

1. "Improvement of reactive power compensation in power system of Public Utility "Elektroprivreda Srbije" by increasing use of existing capacitors (Phase V – area of Public Utility "Elektrovojvodina", except Public Utility "Novi Sad")"

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade

Project Manager: Miloje Kostić, PhD.

Associates: Petar Kovačević, MSc.

Development and implementation of this project is based on improvement of regulated capacitors operation in network with industrial consumers, new technical solution and patent (which belongs to project manager) and increasing of power factor reference value on capacitor regulators in order to increase the use of capacitors that comprise selected battery. Report of project realization in 33 company in the area of Public Utility "Elektrovojvodina" contains data about achieved effects of reactive power compensation improvement without investments, which illustrates implementation of new technical solution.

Size of Project: 76 pages

Finished in: 2011.

2. "Defining the best values of parameters and characteristics of revitalized units in HPP "Zvornik" connected to the 110 kV transmission network considering Serbian transmission network requirements"

Ordered by: Public Utility "Drinsko-limske hidroelektrane", HPP "Zvornik"

Project Manager: Prof. Dragan Popović, PhD.

Associates: Mr Milan Ivanović, MSc.

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Optimal generation operation can be achieved by good selection of relevant parameters range and characteristics of new and revitalized generation units and corresponding block-transformers, adapted to transmission network requirements. In order to define these parameters, it is necessary to achieve a reasonable compromise between construction price, operation costs and the quality of generated energy in power system. The subject of this study is to determine the most appropriate range of relevant electro-mechanical parameters for revitalized units in HPP, which will meet the requirements of transmission network, based on the steady-state and transient analyses. The results of the analyses are the basis for the development of technical specifications in the tender documents for the revitalized power units.

Size of Project: 80 pages

Finished in: 2011.

3. "Analysis of possibility of wind farm "Ram" grid integration"

Ordered by: MK-Fintel Wind, Belgrade

Project Manager: Saša Minić, MSc.

Associates: Maja Marković, MSc.

The subject of this report is to analyze the possibilities of wind-park "Ram" grid integration considering short-circuit power at the connection point as a parameter which dictates the range of voltage change at the connection point in the transient period during generator starting and stopping. The connection possibility is analyzed considering steady-state wind-park operation. The analysis is based on preliminary test results (the estimated values of electrical characteristics and performances) of wind turbines type Vestas V112-3.0MW, whose installation is planned to wind-park. Analysis of possible wind-park "Ram" grid integration, with three turbines Vestas V112-3.0 MW, is performed for several proposed locations.

Size of Project: 80 pages

Finished in: 2011.

4. "Analysis of protection system of objects TPP "Nikola Tesla", "Kostolac" and HPP "Đerdap" and guidelines for reconstruction - Phase I "

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade

Coordinator: Danilo Buha, MSc.

Project Manager: Dragan Dabić, MSc.

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Marko Gostović, MSc.

The subject of this study is protection system operation analysis at all voltage levels that exists within TPP "Kostolac A" and "Kostolac B" and HPP "Đerdap 1" and "Đerdap 2". Systematization and analysis of existing protection systems at 0.4 - 400 kV voltage were performed for listed plants. Based on the established models, selectivity analysis of protection systems was performed for defined critical topology states in plants and relevant part of transmission system. The proposal to change the parameters and protection settings is given for identified locations in protection system. Finally, suggestion of the method and the possible need for future reconstruction of the protection system was given based of insight in role of protection at some locations within plant, knowledge about the state of protection devices and their reliability, and their capabilities in terms of additional security features.

Size of Project: 956 pages

Finished in: 2011.

5. "Possibility of connection of HPP Novakovići and HPP Zapeće to distribution network"

Ordered by: Interenergo d.o.o., Belgrade

Project Manager: Saša Minić, MSc.

Associates: Maja Marković, MSc.

