Not only are pumped-storage power plants a key element in efforts to develop renewable, CO2-free primary energy sources, but they also hold great promise in terms of improving the security of national electricity supplies. With concern widespread over the sustainability of current methods of energy production, as well as the monopoly some countries hold on supply, the development of renewable methods is a real priority. Research into turbine technology is a key element of this wider goal; wind and solar energy, and other renewable sources, generate energy on quite an irregular basis which imply large scale storage and power control capacity as well. However, energy storing and primary grid control requires for the pumped storage power plants to be operated over a wider operating range while fulfilling the usual criteria of robustness, availability, maintainability and safety of the hydropower equipments.

Therefore, new technology challenged needs to be taken in relation with the following flow phenomena experienced by the storage pumps and the reversible pump-turbines:

- Cavitation control in pump mode;
- Stability of head-discharge characteristics in pump mode;
- Rotor-stator interactions in generating mode;
- Head-discharge characteristics near the runaway mode;
- Etc.

The seminar is introducing the recent progress achieved in the knowledge of hydrodynamics of pump-turbine in the frame work of the HYDRODYNA, European collaborative research programs, EUREKA No 3246 and EUREKA No 4159.