ENERGY UTILIZATION OF THE RIVER ISKAR'S WATER VIA THE CONSTRUCTION OF NINE MINI WATER POWER STATIONS (MWPS) ALONG THE RIVER BED ON THE TERRITORY OF SVOGHE AND MEZDRA MUNICIPALITIES, BULGARIA

PUBLIC CONSULTATION AND DISCLOSURE:

Non-Technical Summary

Prepared for Vez Svoghe

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NON-TECHNICAL SUMMARY

ENERGY UTILIZATION OF THE RIVER ISKAR'S WATER VIA THE CONSTRUCTION OF 9 MWPS ALONG THE RIVER BED ON THE TERRITORY OF SVOGHE AND MEZDRA MUNICIPALITIES

1. INTRODUCTION

Vez Svoghe OOD is a joint venture between Svoghe Municipality and Petrovilla Bulgaria AD, a subsidiary of the Italian Petrovilla Group. Located to the north of Sofia, Svoghe Municipality consists of 33 towns and villages inhabited by 24,000 people. Petrovilla is a consortium of leading energy industry companies based in Northern Italy. In Italy Petrovilla operates in the regions of Milan, Trento, Bolzano, Verona, and Vichenza. Its annual turnover exceeds €330 million (2005).

This Report is a Non-Technical Summary (NTS) of the 'Environmental Impact Assessment Report' for the *'Energy Utilization of the River Iskar's Water via the Construction of 9 MWPS along the River Bed on the Territory of Svoghe and Mezdra Municipalities'* (the 'Project') prepared by Ass. Prof. Eng. Rositsa Nikolaeva and submitted in September 2004. The Non-Technical Summary sets out the following:

- A description of the Project and its rationale;
- A description of the Project environmental and social setting;
- A summary of potential environmental impacts;
- A summary of potential social and socio-economic impacts;
- Proposed mitigation measures;
- Environmental monitoring; and
- Topographic and visual representations.

2. THE PROJECT

The Project comprises the construction of nine **Mini Water Power Stations (MWPS)** along a 33 km stretch of the middle section of the River Iskar (Middle Iskar), Bulgaria.

Each MWPS comprises a small dam structure and small lake upstream of the dam. Most of the dams are 7-8m in height with the largest being approximately 11m in height. Water flows through turbines within the dam structure to generate electrical power which is then fed into the electrical grid system.

2.1. Why is the Project Needed?

Bulgaria has limited reserves of natural resources and is reliant on fuel imports for the generation of a large portion of its power supply. The construction of the MWPS forms an important part of the country's renewable energy strategy and reflects the European Union's energy policy which promotes the use of renewable resources. The development of the MWPS on the Middle Iskar represents the realisation of a series of assessments of the hydrological power resources for this and other rivers in Bulgaria.

Through the permitting process and consultation with local communities, the nine MWPS being developed are considered to provide an appropriate balance between the preservation of the ecology and sustainability of the river, and the creation of power, employment and amenities.

2.2. Where is the Project Located?

The nine MWPS that make up the Project are located along a 33km stretch of the River Iskar in the Svoghe and Mezdra Municipalities to the north of Sofia. The presence of a major railway and road along the banks of the Iskar River limits the location of the hydro plants to the main river channel and the first of the river's flood terraces.

The general location of the project within Bulgaria is illustrated in ***Figure 1*** below:

Figure 1: Location of the Project Area

The location of the MWPS within the Middle Iskar is illustrated in ***Figure 2*** below:

Figure 2: Location of the Nine Mini Water Power Stations within the River Iskar Catchment

The MWPS are located in the following areas:

- Prokopanik;
- Tserovo;
- Cascade One: Bov-South, Bov-North;
- Cascade Two: Lakatnik, Svrazhen, Opeltnya, Levishte, Gabrovnitsa.

In the case of the cascades, the tail of the lower lake created by the lower weir(s) typically extends to the base of the weir for the next upstream MWPS.

