THE MODELLING OF ROSIORI POWER STATION 400/220/20 kV RETECHNOLOGIZED OF TRANSELECTRICA COMPANY. THE SIMULATION OF THE PERMANENT REGIME WITH EDSA PROGRAMME

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Abstract. **This paper wishes to illustrate the functioning of Rosiori power station 400/220/20 kV retehnologization, during the permanent regime and the behaviour of the electric equipment of the power station regarding this phenomenon. According to the obtained results, we suggest that the power station functioning of quality parameters, according to the new requirements of UCTE - The Union for the Coordination of Transmission of Energy and the European Union.**

Keywords: *electrical station, permanent regime, EDSA programme*

1. INTRODUCTION

Rosiori power station 400/220 kV is in Rosiori village, Valea Vinului commune, Satu Mare county, belonging to the Center of Running the Networks of Electricity Transmission from Baia Mare, CLUJ branch of Transmission of Energy.
The power station is situated in the northen part of Romania and represents an important connection for the National Power System, since it is a station of international interconnection linked to the National Power System of Ucraine through Mukacevo station 400/220/110/35 kV. Rosiori station 400/220/20 kV, through Mukacevo station 400/220/110/35 kV, connects our country with the National Power system of the European Union.

2. PRESENTATION OF ROSIORI POWER STATION 400/220/20 kV

2.1 Presentation of the 400 kV power station

a) *OHL 400 kV Gadalin*:
- 119 km. OHL (OL-AL);
- s = 2 x 450 mm^2 / phase (fascicular conductors)

b) OHL 400 kV Mucacevo (Ucraina):
- 153 km.OHL (OL-AL) -39 km.on Romanian territory;
- s = 2 x 450 mm^2 / phase (fascicular conductors)

c) OHL 400 kV Oradea
- 133 km. OHL (OL-AL);
- s = 2 x 450 mm^2 / phase (fascicular conductors)

d) Autotransformer 400/220/20 kV
- S = 400 MVA.

e) Reactance coil 400 kV
- *Q = 100 MVAr.*

2.2. Presentation of 220 kV station

a) OHL 220 kV Vetis:
- 35 km. OHL (OL-AL);
- s = 450 mm^2 / phase.

b) OHL 220 kV Baia Mare-double circuit
- 33 km. OHL (OL-AL);
- s= 450 mm^2 / phase.

3. PRESENTATION OF THE EDSA PROGRAMME

EDSA – Energy Distribution System Analysis is one of the most performant programs for designing, analysing and running of the electricity networks and systems, using personal computers (PCs). The integrated system of programs EDSA represents a group of powerful calculation and modelling instruments that allow the solving of the electricity problems from the designing phase up to the running and maintaining phase of the systems of networks of electricity. EDSA T2K is the design, analysis and modelling instruments necessary in the engineering and management of the transport and distribution of electricity. EDSA lowers the time due to designing, increases the quality of the projects and makes possible an operation of the electric system to optimum performances. The EDSA model represents a complete and spatial information of the system of transport and distribution : unlimited number of simulated connections (50000+) ; triphasic/monophasic designing ; triphasic designing ; monophasic designing ; unbalances triphasic systems ; triphasic/ continuous current designing ; designing in continuous current ; 100% compatible AutoCAD ; 100% compatible Microstation, ActiveShapes registered technology ; Plugs&Sockets registered technology ; import/export DWG, DXF, WMF ; the data base is ODBC compatible ; control of the revision ; built in Visual Basic for applications ; possibility of internet connecting ; incorporation of the important documents of the projects.

3.1. Presentation of the EDSA subprogramme

- The calculation of the permanent regime Advanced Power Flow with Voltage Controls
- The calculation of the power break down currents – AC Short Circuit
- The choice and the coordination of the protection devices by relays - Protective Device Coordination Verification & Validation
- The simulation of the transitory regimes - Advanced Transient Stability
- The projection of the grounding devices - 3-D Substation Ground Grid
- Teh automatic dimensioning of the generators - Generator Set Sizing
- The economic repartition of the active powers in the system - Active Optimal Power Flow
- The economic repartition of the active powers in the system - Rective Optimal Power Flow
- The analysis of the transitory stability - Advanced Transient Stability
- The dimensioning of the cables out of cable beds - Wire Size NEC
- The mechanical calculation of L.E.A. - Cable Pulling Tensions
- The analysis of the starting regime of the electric motors - Motor Start Verification
- The dimensioning of the electric wires - Wire Size NEC
- The dimensioning of the bar systems - Bare Wire Sizing
- Determining the power load of the wires and their local regime - Load Forecasting
- The automatic dimensioning of the power transformers
- The harmonics analysis and the automatic choice of the compensation filters - Harmonics Analysis
- The calculation fo the electro magnetic transitory regimes EMTAP – Electromagnetic Transient Analysis
- The dimensioning of the batteries from stations and/or transforming posts - Battery Sizing
- The compensation of the power factor - Capacitor Size and Location
- Standard CAD interferences – The calculation of the electromagnetic.electromagnetic compatibility - Magnetic Field – Cable EMI
- The analysis of the power stations' connections diagrams realiability – Advanced Substation Grounding Grid Design
- The analysis of the reliability of the distribution systems - Reliability Worth Assessment of Distribution Systems
- The estimation of the electric load – Induction Motor Parameter Estimation
- The calculation of the constants of short power lines – Short Line Parameters
- The calculation of the constants of long power lines –- Line Constants

