and investors. The 97.33 MW installed capacity of the 13 concessions far exceeds the 15-20 MW target by the government and overall, the Project leveraged USD 47 million in private sector investment with a USD 1 million budget.

Lessons learned during the design and implementation of the Project are discussed in this report for future consideration in similar projects as part of a strategy to scale-up RE generation. In particular, it was concluded extensive collaboration with the government was a key element to raise credibility in addition to focusing efforts on a single target sector maximized limited resources and emphasizing outreach amongst principal actors, including the financial sector. For relatively long Project durations, scope flexibility proved beneficial, and two important considerations in RE market development initiatives were determined to be costs of grid renovation and resolution of concession ownership transfer to serve as bank collateral.

In summary, sustainability and ensuring continued Project success after the Project is phased out was a key consideration during the course of Project implementation. By collaborating with the government to put in place supportive legal and regulatory frameworks, making administrative processes related to renewables more efficient, and improving technical capacity of main market actors, UNDP-GEF and the government has set the stage for long-term economic development through maximizing the country's abundant natural water resources.

1. The Case for Small Hydropower in Montenegro

Key Messages:

- Energy generation fueled by renewable sources helps meet the needs of rising energy demand and improves energy security.
- Small hydropower is cost competitive, offers long-term sustainability, generates electricity without negative social or environmental impacts, and takes advantage of an abundant natural resource.
- Although two large hydropower plants produce 76% of domestically generated power, the total energy they produce is only about 17% of the total hydropower potential.

Since becoming an independent country in 2006, diversification of Montenegro's power portfolio to include a greater percentage of RE sources has been a core element of the country's energy development strategy. This strategy is encapsulated in the decision to put in practice two concrete targets to promote development in the renewables sector: the 2007 Energy Development Strategy of Montenegro of 2025 indicated that RE sources would occupy at least a 20% share of primary energy consumption to match the objectives set by the European Commission[2]; and the 33% national target of energy arising from renewable sources by 2020 set by the Energy Community in 2012[3] (see Section 2 for details).

A stark rise in electricity consumption in the last 20 years has not coincided with a corresponding increase in generative capacity since 1982 when the Pljevlja coal plant was constructed, and this has resulted in energy deficits and a current shift in energy strategy. From 1994 to 2011, Montenegrin electricity consumption increased 505 GWh to 4,217 GWh[4]. This was mostly due to a rise in demand from the residential sector through growth in the housing market, heavily subsidized fuel costs, and inefficient household energy use. Based on a 2008 study by the national electrical utility, energy deficits totalled 2,112 GWh in 2007 and 1,663 GWh in 2008[5].

Since Montenegro is heavily reliant on hydropower, weather extremes that have lower reservoir water levels also affect imports. From 2010 to 2011, net energy imports grew from 789.6 GWh to 1,228 GWh in part due to a severe drought in the region, and in 2011, imported power accounted for 37% of consumed electricity. The country's large hydropower plants were also strained recently during the warm summer months in 2012 and low water levels[6].

In this report, the achievements of the UNDP-GEF Project that highlight the potential of small hydropower in Montenegro and the lessons learned on how to best establish a supportive policy framework on renewables market development are presented. Chapter 1 of the report provides background information of the Montenegrin power system, the potential for hydropower, and how this fits in with the government's strategy for a more diversified and secure energy portfolio. Section 2 provides an overview of the market barriers that have historically limited the uptake of small hydropower technology and the legal and regulatory frameworks in place to develop the RE market. Section 3 discusses the goals of the Project, the tasks performed to put the strategies in action, and the results. The final sections discuss the impacts the Project has had to date, recommendations for further scale-up, and a summary of the lessons learned with an eye towards these findings being useful to replicate elsewhere.

1.1 Benefits of Renewable Energy

Renewable energy (RE) use has become increasingly mainstream. Between 2010 and 2011, new investments in RE increased by 17% with renewables representing 16.7% (3.3% of which was from hydropower) of global final energy consumption in 2011. Small and mini-hydropower plant construction offers cost, social and environmental benefits that make hydropower competitive with other electricity generation alternatives.

Although domestic financial institutions were found during stakeholder consultations[7] to have limited expertise in lending for RE and a general lack of awareness, there is an appetite for RE lending that will increase as the market matures and as success stories with using the Feed-in-Tariff and SHPP construction are publicized. For example, a growing number of operating RE source power plants has resulted in cost analyses that estimate costs of plant construction. This type of analysis, of which examples are provided below, improves awareness among prospective investors and creates role models to emulate.

- In 2010, the International Energy Association (IEA) compiled data on the costs of constructing and operating a SHPP. IEA determined new SHPPs cost approximately USD 2,000,000-4,000,000/MW to construct, USD 50-100/MWh for generation, and about USD 10-40/MWh for operations and maintenance[8]. SHPPs take approximately two years for design, permitting, and construction, and the Montenegro Concessionary Act for

Concession Award to Exploit Water Streams for Construction of SHPP estimates the SHPPs are expected to result in a 16.1 - 21.7% internal rate of return over the 30-year life of the concession with a payback period on investment between 4.4 and 6 years[9].

- A 2012 cost analysis of renewable power generation by the International Renewable Energy Agency (IRENA) supports the IEA estimates with a higher maximum investment cost of USD 1,300,000-8,000,000/MW using a 20 MW maximum capacity for SHPP as opposed to the more commonly used 10 MW[10]. IRENA notes the levelized cost of generation for small hydropower ranges from USD 20-270/MWh with a 10% discount rate. By comparison, EIA and the Organisation for Economic Cooperation and Development (OECD) Nuclear Energy Agency conducted a joint study in 2010, which determined coal-fired plants have a levelized cost of generation from USD 67-142/MWh, also with a 10% discount rate[11].
- In a 2008 assessment of new potential sources of energy, the national energy utility Elektroprivreda Crne Gore (EPCG) determined that the costs to import electricity to cover the Montenegro's energy deficits were EUR 137,800,000 for 2,112 GWh in 2007 and EUR 136,400,000 for 1,663 GWh in 2008[5]. Using average currency conversion rates in 2007 and 2008, this coincides with USD 91.77/MWh in 2007 and USD 107.02/MWh in 2008[12]. These import rates were therefore cost competitive with the costs of new SHPP construction.

In addition to financial considerations, sensitivity to sustainably utilizing natural resources is consistent with the growing domestic economic focus on tourism. In 2012, tourism represented 24% of Montenegrin incoming foreign direct investment and is expected to be one of the fastest growing travel and tourism economies over the next decade[13]. Supporting new energy facility construction that has potential to result in negative social and environmental consequences could significantly increase medium and long-term costs as a result of Montenegro's positive reputation as an ecological state. For example, when the Mratinje hydropower plant was constructed on the Piva River in 1975, a 16th century monastery was submerged so the monastery was relocated to higher ground 3.5 km away. Energy planning should therefore encompass new plant construction cross-sector influences.

Hydropower is an abundant domestic natural resource in Montenegro. From an environmental standpoint, small and mini-hydropower plants offer small carbon footprints, do not disturb local habitats, avoid deforestation and submergence associated with large hydropower plants, and they

do not emit greenhouse gasses during the generation and construction processes. Although environmental impacts are site-dependent, smaller hydropower plants will be non-threatening to aquatic life if designed carefully. For large hydropower plants, a dam that creates a reservoir will change water flow characteristics and also potentially affect sedimentation, physical land characteristics upstream and downstream, the ability for fish to reach spawning grounds, and cause fish deaths for fish swimming through turbines. Reliability is an advantage of small and mini-hydropower plants as well since water flow is predictable. Although there can be inconsistency in water flow levels, flow levels can be forecast and minimal flow levels accommodated.

During consultations with local project developers, it was emphasized that the scale-up of the small hydropower sector offers greater opportunity for local communities than solely for electricity generation fed into the national grid[7]. Potential social benefits of SHPPs that are recommended to be incorporated into construction planning include encouraging community participation and ownership, constructing new roads and provision of extra local power, conserving natural river conditions, employing local workers for plant construction, and not resulting in loss of habitat.

1.2 Challenges in Introducing Renewable Energy

There are several challenges to incorporating RE into a national portfolio on an increased scale. In 2006, the government of Montenegro and UNDP-GEF engaged in partnership through the project entitled, **Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro** (the Project), as an integrated response to scale up the size of the local small hydropower market. The Project instituted changes in power policy, administration, legal rules and regulations, and improving technical capacity on the ground. Overcoming these challenges to scaling up renewables with a focus on small hydropower was a key objective for the Project.

Most notably, the country lacked workers with technical expertise and financial institutions had little appetite for investing in renewables until they had the opportunity to become more familiar with the technology, regulations, and administrative procedures surrounding SHPPs and the Feed-in-Tariff process. The capacity of project developers also posed challenges, as it can be difficult to

create bankable investment proposals, feasibility studies, and business plans in this relatively new sector. Implementation and supervision of these highly specific RE projects during design and construction phases is also complex and requires expertise from numerous different fields such as electrical engineering, construction, economics, and hydrology, and with the exception of some notable local experts, this expertise needs to be imported from other countries.

Through the UNDP-GEF Project, institutional challenges were addressed as well to put in place a regulatory framework that facilitates permitting and construction of new SHPPs to attract investors, and raise awareness and the comfort level in developing renewable technologies. In addition, financial incentives were required to scale up RE generation to make RE more cost-competitive in relation to fossil fuels that benefit from government subsidies. Feed-in-Tariffs that were instituted through the Project to increase RE profitability (Section 3.1c) are a widely used policy option for improving operation margins. Incentives such as Feed-in-Tariffs are beneficial due in part to relative high up-front construction costs of SHPPs and associated long-term investments required, the relatively well developed market infrastructure that supports fossil fuel technologies, and the perceived risk of investing in technologies like RE where investors have less understanding of the unique risks. This perception of risk leads to higher costs for borrowing for developers with less attractive interest rates, shorter loan terms, and greater collateral requirements[14].

To effectively scale up the SHPP market, policymakers must create an enabling policy environment to reduce the real and perceived risks of RE power. Policy initiatives designed to promote development of RE resources and thereby reduce risk must consist of comprehensive innovative reforms tailored to meet the needs of key stakeholders in a country-specific context and leverage public funds with private investment. In Montenegro, the country was in a rather unique position as it declared its independence in 2006, a strong political will for change emboldened the State to reevaluate long-standing procedures, improve transparency and credibility, and open up previously centralized markets.

One of the most significant barriers in Montenegro when the Project started was the lack of regulations to facilitate connection of RE sources to the national grid. Once the Project assisted making RE connections to the grid viable, other major reforms were put in motion with assistance from the Project: (1) ensuring the grid could handle added load from the distributed generation

(DG) sources; (2) streamlining the tendering and concession process and making it more effective, transparent, and credible; (3) bearing the cost of collecting hydrological data useful for potential investors to consider SHPP investment to help attract investment; and (4) raising awareness and the skill level of key Montenegrin stakeholders in the federal and local governments and private sector that stimulated a sustainable pipeline of small hydropower investments. In Section 3 of this report, the Project accomplishments that mitigated these risks and thus create a more attractive environment for investment in RE are discussed. Project developers interviewed during the stakeholder consultation generally agreed the new Montenegrin legislation pertaining to RE and IPPs is comprehensive and designed to facilitate procedures to scale up implementation[7]. Overall, the tendering procedure was noted to be more complex as a result of a more transparent procedure but the new system was noted by a developer to bring more fairness.

1.3 Overview of the Montenegrin Power System

The vast majority or about 99% of Montenegrin power capacity originates from two large hydropower facilities and one coal-fired plant: the Piva and Perućica Hydroelectric plants (design capacities of 360 and 307 MW, respectively) and the Pljevlja Thermal Power Plant (210 MW). Another approximately 9 MW is added via seven small hydropower facilities. The domestic generating capacity originating from hydro power is a function of precipitation, but total domestic production can be as high as 3,000 GWh/year[15].

