CE System Separation on 08 January 2021 - current state of investigations

Chair of ICS Expert Panel

Meeting of SO CG sub group Electricity 2 July 2021
ICS Investigation Expert Panel

- The Expert Panel has met 5 times and finalized its work at 29th June 2021
- Dedicated groups were formed and met separately in April/May/June to address the four main topics of the Final Report:
  - System conditions before the incident
  - Sequence of events and system stability during the incident
  - Frequency Support / TSO coordination
  - Market aspects
- The discussions, development of work and overall cooperation with ACER/NRAs have been rather fruitful and in a trustful and constructive atmosphere
- Several requests for clarification and additional data and/or analysis have been requested
- The ICS Expert Panel has concluded on 21 recommendations for follow up work, taking the event as an opportunity to learn, where processes can be further improved
- Publication of the “Final Report” is envisaged for mid of July 2021
Derivation of the root causes of the incident

Legend:
- Part of the tree of causes
- Essential (root) cause
- Cause to be investigated

1. **Legend**
   - Essential (root) cause
   - Cause to be investigated

2. **States of Regional CSA Methodology**
   - Definition of observed elements in CSA
   - Capability of SCADA to calculate flow on BB couplers

3. **Overcurrent incident**
   - BB coupler installed
   - Policy on how to protect grid elements
   - Overcurrent relay installed

4. **System separation**
   - Opening of line Subotica-Novisad
   - Opening of line Ernestinova

5. **High Real Time flow not properly forecasted**
   - Large positive ACE in Balkan area at 14:05
   - High non-scheduled exchanges on Balkan border

6. **Definition of observed elements in CSA**
   - BB Coupler not part of observed CD
   - Normal Configuration of Ernestinova SS

7. **Overcurrent relay installed**
   - Effect of the higher flow not calculated
   - Underestimation of the severity

8. **High Real Time flow not properly forecasted**
   - Program change on MONITA cable
   - Market flow too high

9. **Cheap energy in Balkan area**
   - Stability not considered when allocating trade

10. **Constricted NACC (NTC) Methods**
    - MTCC prices in the market very high

11. **Status of Regional CSA Methodology**
    - Quality of the IGM provided
    - Definition of observed elements in CSA

12. **High flow not calculated**
    - BB Coupler not part of observed CD
    - Overestimation of the severity

13. **Policy on how to protect grid elements**
    - BB coupler installed
    - Overcurrent relay installed

14. **System separation**
    - Loss of 12 lines between Adriatic Sea and Ukraine
    - System separation

15. **System on the edge of Angular instability**
    - Angular instability
    - Functioning of Distance protections

16. **Overcurrent relay installed**
    - Tfos Ernestinova not part of Security Analysis
    - The Ernestinova not part of Security Analysis

17. **Status of Regional CSA Methodology**
    - Definition of observed elements in CSA
    - BB Coupler not part of observed CD

18. **High flow not calculated**
    - BB coupler installed
    - Overcurrent relay installed

19. **System separation**
    - Loss of 12 lines between Adriatic Sea and Ukraine
    - System separation
Derivation of the root causes of the incident

Configuration of Substation Topology

Application of (n-1) Security Calculation

Alarm handling in HOPS control centre

High power flow / small stability margin

Overcurrent Protection Concept

1st Event: Opening of busbar coupler

2nd Event: Loss of line

Dynamic angular instability

System Separation

Legend

Essential (root) cause
Part of the tree of causes
Unclear cause to be investigated

Quality of the IGM provided
LFC behaviour between 14:00–14:05 to be investigated

Insufficient real-time margin on element
Policy on minimal margins on elements

Tfos Ernestinova not part of Security Analysis
Change on MONITA cable

High power flow / small stability margin

2nd Event: Loss of line

Dynamic angular instability

System Separation

1st Event: Opening of busbar coupler

Application of (n-1) Security Calculation

Alarm handling in HOPS control centre

High power flow / small stability margin
Further Critical Factors analysed

Critical Factor before system separation
- Change of flows before the initial event
- Regional capacity calculation
- Regional security analysis

Critical Factor after system separation
- Frequency stability in case of system separation
- Operation of IGCC
- Operation of LFC
- Non grid code conform behavior
- Frequency support
- Data representation in EAS
- Communication between TSOs
- Procedure in case of system separation and resynchronisation of separated grid areas
- Coordinated execution of measures in case of extraordinary disturbances