Real time voltage control with TVPP

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TVPP definition

(From FENIX glossary)

- *A **Technical VPP (TVPP)** is a type of VPP. The TVPP consists of DER from the same geographic location. The TVPP has an aggregated profile which represents the cost and operating characteristics of the DER portfolio, it also includes the influence of the local network on DER portfolio output.*

- ***Services/functions from a TVPP include local system management for DSO, as well as providing TSO system balancing and ancillary services.***

- *The operator of a TVPP requires detailed information on the local network; typically this will be the DSO.*

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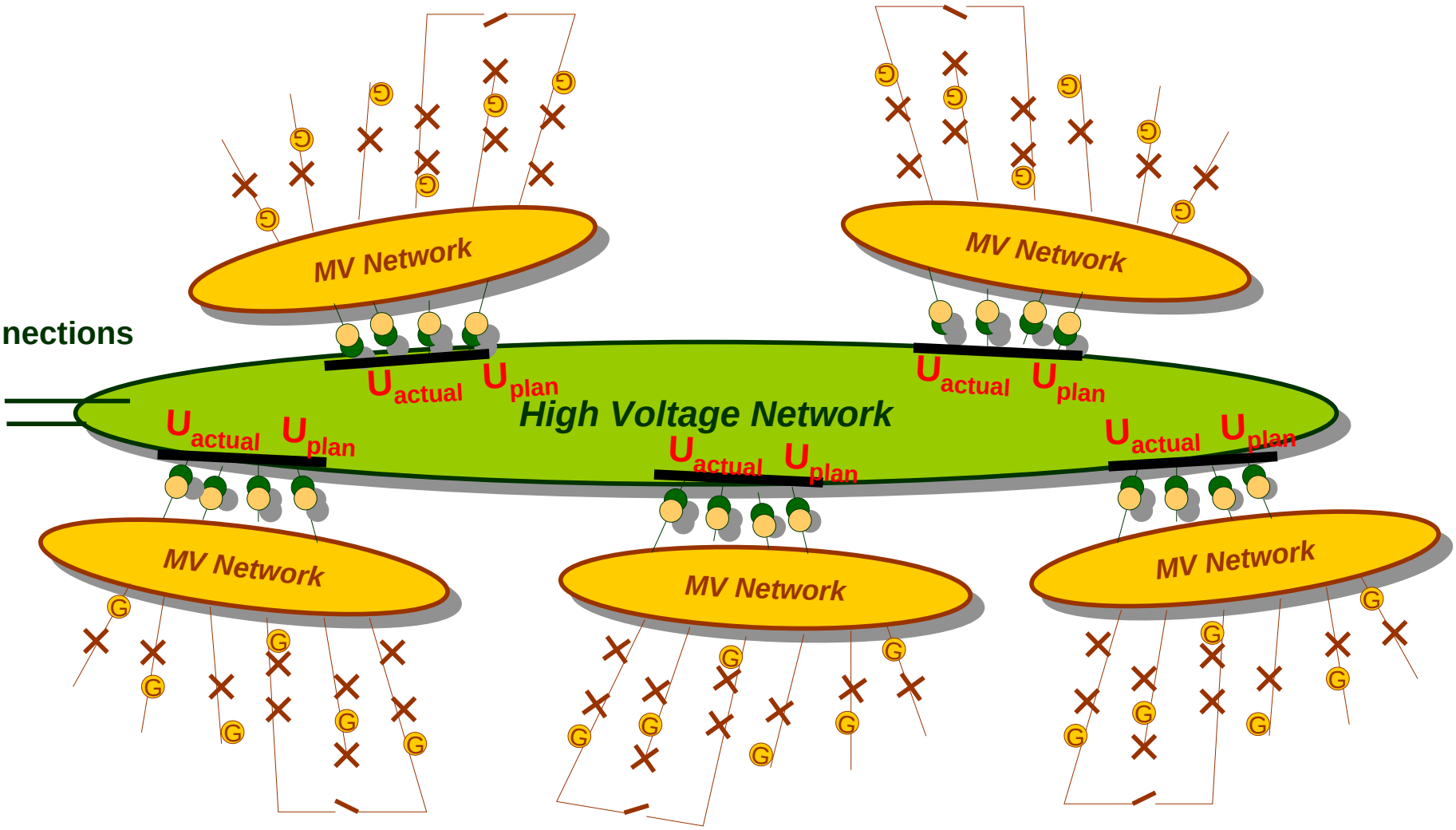
Interconnections



