

The future for new hydro
projects in the National Trust

Mining towards renewable
energy

The economics of Natural
Capital

SPOTLIGHT

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Mining towards Renewable Energy in the UK

The efficient use of energy is a significant societal demand. In the UK, the move towards Net Zero 2050 using renewable electricity generation is changing the role that pumped storage can play in supporting the reliability of the national grid. While many energy storage options lack the reliability that grid operators depend on, pumped storage excels at rapidly bringing large amounts of generation online to fill the gap. Pumped storage hydropower offers critical back-up during periods of excess demand by maintaining grid stability.

Former quarry and mine sites offer the ideal infrastructure for the development of pumped storage projects and have the potential to add a considerable amount of renewable energy and storage to the national power grid. Due to the infrastructure, location and water storage capacity at existing quarry and mine sites, private developers are proposing that a significant portion of the global pumped storage capacity be used at these sites.

The UK is a leader in planning for pumped storage at existing mine sites. The 1728 MW Dinorwig Pumped Storage Scheme in North Wales was fully commissioned in 1984 and is a prime example of an abandoned slate quarry being utilized to develop a pumped storage generation. When it was first commissioned, it was regarded as one of the most imaginative engineering and environmental projects in the world, and to this day, it remains the largest project of its type in Europe. The underground powerhouse is poised to supply the national grid in the UK in the event of energy shortages.

Existing quarry and mine sites offer a unique opportunity to evaluate the potential of pits post closure for use as flooded reservoirs for pumped storage. Published and approved UK projects include the 400 MW Glenmuckloch in Scotland and the 100 MW Glyn Rhonwy pump storages in Wales, with several others in development throughout the UK.

The main attraction for developing a pumped storage scheme at a quarry or mine site is the utilisation of

the existing infrastructure. Underground tunnels and caverns can be used for the storage, although these are not as common as open-cast sites.

Using the main pit as the lower storage reservoir eliminates the need to construct a dam to form the lower storage. As a result of previous mining operations, mine sites have a good chance of already being understood geologically and geotechnically. Additionally, the lithology, structural and hydrogeological aspects of mine sites are typically documented as well, which can expedite studies.

The transformation presents an opportunity to restore the land to a safe, stable and self-sustaining condition with due consideration to the surrounding environment and communities. Mine sites often have in place suitable access and electricity transmission grid connection, offering significant cost and permitting benefits. Although development costs will be required to establish the upper and lower storage reservoirs, the offset rehabilitation costs could be substantial, and an ongoing beneficial asset is created.

With a long history of quarrying and mining in the UK, there are many sites suitable for transformation to pumped storage, with several developments already approved and several more in planning. Pumped storage will be within the mix of enablers to achieve the UK Net Zero targets.

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