2.2.1. MWPS Design and Construction

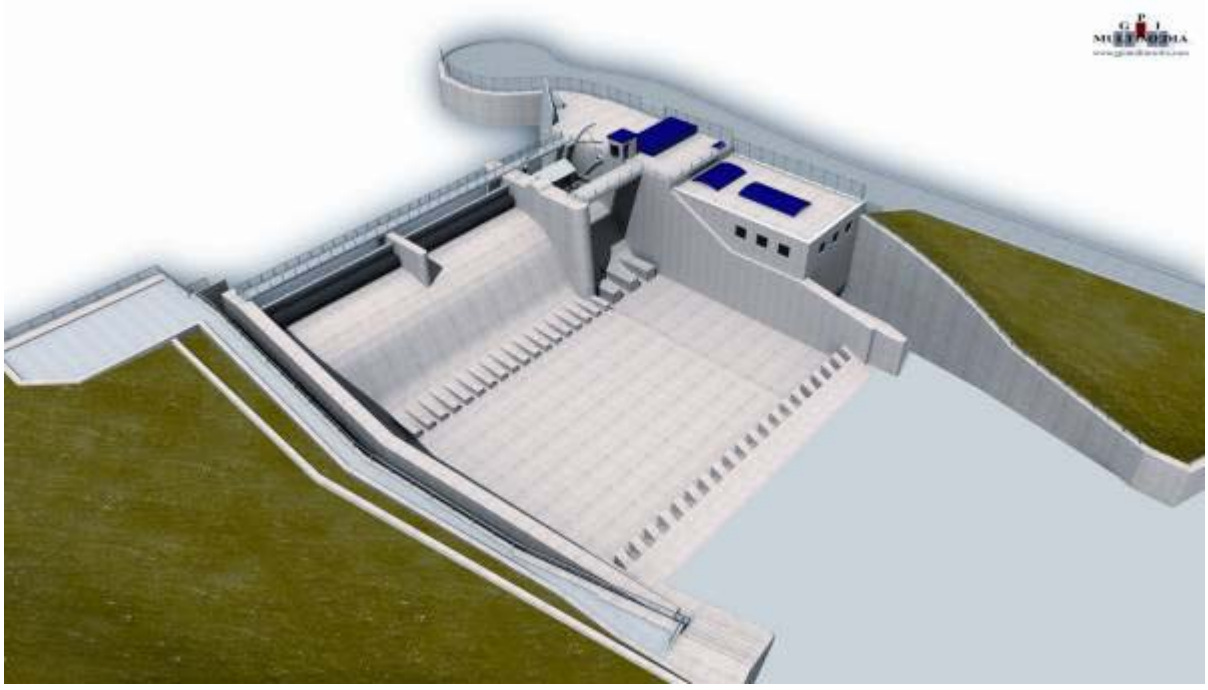
Each MWPS will comprise the following:

- a concrete weir designed to control and channel water flow in order to generate power;
- steel valves and slide gates that stop sediment from building up behind the weir; and
- a fish passage to allow fish bypass the MWPS and to pass freely along the river.

The height of the weir varies between approximately 6.5 m at Gabrovnitsa to 11.1 m at Prokopanik. The weirs or dams making up the Project are all considered to be small dams posing low risks to local communities and the environment.

Associated with the weirs will be a number of additional facilities. These include a station building, a service road and additional infrastructure to permit power connection to the national electricity grid. An illustration of the proposed design and layout of the MWPS is presented in ***Figure 3*** below.

Figure 3: Illustration of MWPS Design with Fish Passage in Foreground



Each MWPS will be fully automated to maintain a constant water level and to avoid flooding in the vicinity of the weir. Energy generated from the MWPS will be fed directly to Bulgaria's national electricity grid.

2.2.2. Construction Schedule

The construction process will utilise natural materials obtained from the site during the excavation, blasting, reinforcement and construction works. Much of the initial material removed from the river bed and terraces will be used to improve the access roads to the sites. Any excess material will be used for the construction of other roads or infrastructure purposes in the vicinity of each MWPS.

The construction of the 9 MWPS is scheduled take **7 to 8 years** in total. The proposed construction schedule is as follows:

- Years 1-2: Construction of 2 MWPS (Lakatnik and Svrazhen).
- Year 3: Evaluation of effects and operating conditions.
- Year 4-5: Construction of 3 MWPS.
- Year 6-8: Construction of remaining 4 MWPS.

As the construction is being done in sequence, the impact of each MWPS will be evaluated in turn, in addition to the cumulative impacts of the cascades on the overall environment of the River Iskar. Any further environmental improvement measures identified can be incorporated into the design of subsequent MWPS and, if appropriate and feasible, retrofitted to the existing MWPS. This step-by-step approach will ensure that environmental practices and procedures are continuously improved through the life of the Project.

2.2.3. Operation of the MWPS

The average annual electricity to be generated by the full project will be **137,284,216 kW/h**. The nine MWPS will work on a "constant flow" basis, and the level of water at each station will be electronically monitored. During operations there will be a constant water flow through the fish passage.