To provide an overview of Montenegrin levels of energy production and consumption, the 2009 to 2011 energy balances reported by EPCG in 2013 is provided in Table 1[16]. Table 1 also includes an EPCG estimate of 2012 usage. The 2012 Annual Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community[17] noted that the high level of imports in 2011 were due to the severe drought that affected southeast European countries. In addition to the volatility of weather, the possibility of future energy deficits is increasingly viable due to the growth in the Montenegrin housing market and tourism sector.

Table 1: Energy Balance for 2009-2012

	2009 [GWh]	2010 [GWh]	2011 [GWh]	Est. 2012 [GWh]
Net Power Plant Production				
Hydropower plant Perućica	1,099.6	1,434.9	629.8	785.0
Hydropower plant Piva	943.1	1,285.8	558.4	639.0
Small hydropower plants < 10MW	19.9	28.9	15.7	19.7
Thermal plant Pljevlja	616.9	1,271.7	1,452.3	1,264.0
Received from Electric Power Industry of Serbia (EPS)	1,184.4	1,203.6	1,209.7	1,204.0
Imports	1,158.0	731.5	1,382.8	943.0
Deviation (Import - Export)	18.7	11.0	30.3	23.6
Delivered to EPS	1,108.1	1,450.7	629.6	725.0
Exports	171.7	482.8	431.5	184.3
Network Losses	3.3	12.3	0.2	26.7
Total available electrical energy	**3,757.5**	**4,021.7**	**4,217.7**	**3,942.3**
Consumption				
Net consumption	3,040.0	3,354.4	3,566.3	3,294.9
Losses in the Distribution Network	570.0	502.9	491.9	494.4
Losses in Transmission	147.5	164.4	159.5	153.0
Total Consumption	**3,757.5**	**4,021.7**	**4,217.7**	**3,942.3**

As noted in the beginning of this section, the Pljevlja coal plant was the last substantive increase in domestic generative capacity, which was 30 years ago. As consumption increased over 700% to 4,217 GWh between 1994 and 2011[4] without a corresponding rise in domestic capacity, energy deficits rose (2,112 GWh in 2007 and 1,663 GWh in 2008)[5] with the country increasingly reliant on imports and favorable weather to maintain existing hydropower systems.

An important consideration in the country's energy balance is the large effect of an aluminum smelting facility located on the outskirts of Podgorica, Aluminum Plant Podgorica (Kombinat Aluminijuma Podgorica or KAP), which regularly consumes the largest percentage of the country's electricity (1,875 GWh or 50.4% total consumed electricity in 2005, and 1,927 GWh or 50.5% in 2006). This level of consumption was significantly greater than the combined total of all households (1,109 GWh and 1,097 GWh in 2005 and 2006, respectively). Under full operation, the KAP level of energy consumption would continue to dominate domestic levels of usage; however, future levels of KAP plant consumption is unclear because recent discussions on the fate of the plant have included rumors of cutting electricity consumption, selling the plant, and declaring bankruptcy as a result of recent poor financial performance. Indicative of the KAP decrease in consumption, the 2013 EPCG energy balance further adds that the plant's most recent

consumption was 1,386.9 GWh in 2011 and estimated to be 1,110.0 GWh in 2012[16]. KAP operates under electricity prices that are fixed below market prices and this has been a political source of contention as well.

Overall, the upward trend in consumption has placed greater strain on local resources and required increasing reliance on imports. Shortages are exacerbated by damage to grid infrastructure during the 1999 Kosovo conflict, heavy use periods in winter months, and illegal connections. In 2010, Montenegro imported more than 800,000 MWh of electricity, or about one third of its power needs, mainly from Bosnia and Serbia[18]. With regard to economic development limitations, the imported price of electricity was EUR 4.2c/kWh as opposed to a more efficient EUR 2.65c/kWh for domestic generation. Montenegro eliminated subsidies for the KAP plant as of Jan. 1, 2013, and during the last half of 2012, Montenegro did not import electricity due to decreased KAP aluminum plant electricity usage[7]. Removal of fossil fuel subsidies is also a key consideration for the accession process to the EU and to comply with the Energy Community, of which Montenegro is a Contracting Party.

Regarding energy supply chain losses, based on International Energy Agency and World Bank data, electricity power transmission and distribution losses in Montenegro accounted for 22%, 25%, and 16% in 2008, 2009, and 2010, respectively[19].

Although the distribution and transmission utilities, EPCG and Crnogorski elektroprenosni system AD (CGES), respectively, are mostly state-owned, the power sector grows increasingly decentralized and has an increasing international focus. Private Italian companies A2A and Terna own 43.7% of EPCG and 22% of CGES, respectively. The largest Montenegrin hydro plant, the Piva or Mratinje Hydroelectric Plant in Pluzine, is operated by the Electric Power Utility of Serbia, and planning is ongoing for the realization of an underwater interconnector connecting Montenegro with Italy and over land with neighboring Serbia and Bosnia[4,20]. The seven existing SHPPs were in discussion by the government to be privatized; however, this has not been realized as of the writing of this report. The national electricity grid is presented in Figure 1 and the locations of the coal and hydropower plants are shown in Figure 2 (squares represent the coal plant and two large hydro plants and the seven dark circles represent SHPPs).

Figure 1: Montenegro Electricity Grid[21]

Figure 2: Montenegro Power Plants[22]

Increasing strain on domestic energy supply is not limited in the Western Balkans to Montenegro. World Bank notes extreme weather conditions consisting of record low temperatures, hot summer months, and drought led to "hydropower shortages and insufficient energy production" throughout the region[23]. Without a significant increase in infrastructure investment, the 2012 World Bank assessment concludes the Western Balkans is expected to become a net power importer by 2020 (importing 10% by 2020 and up to 30% by 2030).[24] Improved regional connectivity and increased Montenegro-generated power would better enable Montenegro to be an energy exporter.

1.4 Key Actors in the Power Market

During planning stages of power sector reform, it was imperative for UNDP-GEF to collaborate with stakeholders fluent in the functioning of the institutions operating at the time to best recognize how to make improvements. Accordingly, during implementation of the Project, expert working groups composed of Montenegro government and local municipality officials, actors in the local business and power sectors, local and international private consultants, UNDP-GEF, and other RE experts (e.g., Norwegian government, GTZ) provided feedback to create an effective, efficient, and transparent system to be applied to the existing foundations already established.

This section discusses the key actors of Montenegro's power sector that participated in the consultations.

- The Ministry of Economy has overall responsibility of attracting and managing SHPPs, deciding what locations will be offered for concession, inviting tenders for new SHPPs, research and preparations for country energy strategy development. The Ministry also established the methodology for Feed-in-Tariffs and created an Energy Efficiency (EE) and RE Unit dedicated to concentrating on this increasing area of focus. The Unit authorizes and permits new generating facilities (small, medium, and large hydropower plants), and inspects facilities for compliance. The Unit was the primary point of contact for UNDP during Project design and implementation.
- The Energy Regulatory Agency (ERA), established in 2004, is responsible for the functioning of the energy market. The ERA issues licenses for energy activities, issues guarantees of origin to confirm if produced energy is from RE sources, approves the status of and maintains a register of privileged producers (i.e., a producer that uses RE sources or waste, or simultaneously generates electricity and heat for district heating, cooling, or industrial use in its individual generating plant), establishes methodologies for setting tariffs and prices for the transmission and distribution systems, and conducts annual monitoring of RE source contributions and publishes the results. Although the Ministry of Economy is responsible for setting the Feed-in-Tariff methodology, the methodology is submitted to ERA for input.
- The Ministry of Sustainable Development and Tourism includes the Environmental Protection Agency of Montenegro (EPA), which is responsible for environmental policy and enforcement. The Ministry also includes the Department of Spatial Planning that enforces legalities related to land usage.
- Elektroprivreda Crne Gore (EPCG) is the national electric power company of Montenegro. EPCG manages distribution, generation, and supply activities to meet consumer electricity demand. Prior to 2007, the entire power sector, including the generating facilities, transmission system, and distribution system were owned and managed by then 100% State-owned EPCG. Recent regulations such as the 2010 Energy Law highlighted the need to functionally unbundle EPCG[25], leading to the State currently owning 55% of EPCG, although still the majority shareholder**Error! Bookmark not defined.**. EPCG is the only company licensed to supply electricity in the country. For power imports, EPCG issues a

tender to prospective bidders, and enters into bilateral annual contracts with winning bidders. It is the responsibility of EPCG to ensure safe and reliable delivery of electricity to its customers. Regarding the connection of new IPPs to the grid, EPCG can reject system access due to insufficient capacity or if it will jeopardize the provision of public services; however, EPCG worked with the UNDP-GEF Project team to generate a Grid Study (see Section 3.1b) to lay out the technical conditions IPPs are required to comply with for connection to the grid.

- Crnogorski Elektroprenosni System AD (CGES) is the Montenegro transmission system operator. In 2009, CGES was spun off from EPCG, 55% is owned by the State, and 22% is owned by Terna as part of an agreement to construct an undersea interconnector between Montenegro and Italy. In 2012, a fully State-owned market operator, Crnogorski Operator Trzista (COTE), was spun off from the transmission system operator[4]**Error! Bookmark not defined.**.
- The Market Operator, a role that was established through the 2003 Energy Law, establishes market rules, tracks the trade balance, and maintains trade records. After a guarantee of origin is submitted for privileged producers, grid-connected users trade power through the Market Operator as for other generators, but they are subject to RE-specific licensing and tariff conditions. The Market Operator makes monthly payments to the producer, consistent with contracts signed with IPPs.
- The Institute of Hydrometeorology and Seismology ('Hidrometeorološki zavod Crne Gore' in the Montenegrin language) performed the hydrological data collection that was a key component of the UNDP-GEF Project (see Section 3.2). In general, the Institute is responsible for managing and monitoring surface and groundwater resources.
- Local municipal governments are responsible for municipal services within their jurisdictions. While the Ministry for Economy is responsible for issuing licenses, it is the responsibility of municipalities to issue concessions for licensed locations.

1.5 Existing Hydro Resources and Hydro Power Potential

Montenegro has abundant water resources compared to its relatively small size. Although two large hydropower plants produce 76% of domestically generated power, the total energy they produce (1,800 GWh) is only about 18% of the total 9,846 GWh hydro potential on the main water bodies[26]. The Ministry of Economy generated the data listed in Table 2 that summarizes

theoretical hydro potential; however, this does not take into account social considerations such as a portion of the Tara River being located in a UNESCO World Heritage Site, thus restricting potential for construction. Major Montenegrin water bodies are presented in Figure 3.

Table 2: Hydropower Potential of Montenegrin Water Bodies[27]

Water Body	Hydro Potential [GWh]
Tara	2,255
Zeta	2,007
Morača (up to Zeta)	1,469
Lim	1,438
Piva	1,361
Ćehotina	463
Mala rijeka	452
Cijevna	283
Ibar	118
TOTAL	**9,846 GWh**

Figure 3: Montenegrin Water Bodies[28]

Montenegro has seven publicly owned SHPPs, which are rather old with an average total annual generation during the last 10 years of 17.4 GWh. Of these seven, more than half have been in operation over 40 years. A photograph of the penstock that directs the flow of water to plant turbines at the Rijeka Crnojevica SHPP is shown in Figure 4. As a result of the relatively small realized capacity of SHPP, their long track record of power generation, and the significant unrealized hydro potential of approximately 7,000 GWh/year with the natural flow of water, the government of Montenegro is attempting to correct this shortfall.

Figure 4: Penstock for the Rijeka Crnojevica SHPP

In addition to the government looking to small hydropower solutions to meet growing electricity demand, EPCG conducted a study in 2008 on potential new sources of electricity that were being considered[5]. In the study, EPCG noted the following hydropower projects were in the pipeline: (1) four large hydropower plants on the Morača River with total installed capacity of 238.4 MW, which had preliminary and final designs drafted in 1987 and a tender process performed in 1997-1999; and (2) a 168 MW hydropower plant on the Komarnica River that had partial technical documents drafted in 1988 with an original technical study conducted in 1973[29]. EPCG indicated in the 2008 study it was their intention to secure resources to construct these facilities; however, this was not confirmed during the EPCG interview for this report. Further investigation is recommended to confirm the status of future large hydropower plant construction.