Spanish Regulation: P.O28.-7.429

… The applied regulation at the Spanish electricity market addressing the voltage control is defined by the Operational Procedure 7.4: Ancillary service for voltage regulation at the transmission network…

- Qualified consumers are defined a range of maximum power factors for peak, flat and valley periods (see Table):

Penalties for the DSO ➔ Power factor limits

Period	Power Factor
Peak	**0.95 (inductive) > cosΦ**
Flat	**0.95 (inductive) < cosΦ < 1**
Valley	**cosΦ < 1 (capacitive)**

- Distribution system operators must follow the same power factors as qualified consumers

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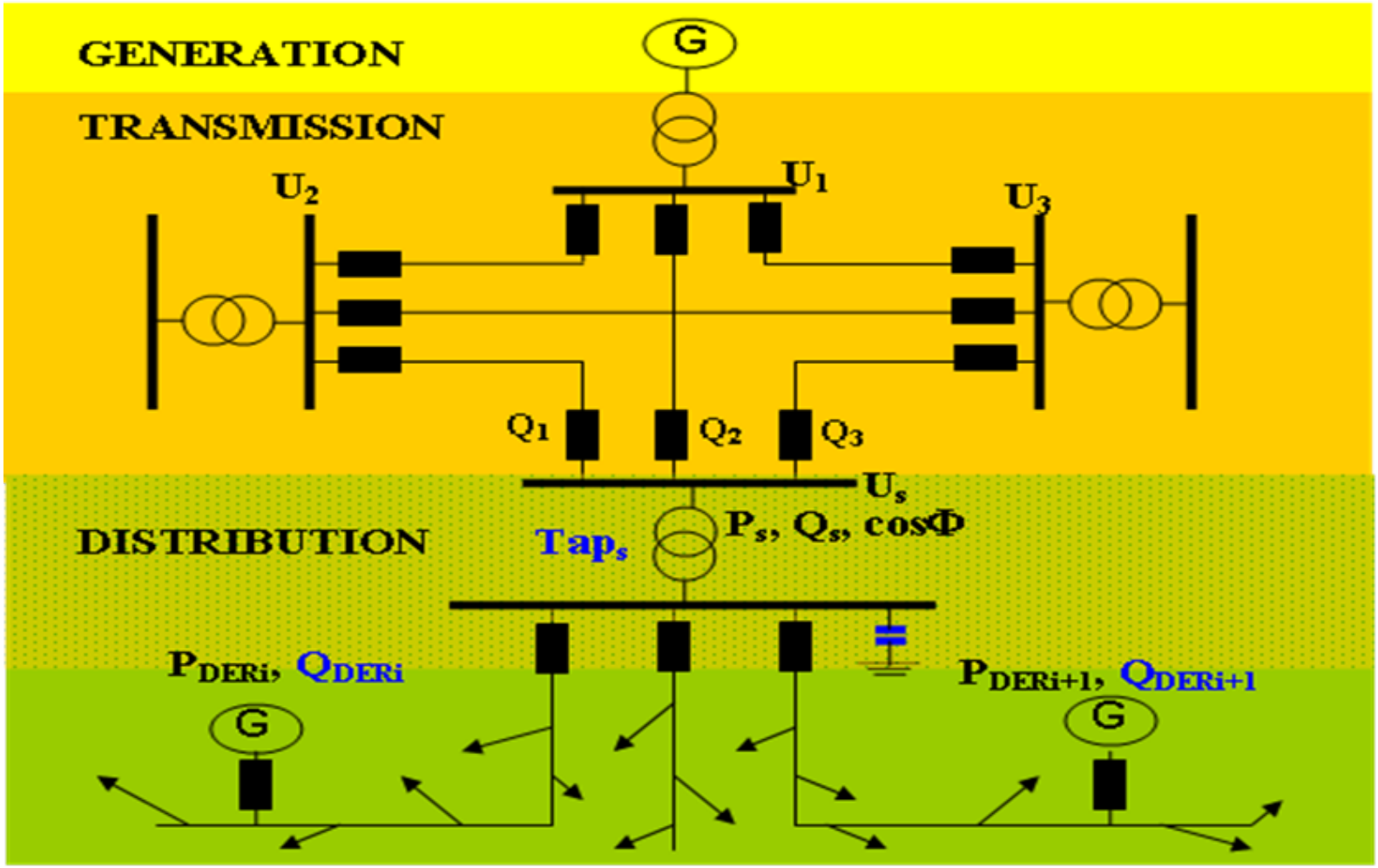
TSO-DSO

