



## WP 5

### Frequency and load governing

A more varying power marked as well as a more dominating element of non-governing power, will challenge the existing governing and control systems. The governing stability is initially robust with good stability margins.

Wind power will not contribute positive and result in reduced stability margins. The water power system will be exposed to more rapid and more frequent load changes which will result in pressure surges in penstocks and conduit system. Already there have been incidents causing higher loads on equipment and increased sand erosion. In a quite a few occasions, mass oscillations have been the cause for emptying sand traps through the machinery.

Topics to be investigated are:

- Evaluate the original dimensional criteria regarding governing stability
- Define new demands under changed operational regime
- Develop governing and control systems to meet the new challenge
- System dynamic modeling, pressure transients, mass oscillations and governor stability

There are strong links to WP4, WP6 and WP7.