The existing hydropower potential in Montenegro was greatly improved through the Project and collaboration between the Ministry of Economy and UNDP-GEF. The Project endeavored to overcome the country's recent energy deficits with several independent but complementary measures such as improving the efficiency of the tendering and contracting procedures, offering Feed-in-Tariff incentives to SHPP project developers, hydrologic data collection, and extensive stakeholder consultation and collaboration. These Project activities are discussed in detail in Section 3.

2. Market and Institutional Considerations for Renewable Energy

Key Messages:

- Renewables and EE are primary areas of focus for the government. National targets for 2020 were set via a 20% RE generation objective in conjunction with the EU pledge, and a 33% national target share of RE as a contracting party of the Energy Community.
- Prior to the UNDP-GEF Project, no special provisions existed to regulate transmission, distribution, and connection of electricity produced from RE sources to the national grid and there were no financial incentives for RE generation.
- Primary electricity generation goals are to ensure a safe, competitive, and environment-conscious supply of energy services while attracting foreign investors, creating sources of domestic employment, and maintaining Montenegro's international reputation as an ecological state.

2.1 Government Energy Strategy and Vision

Before the UNDP-GEF Project was implemented, the only legal document addressing RE sources was the 2003 Energy Law. The recent adoption of Montenegro's independence referendum in 2006 and subsequent recognition as an independent state and UN member has set the country on a path to create new trajectories that prioritize target objectives. With its accession negotiations underway since 2012 with the EU, entry into the European Energy Community as a Contracting Party, and consolidation of a normative framework that creates an enabling environment to bolster clean energy markets, the government of Montenegro has made renewables and sustainable green business a primary area of focus.

Montenegro's pledge to adopt strict environmental norms and standards is traced back to the 1996 Environment Law, which includes emission standards, regulations governing environmental impact assessments, and protected areas. The 2003 Energy Law laid the legal foundation for unbundling the energy sector and began development of a new energy sector by indicating the government should promote "private sector participation in the energy sector of Montenegro and privatization of state-owned energy undertakings"[30]. The 2003 Energy Law also established the ERA as an autonomous non-profit organization with the task of supervising energy undertakings, established the framework for the electricity market, and drafted roles for the Market Operator to sets rules and regulations for participation in the market.

The ERA is also entrusted with ensuring a reliable, safe, and environmentally sound supply of energy licenses for approved energy activities and with setting tariffs and prices in an objective, transparent, and non-discriminatory manner[31]. As of 2003, ministerial oversight and inspection of the energy program is generally noted in the Energy Law as the responsibility of the Ministry with energy competencies, which is predominantly the Ministry of Economy.

In 2005, Montenegro became a signatory of the Treaty to Establish an Energy Community. Main tenets of the Energy Community are to strengthen cooperation, foster conditions of economic growth and stability, create a single regulatory space for energy trade, and attract investment in power generation[32]. Non-members of the EU who are Contracting Parties of the Energy Community are committed to implementation of the EU core energy legislation known as the "acquis communautaire." Notably, European Parliament Directive 2009/28/EC indicates there is a need to increase the use of energy from renewable sources and EE technology to promote energy security, technical innovation, and regional development.

Reflecting the nationalist spirit associated with the June 3, 2006 declaration of independence, the Montenegrin government drafted two documents in 2006-2007 that outlines the country energy development strategy and potential for small hydropower: (1) The Strategy for Development of Small Hydro Power Plants[33]; and (2) The Energy Development Strategy of Montenegro by 2025. The first strategy document envisaged a target of 15-20 MW of newly installed SHPP capacities and specified steps the state should take to realize this capacity. Measures includes collecting data to help potential investors make decisions on where to potentially build SHPPs, establishing a

registry of new plants with site mapping of watercourses, developing a system of guaranteed fixed prices or incentives, and introducing simplified procedures for granting concessions.

The Energy Development Strategy presents the Montenegrin vision of energy management and energy development. The Strategy establishes objectives and defines mechanisms for supplying consumers with a safe, competitive, and environment-conscious supply of energy services. In addition, the Strategy considers such short and long-term goals as attracting foreign investors, domestic employment, and maintaining Montenegro's international reputation as an ecological state.

Directive 2009/28/EC emphasizes the benefits of demonstration and commercialization phases of decentralized RE technology, noting that to reach the Energy Community target of a 20% share of energy from renewable sources by 2020, mandatory national targets are required and should be weighted by GDP[34]. On Oct. 12, 2012, the 10th Energy Community Ministerial Council issued its resolution of the implementation of EU Directive 2009/28/EC and the Montenegro target share of RE sources in 2020 was set at 33% from a reference level of 26.3%[3]. Consistent with the increasing trend of using national RE targets, the latest REN21 Global Status Report notes that the number of countries with national RE targets increased from 89 in 2009 to 118 in 2012[35].

2.2 Overview of Renewable Energy Policy and Legal and Regulatory Frameworks

Prior to the UNDP-GEF Project, contracting for SHPP construction in Montenegro was significantly more complex, involving approval from a large number of actors and without regulations specific to RE. During stakeholder consultations, it was noted by the Ministry of Economy that the bid evaluation process and quality of concession application were inferior to the new system installed today and the tender process was much slower (see Section 3)[7]. There were previously no special provisions regulating transmission, distribution, and connection of electricity produced from RE sources to the national grid. For this reason, during the planning stage of the Project, it was determined that development of the legal and regulatory framework establishing relations between IPPs and grid operators was a critical issue that required further clarification and formalization (see Section 3), especially in light of energy sector restructuring and unbundling.

UNDP broadly classifies two policy tools designed to reduce the barriers existing to small hydropower market development: (1) policy derisking instruments that remove root causes of risk (e.g., guaranteed access to the grid by IPPs, streamlined permitting, creating a premium price for RE, Feed-in-Tariffs); and (2) financial derisking instruments that transfer risk to public actors like development banks (e.g., partial loan guarantees, political risk insurance, public co-investment)[36]. The government with assistance from UNDP-GEF has worked extensively to put in place policy derisking tools.

Key rules and regulations and other elements of energy policy governing RE policy, including those pertaining to policy derisking instruments, are summarized below:

- The 2009 Law on Concessions governs procedures for awarding concessions. The Law notes concessions will be awarded on the principles of transparency, competition, and competitiveness. In the context of SHPP IPPs, concessions are defined in Article 6 as a right to use state-owned natural wealth, and it generally includes the following: usage of water courses; construction and usage of water-related facilities, roads, and water transport facilities; construction and usage of energy-related structures for generation, transmission, and distribution of electrical energy; and use of river banks and lake shores. The concession is to be awarded either by the government of Montenegro or local municipality, depending on ownership rights.
- The Energy Law of 2010 defines basic principles for implementation of the energy strategy. The Law notes the objectives of energy sector development are to ensure sustainable, reliable, and high quality energy supply using a diversified group of energy sources. Increasing production from RE sources is encouraged and supported by requiring local government authorities to draft a Local Energy Plan (LEP) that includes the plan for energy demand and supply, the use of RE and cogeneration, and measures for EE. The Law also outlines the roles and responsibilities of the ERA, including the issuance of guarantees of origin and setting regulated tariffs, notes distribution and transmission system operators shall give priority to connection for RE generation, and states the intention of unbundling generation, transmission, transmission, and supply activities[37].
- To qualify for ERA issuing an energy license, generators must provide conceptual technical designs, measurement on RE potential, opinion on spatial use from municipal authorities, and a statement from a bank indicating willingness to finance the construction.

Contributing towards the national RE source target was noted to be a valid justification for issuing an energy license[38].

- The Energy Development Strategy of Montenegro by 2025 indicates the government encourages private investment to drive the construction of new generating capacity.
- Environmental law OGoM 48/08 states that Montenegro must synchronize economic and social development and growth with principles of environmental protection. This includes protection of natural heritage, biological diversity, risk reduction, environmental assessments, alternative solutions, substitution of chemicals, reuse and recycling, polluter responsibility for pollution and penalty fees, charging for the use of natural heritage, insurance for responsibility for potential pollution, and transparency of information regarding environment and timely and complete monitoring and reporting[39]. In addition, the Law on Environmental Assessment requires an environmental impact assessment on SHPP if too much water accumulates during operation.

One unresolved issue the ERA is discussing with investors is the point of IPP connection. As noted during the stakeholder consultation by a representative of ERA, energy flow is measured at the point of IPP connection to the grid, not at the SHPP. In light of the energy loss with distance and because many SHPPs are located far from the grid, this will cost investors extra money for electricity not used.

In addition to economic growth, other goals for RE policy measures include creating new jobs, strengthening institutions, improving local environment and health conditions, and improving access to electricity, especially in rural areas. In Montenegro, although the policy reform movement began relatively recently, it is clear the reforms associated with this Project have been useful in stimulating public discussion on minimizing barriers to sustainable transformation to create an energy market more reliant on renewables and it increased transparency and inspired creative re-thought in sector operations. A great deal of sensitivity is required when crafting a new framework to: minimize market distortion, avoid conflict with other development goals, and avoid placing an undue burden on ratepayers. The measurement of 'success' for policy reform initiatives can be seen as jump-starting the RE market measured in the quantity of new capacity installed due to project interventions, which is discussed in Section 3.3.

2.3 Main Barriers and Risks for Renewable Energy Investment

The design and implementation of risk mitigation strategies begins with identifying priority areas for development such as small hydropower generation, followed by assessing the barriers that have thus far limited dissemination of the technology. In the case of SHPP, devising a portfolio of supportive policies with political and financial derisking instruments that tackle the barriers must consider all key stakeholders (i.e., technology manufacturers, developers, investors, end consumers, policymakers, and utilities) and this process is country-specific so policy development required original and innovative strategies to match capacities and potential in Montenegro. Prior to the UNDP-GEF Project, there were four main categories of barriers addressed to try to stimulate the RE DG market: (1) inefficient administrative processes that were unable to effectively attract project developers and financiers in part to due to lack of transparency; (2) lack of access to affordable financing and financial incentives to improve the competitiveness of RE with subsidized fossil fuel technologies; (3) high transaction costs for prospective investors and developers to collect enough site data to identify preferred sites for new RE-powered power plants; and (4) lack of technical capacity about RE technology and its potential. These market obstacles are discussed below.

Administrative barriers played a prominent role in restricting growth in the RE market. For example, there was a lack of clarity and guidelines in connecting new IPPs to the grid, overlapping institutional responsibilities and gaps in communication, long delays accompanied the issuing of concessions and construction permits, lack of technical standards required for new SHPPs, limited capacity for municipalities to generate Local Energy Plans and spatial planning documents, and inefficient and incomplete energy data collection. This list of needs for improvement was not unexpected because new political systems and regulations were being developed to support the new government. Extensive cooperation between UNDP-GEF and the Ministry of Economy was required to enact effective reform yet work within the system.

In the Montenegrin financial sector, the level of experience in providing finance for RE facilities like SHPPs varies widely. Some institutions have in-house expertise in this type of lending or the expertise can be provided through trainings from mother companies, and some banks are waiting for the small hydropower market to become more mainstream. High profile demonstration projects are useful in raising awareness about potential for SHPP. Similarly, project developers

have limited experience creating a persuasive business case or model to convince financiers of project bankability so they can secure loans with attractive terms. Regarding price of energy generated, the phasing out of fossil fuel subsidies, which is still not complete, creates market distortion whereby unsubsidized RE electricity generation is at a disadvantage. Feed-in-Tariffs of the sort created in Montenegro with assistance from the UNDP-GEF Project help balance subsidy distortion by raising the value of SHPP electricity sold to the grid (discussed further in Section 3.1). Due to a rapidly changing market environment, Montenegro Feed-in-Tariffs are updated annually.