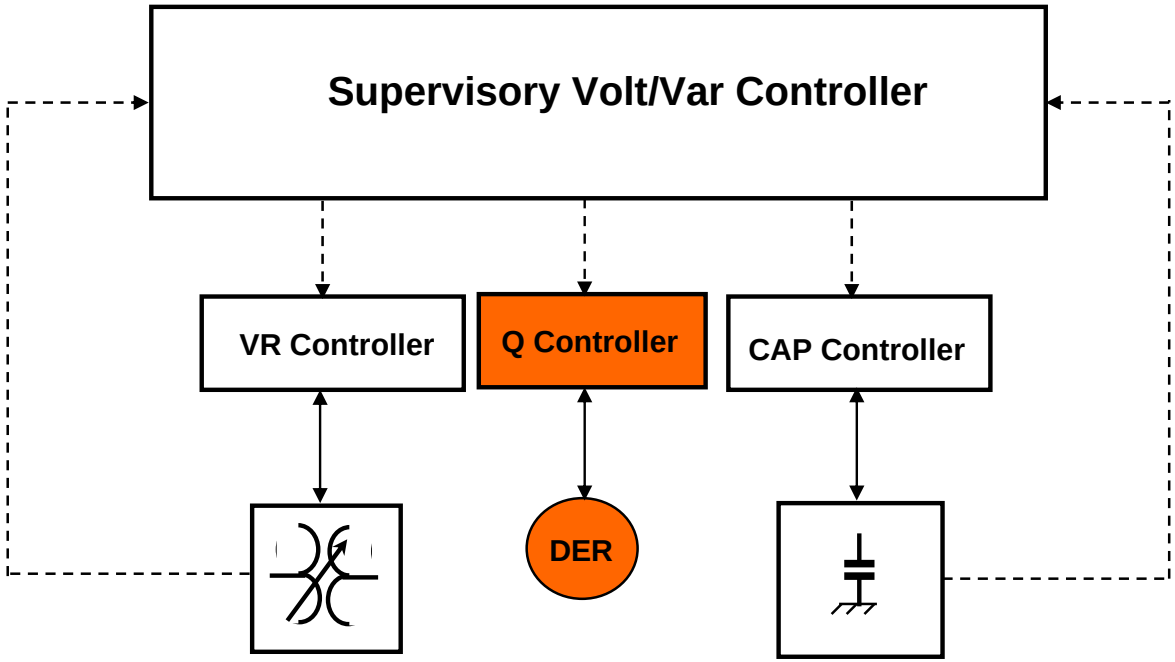


Basic Tasks:

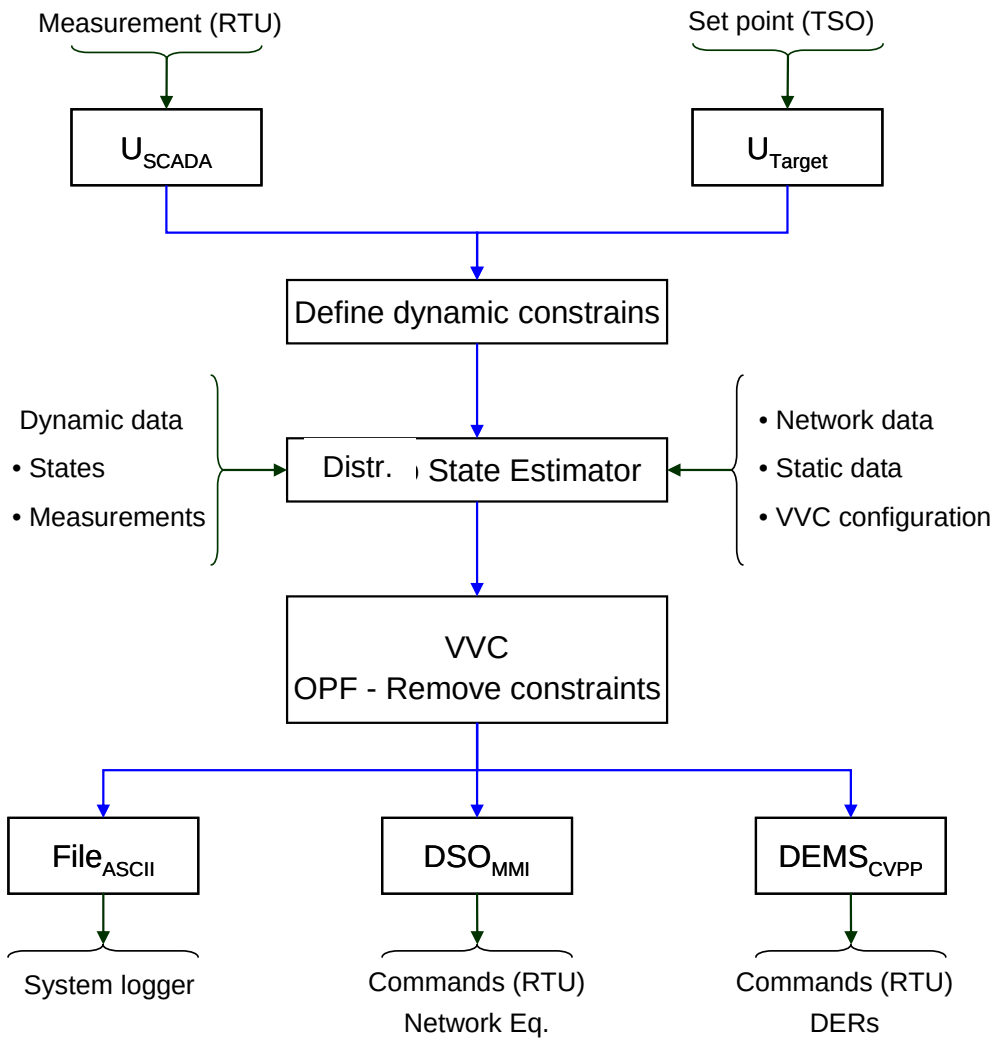
- Improve reliability and quality
- Cost effectiveness

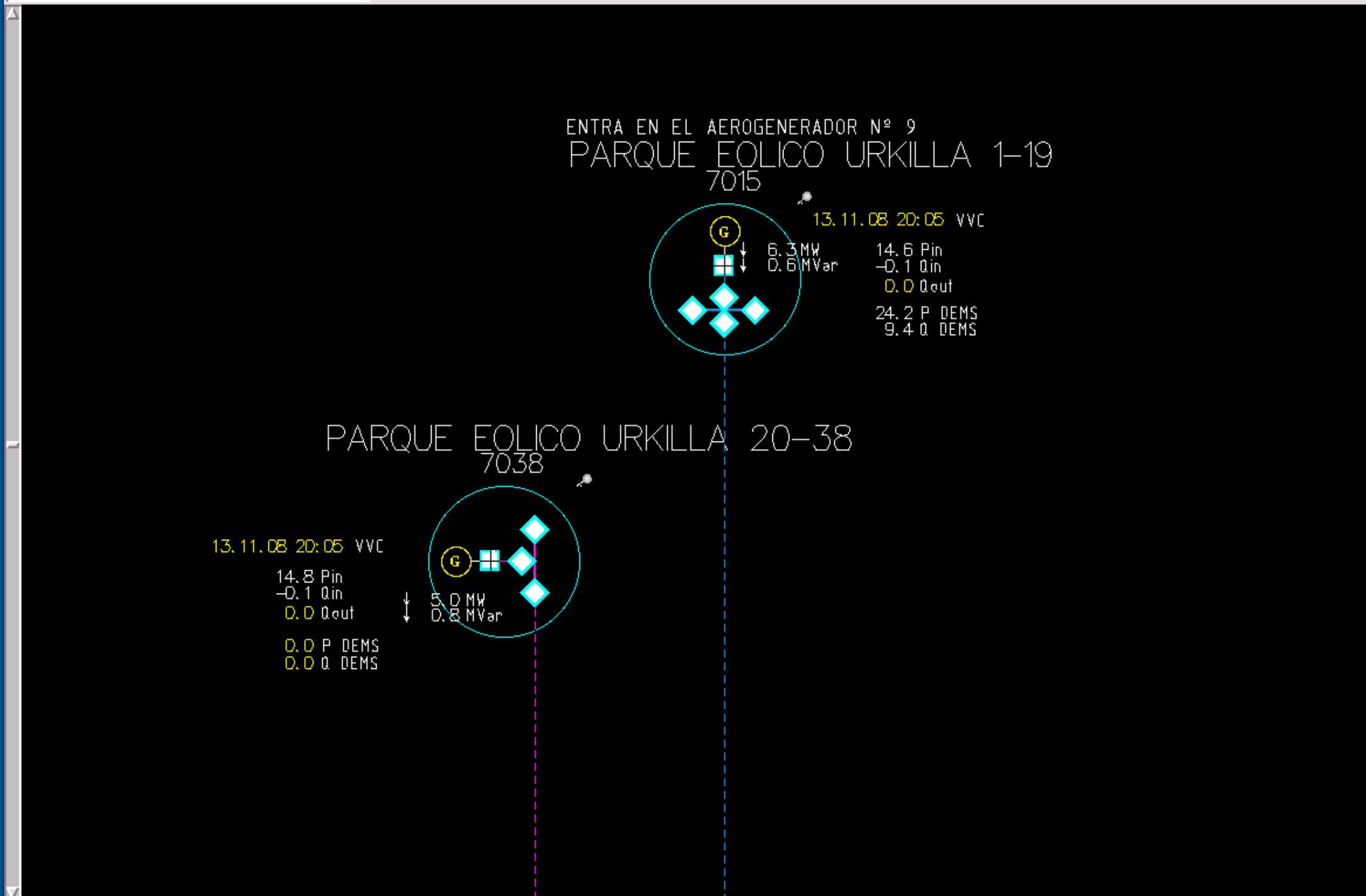
- Constraint violations removal (voltage violation)
- Power demand minimization or desired reduction
- Power loss minimization
- Generated reactive power maximisation (Qdemand)
- Revenue maximization

