Hydropower is a clean and renewable energy source with many economical, technical and environmental benefits. Storage capability and flexible generation makes hydropower an ideal form of power generation. However, the variable demand on the energy market, as well as the limited energy storage capabilities, requires a great flexibility in operating hydraulic turbines. As a result, turbines tend to be operated over an extended range of conditions quite far from the design point (the best efficiency point). Hydraulic turbines operating at part-load conditions have a high level of residual swirl at the draft tube inlet. The decelerated swirling flow in the draft tube cone may lead to flow instabilities resulting in the formation of a helical vortex called the “vortex rope”. The vortex rope is now recognized as the main cause of severe flow instabilities, efficiency reduction, pressure fluctuations and vibrations experienced by a Francis turbine operating at part-load conditions. Given the strong effects that vortex rope can have, analysis and investigation of its formation as well as control or elimination of its effects are necessary for improving hydropower plant efficiency and preventing structural vibrations. This seminar presents some of the efforts in our research group in simulation and understanding of the vortex rope formation in draft tubes.