To support investment decisions, supportive data that identifies preferred locations to build RE-fuelled generation facilities like SHPPs are required to facilitate detailed conceptual designs and estimate profitability. These data are very site-specific and include qualitative and quantitative information on hydrological flow, subsurface hydrogeology, geology, social and environmental criteria of surrounding areas, and flow regimes within catchment areas. These data were not recent, regularly updated, nor freely available to prospective investors prior to the Project and collecting these measurements is expensive and resource-intensive.

In Montenegro, the technical barriers related to growing the small hydropower IPP market are related to lack of local skill using the technology. Little in-country expertise exists to manage and supervise SHPP projects. Furthermore, there are few examples of SHPP success stories to emulate as role models in Montenegro other than the seven SHPPs already been in operation for many years, thus the lack of awareness or informational asymmetry of RE potential is an obstacle to SHPP development. As an example, EPCG required data through a Grid Study[40] sponsored by the UNDP-GEF Project to confirm connection to new IPPs would not cause instability in the national grid. Grids can require substantial renovation and financial investment to accommodate IPPs. The Project is a first-of-its-kind program in Montenegro that collaborates with policymakers to emphasize the commercial component of RE market creation.

A primary goal of eliminating these barriers is to mitigate perceived and actual risks in SHPP development to result in more favorable loan terms for developers, lower returns on equity for financiers, and lower transaction costs, which translates to greater revenue for IPPs. Public funding is insufficient to sustainably scale up RE markets; therefore innovative barrier elimination strategies are critical to mobilizing private sector investment.

3. Goals and Outcomes of the UNDP-GEF Project

Key Messages:

- The UNDP-GEF Project was conceived to work with the government to overcome the barriers that limited the development of the small hydropower sector.
- The Project included the following core elements to support SHPP: (1) develop streamlined and transparent operations to approve concessions and permits, (2) establish financial incentives to make SHPPs more cost effective, (3) collect hydrological data, and (4) provide technical assistance to key stakeholders. These were divided into three Project Outputs.

The UNDP-GEF Project entitled, **Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro** (the Project), was conceived in 2006-2007 to work with the government to overcome the main barriers that had previously limited the development of and investment in the small hydropower technology. The Project was part of a comprehensive and multi-faceted approach by the government that also included adopting the 2006 Strategy for Development of Small Hydro Power Plants in Montenegro, the Energy Development Strategy of Montenegro by 2025, and the 2010 Energy Law, and all shortly followed the 2006 declaration of independence. This rapid and determined progress demonstrates a dedicated political will and willingness to creatively re-think power sector policy to kick-start the small hydropower market.

The Project was funded by the Global Environment Fund (GEF) and UNDP. The principal goal of the Project was to support the government in realizing the goal of 15-20 MW of new small hydropower generating capacity by 2015 set out in the 2006 Strategy for Small Hydro Power Plants Development in Montenegro. To attain this goal, several interim steps had to be satisfied to create an enabling policy framework with supportive energy market legislation before a sustainable pipeline of SHPP concessions and construction permits could be possible: (1) develop streamlined and transparent operations to approve concessions and permits, (2) establish financial incentives to make SHPPs more cost effective, (3) collect hydrological data to assist developers and investors select the most appropriate sites for their SHPPs, and (4) provide technical assistance to key stakeholders such as ministerial offices, local governments, electrical utilities, and investors. Through these efforts, the Project helped reduce the risks associated with investing in RE, scaled up RE investment, and formulated the basis of the 2010 Energy Law.

The overarching goal of the Project was to reduce greenhouse gas emissions by creating a favorable legal, regulatory and market environment and building institutional and administrative capacities to promote Montenegro's small hydropower potential for grid-connected electricity generation. By realizing the 15-20 MW increase in capacity, the Project is expected to result in the estimated reduction of between 20,000 and 26,800 tCO2-eq/year from new SHPPs construction. This Project strategy was accomplished through the achievements of the main Outcomes discussed herein in Sections 3.1 - 3.3.

3.1. Outcome #1: A Multi-Faceted Approach to Scale Up Investments in Small Hydropower

UNDP-GEF Project Outcome #1: Main Accomplishments

1. **Feed-In-Tariff and regulations were adopted to facilitate IPP PPAs**
2. **Tendering and authorization procedures were simplified and streamlined**
3. **UNDP helped prepare 3 Local Energy Plans and a detailed study of the grid**

The first Project Outcome was designed to attract investment in SHPP generation by supporting the government to put in place institutional, legal, and price conditions. The government formed a new EE / RE Unit within the Ministry of Economy to in part implement the SHPP Strategy, and the Project provided capacity building to create an effective enabling environment for SHPP investment. Technical assistance was provided to simplify the tendering and authorization procedures for small hydropower, develop regulations for connection by small power producers to the grid, and develop a system of incentive-based tariffs for small hydropower producers.

3.1a Simplification and Streamlining Tendering and Authorization Procedures

Setting up a simplified and streamlined institutional framework to support a favorable business environment for SHPP development in Montenegro consisted of three broad categories of activities: (1) develop a more efficient tendering and concession procedure, (2) passage of secondary legislation or bylaws on energy market issues such as status of RE producers, tariffs, and financial incentives, and (3) developing Local Energy Plans (LEP or 'Lokalni energetski plan' in the Montenegrin language).

The new improved tendering procedure was drafted and employed with support from the Project for the second concessional tender in 2009. The first tender in 2008 was successful as well but with a tendering process still in development. The concession process was also re-engineered to be more efficient, simpler, and more transparent to applicants. Permit requirements for IPP energy generation were reassessed, including required collaboration with local spatial planning documentation. A technical review committee was created to evaluate and select winning SHPP concession proposals. During stakeholder consultations, it was noted by the Ministry of Economy that the bid evaluation process and quality of concession application has improved substantially, the tendering procedures is much quicker and the tendering process now takes approximately 1.5 years whereas the tendering process was not functional before the UNDP-GEF Project was instituted[7].

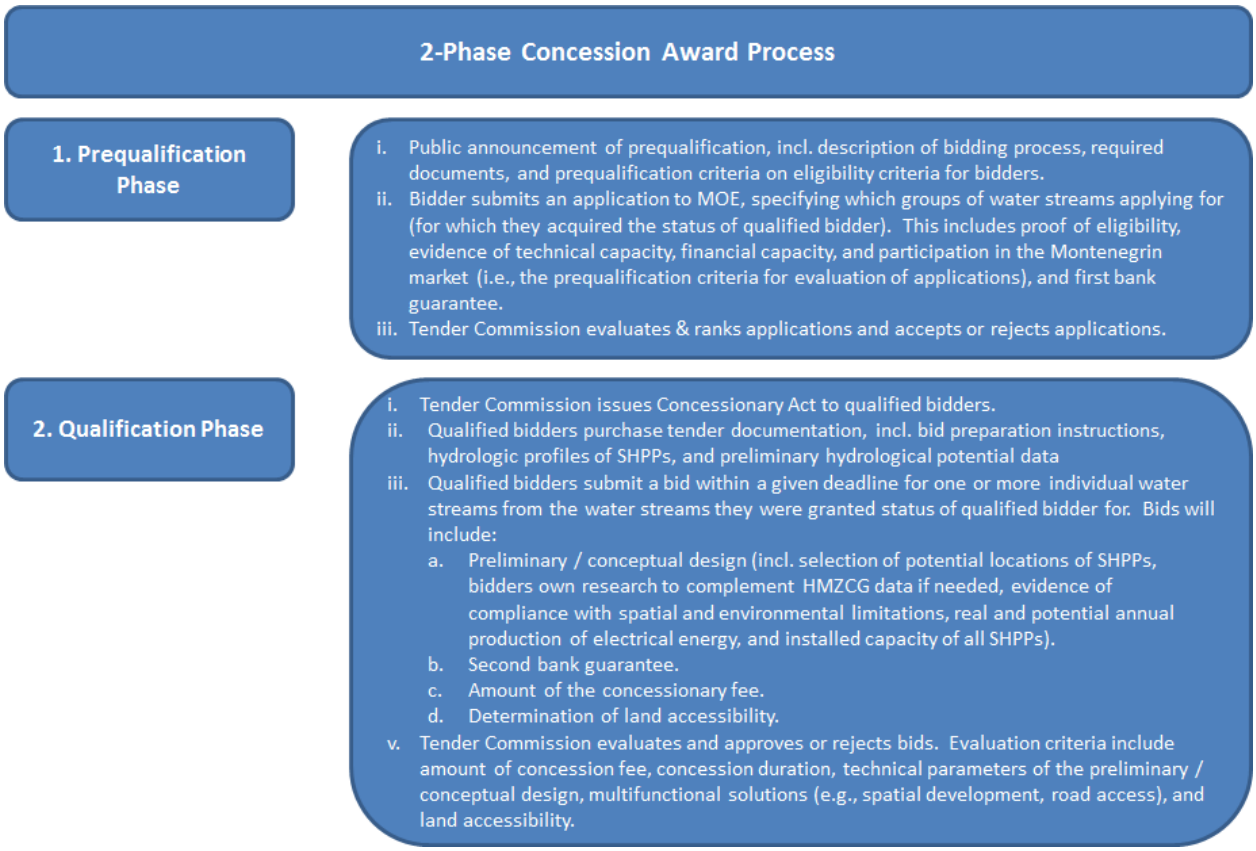
Close cooperation between UNDP-GEF and the Ministry of Economy has allowed for faster adoption of a large body of secondary legislation or bylaws related to RE. Rules and regulations that were drafted included: (1) new incentive tariff rates for power generated by RE sources (hydro, wind, solar, biomass, and biogas); (2) a methodology for calculating the Feed-in-Tariff; (3) the combination of fees for water usage and site concessions into a single fee for SHPPs to streamline the concession process; (4) regulation for obligatory purchasing of power from SHPPs; and (5) numerous bylaws governing incentive schemes and financial mechanisms for RE producers, a tariff system for establishing incentive rates for RE power, the classification of privileged energy producers and origins of RE sources, and the methodology of calculating tariffs from RE sources. In the second half of 2011, the required policy and regulatory framework for small hydropower and other RES sources was established and is now fully enforced. A third tender is planned for June 2013 where the new concession and tender system will be used for the issuance of 10 concessions.

Concessionary Act

The Concessionary Act for Concession Award to Exploit Water Streams for Construction of SHPP was drafted for the second tender as one of the UNDP-GEF Project deliverables. Section 1 of the Concessionary Act outlines the Prequalification and Qualification phases associated with the concession award process (Figure 5):

- The Prequalification Phase is comprised of the following chronological steps: a public announcement of prequalification, the bidder submits an application stating which groups of water streams he/she is applying for, then the Tender Commission evaluates and ranks the applications based on technical and financial capacity, and participation in the Montenegrin market; and
- The Qualification Phase is comprised of the following: the Concessionary Act is submitted to qualified bidders, qualified bidders purchase instructions for bid preparation for the tender, qualified bidders submit bids for one or more individual water streams within the group of water streams for which they were earlier granted status to be qualified bidders, the bidder provides a bank guarantee, the Tender Commission either approves or rejects the preliminary conceptual design, and if accepted, then the Tender Commission ranks the bid.