Volt/VAr Control



Volt/VAr Control
block diagram




ENTRA EN EL AEROGENERADOR Nº 9
PARQUE EOLICO URKILLA 1-19
7015
13.11.08 20:05 VVC
6.3 MW
0.6 MVar
14.6 Pin
-0.1 Qin
0.0 Qout
24.2 P DEMS
9.4 Q DEMS
PARQUE EOLICO URKILLA 20-38
7038
13.11.08 20:05 VVC
14.8 Pin
-0.1 Qin
0.0 Qout
5.0 MW
0.8 MVar
0.0 P DEMS
0.0 Q DEMS

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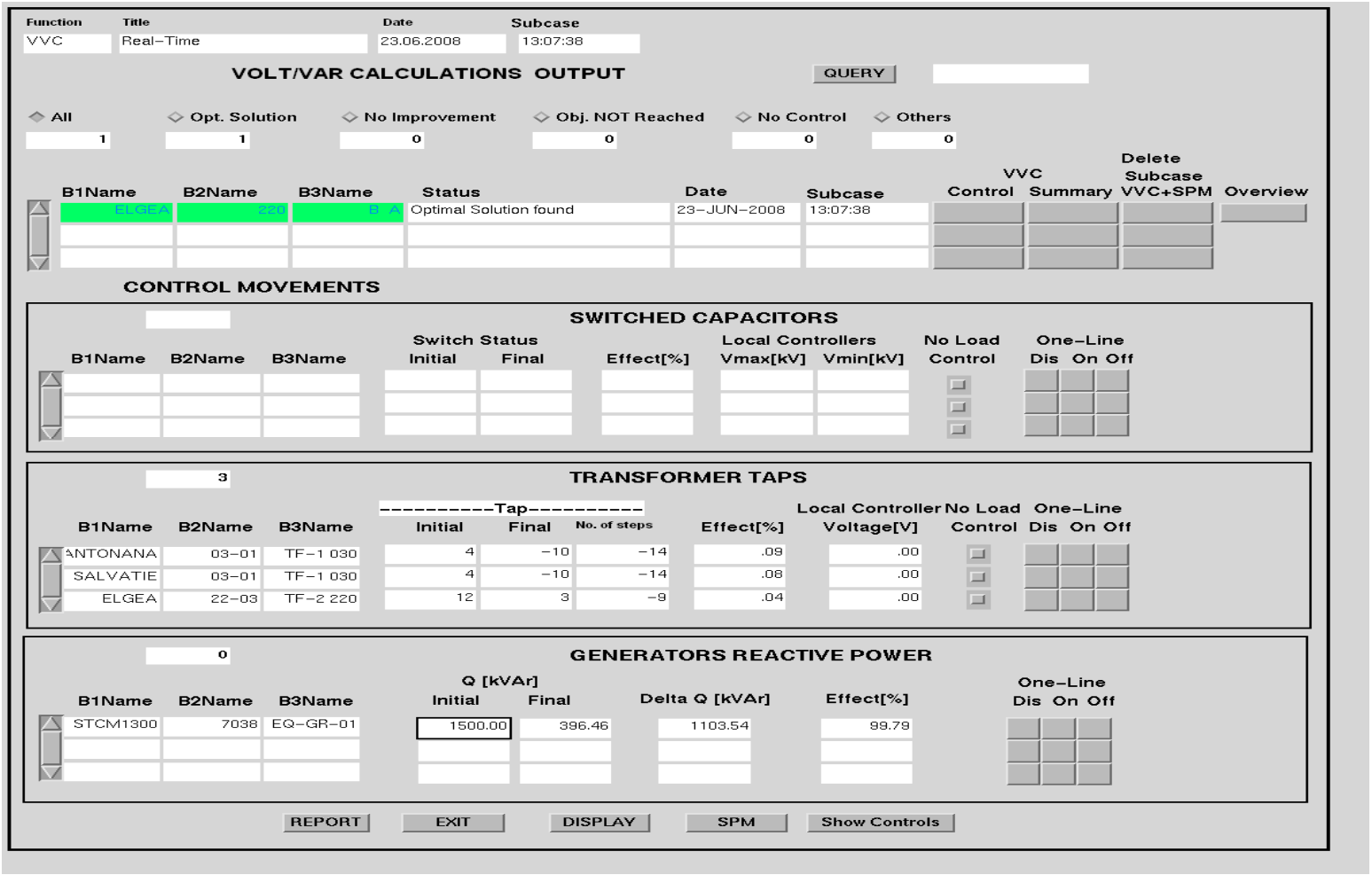
Volt VAr results



Function: VVC | Title: Real–Time | Date: 23.06.2008 | Subcase: 13:07:38

VOLT/VAR CALCULATIONS OUTPUT — QUERY

All	Opt. Solution	No Improvement	Obj. NOT Reached	No Control	Others
1	1	0	0	0	0

B1Name	B2Name	B3Name	Status	Date	Subcase	VVC Control	VVC Summary	Delete Subcase VVC+SPM	Overview
ELGEA	220	B_A	Optimal Solution found	23–JUN–2008	13:07:38				

CONTROL MOVEMENTS

SWITCHED CAPACITORS

B1Name	B2Name	B3Name	Switch Status Initial	Switch Status Final	Effect[%]	Local Controllers Vmax[kV]	Local Controllers Vmin[kV]	No Load Control	One–Line Dis	One–Line On	One–Line Off

3

TRANSFORMER TAPS

B1Name	B2Name	B3Name	Tap Initial	Tap Final	Tap No. of steps	Effect[%]	Local Controller Voltage[V]	No Load Control	One–Line Dis	One–Line On	One–Line Off
ANTONANA	03–01	TF–1 030	4	–10	–14	.09	.00				
SALVATIE	03–01	TF–1 030	4	–10	–14	.08	.00				
ELGEA	22–03	TF–2 220	12	3	–9	.04	.00				

0

GENERATORS REACTIVE POWER

B1Name	B2Name	B3Name	Q [kVAr] Initial	Q [kVAr] Final	Delta Q [kVAr]	Effect[%]	One–Line Dis	One–Line On	One–Line Off
STCM1300	7038	EQ–GR–01	1500.00	396.46	1103.54	99.79			

REPORT | EXIT | DISPLAY | SPM | Show Controls

Conclusions

- There do exists the possibility of an interaction between DSO and TSO to achieve an optimized controlling of transmission and distribution network

- The interaction impact distribution/transmission is very individual and can not be predicted in theory.

- The impact degree will have an experienced value and will be tracked out after a relevant exploitation period.