2.3. Environmental Impact Assessment (EIA) Process

An EIA for the MWPS was submitted to the Bulgarian Ministry of Environment and Water in 2004. This EIA was evaluated in accordance with Bulgarian legislation and awarded a Grade A i.e. no reassessment or further submissions were required by the Project proponent. The EIA Decision was issued on 1 January 2005 which contained a number of conditions and comments on the Project (RESOLUTION OF VALUATION OF THE INFLUENCE ON THE ENVIRONMENT / VIE/N 1-1/2005). The resolution included the following environmental conditions:

- Construction of all 9 of the MWPS is recommended;
- The Project will be constructed in such a way that groundwater (quality and supply to the villages) is not compromised;
- The Project will not result in adverse river flow conditions;
- The Project will not impact the safety of the railway line Sofia-Varna and Rebarkovo-Eliseina-Svoge-Sofia;
- Construction will not adversely affect the ecology of the region and, in particular, disturb bird life;
- The Project will be constructed in line with the staged approach as described whereby the impacts of the first two dams are considered prior to construction of the latter dams;
- The Company should maintain full documentation in relation to the construction programme;
- Routine monitoring should be conducted of the impact of the dams, with more intensive monitoring during years 1 and 2 and the results used to make design changes (if appropriate);
- The Company should maintain bridges and other communication channels used by the community;
- Regular assessment of impacts to river fauna should be conducted; any deleterious effects to fish life should be examined and appropriate changes to fish ladders or other components of infrastructure made.
- The document also includes a number of specific technical/design requirements which are not reported in this document.

The EIA Decision confirmed that no petitions or objections to the Project had been received by the Ministry. The majority of conditions related to specific technical requirements for the MWPS. A full copy of the EIA Decision is available in the Vez Svoghe office.

3. CURRNET ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1. Environmental Conditions

Climate

Climatic conditions within the Iskar river valley are strongly influenced by the surrounding Balkan Mountains. There are well-defined seasons in the area, with winter temperatures falling to a minimum of -15 to -16^{o}C during January. At an average altitude of 400 – 500 m, rainfall ranges between 650 to 750 mm per month. Maximum rainfall generally occurs in May and June, while winter is the driest season with rainfall of 105 to 130 mm per month.

River Flow

The River Iskar is Bulgaria's longest river flowing from its source in the Rila Mountains, northwards through the centre of the country for 3,639 km, and the river has an overall catchment area of 8,646 km^2. The River Iskar discharges into the Danube on Bulgaria's northern boarder. The average annual volume of water flowing in the river ranges between 716 million m^3 (at Novi Iskar at the top of the Middle Iskar gorge) to 1,325 million m^3 (at the end of the gorge at the village of Rebarkovo).

The Project will not affect the overall volume of water flowing through the Iskar nor have any impact on the flow of the Danube River, to which it is a tributary.

The River Iskar is under the control of the Water Basin Directorate – Danube Region, part of the Bulgarian Ministry of Environment and Water. This Water Basin Directorate has been involved in a detailed, ongoing review of the EIA and has been instrumental in developing the conditions associated with the permit to develop the Project.

Underlying Geology

The underlying solid geology varies from sedimentary rocks such as sandstone and limestone, to igneous rocks such as schists and basalts. Other than the karstified limestone, none of these formations are considered to represent a significant groundwater resource.

River Water Quality

The water quality in the Middle Iskar is impacted by contaminants from a range of sources:

- Treated untreated domestic and industrial wastewater from Sofia. Particularly during times of flood, untreated sewage and wastewater is discharged directly into the river;
- Untreated wastewater from cities adjacent to the Iskar and from rivers that drain into the Iskar;
- Industrial wastewater from the Kremikovsti metallurgical plant on the River Lesnovsk, a tributary of the Iskar which joins upstream of the Iskar Gorge;
- Dumping of waste and litter into the river; and
- Discharges of untreated wastewater from villages along the section of the river.

In summary, the majority of significant contamination entering the Iskar River enters directly or through tributaries in the Sofia basin before the start of the Iskar Gorge and before the Prokopanik MWPS.

Historical studies of the water quality, as well as the baseline surveys undertaken as part of the EIA, indicate that the water quality of the River Iskar is subject to "pulses" of contamination associated with high rainfall events. Overall, however, the water quality in the Iskar River has been steadily improving over the last twenty years, with the installation of new WWTPs in Sofia and other towns. Prior to these improvements the river was significantly impacted with limited fish life.

Sediment Load

There is little data available on the sediment load in the river. A study carried out in 1973, calculated that there was 4,750,400 m^3 of floating sediments and 475,040 m^3 of trailing sediments passing through the cascades per year.

The Project will control the potential accumulation of debris and sediments in the lake behind the weir of the MWPS through the use of gates in the dam wall which will be opened periodically to flush sediments through the MWPS so that natural sediment flows are disrupted as little as possible.

