

## Case study

### Hydroelectric Power Station

#### Project Summary

**Application:** Revamped electrical system  
**Rated power:** 126 MVA  
**Speed:** 166 RPM  
**Power factor:** 0.95  
**Stator voltage:** 15,750 V

#### Nidec's Role

Nidec Industrial Solutions provided stator coils and complete rewinding of the generator stator in the revamping of Greece's largest hydroelectric plant.

#### Scope of Supply

- Feasibility study
- Turnkey design and replacement of stator coils and static exciters on one 15,750 V vertical hydro generator
- Production of 425 coils



#### The challenge:

**To increase the output of a 50-year-old, 115 MVA hydroelectric generator by 10%**

A 400 MVA hydroelectric power station constructed in the late 1960s had grown increasingly expensive to maintain in operation compared to the new more efficient power stations that have come online in the years since.

Increased interest in renewable energy led the Greek power company that owns the plant – the largest of its kind in the country -- to consider whether to close the plant or to revamp it and increase its power output. The original 460 MVA plant consisted of four Francis-type turbine generators with 110 m heads.

After surveying the original plant's condition Nidec Industrial Solutions developed a plan for revamping the generators and increasing their output by 10% to 126 MVA. Based on the strength of the plan, which involved replacing stator coils and existing exciter, the owner awarded a contract to Nidec.

**The solution:**

**Nidec's work on the revamping project was completed in three phases**

*Bridge crane certification* – The first job was to ensure that the bridge crane that would be used to disassemble the machine and to extract the generator's 290-ton rotor was certified with a 380-ton hoisting capacity. That required load-testing the bridge crane in the presence of owner-certified and approved third-party testers.

*Coil production* – Because the original manufacturer's documentation was unavailable, Nidec used a spare sample to conduct a three-dimension laser reconstruction of the coil. To achieve a 10% power increase, Nidec engineers improved the insulation materials and made other changes to optimize the existing design. Over a three-month period, the company then produced 425 resin rich coils.

*Stator rewinding* – To speed up the turbine's reconnection to the grid, the rewinding process was completed on an aggressive 2.5-month schedule. During that time, Nidec professionals disassembled the machine, extracted the 290-ton rotor and dismantled the existing stator winding. Then, after performing cryogenic cleaning on the stator coil, all the new coils connected in the original winding scheme. The company's work also included overhauling, testing, cleaning and painting the rotor and replacing the existing rotating exciter with a new static exciter.

