



OL1/OL2 PART LOAD OPERATION EFFECT ON LOADS AND STRUCTURAL INTEGRITY



OL1&OL2

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1. BACKGROUND AND SCOPE

- TVO is investigating the possibility to run OL1 and OL2 at reduced effect, i.e. part load operation, to be called PLO from now on
- Originally the plants were to some extent designed for PLO. Probably this was mainly studied for the reactor island.
- The scope of the present work are loads and structural integrity for both the reactor island and the turbine island

2. METHODOLOGY

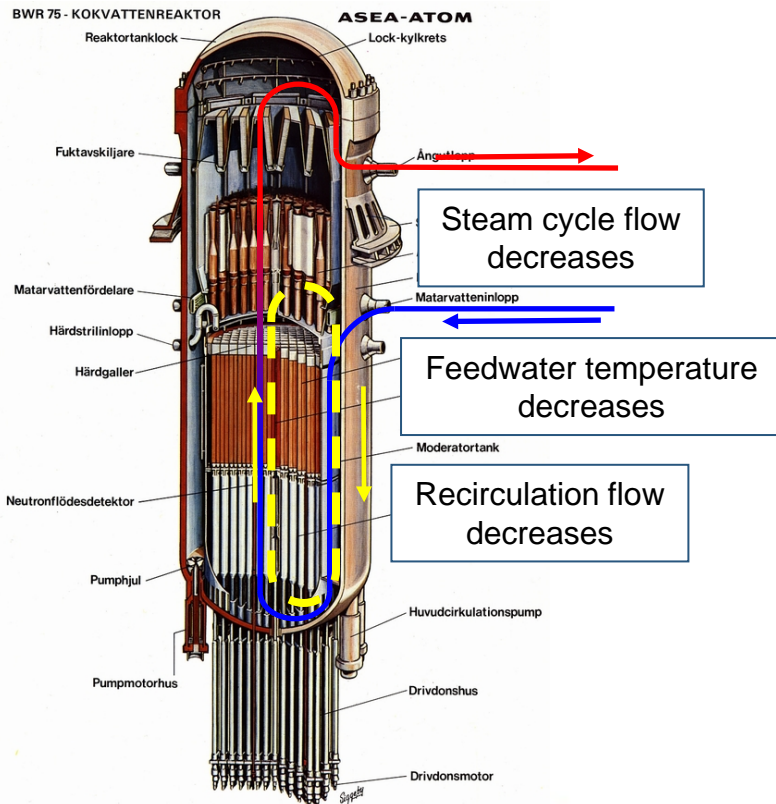
The procedure followed is:

- The influence of PLO on significant process parameters is established
- Significant process parameters are:
 - Mass flow
 - Temperatures and temperature fluctuations
 - Pressure and pressure fluctuations
 - Moisture content
- Possible damage mechanisms are identified
- The effect of process parameters on damage mechanisms are identified
- *The effect of PLO on the process parameters for different components are identified*
- Damage mechanisms for different components are identified
- Actions needed for different components are identified and quantified
- Economic risk for different components is identified

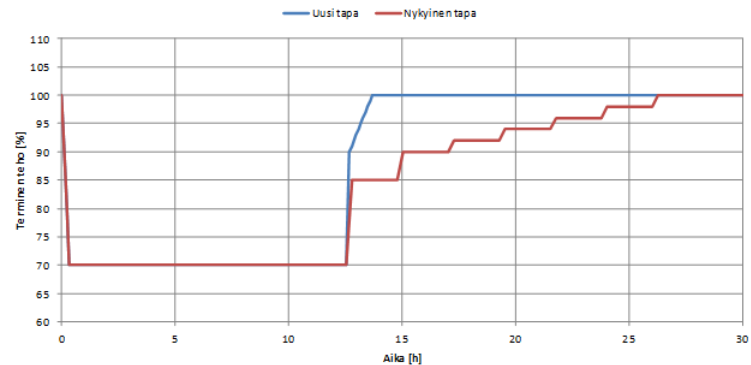
6. PART LOAD OPERATION (PLO)

PLO at 50%, 70% or 90% power, affecting:

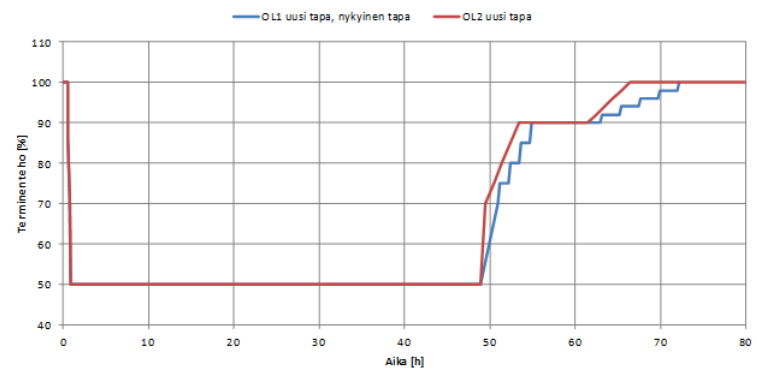
- Steady state operations – new operating point with respect to flow, temperature and pressure
- Load reduction and return to full effect – new set of transients for the plant
- Initiating events – initiating events will have a new starting point that will affect plant behaviour during the events



