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## Winner Category 3

**Quote of the Jury:** *“The way different complex technical aspects of this project have been mastered makes this project quite unique. A variety of calculation types were performed by combining a large number of features available in a single software program - SCIA Engineer. Furthermore, this engineering effort contributes to the provision of sustainable energy.”*

Owner *Nant de Drance SA*  
 Architect *Nunatak sàrl*  
 General Contractor *GMI (Groupement Marti – Implénia)*  
 Engineering Office *BG Consulting Engineers SA*  
 Construction Period *2011 - 2017*

The Nant de Drance pumped storage project is a hydroelectric power facility in Switzerland with a capacity of 900 MW. By 2019, it is forecast that this facility will produce 2500 GWh of peak energy per year. At 184 m long, 32 m wide and 52 m high, the main transformer cavern is a reinforced concrete structure, excavated in the rock.

The first challenge was to identify the risk scenarios and the limit states, by analysing the cavern stability and the surrounding rock mass.

The second was to reproduce the complex electromechanical forces in the model and apply them to the structure.

The third was to respect the very strict deformation and stiffness criteria, which were imposed by the manufacturer.

It was necessary to create several calculation models to analyze all these constraints. The 3D model provides an indication of the general behaviour of the structure and its reinforcement. Nonlinear calculation allows the cavern walls to be designed and reinforced. Multimodal calculation and time domain dynamic analysis allow us to understand the overall behaviour of the structure with regard to risks linked to operation of the machines. This publication addresses the analysis and design of the underground cavern structure in Nant de Drance project, by taking full advantage of the potential of SCIA Engineer numerical tool.

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