Decommissioning or Repowering a Wind Farm

Wind farms are an important investment in the Canadian electricity grid and provide clean, renewable energy for several decades, typically 20 to 30 years. Once a wind farm reaches the end of its life cycle, consideration is given to either decommission or repower the facility. Easy access to the assets makes it possible for owners to either reclaim some of their investment and restore the site or install new turbines to extend the lifespan of the wind farm.

Decommissioning (wind farm's power production is ceased and the site is dismantled)
Repowering (wind farm's equipment is replaced or upgraded with more advanced and efficient technology)

Why and when are wind farms decommissioned?

As wind turbines reach the end of their useful life it may be difficult to find replacement parts or components may begin to fail at a rate that becomes too expensive to maintain. In other cases, it can simply be the end of the business case or the end of a power purchase agreement and the owner closes the project as planned.

The wind industry in Canada is relatively young compared to the typical wind turbine service life. As a result, decommissioning experience is limited in Canada. In 2016, TransAlta was a Canadian pioneer in decommissioning its commercial wind farm at Cowley Ridge, Alberta. Even with the removal of the old technology TransAlta is pursuing options for repowering the facility.

Why and when are wind farms repowered?

Global trends currently favour repowering over decommissioning, primarily because wind resources are renewable and can continue to be harvested. There is often a compelling business case to leverage the initial investment in buildings, roads and electrical infrastructure as well as the established relationships with landowners, municipalities and local communities.

As part of the repowering process it is typical that the environmental and wind resource assessments are revisited. With decades of on-site data and experience, the development of a business case for repowering is less risky than the development of the business case that supported the initial project. Advances in technology and more turbine options allow for an increasing number of choices to replace dated turbines with larger, more efficient machines or retrofit existing hardware to modernize the power plant. Wind energy's technological advances have been significant and European experience shows that repowered projects often use half the number of turbines to produce twice the power.

The mechanics of decommissioning

Approaches to decommissioning vary depending on the unique site characteristics and the extent to which parts can be recovered for resale or scrap value.

Deconstruction for resale – This involves a careful reversal of the construction process to remove blades, towers and control equipment. This can be a lengthy and costly exercise but if there are buyers for the components that hold the most value, i.e. towers, generators, gearboxes and transmission equipment, this process offers the greatest opportunity for owners to reclaim investment in the components.

Rapid deconstruction – In this approach components are dismantled but not preserved for resale. Cables are cut rather than disconnected and parts are rendered unsalable as they are removed. This is less expensive and is faster than deconstruction for resale.

Demolition – This is similar to the tearing down of an old building. Towers are toppled and the focus in on clean-up of the debris from the site rather than removal of individual parts.

Regardless of the approach, some of the activities for each method may include:

- Improvements to side and service roads to accommodate heavy equipment like cranes, trucks and grading equipment.
- Establishing temporary crane pads at each turbine.
- Dividing materials for proper disposal – Fiberglass blades, oil, grease and other fluids are delivered to the proper disposal site; metal and electrical parts are recycled or sold as scrap.

Once deconstruction of above ground equipment is complete, the final step involves the removal of subsurface components where possible and restoration of the land. It is typical for the foundation and cables to be removed to a feasible depth.

The mechanics of repowering

There are two approaches to repowering:

Full repowering – This involves each turbine being replaced with an equivalent or improved model or several turbines being replaced with one newer model capable of producing the same or greater electricity levels.

Partial repowering – This typically involves an upgrade or life extension to the existing wind turbines such as the installation of of longer blades, a bigger generator or better control systems. An upgrade to the high voltage electrical components may also be required if the repowered farm is going to generate more electricity.

In either approach, repowering may look similar to decommissioning and require road upgrades for heavy equipment access, re-establishing of crane pads and widening of some roadways to accommodate the installation of longer blades.

Who pays for decommissioning or repowering?

Unless other arrangements are made, the wind farm owner is responsible for end-of-life arrangements and costs. Each jurisdiction may have its own approach to decommissioning requirements and the wind industry works to comply with these local requirements as an integral part of the project.

Summary

Decommissioning and repowering is another opportunity for wind energy to prove its economic worth. In either case, there will be some disruption on the site during construction. However, once completed, land is generally restored to its original state or there is reinvestment to continue producing benefits for the community.