70 % Teho, 12 h



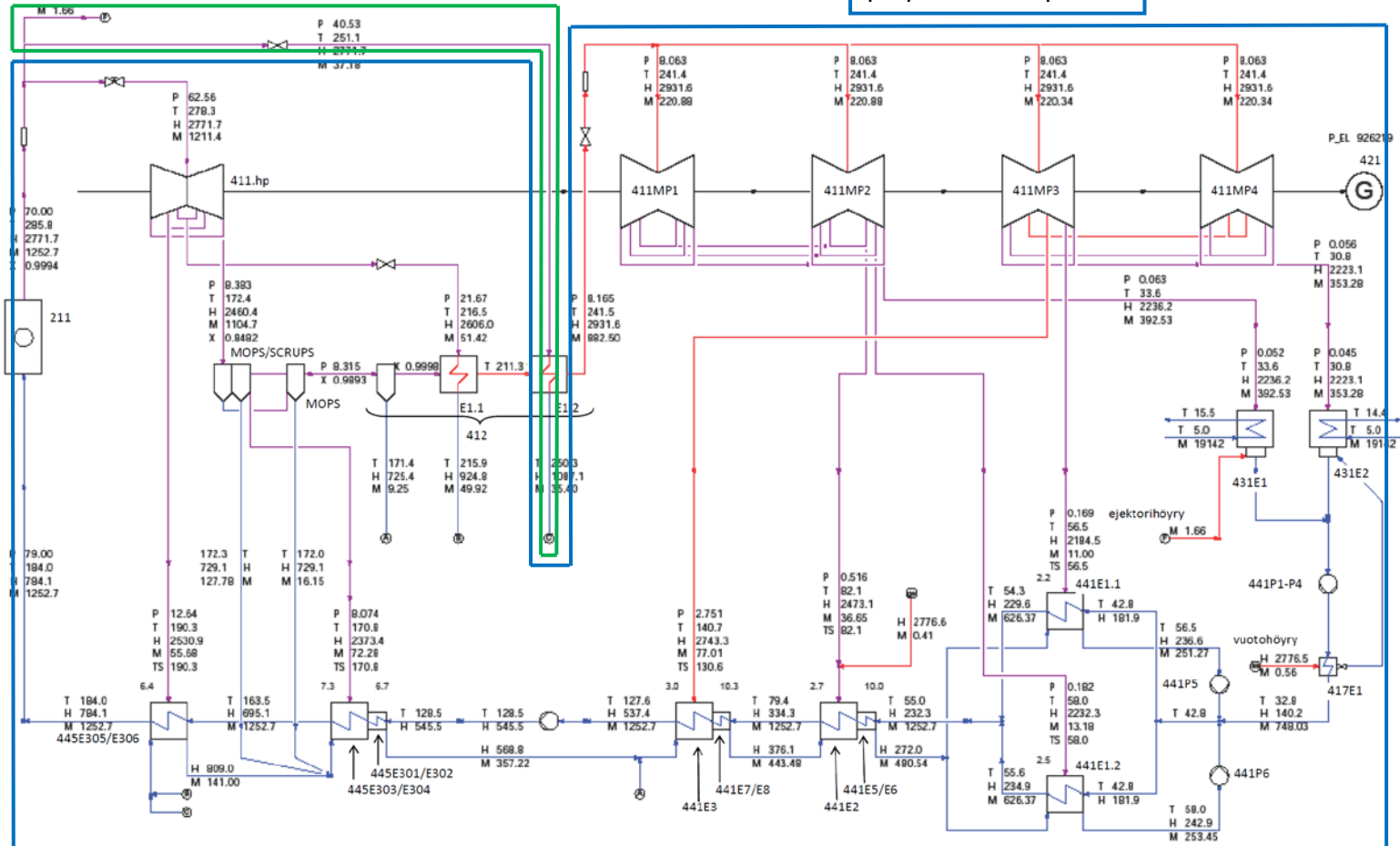
50 % Teho, 48 h



6. INFLUENCE OF PLO ON THE FLOW

Mostiure Separator
Reheater tube side
No flow change

Turbine island except
MSR tube side
Flow decrease
proportional to power



7. DAMAGE MECHANISMS

- Vibrations – Risk of high cycle fatigue
- Erosion – Risk of detrimental effects and rupture
- Thermal Fatigue – Risk of crack initiation and rupture
- Chemistry – Risk of corrosion, stress corrosion cracking as well as other detrimental effects
- Process stability – Risk for transient events

- Damage mechanisms may be applicable on:
 - Component level
 - System level
 - Plant level

9. SUMMARY

- PLO is possible when the following is considered
 - Investigate before part load operation:
 - Vibrations
 - Erosion
 - Component performance
 - Process stability
 - Monitor during/after test run, i.e. first year with significant PLO:
 - Vibrations
 - Chemistry
 - Study during PLO:
 - Vibrations
 - Thermal Fatigue
 - Chemistry
 - Monitor during PLO:
 - Vibrations
 - Chemistry