hydropower
Glendoe, Scottish Highlands
KGAL provided engineering and project management services for synchronous condenser operation retrofit.
KGAL’s team of hydro engineers has over 100 years of collective experience in hydropower; a unique wealth of expertise and depth of knowledge to deliver all your hydro engineering needs.

Many of KGAL’s hydro engineers cut their teeth with Boving & Co Ltd.; the UK’s last supplier of large hydro-turbines and the company that supplied the six 300 MW reversible pump-turbines for the Dinorwig power station in North Wales, one amongst many major projects worldwide. The company later became Kvaener Boving, part of the Norwegian Kvaener group, and finally GE Energy UK, part of the American giant GE.

With skills in scheme concept optimisation, hydro turbine selection, transient analysis, mechanical design, control system design and the project management of large projects, KGAL can provide anything from a pre-feasibility study for a green field site to the finished power station, or refurbish an existing one from the first condition assessment to the recommissioning.

KGAL always has an eye to the future where the legacy of our historical experience is being bred into a new generation of mechanical and electrical engineers - already senior in their respective fields - to continue the capability of hydropower expertise with the company.

This hydropower proficiency is complemented by our skill with all the other engineering elements that combine to form the complete mechanical and electrical package for a hydropower station: the water control gates for spillways, draft tubes, intakes, low level outlets and fish passes, the penstocks to deliver the water to the turbine and all the equipment necessary to control and operate it all.
Hydropower currently provides 71% of the world’s renewable electricity. With an economically viable potential to double today’s installed capacity, new hydro has a vibrant global future.

KGAL has the tools to develop a project from inception to completion. Starting with a pre-feasibility study that provides an economic analysis of the energy production and the associated technical options to optimise the return, KGAL can provide a range of solutions for your specific needs. From the early stages of a project, KGAL will be your partner and will work with your staff and equipment suppliers to meet your requirements.

A feasibility study will refine and develop the chosen concept, lay out the penstocks, develop the gates and intake designs, select the type of turbine, its rating and speed, check the transient performance and produce the specification for all the mechanical and electrical equipment for the scheme to allow the works to be tendered.

KGAL can project management the project implementation including supplier selection and management, commercial contract management, quality assurance, site supervision and commissioning management. We can even collate, review and write the Operation and Maintenance manuals.
Much of the world’s existing hydropower fleet of 1.2 TW was installed in the 20th Century. Even though hydropower is the longest lasting of any generating plant, and might run for 50 years or more, many facilities are beginning to show their age.

Unlike thermal generating plant, there are no high temperature components in a hydro turbine and there is no extreme thermal cycling. There tends not to be a pre-defined life for each component and the deterioration is on a much longer time span. The associated civil structures - the dams and water courses - typically have a design life that is measured in hundreds of years; hydropower stations just tend to run and run and run, often well beyond their original design life expectancy.

Eventually, however, even the best hydro plant starts to lose reliability: efficiency starts to drop and maintenance costs start to rise. Many owners and operators often want to reduce manpower through automation and remote operation as well as taking advantage of improvements in turbine and generator efficiency.

KGAL can offer all the services needed for hydropower refurbishment from condition and remaining life assessments that look in depth into every aspect of every part of the equipment, at every drawing, document and manual, through option studies, to the delivery of refurbished equipment or the complete replanting of a power station.

KGAL has significant experience in the UK market of refurbishment, upgrading and replanting of hydro-electric power stations. Projects relating to turbines and turbine inlet valves include:

- **Foyers pump storage scheme**: project management of inlet valve replacement
- **Storr Loch power station**: project management of the whole station replanting
- **Sloy power station**: project management of inlet valve replacement
- **Dolgarrog power station**: replacement of Francis turbine unit 4
KGAL constantly invests in the best people and the best systems: from the latest 3D CAD and FEA to bespoke software capable of modelling the transient behaviour of the turbine, the waterways and the electrical system.

Having the right tools is not enough to drive success; knowing how to use them and having the experience to judge the outcomes are key abilities that KGAL apply to their hydropower projects.

KGAL not only has the experience to use the tools correctly, we’re also committed to passing the knowledge on to the next generation of engineers to develop a sustainable path to the future in hydropower.

Our range of clients, in the UK and in over twenty countries overseas, include energy suppliers, leading international engineering consultants, major contractors, specialist component manufacturers, private asset owners and government departments. They all depend and trust in our ability to provide the best solutions tailored to their specific needs.

As the overall scheme designer our clients rely on us to provide the complete hydro engineering service; from economic viability assessment through conceptual design development to final commissioning. Or, as a JV partner or significant team collaborator, to provide detailed modules such as the design and specification of hydro mechanical equipment, model testing, simulation, asset assessments, risk assessments and project management – both for new installations and for the rehabilitation or upgrade of existing equipment.

From small schemes of up to 10 MW to some of the world’s largest (100 MW+) hydropower projects, KGAL has the skill and scale to deliver.
Building a winning project – KGAL has the experience

**Procurement**

Careful and experienced management of the procurement process is a basic requirement for a successful project. KGAL’s in-depth knowledge of the equipment market enables us to give advice on potential suppliers and the most appropriate commercial structures. We can then prepare the pre-qualification and enquiry documents, tender schedules and advise on contract award.

KGAL can manage the supply process and provide you with a team of engineers to perform the role of Principal Designer (CDM 2015), inspections, expediting and testing.

**Site installation and commissioning**

Installation and construction of hydro schemes can be challenging but very rewarding. KGAL’s engineers have been resident on construction sites in Africa, India, South East Asia as well as our home market in the UK. KGAL has managed the installation directly as the contractor and as the client’s engineer - Principal Contractor (CDM), Project Manager and Supervisor (NEC) roles respectively.

**Staying with you**

Commissioning and hand-over does not bring an end to the project, it marks the point at which the asset starts to realise income and make that all important return on its investment. From then on, protection of the income is key to the on-going success and profitability. This requires maintenance management, planning, periodic inspections, operation and maintenance audits and continuous condition monitoring.

KGAL’s services begin when you first start to think about the broad possibilities for your project, they do not really have an end – KGAL is your long-term partner in hydropower.