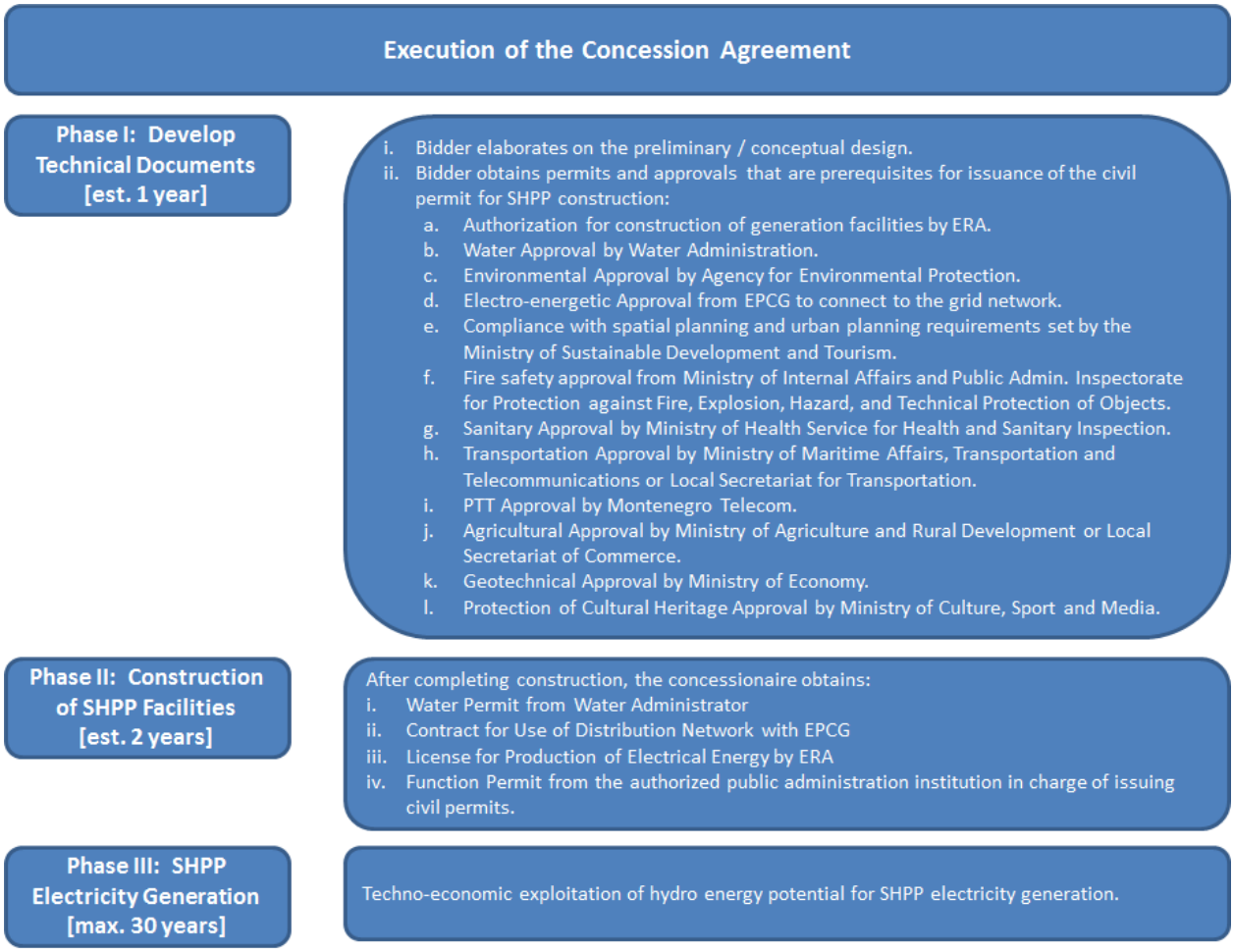
Figure 5: SHPP Concession Award Process



Once the bid is approved, the Concessionary Act Section 6 identifies the three phases of the Concession Agreement (Figure 6):

- In Phase 1, technical documents are developed in about one year, the plans must be in compliance with spatial planning documents, and a civil permit is required from the Ministry of Spatial Development and for environmental protection.
- In Phase 2, the SHPP facilities are constructed over the course of about two years. After construction, a water permit is required, an EPCG contract is required for use of their distribution network, and ERA license is required to produce energy, and an operation permit is required. A test phase is performed after the construction is complete.
- Phase 3 is the exploitation of the hydro energy potential and this lasts for the 30-year duration of the concession.

Figure 6: SHPP Concession Agreement Execution



Local Energy Plans

In response to the needs of local municipalities in meeting the legal obligation of Article 11 of the 2010 Energy Law whereby each Montenegrin municipality must develop a LEP, UNDP-GEF drafted a model LEP that can be used as a template by local municipalities, and is in the process of working closely with three municipalities (Bijelo Polje, Cetinje, and Andrijevica) to finalize their Plans by mid-2013.

> The Local Energy Plan *"provides an excellent basis and insight into the current state of energy at the local level and it should be a meaningful document to investors who can easily see in one place, what are the features and capacity of municipalities to invest."*
>
> - Mr. Miodrag Ivanovic
> Manager, Andrijevica Municipality

> *"The Local Energy Plan and its Action Plan are great complements to the Five-Year Strategic Development Plan."*
>
> - Mr. Blažo Vlaović
> Energy Manager, Bijelo Polje Municipality

The main elements of the LEP as determined by the Ministry of Economy and UNDP-GEF are as follows: (1) overviews of the current energy supply, production, and distribution capacity; (2) analysis of current energy consumption; (3) calculation of greenhouse gas emissions; (4) estimates of future energy use and future energy supplies; (5) analyses of RE/EE potential; (6) definition of energy goals in terms of supply, production, and distribution; (7) analysis of measures to achieve these objectives; and (8) financial resources for implementation of the LEP. The model LEP that UNDP-GEF generated that includes instructions for these main elements is available free and online[41].

The LEP is intended to attract investment. It stimulates sustainable economic development and sets a local strategy for energy consumption and production at the municipality level. In addition to the model, as part of the Project, UNDP-GEF developed the methodological guidelines and structure of the LEP.

To ensure the new procedures and requirements are understood by key stakeholders, a number of workshops were organized on tenders, concessions, LEP preparation, and technical and financial considerations of building and maintaining a SHPP. In addition, in the early stages of the Project, UNDP-GEF coordinated a study visit to Slovenia and Austria for the representatives of the business sector, Ministry of Economy, and local government to showcase how RE sources can trigger economic development in rural areas.

3.1b Passage of Regulations to Facilitate Small IPPs Connecting to the National Grid

To facilitate IPPs connecting to the national grid, the Project collaborated extensively with the Ministry of Economy and EPCG to complete the set of regulations for connection of small power producers to the grid, and defined grid connection rules and fees. The Project also financed the completion of a 2012 study by the Milan Vidmar Electro Institute to identify opportunities and define conditions for connecting different types of RE distributed power sources to the power system. The study[40] was entitled, Distributed Source Connection and Operation in the Electric Power System of Montenegro (the Grid Study) and included the following components: (1) analysis of the regulatory environment governing DG connections to the power network; (2) recommendations on changes in technical regulations; (3) a quick reference compilation of Technical Conditions for the utility authority to provide to prospective IPPs to alert them about technical connection requirements; (4) analysis of technical and economical practicality of anticipated distributed source connections to the grid through upcoming Montenegro government concessions; and (5) training and instructional documents provided to EPCG to enable EPCG to conduct analyses of distributed source connections to the grid by applying a software package called PSS®SINCAL.

The Grid Study was made possible by extensive UNDP-GEF Project collaboration with the Ministry of Economy and EPCG. The main findings of the Grid Study were as follows:

1. It was concluded that Montenegro had a relatively modern and functional set of energy regulations;
2. Technical and legal issues that needed to be changed and updated in existing documents for enabling distributed source connections to the grid were identified and discussed with EPCG and government ministries;
3. Development plans of the nation's electric power system were verified;
4. A methodology was established for conducting network analysis of DG connections to the distribution system and for controlling impacts on the distribution system in terms of line disturbances with the goal of setting clear and unambiguous rules;
5. Technical conditions referring to distributed source connections and operations were developed to provide faster and safer connection with minimum disturbances; and

6. The Grid Study team analyzed tender applications and provided topological and digital network models of the distribution system to EPCG for areas with new proposed SHPPs.

> *"Since numerous SHPPs will be coming online and several can be located close to one another, the Grid Study was extremely useful for making analyses for future planning."*
> - Mr. Slobodan Vukasinovic CGES-AD

This type of grid analysis was determined to be essential to overcome a significant barrier for SHPP integration in the central grid: the inability of power supply companies to develop these technical conditions. The Grid Study covered technical, managerial, safety, and economic aspects of IPP connections and it is available free and online[40]. As an example of its use in the field, during stakeholder consultations, a local SHPP designer / developer indicated the Grid Study was particularly helpful to determine the diameter of power lines to use and acceptable power levels and power level drops in the power lines[7].

> With support from the Grid Study, *"EPCG has what it needs to account for renewable energy source connections to the grid."*
> - Mr. Stojan Anđelić Distribution, EPCG

Presently, grid connection rules and fees have been completed as well as a stand-alone document also drafted by Milan Vidmar Electro Institute that outlines permissible connectivity technical conditions to be given to SHPP IPPs. The Grid Study does note that although energy from IPPs can safely and efficiently be incorporated into the grid, the "existing network needs to be reinforced with more than 200 km of 10 kV and 35 kV lines and with the installation of several new [substations]"[40] to accommodate the projected number of new distributed sources and this will cost about EUR 20 million. As noted in an interview with EPCG, DG sources are located "mainly in passive grid areas where the grid is less developed," resulting in greater need for rehabilitation[40]. The status of these renovations was not known as of the date of the writing of this report.

3.1c Financial Incentives for Small and Micro Power Development

A Feed-in-Tariff is a policy mechanism that pays IPPs for energy generated from RE sources and discharged into the national grid. Through this payment, IPPs such as SHPP developers are provided with a secure future stream of revenue that minimizes the risk associated with long-term, fixed cost investments. Without sensitivity to the fluctuation of fossil fuel prices and a reliable source of hydropower, a Feed-in-Tariff can substantially improve the bankability of a new

SHPP. As testament to the success of Feed-in-Tariffs in RE market transformation, as of early 2012, there were 66 countries with Feed-in-Tariffs in place[42].

Box #1: On 29 September 2011, the Government of Montenegro passed the Decree on the Tariff System for Determining the Incentive Prices for Electricity Produced from RE Sources and High Efficiency Cogeneration. The Decree establishes the following incentive prices for electricity produced in plants using RE sources:

Renewable Energy Source	Feed-in-Tariff [€/kWh]
Small Hydropower Plants	
< 3 GWh/year	*0.1044*
3-15 GWh/year	*0.0744*
> 15 GWh/year	*0.0504*
Wind farms	*0.0961*
Biomass	
Power plants using biomass from forestry and agriculture	*0.1371*
Biomass from the wood-processing industry	*0.1231*
Power plants using solar energy on buildings/engineering construction	*0.1500*
Power plants using solid waste	*0.0900*
Power plants using waste gas	*0.0800*
Power plants using biogas	*0.1500*

The UNDP-GEF Project worked with the government to determine purchase prices based on the type of RE technology and guaranteed grid access for IPPs, and the Feed-in-Tariff is now in place. Feed-in-Tariff incentives are included in the 2011 Montenegro Decree on the Tariff System for Determining the Incentive Prices for Electricity Produced from RE Sources and High-Efficiency Cogeneration for electricity generated from RE sources and cogeneration. A flat tariff is paid for electricity, adjusted annually for inflation. Interconnection is guaranteed if the project design matches utility technical standards, and the IPP pays for cost of interconnection. Feed-in-Tariffs are expressed in EUR/kWh (see Box #1) and are revised annually based on the inflation index[43]. In the event a SHPP is constructed on existing infrastructure (pipeline and/or dam), the small hydro tariff is calculated at 80% of the tariff items noted in the Decree.

Based on the 2012 REN21 Global Status Report, the range in hydropower Feed-in-Tariff payment rates in September 2011 for 20 countries analyzed was between USD 0.072/kWh and 0.321/kWh (EUR 0.0538/kWh and 0.2401/kWh, respectively, based on average 2011 currency conversion values)[44] so Montenegro tariffs fall within this range for SHPPs below 15 GWh/year.

