

1. "Revision of long-term distribution network development plan up to 2025 in the wider urban area of Public Utility "Elektrodistribucija Beograd""

Ordered by: Public Utility "Elektrodistribucija Beograd", Belgrade
Project Manager: Saša Minić, MSc.
Associates: Ana Šaranović, MSc.
Igor Belić, MSc.
Dragan Dabić, MSc.
Gordana Radović, MSc.

The objective of this study is revision of the study made by Electrical Institute Nikola Tesla in 2007 which considers development of prospective 110 kV and 35 kV networks in the wider urban area of "Elektrodistribucija Beograd", south from river Danube and East from river Sava for the period 2010 to 2025. This area has population ~1 million (~450000 electrical energy consumers with 3.8 billions kWh annual consumption and ~1000 MW annual active power peak). New criteria and technical constraints considering existing 35 kV network topology and transformers with tertiary coil used for supply prohibition are established.

Based on network present condition analyses, and results of load forecasting from original study, techno-economical analyses and comparison of possible development variants were performed, and the most prosperous solution of distributive network further development in the considered area for the period up to the year of 2025 has been suggested.

Size of Project: 187 pages
Finished in: 2009.

2. "Load and higher harmonic analysis and solution for reactive power compensation for Ski Center Zlatibor", and "Analysis of measurement results and compensation effects to reactive power and higher harmonics reduction for Ski Center Zlatibor"

Ordered by: Public Utility "Skijališta Srbije", Belgrade
Project Manager: Miloje Kostić, PhD.
Associate: Branka Kostić, MSc.

The objective of the first study is making the solution for reactive power compensation for 730 kW DC motor, that supplies cableway in Ski Center Zlatibor, with reactive load (250 kvar - 550 kvar) close to active (300 - 500 kW), and big total harmonic distortion of current (THDI = 30 - 60%), and of voltage (THDU = 8 - 14%). Based on active and reactive load and higher harmonic currents measurements, original and very economical reactive power compensation solution was presented. Multiple capacitor sections, that switch on sequentially, enable reactive power compensation and THDU reduction by 2 to allowable limits. Proposed solution was realized under surveillance of project manager, and new active and reactive loads and higher harmonic currents were measured after realization. All project goals were achieved:

- reduced reactive energy costs with annual profit rate 30%,
- THDU reduction from 14% to allowable 6.5%.

Size of Project: 39 + 18 pages
Finished in: 2009.

3. "Study of long-term prospective 10 kV network development for Pirot branch"

Ordered by: Public Utility Jugoistok Niš
Project Manager: Milan Ivanović, MSc.
Associates: Nikola Šušnica, MSc.
Ana Šaranović, MSc.
Miroslav Stanković, MSc.
Saša Minić, MSc.

The objective of this study is development of prospective 110 kV, 35 kV and 10 kV networks in Pirot branch of Public Utility "Jugoistok", Niš for the period 2008 to 2030. The population of analyzed area near border with Bulgaria is ~105000 and its size is 2760 km² (~60 MW annual active power peak, ~295 GWh consumption). Utility provides electrical energy for ~50500 consumers. As preparation for study, all relevant points in 10-110 kV network are tracked using GPS devices and transferred to GIS environment, based on previously digitalized geo-referenced maps. Geographical data were also transferred for ~20000 consumers (their location and connection to supplying MV/LV substation). The study includes analyses of energy consumption development for the period up to the year of 2008 as well as load and energy consumption forecast until the year of 2030. Detailed analyses of 110 kV, 35 kV and 10 kV networks

present condition (including physical state of networks, load of elements, voltage conditions and losses) have been accomplished.

Based on those analyses, results of load forecasting, techno-economical analyses and comparison of possible development variants, the most prosperous solution of distributive network further development in the considered area for the period up to the year of 2030 has been suggested. Initial network size: ~620 MV/LV substations.

Size of Project: 564 pages

Finished in: 2009.

4. "Rationalization of electrical energy consumption and reactive power compensation in 6 kV network of "Drmno" mine"

Ordered by: Public Utility "Thermal Power Plants and Mines Kostolac", Kostolac

Project Manager: Miloje Kostić, PhD.

Associates: Branka Kostić, MSc.

Milan Ivanović, MSc.

"Drmno" mine is supplied from two 110/6 kV substations (Rudnik 1 with 2x16 MVA and Rudnik 2 with 1x16 MVA installed capacity), with ≈102 GWh active energy and ≈135 Gvarh reactive energy consumption.

The first phase of project contains analyses and general project for reactive power compensation, including:

1. Higher harmonic currents and voltages calculations and analyses in order to avoid 5th and 7th harmonics resonance, and to avoid 11th and 13th harmonics resonance in networks with 12pulse rectifiers;
2. Percussive currents calculation for every single capacitor and percussive coils dimensioning;

Compensation was considered as individual and as mutual (individual and group compensation) and these two solutions were analyzed technically and economically. Mutual compensation is proposed as solution with 20000 kvar of capacitor installed capacity proposed at two voltage levels: 6 and 0.4 kV.

The savings attained by rationalization of plant's own consumption have been estimated to about 4 GWh and about 100 Gvarh per year, with 500 000 € annual savings.

The final phase of project included detailed schedule of compensation realization starting with central compensation at 6 kV of 110/6 kV transformers, continuing with compensation at 0.4 kV side of 6/0.4 kV transformers, finishing with compensation at 6 kV motors.

Size of Project: 139 pages

Finished in: 2009.

5. "Study of long-term prospective distribution network development for Budva community"

Ordered by: Budva community, Montenegro

Project Manager: Ivan Stanisavljević, MSc.

Associates: Miloš Stojković, MSc.

Saša Minić, MSc.

The objective of this study is development of prospective 110 kV, 35 kV and 10 kV networks in the area of Public Utility Budva for the period 2009 to 2030. Specific of this area is its rapid development as vacation area. The population of analyzed area near Adriatic sea is ~18000 (~57 MVA annual active power peak). Utility provides electrical energy for ~23000 consumers. The study includes analyses of energy consumption development for the period up to the year of 2008 as well as load and energy consumption forecast until the year of 2030. Detailed analyses of 110 kV, 35 kV and 10 kV networks present condition (including physical state of networks, load of elements, voltage conditions and losses) have been accomplished.

Based on those analyses, results of load forecasting, techno-economical analyses and comparison of possible development variants, the most prosperous solution of distributive network further development in the considered area for the period up to the year of 2030 has been suggested. Initial network size: ~180 MV/LV substations.

Size of Project: 241 pages

Finished in: 2009.

6. "General project with pre-feasibility study for supplying electrical network in Park of nature Golija"

Ordered by: Public Utility "Direkcija za puteve, građevinsko zemljište i izgradnju" Ivanjica

Project Manager: Ana Šaranović, MSc.

Associates: Saša Minić, MSc.

Nikola Šušnica, MSc.

Igor Belić, MSc.

Dragan Dabić, MSc.

Ivan Stanisavljević, MSc.

Main task of this project was to form long term network solutions (up to 2025) to satisfy electrical energy and power demand in Park of nature "Golija". Large tourist resort is predicted for building in the area of mountain Golija, which is promoted to protected area - Park of nature. This task is realized through several phases of project.

Four significant tourist zones should be built up to 2025 in this area, and optimal solutions of supplying electrical 10-110 kV network are presented in this project. Future network for supplying existing settlements is also based on predicted load.

Special attention was paid to phase network development based on phase building process.

For network analyses geo-referenced network and consumption data were used.

Size of Project: 142 pages

Finished in: 2009.