Sediment Quality

Sediments deposited in the Iskar valley have been sampled and analysed for a range of contaminants to assess the level of impact from the industrial and domestic effluent discharges entering the river. The analysis undertaken indicates that the sediments contain elevated concentrations of heavy metals, petroleum products and organic chemicals. The impact of these sediments on water quality will be managed during the MWPS construction programme.

Water Use and Consumption

There is very limited use of river waters in the Middle Iskar. The main source of irrigation (for domestic vegetable gardens) is drinking water. Drinking water is sourced from streams and lakes in the surrounding mountains. No groundwater is reported to be used in the area.

The Middle Iskar is used for some recreational activities including fishing, and water sports (canoeing, kayaking and rafting).

Protected Areas

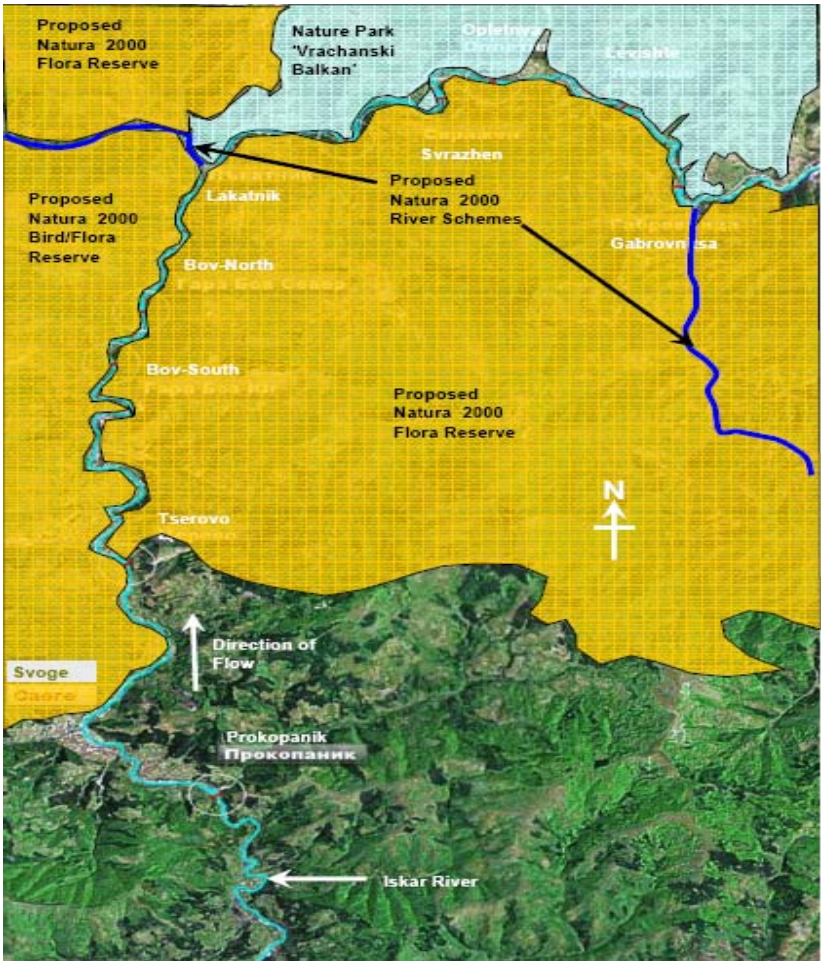
The Vrachanski Balkan Nature Park covers an area of 28,844 hectares (ha), most of which is covered with 1,300 m thick karstified limestone, creating an abundance of caves and chasms in the park. Around 950 species of plants have been recorded in the park of which more than 80 are rare species. The park is home to a diverse fauna range with 214 registered species of vertebrates of which species living in the caves (8 species of bats) and birds of prey are of particular interest. The birds of prey include rare and endangered species such as the Egyptian vulture, peregrine falcon, short-toed eagle and long-legged buzzard. The Middle Iskar forms the southern boundary of the park and the Second Cascade of five MWPS is located along this boundary (see ***Figure 4*** below).

Natura 2000 is a European network of protected sites which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. The term Natura 2000 comes from the 1992 EC Habitats Directive (92/43/EEC); it symbolises the conservation of precious natural resources for the year 2000 and beyond into the 21st century.

The identification of Natura 2000 sites in Bulgaria is still underway, and the areas to be designated have yet to be finalised. To date there have been a number of proposed parks identified in the Balkans which abut with the course of the Iskar. These have been designated based on their flora or bird life (these include the Vrachanski Balkan Nature Park). These parks do not extend to include the Iskar River, largely because the river is significantly degraded and contaminated and/or is not of importance for the protection of the nominated species.