The subject of this report is to analyze the possibilities of grid integration of HPP "Novakovići" and HPP "Zapeće" on Ugar river, into distribution network of "Elektro-Krajina", Banja Luka. Analysis of technical options of grid integration for different ways of connecting these HPPs was performed from the viewpoint of the required investments in distribution network. The effect of HPPs connection to distribution network was determined in terms of losses and voltage in states with maximum and minimum load. For analyzed solutions of connecting, investments to the medium voltage distribution network elements required to realize the proposed solution were estimated. To assess the impact of losses a new algorithm for energy loss calculation is developed. It takes into account forecasted monthly energy production from plant, its forecasted minimal and maximal engagement and two expected network load states.

Size of Project: 22 pages

Finished in: 2011.

6. "Analysis of voltage and current harmonics for wind turbine Enercon E-40"

Ordered by: Hidrowind d.o.o., Belgrade

Project Manager: Saša Minić, MSc.

Associates: Branka Kostić, MSc.

The subject of this report is to analyze harmonics injection to distribution network from wind-generator placed close to village Leskova around Tutin. The results of measurements of injected harmonic voltage and current of  $v = 2\text{nd}, 3\text{rd}, 4\text{th}, 5\text{th}, \dots, 49\text{th}$  order, at three different time intervals, were used in analysis.

Size of Project: 7 pages

Finished in: 2011.

7. "Possibility of connection of HPP Medna to distribution network"

Ordered by: Interenergo d.o.o., Belgrade

Project Manager: Saša Minić, MSc.

Associates: Maja Marković, MSc.

The subject of this report is to analyze the possibilities of grid integration HPP "Medna" on Sana river, into distribution network of "Elektro-Krajina", Banja Luka. Report contains analysis of technical and economical aspects of HPP "Medna" grid integration. From the viewpoint of the required investments in distribution network, different ways of connecting HPP "Medna" were performed. The effects of HPP operation on

distribution network were determined in terms of losses and voltage in states with maximum and minimum load. For analyzed solutions of connecting, investments to medium voltage distribution network elements, required to realize the proposed solution, were estimated. To assess the impact of losses previously developed algorithm for energy loss calculation is applied. It takes into account forecasted monthly energy production from plant, its forecasted minimal and maximal engagement and two expected network load states. Based on that modeling annual impact of energy losses were calculated for different ways of HPP connecting.

Size of Project: 21 pages

Finished in: 2011.

8. "Defining the best values of parameters and characteristics of block-transformers in HPP "Đerdap 2""

Ordered by: Hydro PowerPlants "Đerdap 2", Kladovo

Project Manager: Mr. Milan Ivanović, MSc.

Associates: Dragan Popović, PhD.

Branka Kostić, MSc.

Dragan Dabić, MSc.

Optimal generation operation can be achieved by good selection of relevant parameters range and characteristics of new and revitalized generation units and corresponding block-transformers, adapted to transmission network requirements. In order to define these parameters, it is necessary to achieve a reasonable compromise between construction price, operation costs and the quality of generated energy in power system. The subject of this study is to determine the most appropriate parameter values and characteristics of new block-transformers in revitalized HPP "Đerdap 2", which will meet the requirements of transmission network, based on the steady-state analyses. In order to define these parameters and characteristics, it was necessary to analyze and determine their effects on the parameters of the short circuit currents and operation of existing protection devices.

Size of Project: 108 pages

Finished in: 2011.

9. "Analysis of possibility SPP "Merdare" grid integration into distribution network of Prokuplje branch"

Ordered by: Public Utility "Jugoistok", Niš

Project Manager: Saša Minić, MSc.

Associates: Igor Belić, MSc.

Nikola Šušnica, MSc.

The subject of this report is analysis of the possibilities of solar power plant "Merdare" connection to distribution network considering voltage change in the transient and steady-states which the connection of this power plant causes. The analysis is based on limited information relating only to nominal power generation (2 MW) and location of SPP "Merdare". Optimal connection solution, considering network investment costs and technical requirements, is proposed in report.

Size of Project: 11 pages

Finished in: 2011.