UNDP-GEF contracted an international consultant in the field of the Kyoto Protocol clean development mechanism (CDM) to do an in-country assessment of RE projects to determine their potential for attaining marketable Certified Emission Reductions (CERs). Based on the consultant's findings, it was determined CERs were not currently a feasible source of carbon revenue due to lack of CER demand and the time and money resource-intensive preparation steps necessary to first qualify for CERs. It was recommended not to pursue carbon revenue in

Montenegro for RE sources until there is a sustained upward push on the carbon price as a positive sign the market rebounded, which will likely not occur until new legally binding commitments are agreed upon under global climate change negotiations. A workshop was organized in association with the UNDP-GEF Project to provide CDM technical assistance.

> *"The tendering procedure is still a work in progress but the version [to be used going forward] is a huge improvement compared to early calls for tender."*
>
> - Mr. Ivan Boskovic
> RE Office Leader, Ministry of Economy

Prior to the Project, spatial planning documentation was a bottleneck in the issuance of construction permits for RE sources. As part of the Project, a local consultant was therefore contracted to perform the following activities: (1) identify gaps and uncertainties; (2) confirm they addressed RE sources; (3) provide recommendations on urban technical conditions specific to RE sources; and (4) issue recommendations on the issuance of construction permits for RE IPPs pertaining to spatial planning document requirements. Through implementation of the Project, spatial documentations (e.g., hydrological and geological maps and datasets for each location on the calls for tender) were generated to support concessionaires and accelerate the planning process. Spatial documentation documents are critical for SHPP construction because the Concession Agreement and construction permits (see Figures 5 and 6) must be in compliance with spatial planning documents developed by Montenegro's municipalities.

To assist potential investors with understanding the bidding process, the concession process, and the permits that are required for the construction of SHPPs, UNDP-GEF prepared an investor-friendly guide entitled "Roadmap for Investors" to encourage development of small hydropower projects[45]. The Roadmap discusses legal procedures, identifies potential avenues investors can take for technical support, presents hydrological data reports that are available for use for free online (see Section 3.2), and lists the steps to follow from applying to the tender, through getting the permits, to the construction phase.

3.2. Outcome #2: Data Collection to Support IPP Entrepreneurs in SHPP Investment Decisions

UNDP Project Outcome #2: Main Accomplishments

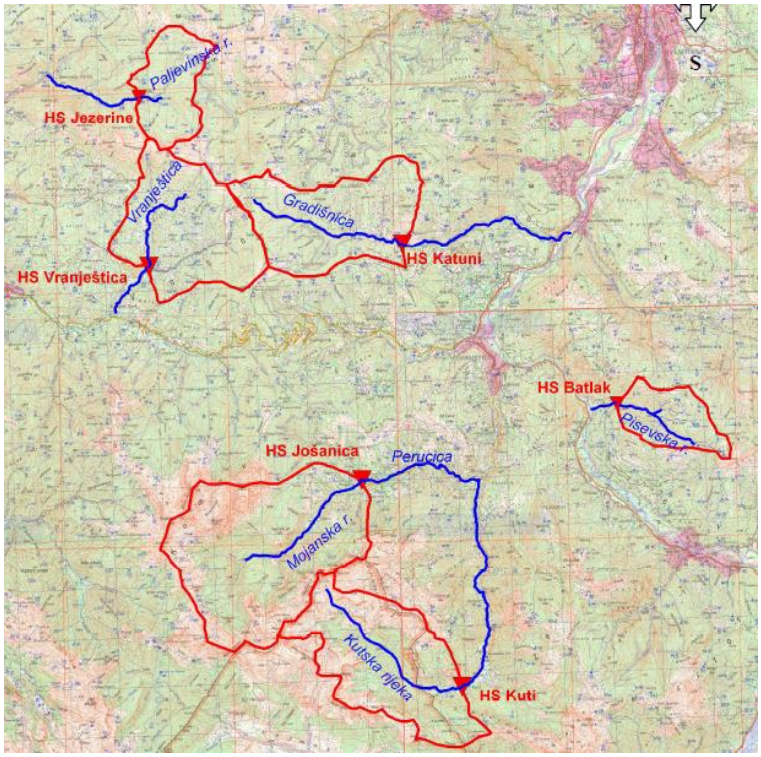
1. **Collected 2 years of hydrologic data at 15 stations to attract investors**
2. **Set up a pilot mini-HPP project with Andrijevica Municipality**
3. **Created a One-Stop-Shop website as an interactive platform to share data**

Outcome 2 was designed to support IPP investment decisions in small hydropower and one of the principal ways to do this was to collect site-specific hydrologic data to better estimate the profitability of hydropower at the locations and potentially save investors two years of data measurement. This information helps make investment decisions and enables more precise energy development planning. The Project data collected was complemented by data sets compiled through hydrological measurements financed by the Government of Norway. All data and summary reports were posted online on a One-Stop-Shop website for potential investors (www.oie-res.me) and the Project also coordinated and funded the development of a high-profile pilot project in Andrijevica municipality to raise awareness of micro and small-hydropower opportunities.

3.2a Hydrological Data Collected

In association with the UNDP-GEF Project, data collection was performed at 15 measurement stations on nine rivers (Ćehotina, Morača, Ibar, and six rivers on the Tara and Lim river systems) between 2010 and 2012. The two reports generated containing these data and detailed GIS maps of the catchment areas are presented online[21]. As an example in the 2012 hydrological report of the GIS location map, Figure 7 shows six catchment areas (shown outlined in red), measuring stations (red text beginning with "HS"), and sampled water bodies (in blue) investigated[46]. At each station, 7-12 measurements were collected of minimum and maximum flow rates, runoff coefficients, and precipitation. The UNDP-GEF Project procured 15 sets of hydrometric equipment for use by the Institute for Hydrometeorology and Seismology (Zavod za Hidrometeorologiju I Seizmologiju) who performed the data collection. These data complement sampling activities supported by the government in 2000 and a partnership with the government of Norway in 2006 to collect hydrologic data regarding potential sites for hydropower generation. Sampling activities supported by the Government of Norway were part of a 2-year sampling programme at 15 stations along the Lim, Piva, and Komarnica Rivers.

Figure 7: Hydrogeologic Map of Sampled Water Bodies



UNDP-GEF Project reports do not include interpretations and comparisons of the data as this activity is most relevant for developers and investors. These data are particularly useful for potential investors as the existing data prior to the UNDP-GEF Project are insufficient on their own to make basic investment decisions for most of the sites. During the Project's sampling events, measurement stations were only sampled during the course of 1-2 years. Since annual rates of precipitation can vary significantly, it is possible for developers to conduct their own follow-up sampling by certified samplers.

3.2b Mini-Hydropower Plant Pilot Project and Posting Data Online

In addition to LEP development in Andrijevica, the Project also conducted an economic study for a concession issued in the municipality in the second tender on the river, Trepačka Rijeka. The economic study was performed in collaboration with a different UNDP programme entitled "Climate-Change Friendly Economic Settlements" and it serves to identify uses for the electricity, the impact on the economy of the municipality, to enhance the attractiveness of the mini-hydropower plant (mini-HPP) investment[47]. It will also serve as a basis for a Business Plan for mini-HPP construction that is being developed.

The LEP model and hydrological data discussed in Section 3.2a are all provided free and online on the Ministry of Economy RE Sources Unit website[21]. The website was designed to serve as a One-Stop-Shop location to provide information and documentation to support investment decision-making. The information online is updated regularly and presents data and reports transparently. Due to a significant increase in the number of visits to the website and feedback received, the site was re-designed with a more user-friendly interface in 2012.

A Handbook for Multipurpose Use of SHPPs was drafted in 2010 by UNDP-GEF to provide a broad, non-technical overview on hydropower as well as the tendering and concession processes. The Handbook, which is available online[48] was developed to raise awareness on RE for communities.

As part of the Project, UNDP-GEF support was provided to the Andrijevica municipality for a pilot mini-HPP construction on the main water supply system with a rated capacity of 80 kW. UNDP-GEF reviewed the construction designs, which were originally drafted in 2004 and resulted in a construction permit being issued. To date, no construction has been performed. The mini-HPP pilot project was in-line with the objective of the UNDP-GEF Project because it would secure additional new renewable generating capacity and create an innovative stream of concession fee revenue for the municipality, which is a model that is potentially replicable in other municipalities.

As a result of the review of the construction designs, UNDP-GEF recommended not constructing the mini-HPP at the location recommended by the municipality at this time because there were discrepancies in the data provided and the water supply system reconstruction was needed[49]. To usher this pilot project to the next stage of development, a request for proposals was recently issued to develop 1 MW SHPP design documents (rather than an 80 kW mini-HPP) and this will coincide with selecting a new site location

3.3. Outcome #3: Efficiency and Transparency Improvements in the IPP Concession Process

UNDP Project Outcome #3: Main Accomplishments

1. **Construction permits were issued for 8 SHPPs and 2 wind farms**
2. **8 SHPPs leveraged €38 million in private investment**
3. **13 SHPP concessions have 97 MW installed capacity to far exceed the target**

The third Outcome focused on operationalizing small hydropower IPP concessions to collaborate with the Ministry of Economy RE Sources Unit (a focus area that was formerly included within a combined EE / RE Unit within the Ministry of Economy) to assess tendering and contractual document options, provide technical assistance centered around the bidding process, and design model or template documents to streamline future agreements and approvals.

3.3a Design Model Tendering and Contractual Documents for SHPPs

To facilitate a rapid turnover in concessions issued and contracts finalized, UNDP-GEF created a streamlined and simplified tendering process with the Ministry of Economy. The Project also standardized a model power purchase agreement (PPA) for the purchase of electricity by EPCG from the SHPP where the generator provides the operator with monthly and annual generation plans and the electricity price is agreed to, and Concession Agreement and bidding documents approved and adopted by the Ministry.

Through the Project, UNDP-GEF organized a Technical Expert Group of local and regional RE experts to evaluate submitted proposals for the first and second tender and the technical criteria used for evaluation include design construction and compliance with environmental and hydrological regulations. The Technical Expert Group served as key advisors during planning and implementation stages of the Project and played a critical role in working with the Ministry of Economy to draft terms of the Feed-in-Tariff financial incentives[7].

3.3b Collaboration with and Training of the New Energy Efficiency and Renewable Energy Unit

The Ministry of the Economy EE / RE Unit was created in 2008 to be responsible for RE generation sites, authorizing and permitting new generating facilities, and licensing and inspecting activities. In light of the new tendering and contracting procedures, UNDP-GEF trained the Unit in the new methodologies and helped organize the Unit. Consistent with the derisking public instruments discussed in Section 2b, the Project enhanced the capacity of policymakers to identify an appropriate mix of public instruments to catalyze private investment flows for clean energy development. The Unit also received capacity building from UNDP-GEF on drafting bylaws, preparation of LEP templates, the tender bidding and negotiation process, and developing requirements for submission of data by IPPs to the Unit.

3.3c Tender and Contract Development

The Project has been instrumental in operationalizing SHPP concessions. Two tenders were issued in 2008 and 2009 and, as shown in Table 3, the government issued 13 concessions in six municipalities for a total of 33 SHPPs and an installed capacity of 97.33 MW. Of these concessions, one SHPP has been constructed (Figures 8 and 9) and construction is underway with seven other SHPPs having a total SHPP capacity of 38 MW and two wind farms with a total capacity of 96 MW. Construction permits have been issued and PPAs were negotiated and signed. As noted earlier, the Concessionary Act for Concession Award to Exploit Water Streams for Construction of SHPP was drafted for the second tender. The Ministry of Economy estimates that five SHPPs will be constructed in 2013[7].