Two tributaries of the Iskar which enter the Iskar in or near the Project area, have been identified as potential Natura sites (See ***Figure 4*** below), and are recognised as havens for rive life, which will enable the re-population of the Iskar River as water quality improves over time.

Figure 4: Location of Vrachanski Balkan Nature Park and Proposed Natura 2000 Sites



3.2. Social Conditions

The Project areas are typically undeveloped natural riverbank areas with a mix of natural and cultivated forests and open meadows. There are few properties in or near the areas which will form part of the infrastructure or associated lake. Properties near the Project areas are largely used as summer houses or hunting lodges. Land ownership is predominantly State-owned forestry or agricultural land, with some privately-owned lands.

Other potentially-affected parties include goat and sheep herders, local water sports users, sports fishers, game hunters and walkers.

4. ENVIRONMENTAL IMPACTS

4.1. Environmental Impact Assessment (EIA) Process

An EIA for the MWPS was submitted to the Bulgarian Ministry of Environment and Water in 2004. The EIA was evaluated in accordance with Bulgarian legislation and a positive EIA Decision was issued on 1 January 2005 enabling the Project to proceed subject to a number of operational conditions. The EIA Decision confirmed that no petitions or objections to the Project had been received by the Ministry.

4.2. Summary of Environmental Impacts

The principal environmental impacts associated with the Project, as identified in the EIA, are as follows:

- Potential impacts to nature protection areas;
- Potential impacts to flora and fauna and, in particular, fish populations;

- Visual impacts;
- Disturbance of river sediments; and
- Potential impacts to cultural (archaeological heritage).

A further discussion of these impacts is provided below.

4.3. Impacts to Nature Protection Areas

Vrachanski Balkan Nature Park

The Project will result in the flooding of thin strips of land, adjacent to the existing course of the Iskar River, along the edge of the Vrachanski Balkan Nature Park. It is anticipated that approximately 11 ha of land will be flooded as a result. The Svrazhen MWPS has the largest impact flooding an area of some 3.48 ha. The affected land falls within a strip 20 -100 m wide which runs between the Sofia-Mezdra road and the Iskar River's left bank. No endemic or threatened species have been identified in this (or any other section affected by the MWPS).

The karst system of underground caves and rivers in the Park drains to the Iskar Gorge and the Svrazhen and Opletnya MWPS have been designed to be below the line of discharge from this karst system, to prevent any impact on the water levels in the karst system. Park Management are satisfied with the development of the Project and consider that the creation of the lakes will increase the biodiversity of the area, with the creation of more permanent marshy areas along the edge of the lakes and a subsequent increase in number of water fowl.

Natura 2000 Sites

No adverse impacts to the proposed Natura 2000 sites are expected as a result of the Project. The two rivers associated with the Natura 2000 sites flow through the sites and then drain into the Iskar, so therefore no effects are expected from the Project itself.

4.4. Impacts to Plants and Wildlife (including Fisheries)

The number and diversity of plant and fish species in the river is reportedly starting to increase. This is due to the gradual improvement in overall ecological conditions resulting from the decreasing pollutant load in the river.

The unpolluted tributaries to the Iskar River in the Iskar Gorge are of great importance for the preservation and repopulation of plant and fish species within the Iskar Gorge. These tributaries represent important havens from which species can recolonise as the river water quality increases. The importance of these tributaries has been recognised in a series of Natura 2000 studies which have identified two tributaries in the gorge as potential Natura 2000 sites (as described above).

The MWPS have been designed with fish ladders which will enable the migration of fish through the cascades; the opening of the gates to remove sediments during periods of high river flow will also provide an opportunity for the mixing of river species. In addition there will be an initiative to restock fish species in the river, where this is considered appropriate. Overall, some positive impacts to fish stocks are expected as water quality improves over time.

No significant fish spawning areas are reported to be present in the Middle Iskar River.

4.5. Visual Landscape and Heritage Impacts

The principal landscape characteristics within the Project area as follows:

- The overall landscape comprises a low mountainous forest landscape with predominantly natural forests and some commercial plantations;
- The immediate hills next to the river range in altitude between 600 and 800m;
- River banks are generally steep and gorge-like with some areas of grazing fields and meadows forming the low-lying areas near the river; and
- Sections of the river, particularly around the second cascade, have distinctive limestone scarps above the valley which are of significant landscape value.

