

REPORT

To: MEDOW

From: Marc Cheah

Subject: Elia visit. Penetration of DC devices and power electronic driven sources: new challenges for stability of power systems

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Oliver Bronkart is member of one of the working groups in Elia called Network Security Assessment (NSA). In this session, he explained the key issues of stability in power systems with the integration of DC devices and power electronic converters. An overview of the 3 main types of power system stability was presented pointing the impacts of increasing the penetration of power electronic devices. In rotor angle stability (steady state stability) is expected a reduction of the short-circuit power which could cause a loss of synchronism in the power system. The frequency stability will be affected by a reduction of the natural inertia. The power electronic devices can provide virtual inertia and a proper dimensioned is required. The voltage stability is also affected with a possible risk of voltage collapse, limited voltage restoration or disconnection of grid costumers. The power electronic devices can also provide reactive power with a quick response, however the total amount of power could be insufficient. Other questions, such as the electromagnetic phenomena and the interaction with the current electromagnetic issues have to be considered. Also, a new approach for static indicators have to be defined, for example in relation to the short-circuit power.

Therefore, the penetration of power electronic devices will increase the complexity of the dynamic stability monitoring and assessment. In case of predictable operation conditions, such as storms or maintenance procedures, the limitation of HVDC transmission imports and the offshore injection can be used as preventive measures to reduce the risk. Special Protection Systems (SPS) / Remedial Action Schemes (RAS) solutions have to be considered when unpredictable situations occur, such as N-2 contingencies. SPS have to ensure a stable operation, reducing HVDC power transmission or disconnecting offshore injection, and has to avoid a strong unbalance through power reserve provision and load shedding.

At the end, the presenter concluded that the issues associated to the penetration of these new devices have to be well defined before applying specific preventive or protection requirements.