

1. "Selection of the way to reduce distribution network reactive load for 200 Mvar",

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade

Project Manager: Saša Minić, MSc.

Associates: Miloje Kostić, PhD.  
Dragan Popović, PhD.  
Srđo Mrđa, MSc.  
Tijana Janjić, MSc.  
Milan Ivanović, MSc.

The main purpose of this Project was to make a proposition how to reduce reactive power in transmission network in Serbia through low voltage reactive power compensation. Detailed analysis of relevant technical and economical effects of proposed reactive load reduction was performed. Performed analyses showed that: 1) there are several parts of transmission network with bad voltage conditions and big losses; 2) some of problems will be solved with new network elements, but investment process is slow; 3) Effects of reactive load reduction established in this project are considerable - transmission network maximum losses reduction of 8.6 MW is expected and invested money is paid back within two years; 4) Reactive load reduction does not jeopardize normal functioning of transmission network in minimal regime. List of substations 110/X kV to reduce reactive load and amount of reduction is presented. Performed analyses showed that reactive load reduction should continue.

Size of Project: 129 pages

Finished in: 2005.

2. "Study of long-term prospective 110 kV, 35 kV and (partially) 10 kV networks development for the area of "Elektrodistribucija" Užice",

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade

Project Manager: Srđo Mrđa, MSc.

Associates: Ivan Stanisavljević, MSc.  
Tanja Đokić, MSc.  
Milan Ivanović, MSc.

The objective of this study is development of prospective 110 kV and 35 kV networks, and also for rural 10 kV network in the area of "Elektrodistribucija" Užice for the period 2002 to 2020. This area comprises 10 communities in southwest Serbia with population ~320000 (~137000 electrical energy consumers with 886460 MWh annual consumption and ~200 MW annual active power peak). The study includes analyses of energy consumption development for the period up to the year of 2002 as well as load and energy consumption forecast until the year of 2020. 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 2020 has been suggested. Initial network size: ~2100 MV/LV substations.

Size of Project: 876 pages

Finished in: 2005.

3. "Upgrading of reactive power compensation in EES EPS using existing capacitor batteries - the 3rd phase for the area of Public Utility "Elektrošumadija" Kragujevac, "Elektromorava" Požarevac, "Elektrodistribucija" Užice, "Elektrotimok" Zaječar",

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade

Project Manager: Miloje Kostić, PhD.

Associate: Ivan Stanisavljević, BSc

Upgrading of reactive power compensation has been realized by using procedures for increasing usage of capacitor batteries in networks of small and medium consumers. Complete realization of the Program included study phase, project phase and also the proposed solution realization phase (without investment and also in short term: endmost in 1 - 2 months at the concrete consumer). Beside energetic analysis, needed analysis of the higher harmonic regimes have also been performed, both for consumers' network and for supplying distribution network. Project has been realized for 30 consumers. As a result of the project realization, capacitor batteries, whose overall power is about 22,000 kVar, are working in a permanent regime now. Amount of produced reactive (capacitive) energy increased about 190,000,000 kVarh/year in regard to previous case, where capacitor batteries were with automatic regulation.

Size of Project: 50 pages  
Finished in: 2005.

4. "Rationalization of the own electrical energy consumption in Thermal Power Plant "Nikola Tesla B" Obrenovac",

Ordered by: Public Utility "Thermal Power Plant Nikola Tesla", Obrenovac  
Project Manager: Miloje Kostić, PhD.  
Associates: Ivan Stanisavljević, MSc.

Thermal Power Plant "Nikola Tesla B" has two aggregates whose total power is 1200 MW:

Its own consumption is about 6% of the plant's power (about 70 MW) as well as about 6% of total produced electrical energy. 6 kV asynchronous motors participate over 90% and 0.4 kV asynchronous motors participate with about 5% in the thermal plant's own consumption. Within this study in the first phase the study "Energy analysis of own consumption and selection of proceedings for the rationalization" was made.

It contains 3 chapters:

1. Energy analysis of own consumption and loads, based on estimations and/or calculations of total losses in 6 kV and 0.4 kV asynchronous motors, and the structure of losses.
2. Selection of measures for the rationalization according to the analysis specified in previous thesis. For the rationalization of plant's own consumption (that is, of the electromotive drive), following measures have been chosen:
  - Identification of the optimal voltage values within  $U_n \pm 5\%$ , for the 6 kV network;
  - Selection of the consumers with economically justified reactive power compensation;
  - Application of asynchronous drives with the speed regulation for chosen drives and,
  - Individual energy rationalizations for 6 kV network, 6/0.4 kV transformers and motors.
3. The savings attained by rationalization of plant's own consumption have been estimated to about 0.3% (1800000 kWh per year).

The second phase included:

- Projects of concrete measures for reducing own electrical energy consumption;
- Realization of projected measures for reducing own electrical energy consumption;

Size of Project: 74 pages  
Finished in: 2005.

5. "Study of long-term prospective 110 kV, 35 kV and 10 kV networks development for the area of "Elektrošumadija" Kragujevac",

Ordered by: Public Utility "Elektroprivreda Srbije", Belgrade, Public Utility "Elektrošumadija", Kragujevac  
Project Managers: Saša Minić, MSc, Ana Šaranović, MSc.  
Associates: Tijana Janjić, MSc.  
Danka Kecman, MSc.  
Andreja Rašić, MSc.  
Gordana Radović, MSc.  
Nada Obradović, MSc.  
Branislav Čupić, MSc.

The objective of this study is development of prospective 110 kV, 35 kV and 10 kV networks in the area of "Elektrošumadija" Kragujevac for the period 2005 to 2025. This area comprises 5 communities in central Serbia with population ~250000 (~100000 electrical energy consumers with 660000 MWh annual consumption and ~160 MW annual active power peak). The study includes analyses of energy consumption development for the period up to the year of 2004 as well as load and energy consumption forecast until the year of 2025. 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 2025 has been suggested. Initial network size: ~850 MV/LV substations.

Size of Project: 436 pages  
Finished in: 2005.