The typical landscapes of the Iskar Gorge are illustrated in ***Figure 5*** and ***Figure 6*** below:

Figure 5: Limestone scarps down-stream of the proposed Svrazhen MWPS

Figure 6: Meadows in the Iskar Gorge up-stream of the proposed Levishte MWPS

The construction of the MWPS will result in the formation of narrow linear 'lakes' within the river valley upstream of the dams and up to the first river terrace. The nine artificial lakes will have a combined length of 17.6 km. The longest lake created will be associated with the Prokopanik MWPS at 2.9 km, and the shortest at Lakatnik MWPS will be 1.2 km. The two cascades will create sequential lakes (i.e. the upper reaches of the lower lake reach the foot of the dam of the upper dam) with overall lengths for the cascades of 3.2 km and 9.1 km.

The development of the dams will result in the flooding of the river banks to a maximum height of up to 11 m at the dam site, decreasing progressively upstream. The visual impact on the landscape is illustrated in ***Figure 7*** below.

Figure 7: Illustration of an MWPS in the Second Cascade

Annex A to the NTS provides a full illustration of the nine dams and their lakes including the original topographic setting and likely appearance after the lakes are full.

4.6. Cultural Heritage

There are 48 listed cultural monuments in the area around the Project area. These range from listed buildings such as churches, residential houses and water mills to archaeological monuments such as fortresses and prehistoric settlements, and a number of commemorative war memorials. These sites of cultural heritage importance are all located in and around the local villages on the sides of the valleys. None fall within the area directly affected by the Project.

4.7. River Sediments and Pollution Impacts

Construction Phase

It is recognised that the construction phase of the Project has the potential for the remobilisation of river sediments and associated contaminants. Management procedures are proposed to manage and minimise the potential impacts that remobilisation could have on the water quality in the River Iskar. For example, construction will be undertaken in the summer months when river flow rates are lower and less powerful. If sediments are remobilised they are likely to be deposited immediately downstream of the construction area, and any impacts are considered likely to be limited in extent and duration.

Operational Phase

The release of sediments from the dams is recognised as important both to prevent the dams silting up and to maintain the natural sediment load in the area downstream of the dams.

A monitoring regime will be implemented during both the construction and operational phases to assess the issues related to sediments and the release of pollutants from sediments. In overall terms, it is considered that the control of sediments by holding them back in the lakes during lower river flows, will lead to an improvement in the biological diversity in the river, with the removal of mud and silt from the rocky sections of the river creating a better environment for plants and wildlife within the river system.

5. SOCIO-ECONOMIC IMPACTS

5.1. Summary of Socio-Economic Impacts

The principal socio-economic impacts associated with the Project are as follows:

- Land acquisition for the construction of the dams and lakes; and
- Socio-economic impacts:
  - Provision of direct and indirect employment; and
  - Leisure and amenity creation.

A further discussion of these impacts is provided below.

5.2. Land Acquisition

The current land use in the area of the proposed 9 MWPS typically comprises forestry with some agricultural grazing land. The total area of land impacted during the construction phase will be **13.17 hectares (ha).** Once constructed, the MWPS infrastructure and associated flooding of the river bed and banks will cover a total area of **134.53 ha**. This is divided amongst the 9 MWPS as follows:

Table 1: Land Requirements Summary

Number	MWPS	Area of Dry Land (Ha)	Area of River Bed (Ha)	Total Area (Ha)
No. 1	Prokopanik	23.72	8.82	32.54
No. 2	Tserovo	18.29	6.60	24.89
No. 3	Bov-South	11.25	6.11	17.36
No. 4	Bov-North	12.68	6.14	18.82
No. 5	Lakatnik	7.35	3.75	11.10
No. 6	Svrazhen	15.12	7.45	22.57
No. 7	Opletnya	15.57	4.73	20.30
No. 8	Levishte	14.86	6.05	20.91
No. 9	Gabrovnitsa	15.68	6.05	21.73
Totals		**78.88**	**55.65**	**134.53**

The type of land affected is as follows:

- Forestry Fund Land 41.34 Ha (25.4 Ha of which are forested)
- Natural Park 'Vrachanski Balkan' 11.09 Ha
- Private Forests 0.55 Ha
- Forestry Fund Agricultural Land 37.54 Ha

The Project has not required involuntary resettlement of any local residents, and all land required for the Project has been acquired on a voluntary basis. Only one residential property (used as a summer house) has had to be purchased as a direct result of the Project.

The land required by the project is illustrated *Annex A*, which shows the current land holdings and the proposed lake levels for the MWPS.