Table 3: Concessions Issued by the Ministry of Economy from the First Two SHPP Tenders

No.	Water Body	Confluence	Municipality	No. of SHPPs	Installed Capacity [MW]
First Tender					
1	Bistrica, desna pritoka	Lim	Bijelo Polje	2	17.00
2	Bistrica	Lim	Berane	8	10.00
3	Šekularska	Lim	Berane	5	5.00
4	Grlja	Lim	Plav	1	1.70
5	Babinopoljska	Lim	Plav	2	9.45
6	Zaslapnica	Zaslapnica	Nikšić	2	1.00
7	Bjelojevićka	Tara	Mojkovac	2	15.00
8	Crnja	Tara	Kolašin	1	5.50
			TOTAL	**23**	**64.65**
Second Tender					
9	Vrbnica	Lim	Plužine	2	12
10	Tušina	Komarnica	Šavnik	4	6.02
11	Trepačka rijeka	Lim	Andrijevica	1	8.30
12	Murinska rijeka	Lim	Plav	2	2.36
13	Komarača	Lim	Plav	1	4.00
			TOTAL	**10**	**32.68**
			CUMULATIVE TOTAL	**33**	**97.33**

The private investment leveraged by public funds and support for these eight SHPPs is approximately EUR 38 million (USD 47 million). Another 17 SHPPs with a total capacity of 26 MW are awaiting their permits. The next open call for 30-year concessions for SHPPs is expected in mid-2013 during which time the new tendering procedure will be fully used.

For the first tender, it was announced and issued prior to the Project collecting hydrologic data so investors had to decide on applying without having hydrology data or they collected measurements themselves for their technical design and calculations of energy production.

Figure 8: Newly Constructed Jezerstica SHPP, Berane Municipality

Figure 9: Newly Constructed Jezerstica SHPP Interior, Berane Municipality Turbine, Ventilation System, Generator, and Hydraulic Equipment

4. Results or Impacts

Key Messages:

- The primary objectives of the UNDP-GEF Project were satisfied by issuing 13 concessions to develop SHPP on specified water bodies.
- The Project leveraged USD 1 million in Project budget into USD 47 million in investment in new SHPPs and 97.33 MW new generation capacity to date.
- A high-quality of concession applications were received because of the Feed-in-Tariff incentive, the improved and more transparent tendering and contracting process, and the freely provided hydrological data.

The issuance of 13 concessions, completed construction of one SHPP, and 10 pending construction permits for SHPP and wind farms provide good evidence the updated tendering and concession process is functioning and sustainable and the small hydropower sector in Montenegro is opening up to developers and investors. The 97.33 MW installed capacity of the 13 concessions far exceeds the 15-20 MW target by the government. None of the investment projects would have started had it not been for the activities undertaken by the Project based on the legislation UNDP-GEF helped draft and was subsequently adopted.

The adopted Feed-in-Tariff was especially critical in providing financial incentive to developers to submit applications for concessions to build SHPPs. As noted during consultations with the Ministry of Economy, the tendering process is vastly improved today over the system used for the earlier calls for tender[7]. Furthermore, with input from the Technical Expert Group, application review for concessions has been standardized with a greater focus on technical quality of proposals. In particular, the RE Sources Unit of the Ministry of Economy collaborated extensively with UNDP-GEF and the Technical Expert Group to raise their internal capacity to more efficiently execute the tender and contracting process to enable new IPP development with minimal further assistance from outside parties.

Public funding is limited and to achieve economies of scale for new investment in the RE sector, this limited funding can best be maximized by leveraging private investment. In the case of the UNDP-GEF Project, leveraging USD 47 million with just over USD 1 million in GEF funding is an impressive turnover. Of critical importance in Montenegro is the creation of new jobs and new

SHPP investment will create new infrastructure and the mainstream a new type of technology, thereby creating real expectations of new employment that will span the hydropower industry supply chain via project design, turbine manufacturing, equipment suppliers, financiers, etc. This is an important consideration as it is preferable to not only import expertise but rather to raise the technical capacity in Montenegro. No comprehensive study producing SHPP job creation data was identified prior to the writing of this report.

The pilot project in Andrijevica has not yet been realized; however, the request for design proposals was recently issued and such a high-profile demonstration project will serve as a good role model for innovative ways rural towns can attract investment.

To create a sustainable pipeline of SHPP projects, securing affordable finance is a primary objective of project developers. During the course of the UNDP-GEF Project, potential finance opportunities were identified for project developers that could work in tandem with the newly instituted supportive policy, administrative, and legal frameworks that support RE development and IPP connections to the national grid. The impact of the power sector reform is therefore amplified via these opportunities. For example, the Investment and Development Fund of Montenegro, founded in 1995, offers low interest soft loans to municipalities to support infrastructure and environmental projects, for which new SHPP projects potentially qualify. Mechanisms available through the Fund include credit, guarantees, and public-private partnerships and, as noted on the Fund's website, support is open to local governments, maximum credit is EUR 750,000 at an attractive interest rate of 5%, and there is a two-year grace period on repayment[50].

Consistent with vision and goals of the Investment and Development Fund to promote entrepreneurship and create a favorable environment for investment, local municipalities who qualify for a loan from the Fund can get a much need influx of capital to enter into public-private partnerships and build SHPPs to collect a reliable source of concession fee revenue. This also serves to address a criticism from municipalities heard during stakeholder consultations[7] about the concession system in that SHPPs often have little involvement with communities. This arrangement is also preferable because it would create a sense of SHPP ownership for the municipality and direct SHPP revenue to communities.

Other potential sources of finance include the Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF), developed by the European Bank for Reconstruction and Development (EBRD), which provides finance for RE/EE projects via loans between EUR 2-6 million. Financial institutions interviewed during the consultations that have been or are currently in negotiations on financing SHPP construction were Crnogorska komercijalna banka (CKB Bank), ERSTE Bank, and the European Bank for Reconstruction and Development (EBRD).

The Project has attracted regional interest in clean energy forums and conferences due to its achievements thus far, and there is a great deal of opportunity in replicating Montenegro power sector reforms to promote SHPP in other countries and for local municipalities to emulate Andrijevica through the pilot project. The Project is receiving good media coverage and the Ministry of Economy RE Sources Unit website has been an important tool for disseminating information to developers and investors. The foundations are therefore in place for UNDP-GEF Project activities to be duplicated at lower transaction costs. For example, a Montenegrin municipality could move forward by securing political commitment to construct a SHPP, finalize a LEP, identify a site for pilot construction, launch a promotion and awareness campaign, and develop a public-private partnership to share investment risk.

5. Lessons Learned

During the Project's six years of design and implementation, sufficient time has passed to enable an introspective view towards the elements of the Project that were more successful and less successful, as well as the externalities affecting achieving its goals.

Lesson #1: Achievement of Project objectives was made possible with extensive buy-in from senior levels of government to raise credibility in and incentives for participation in the Project.

The alignment of Project objectives with strategic goals of the government was critical for producing a substantial level of buy-in from senior levels of government and political will to push the Project forward. This added credibility and incentive for key stakeholders such as EPCG, CGES, the Institute of Hydrometeorology and Seismology, and local municipality officials to collaborate on the Project and contribute meaningful feedback to UNDP-GEF. To maximize the benefits of

this political will, dedicated Project 'champions' both in UNDP-GEF and the Ministry of Economy were required to create and maintain momentum and usher the Project through many years of operation with successful accomplishment of a diverse set of goals. Timing of the Project was favorable to accomplish the Project goals as the government of Montenegro wished to liberalize the RE sector and were therefore in favor of working with UNDP-GEF to aggressively push through small hydropower market sector reform. In addition, the objectives of the Project coincided well with the government's desire to reevaluate institutional procedures, accept restructuring, and remain open to innovative ideas without long proven track records in the region.

Lesson #2: Concentrating the Project on a single sector allowed less division of resources and increased focus on effective delivery of reform.

The Project benefited from having a clear vision focusing on a niche area of the energy sector rather than trying to try to renovate the whole energy sector. To promote RE-fueled electricity generation, broad policy reform was required (e.g., creating updated grid connectivity requirements for IPP); however, the government and UNDP-GEF team also incorporated rules, regulations, and administrative procedures into existing platforms (e.g., Energy Law of 2010, Energy Development Strategy of Montenegro of 2025) that specifically benefit the small hydropower sector. This included collaboration with the Ministry of Economy's RE Sources Unit, assisting with the development of small hydropower Feed-in-Tariff incentives, developing high-profile demonstration LEPs, and developing a SHPP pilot project to work within the systems currently in place while modernizing them and making them relevant for renewables.

Lesson #3: Extensive outreach to key stakeholders is imperative to inform stakeholders of the benefits of the Project, identify valuable partners, accumulate new information, and collaborate with experts (local and international) to improve Project quality.

UNDP-GEF emphasized the necessity to invite feedback from local, RE, finance sector, and institutional experts to ensure the Project was designed to optimize results. Stakeholder engagement and maintaining open lines of communication were incorporated into day-to-day activities to promote constructive feedback, maximize combined resources, and ensure the Project operates well after UNDP-GEF involvement is phased out. The following are examples of measures taken to ensure UNDP-GEF had feedback from key actors in the power sector:

- The Project management board includes a diverse representation from the Ministry of Economy, Association of Municipalities, and Association of Concessioners for RE Sources, so the Project team is able to respond to issues in an early phase such as identifying the need to create the Grid Study, the report with urban technical conditions for RE sources, the business plan for Andrijevica mini-HPP pilot project, and preparation of LEPs, which were all not originally in the scope of work.
- A study visit was conducted to introduce potential Montenegrin stakeholders and the investing community to the potential of rural RE opportunities to stimulate economic development. Similarly, UNDP Kyrgyzstan conducted a study visit to the UNDP Montenegro office in Podgorica to learn recommended best practices on power sector reform and small hydropower market development.
- Municipalities would gain a greater sense of ownership over local SHPP resources by building public-private partnerships to own the plants via soft loans from the Investment Development Fund of Montenegro. Discussions have begun on its feasibility.
- Open and transparent communication and cooperation between the Project team has been crucial for implementation of this project. Periodic progress reports on news and activities are also shared with Project partners personally and online. The participatory manner of implementation has provided valuable results such as relevant national institutions contributing on working groups to provide important contributions on specific tasks.
- Through active participation within working groups, dialogue and cooperation is strengthened and greater ownership over the final Project outputs is secured, resulting in easier introduction of study results and recommendations.

Thus far, the UNDP-GEF Project has been successful organizing seminars, workshops, and study tours as a platform for dialogue to share best practices and share knowledge. Although much progress has been made updating institutional systems related to permits, spatial documents and LEPs, tariff incentives, and tenders and concessions, further capacity building among key stakeholders would create greater awareness of the new procedures and add confidence to potential investors and developers.

Lesson #4: During long-duration projects, it is recommended to incorporate regularly schedule self-evaluative components into management operations due to potential changing conditions on the ground, employees changing position, and changes to stakeholder priorities.

Since the Project duration was quite long, it was necessary to incorporate regularly scheduled opportunities to reevaluate and re-prioritize the Project trajectory, change the scope of work as needed, and ensure continued compatibility among all components. Scope flexibility and creative brainstorming resulted in the realization of much needed Project components (e.g., Grid Study, Urban Technical Conditions report, Andrijevica SHPP Business Plan, and LEPs) that were not evident at the time of original planning in 2006-2007. Furthermore, extra time was deemed necessary to increase the comfort level of utility personnel on IPP connectivity issues, to procure hydrologic equipment and conduct data collection, and due to long delays on spatial document finalization, the Ministry of Economy created a new interim step to not chase away potential investors tired of waiting.

Lesson #5: In Montenegro, the level of awareness and expertise in RE lending amongst financial institutions varies widely and highlighting SHPP project successes would raise interest among financiers.

Finance is the primary underlying consideration in market transformation. Based on stakeholder consultations with local financial institutions, the appetite for lending for RE sources was found to be limited because of a lack of Montenegrin bank expertise in this sector, perceived and actual technical risk, a lack of role models and successful deals to replicate, and a limited number of project developers who are able to prepare convincing business cases to attract investment. As an example, the Ministry of Economy recently issued a tender to construct four new large hydropower plants on the Moraca River with a total installed capacity of 238 MW; however, not a single bid was received, which is likely a result of an unconvincing business case for the plants, poor timing, or limited resources available[7]. Although social and environmental considerations are vitally important to ensure a sustainable energy market, the financial bottom line will be of primary importance.