4. THE SIMULATION OF HE PERMANENT REGIME WITH EDSA ADVANCED POWER FLOW WITH VOLTAGE CONTROLS

For the study of the permanent regime, it was chosen as calculation, the method Newton-Raphson.

4.1. Scenarios:

a)

- *injection power energy of OHL Mukacevo 400 kV and OHL Vetis 220 kV;*
- *OHL Gadalin equilibrium connection;*
- *OHL Baia Mare 1 and 2 / 220kV , OHL Oradea 400 kV consumators.*

EDSA Advanced Power Flow Program V5.60.00
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Project Name:
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Company :
Revision No.:
Engineer : FITA NICOLAE DANIEL
Jobfile Name: Rosiori power station 400/220/20 kV retechilogization
Check by :
Scenario : **a**
Electrical One-Line 3-Phase to Single-Phase IEC project

Summary of Total Generation and Demand
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	P(MW)	Q(MVAR)	S(MVA)	PF(%)
Swing Bus(es):	10.583	-73.912	74.666	14.17
Generators :	-10.000	-33.000	34.482	29.00
Shunt :	0.000	-99.973	99.973	0.00
Static Load :	0.000	0.000	0.000	0.00
Motor Load :	0.000	0.000	0.000	0.00
Total Loss :	0.590	-206.885		
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Mismatch :	-0.007	-0.000		

Total active and reactive power losses are of 0.590 MW, respectively 206 MVA

b)

- *injection power energy of OHL Oradea 400 kV and OHL Vetis 220 kV;*
- *OHL Gadalin equilibrium connection;*
- *OHL Baia Mare 1 and 2 / 220kV , OHL Mukacevo 400 kV consumators.*

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Revision No.:
Engineer : FITA NICOLAE DANIEL
Jobfile Name: Rosiori power station 400/220/20 kV retechilogization
Check by :
Scenario : **b**
Electrical One-Line 3-Phase to Single-Phase IEC project

Summary of Total Generation and Demand
==============================

	P(MW)	Q(MVAR)	S(MVA)	PF(%)
Swing Bus(es):	-8.912	-132.038	132.338	6.73
Generators :	10.000	25.000	26.926	37.14
Shunt :	0.000	-100.334	100.334	0.00
Static Load :	0.000	0.000	0.000	0.00
Motor Load :	0.000	0.000	0.000	0.00
Total Loss :	1.093	-207.372		
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Mismatch :	-0.005	-0.000		

Total active and reactive power losses are of 1.093 MW, respectively 207 MVA

c)

- *injection power energy of OHL Oradea 400 kV, OHL Gadalin 400 kV and OHL Vetis 220 kV;*
- *OHL Mukacevo equilibrium connection;*
- *OHL Baia Mare 1 and 2 / 220kV consumators.*

EDSA Advanced Power Flow Program V5.60.00
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Revision No.:
Engineer : FITA NICOLAE DANIEL
Jobfile Name: Rosiori power station 400/220/20 kV retechilogization
Check by :
Scenario : **c**
Electrical One-Line 3-Phase to Single-Phase IEC project

Summary of Total Generation and Demand
==============================

	P(MW)	Q(MVAR)	S(MVA)	PF(%)
Swing Bus(es):	-98.070	-168.641	195.083	50.27
Generators :	100.000	61.000	117.137	85.37
Shunt :	0.000	-101.281	101.281	0.00
Static Load :	0.000	0.000	0.000	0.00
Motor Load :	0.000	0.000	0.000	0.00
Total Loss :	1.935	-208.922		
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Mismatch :	-0.005	-0.000		

Total active and reactive power losses are of 1.935 MW, respectively 208 MVA

There were calculated and analysed the following:

- Autotransformer's charge
- Active and reactive power loss for the entire system
- Tensions in the system's connections
- Side currents

- Active and reactive power losses from the sides
- Power losses on the lines

5. CONCLUSIONS

This paper wishes to illustrate the functioning of Rosiori power station 400/220/20 kV retehnologization, during the permanent regime.
After simulation Rosiori power station 400/220 kV by EDSA programme, used 3 scenarios results.
Total semnificative active and reactive power losses is:
- used OHL Mukacevo 400 kV at equilibrium connection;
- esed OHL Oradea 400 kV, OHL Gadalin 400 kV and OHL Vetis 220 kV at injection power energy.