5.3. Socio-Economic Impacts

The development and construction of the MWPS will result in the creation of **60 direct jobs for each MWPS** site comprising a mixture of skilled and unskilled positions. Once completed, up to 5 qualified specialists will be employed at each MWPS; the final number will be dependant on the degree of automation and security requirements. Further indirect employment will also arise through the provision of goods and services to the Project.

The electricity produced will contribute to the Bulgarian electrical network thereby reducing the reliance on fossil fuels.

Annual payments to the municipalities during the operation of the MWPS will also contribute to the local economy.

As well as the new water sports centre, recreational areas will be created adjacent to some of the lakes, which will benefit the local communities and potentially increase the tourist numbers to the area, thus contributing to the local economy.

Vez Svoghe have an active investment programme in the community and have leant support to schools, infrastructure projects, education and medical support as determined through the consultation process. Examples include the following:

- Construction of new access roads, bridges and water pipe infrastructure (which are not directly related to construction of the MWPS);
- Provision of financial support to the Svoghe Sports Club (which is 100% owned by the municipality); Vez Svoghe have entered a long-term agreement to support this Club with a regular financial provision; the amount is reported to be Euro 2,500 monthly; and
- Provision of support to students in the fields of ecology (water management and quality), energy production, research into renewable resources etc. This support will be provided through a scholarship system with details on the application process advertised in appropriate locations. The aim is to involve a number of academic institutions and interested parties in the decision-making process. These institutions include the Basin Directorate for whom this work would be directly relevant; the amount is reported to be Euro 5,000 divided between 2-3 students.

6. CUMULATIVE IMPACTS

The nine MWPS to be constructed by this Project form part of a series of MWPS and other water management structures installed along the River Iskar. There are currently three MWPS operating in the Middle Iskar with a combined electricity generation capacity of 2.17 MWe. They are located downstream of the planned project and are understood to have been operating for up to 30 years. A further MWPS (Roman) with a capacity of 1.5 MWe is currently planned downstream of the Project area.

No significant cumulative impacts as a result of these additional MWPS are anticipated.

7. MITIGATION PLAN

The Project has developed a range of management plans and procedures to manage and minimise the environmental and social impacts of the Project. The following table summarises the proposed mitigation measures for environmental and social impacts.

Table 2: Mitigation and Management Plans

Issue	Summary of Impacts (Environmental and Social)	Scale	Proposed Mitigation Measures/Action Plan
Climate	No direct impacts of the Project on climate expected. Potential impacts on the Project from more intense rainfall events including need for higher protection from water erosion on roads, cleared areas and drainage structures during the construction. Alteration of the river profile and creation of lakes affecting passage of flood waters through the valley.	Local	▪ Develop contingency plans for flood events and conduct Flood Risk Assessment
Air Quality	Impacts are considered to be short-term, on a local scale, and related to the construction phase of the project only. There are few sources of industrial emissions in the Project area, hence air quality is considered to be good. Negligible impacts will arise from vehicle emissions and localised dust generated from construction activities and minor unsealed roads.	Local	Implement best practice during the construction phase including: ▪ All heavy vehicles transferring raw materials across the construction sites will be fitted with appropriate sheeting and covers for dust control; ▪ Waste containers for materials will be located in areas sheltered from the wind or, preferably, covered; ▪ Control of vehicle speed limits; ▪ Regular inspection of vehicles, including