During stakeholder consultations, financial institutions discussed their primary perceived risks associated with closing SHPP investment deals[7]. ERSTE Bank emphasized that since banks need collateral in the event of loan default, land, equipment and concessions could be used; however, at present it is not possible to transfer ownership of concessions. Local banks were generally found to not have in-house expertise in lending for RE projects; however, resources were generally available in other offices or with umbrella organizations. The 2008 financial crisis was noted to have a continuing impact on project implementation as banks altered terms for credit and are generally more risk averse[7]. In addition, the lack of precedent examples using the Feed-in-Tariff in Montenegro was also highlighted by the financial sector to be a barrier.

Lesson #6: Renovations that are needed to prepare the grid for the numerous new IPP connections may be very expensive and needs to be incorporated into budgetary planning.

In addition to conducting a Grid Study governing connecting IPPs to the grid and addressing the issue of the grid absorbing large, intermittent supplies of electricity, a substantial amount of funding may be needed to modernize the grid to ensure compatibility and sufficient capacity to expand. As noted in Section 3.1b, the Grid Study concluded reinforcing the grid to accommodate the projected number of new distributed sources will cost about EUR 20 million[40].

Lesson #7: Concessionaires have encountered difficulties securing finance due to the inability to transfer ownership of a concession to lending financial institutions.

One main obstacle encountered in financing SHPPs is regarding collateral in the event of loan default. Banks wish to use the concession as collateral, and at present it is not possible to transfer ownership of a concession. Lenders request the ability to take ownership and sell the land and equipment to another SHPP developer; however, the right to develop a SHPP on a select water body is not transferable.

Finally, although the financial component of SHPP construction and power generation are of primary importance, the substantial inflow of investment and employment also offers new opportunities to incorporate positive social components to the Project, alleviate possible environmental concerns, and support gender equality. Consideration of how the Project can

support these elements needs to be incorporated into the Project during all stages of strategic planning.

6. Conclusions

The development of RE sources in Montenegro was scaled up significantly by the creation of favorable legal and regulatory frameworks, improving technical capacity and awareness, and streamlining administrative procedures. Although many of the regulations drafted, energy strategies, and LEPs extend beyond SHPP generation of electricity, the UNDP-GEF Project was very focused on implementing strategies to specifically support small hydropower. This was a reasonable approach because of the abundance of hydropower in Montenegro and it allowed the Project to focus limited resources on a single target sector.

In addition to improving energy security, responding to the growing power deficit, increasing the supply of domestic energy in the grid, and enabling high-cost energy exports, RE market transformation projects can also generate co-benefits on many levels by boosting economic growth, strengthening market institutions, reducing poverty, creating new jobs, improving local environment and heath conditions, and mitigating global environmental risks.

Moving forward, the tendering and contracting procedures seem to be relatively advanced, compared to before the Project and the legislative package of bylaws that support IPPs connecting to the grid is nearly complete. This has given rise to 33 SHPPs in the pipeline to be constructed, associated with the 13 concessions issued to date. Two years of hydrologic data was collected and hydrologic reports generated, and three LEPs in Andrijevica, Bijelo Polje and Cetinje will be completed in mid-2013 and available as models for the other municipalities. By the end of 2013, an anticipated six SHPPs will have been constructed and a third tender will be issued later in 2013 for an additional 10 concessions[7]. Considering that RE sources provide opportunities for new employment, there are real expectations of new jobs created by the end of 2013.

The areas where further progress is needed is implementation of a scale-up strategy to disseminate the results of the Project both domestically and regionally. To date, there has not been a great deal of awareness about the Project achievements among interviewed financial institutions, which could be quite beneficial to scale up investment. In addition, grid management

companies would benefit from a success story of distributed generation connections from a nearby area. Similarly, the Andrijevica pilot project is ongoing and has potential to be used as a high-profile demonstration project. Several municipalities have approached UNDP to help them draft LEPs. Outreach should incorporate a multi-media strategy that adequately captures all the Project's results and lessons learned and conveys the story of its success to external audiences within and outside Montenegro. This can include workshops for bankers and developers to provide technical assistance on new RE and SHPP procedures.

Montenegro is largely unoccupied territory for investors. Banks are beginning to show increasing appetite for SME and clean energy infrastructure lending, and lending by the Investment and Development Fund of Montenegro might gain traction and improve ownership among local municipalities. From a USD 1 million Project, UNDP-GEF efforts have leveraged USD 47 million among eight new SHPPs, which is a remarkable achievement, and there is a good likelihood that none of these investment projects would have been able to start had it not been for the activities undertaken within the Project.

[1] REN 21. *Renewables 2012 Global Status Report*. Sections 1 and 6. 2012.
[2] Montenegro. Ministry of Economy. *Energy Development Strategy of Montenegro by 2025*. Section 4.5. 2007.
[3] Energy Community. 10th Ministerial Council. *Decision D/2012/04/MC-EnC: Decision of the 10th Energy Community Ministerial Council on the Implementation of Directive 09/28/EC*. Article 4. 2012.
[4] Energy Community. Secretariat. *Annual Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community*. Section 4.1.6. 2012.
[5] EPCG. "New Electric Power Sources, EPCG." *Energy Community*. April 9, 2008.
[6] Energy Community. Secretariat. *Annual Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community*. Table 6. 2012.
[7] UNDP. *Stakeholder Consultation Report - Summarizing Project Achievements*. Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro. 2013.
[8] OECD/IEA. *Renewable Energy Essentials: Hydropower*. 2010.
[9] Montenegro. Ministry of Economy. *Concessionary Act for Concession Award to Exploit Water Streams for Construction of Small Hydropower Plants in Montenegro*. Section 3. Not dated.
[10] IRENA. *Volume 1: Power Sector. Issue 3/5: Hydropower*. Renewable Energy Technologies: Cost Analysis Series. Working Paper. June 2012.
[11] IEA/OECD. *Projected Costs of Generating Electricity*. 2010 Edition. Executive Summary. 2010.
[12] This currency conversion uses an average 2008 rate of 0.711 EUR:US$, and an average rate of 0.760 EUR: US$ in 2007.
[13] United States. Department of State. Bureau of Economic and Business Affairs. *2012 Investment Climate Statement – Montenegro*. June 2012. Web. April 4, 2013.
[14] IRENA. *Financial Mechanisms and Investment Frameworks for Renewables in Development Countries*. December 2012.
[15] European Environmental Agency. Country Profile – Drivers and Impacts (Montenegro). December 2010. Web. April 4, 2013.
[16] EPCG. Energetski bilans Crne Gore za 2013 godinu.Web. May 9, 2013. www.epcg.co.me/pdf/01_03_02/energetski%20bilans%202013.pdf
[17] Energy Community. Secretariat. *Annual Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community*. 2012.

[18] Komnenic, Peter. "Montenegro: 15 European Companies Keen to Build Hydro Power Plants." Balkans.com Business News. February 17, 2011. Web. April 4, 2013.
[19] World Bank. *Electrical Power Transmission and Distribution Losses (% of Output)*. Web. April 4, 2013.
[20] Fossil Fuel Subsidies in the Western Balkans: A Report for UNDP. Annex 2. December 2011.
[21] Montenegro/UNDP. Ministry of Economy. *Renewable Energy Sources*. Web. http://www.oie-res.me. April 4, 2013.
[22] Montenegro. Ministry of Transport, Maritime Affairs and Telecommunications. Section 21 Trans-European Networks. *Questionnaire: Information Requested by the European Commission to the Government of Montenegro for the Preparation of the Opinion on the Application of Montenegro for Membership of the European Union*. Question #13. December 2009.
[23] World Bank. *From Recession to Reform: The Western Balkans and the Impacts of a Double Dip Recession*. December 18, 2012. Web. April 4, 2013.
[24] World Bank. Poverty Reduction and Economic Management Unit. Europe and Central Asia Region. *South East Europe Regular Economic Report, No. 3, From Double-Dip Recession to Accelerated Reforms*. December 18, 2012.
[25] Montenegro Energy Law. Article 103. April 22, 2010.
[26] Montenegro. Ministry of Economy. *Energy Development Strategy of Montenegro by 2025*. Section 7.5. 2007.
[27] Montenegro. Ministry of Economy. *Energy Development Strategy of Montenegro by 2025*. Table 4. Section 7.5.1. 2007.
[28] "Welcome to Montenegro." *Destination-Montenegro.com*. Map of Montenegro. Not dated. April 4, 2013.
[29] Energy Community. Secretariat. *Annual Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community*. Section 3.3.2c. 2012.
[30] Montenegro Energy Law. Chapter II. Article 4. 2003.
[31] Montenegro Energy Law. Chapter II. Articles 12 and 18. 2003
[32] Energy Community. Treaty Establishing the Energy Community. Title I. Article 2. 2005.
[33] Montenegro. Ministry of Economy. *70. Strategy for Development of Small Hydro Power Plants in Montenegro*. 2006.
[34] European Union. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009. Articles 6 and 13-15. 2009.
[35] REN21. *Renewables 2012 Global Status Report*. p. 21. 2012.
[36] UNDP/GEF. *Transforming On-Grid Renewable Energy Markets: A Review of UNDP-GEF Support for Feed-in Tariffs and Related Price and Market-Access Instruments*. Section 1.2.3. 2012.
[37] Montenegro Energy Law. Articles 103 and 151. 2010.
[38] Montenegro Rulebook on Criteria for Issuance of Energy License, Content of a Request and Registry of Energy Licenses. Articles 4 and 15. 2010.
[39] Montenegro. Ministry of Economy. *Concessionary Act for Concession Award to Exploit Water Streams for Construction of Small Hydropower Plants in Montenegro*. Section 10. Not dated.
[40] Elektroinstitut Milan Vidmar/UNDP/GEF/Montenegro. *Distributed Source Connection and Operation in the Electric Power System of Montenegro*. Study No. 2121. September 2012.
[41] UNDP. Model Forme Lokalnog Energetskog Plana (Model Local Energy Plan). Web. http://www.oie-res.me/uploads/Model%20forme%20LEP.pdf. April 4, 2013.
[42] UNDP/GEF. *Transforming On-Grid Renewable Energy Markets: A Review of UNDP-GEF Support for Feed-in Tariffs and Related Price and Market-Access Instruments*. Section 2.1. 2012.
[43] Montenegro Decree on the Tariff System for Determining the Incentive Prices for Electricity Produced from Renewable Energy Sources and High Efficient Cogeneration. Articles 4 and 5. September 29, 2011.
[44] REN21. *Renewables 2012 Global Status Report*. Figure 22. 2012.
[45] UNDP. Mapa koraka za ulaganje u sektor malih hidrolektrana. Undated.
[46] Zavod za Hidrometeorologiju I Seizmologiju (the Institute of Hydrometeorology and Seismology). *Hidrološka obrada*. July 2012.
[47] According to the Montenegro 2010 Energy Law, small power plants such as SHPPs are considered "small" if they are less than 10 MW. Although not explicitly defined in the Energy Law, mini-HPPs are typically classified as < 1 MW.
[48] UNDP. Priručnik za Višenamjensko Korišćenje - Malih Hidroelektrane. Web. www.oie-res.me/uploads/archive/Koriscenje_mHE.pdf. July 2010. April 4, 2013.
[49] Morvaj, Zoran. *Preparation of a Pilot Project on Usage of Renewable Energy Sources to Support Green Economic Growth through Construction of Mini HPP at the Main Water Supply System of Andrijevica Municipality*. Task 1. Section 2. 2012.
[50] Investment and Development Fund of Montenegro. Financing of Infrastructure and Ecology Projects. Not dated. Web. April 4, 2013.