I wrote this paper because Rosiori power station 400/220/20 kV her total retehnologization (change all electrical equipment of electrical station), and her to put in function in year 2006, June month, in perspective interconexion Romania with UCTE (The Union for the Coordination of Transmission of Energy).

UCTE (The Union for the Coordination of Transmission of Energy), through interconexion with Romania obligate romanian part at respect high standards in electrical power quality domanin.

I consider than Rosiori power station 400/220/20 kV at sequel simulation function a normal parameters and electrical power quality paramaters.

Modernization of Rosiori power station 400/220/20 kV have a real butt.

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Electrical conexions scheme at power station 220 kV

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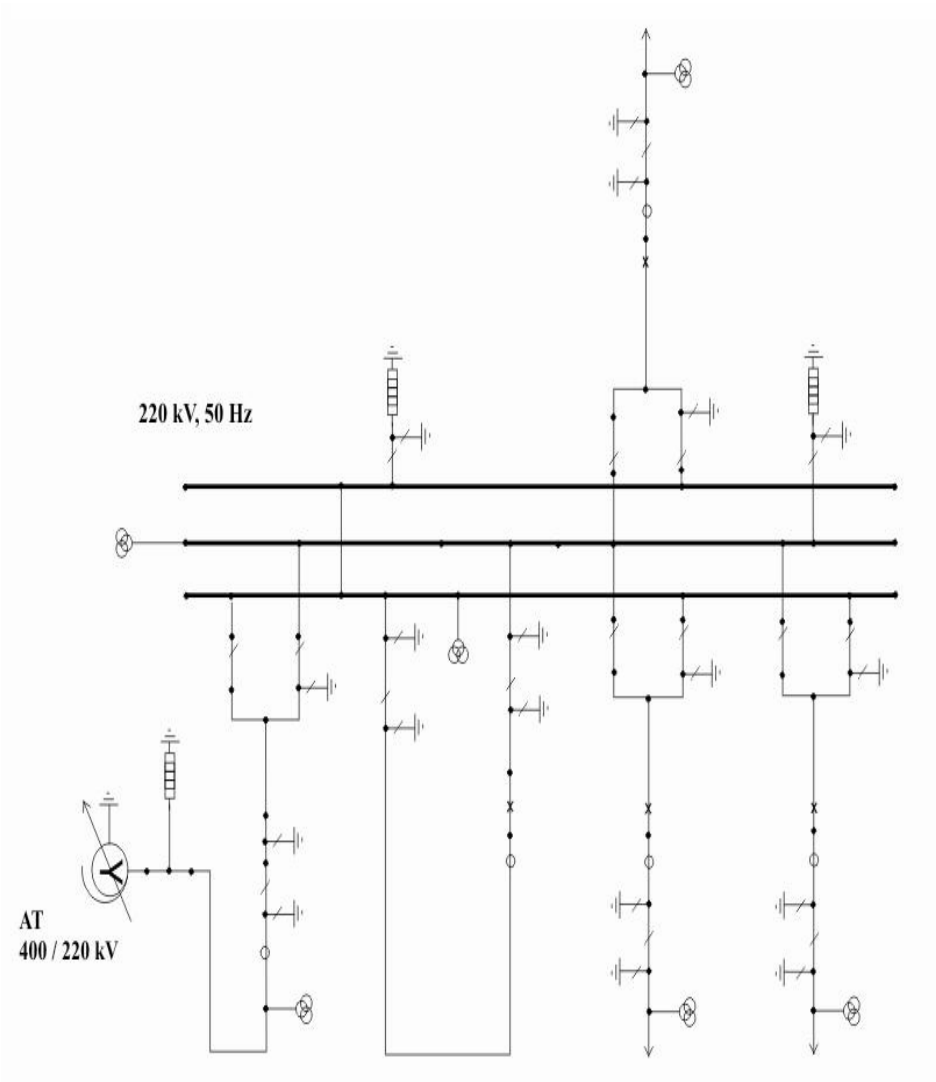
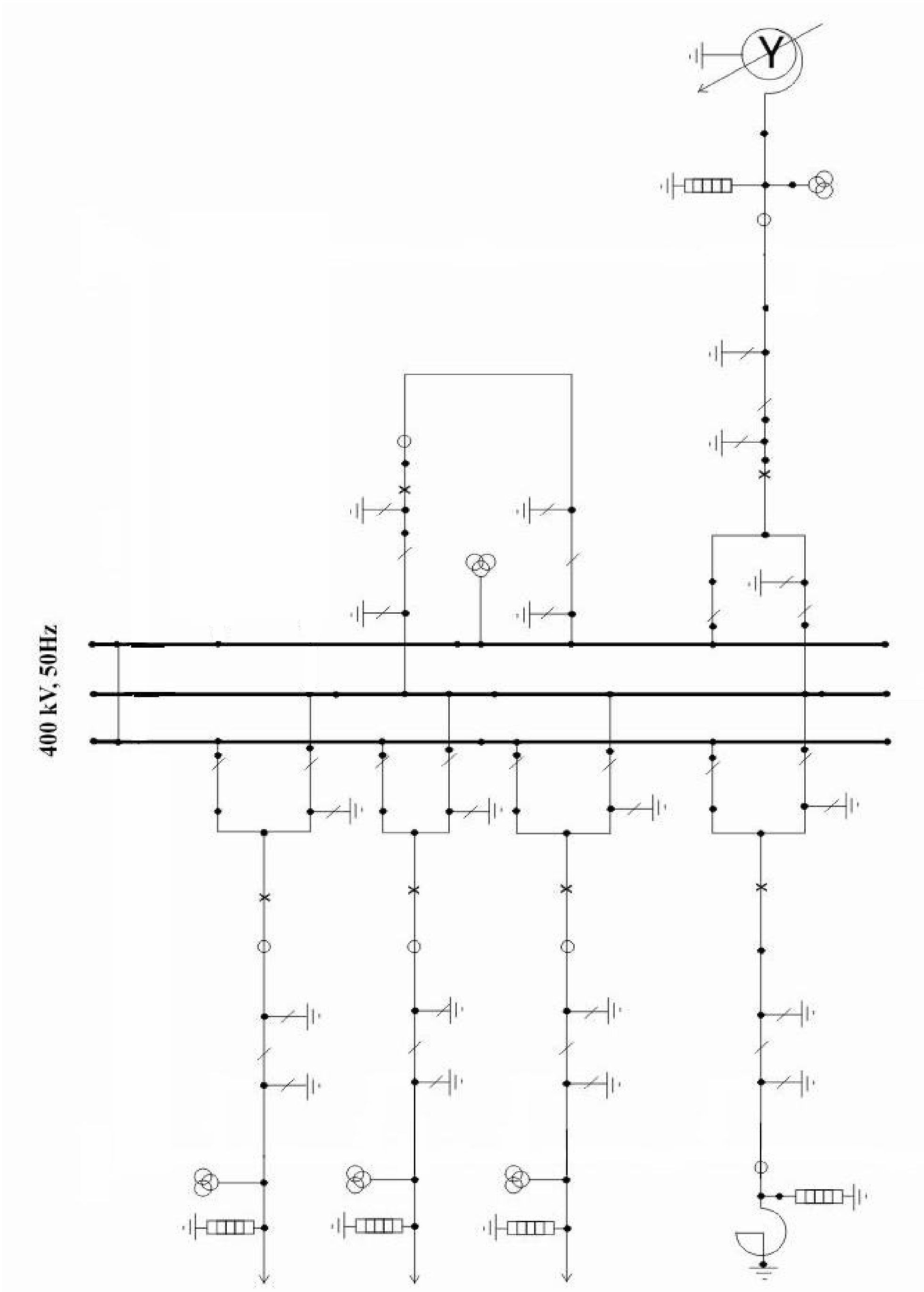


1 2 3 4

1 – AUTOTRANSFORMER 400/220/20 kV;
2 – TRANSVERSAL COUPLE;
3 – O.H.L. 220 kV BAIA MARE 3 – CIRCUIT 1;
4 – O.H.L. 220 kV BAIA MARE 3 – CIRCUIT 2;
5 – O.H.L. 220 kV VETIS.

Electrical conexions scheme at power station 400 kV

5 6



1 2 3 4

1 – O.H.L. 400 kV MUKACEVO;
2 – O.H.L. 400 kV ORADEA;
3 – O.H.L. 400 kV GADALIN;
4 – REACTANCE COIL 400 kV;
5 – TRANSVERSAL COUPLE;
6 – AUTOTRANSFORMER 400/220/20 kV.