			emissions testing to comply with Bulgarian law; and ▪ Adherence to designated routes.
Waste Management	Potential for nuisance, visual impact and disturbance to wildlife and flora during the construction phase. Litter.	Local	Implement best practice for waste management including: ▪ Careful disposal of all litter; ▪ Prohibition of waste dumping and burning at all times; ▪ Segregation of wastes and establishment of temporary waste storage areas; ▪ Careful storage of construction spoil.
Noise and Vibration	Increased noise levels associated with: ▪ construction traffic; ▪ drilling and blasting activities for rock and ore excavation from open pits; ▪ use of excavators and dozers; ▪ haul trucks removing or importing materials; ▪ operation of the MWPS etc. These impacts are regarded as localised by nature, short-term and with negligible to minor significance impacts.	Local	Implement best practice measures for noise and vibration control including: ▪ Control of vehicle speed limits; ▪ Regular inspection of vehicles; ▪ Adherence to designated routes; ▪ Avoidance of night-time operations; ▪ Use of screening for noisy operations; ▪ Use of natural screening/bunding; ▪ Blasting during the daytime only; ▪ All closest settlements will be informed and warned prior to blasting; ▪ Modern blasting techniques will be utilised; ▪ A blasting plan will be produced; ▪ Blasting will be monitored; ▪ Design and practice of blasting will be improved in light of monitoring results.
Geology and Topography	Excavations around the dams and associated infrastructure will have limited, though permanent changes to the landscape/topography.	Local	Grading of slopes around the dam and use of vegetation screening, to screen operations. Restoration of slopes to be sympathetic with surrounding landscape.
Surface Water	The Project will result in the permanent alteration of the water course in the areas of the lakes and creation of new hydraulic conditions around the dam. Operations of the MWPS will enable some mitigation of the effect of floods in the valley. Creation of lakes will lead to areas of slower moving water and sediment capture which should improve water quality down stream of the dams.	Local/ District	Management of surface water in the Project area will focus on maintaining the flow of water through the valley, ensuring the quality of the water is not impacted and managing storm water events. Further monitoring is required, particularly during the set up of the first MWPS to establish changes to water quality (positive and negative) and to ascertain compliance with Bulgarian and EU norms. Monitoring will expect to see some peaks during construction and heavy rainfall events. A monitoring programme is needed to establish the parameters, location and frequency of monitoring.
Groundwater	The project has been designed to have negligible impacts on groundwater.	Watershed	Mitigation measures are incorporated in the design of the dams (e.g. designing lake levels to be below the discharge level of the karst system).
Ecosystems and Habitats	Potential sources of impact include the following: ▪ Localised habitat clearance for the construction of dam and infrastructure and access roads; ▪ Limited noise disturbance to wildlife; ▪ Flooding of lower valleys sides leading	Local	Undertake landscaping and restoration work around the dams and infrastructure. Conduct focused planting of trees and aquatic flora to promote biodiversity. Use of green landscaping to create wildlife refugia and to screen the sites. Design of fish ladders in the dams to allow some species of fish to bypass the dams. Regular opening of the dams during periods of

	to loss of habitats at a very local level; ▪ Creation of new habitats, including wetland areas, reed beds and marsh around the margins of the permanent lakes with a positive impact to biodiversity; ▪ Creation of physical barriers to aquatic life through the installation of the dams; ▪ Management of sediment load (and associated contamination) likely to lead to improved water and riverbed quality.		sediment flushing will also create opportunities for the movement of aquatic species between the dams and lakes. Implementation of a monitoring and management plan for the river to ensure that the water quality is not detrimentally impacted by the project (see above).
Archaeological And Cultural Heritage	No resources within or close to the project. No direct impacts to archaeological resources or heritage sites. No significant impacts identified.	Local/ District	Maintain a Watching Brief during construction to allow for any chance finds not identified during the archaeological survey. Adhere to procedures for 'chance finds'
Visual Impacts	Installation of dams and creation of lakes will have a permanent visual impact on segments of the valley. With the exception of the dams and associated infrastructure, which will be landscaped, the impacts will comprise a change of the natural environment from river bed and meadows/forest to narrow open water.	Local/ District	For the dams and infrastructure, the following mitigation measures will be implemented: ▪ Landscaping around dams and infrastructure; ▪ Sensitive choice of colours of structures; ▪ Integration of amenity with new lake areas (fishing, walking, picnic and viewing spots) to be agreed with the local community; ▪ Enhancement of green landscaping wherever possible.
Involuntary Resettlement	The Project will not result in either the voluntary or involuntary resettlement of any communities. The project has required the purchase of some temporary residences (a summer house and a hunting lodge) within the proposed lake inundation areas.	Local	No mitigation required, owners of temporary residences have been compensated for the loss of the amenity. Compensation (financial and assets) has been agree taking into account legal requirements, the market rate and community needs.
Socio-Economic	The Project will create around 60 direct jobs during the construction phase and 5 direct jobs for each of the MWPS during operations.	Regional	Vez Svoghe will need to ensure that recruitment procedures are transparent and follow local and national labour law requirements. All employees will require training in environment and health & safety management.
Indigenous Groups	The Project is not reported to impact any indigenous groups.	None	None required

8. ENVIRONMENTAL MONITORING PROGRAMME

The environmental monitoring programme for the Project will be designed to address the conditions set out in the Bulgarian Ministry of Environment and Water, Environmental Impact Decision № 1 - 1/2005.

Monitoring will be focused on three locations along the Iskar Gorge:

- The Iskar River at Prokopanik and Gabrovnitsa; and
- The Iskretska River near Svoghe.

The data will be collected quarterly throughout the development of the Project, and will focus on water and sediment quality as well as recording data on fish life and groundwater. This monitoring will be used to assess the impacts on the river, both from the surrounding communities and from the development of the project. The results of the monitoring programme will be used to effect continuous improvement as the MPWS scheme is implemented.