

PMI[®] Case Study

NEW ZEALAND WIND FARM:

Completed On-time and Within Budget Despite Record Storms

Despite its remote location, unstable terrain, and torrential record-breaking storms that swept away a bridge and closed the area for four months, New Zealand built a wind farm on-time and within budget.

How was this challenging task accomplished?

By employing effective project management and using the correct tools and techniques to ensure end results matched with strategic goals, New Zealand's Te Apiti Wind Farm Project was completed in the most profitable and efficient way.

Background

In light of significant power shortages and limited forms of available power generation across New Zealand, it has become increasingly important to explore more diverse types of power generation. And, due to the country's mountainous terrain, harnessing renewable energy is seen as an ideal opportunity.

Meridian Energy Ltd. is New Zealand's largest state-owned renewable energy generator. It committed to exploring a wind farm project and identified a target site before undertaking extensive consultation with the community. From this it shaped the project to meet the expectations and wishes of the community during the planning process.

Public consultation commenced in May 2003, and full consent was granted within four days of the hearing. Work started on the Te Apiti site on 10 November 2003.

Challenges

The key challenges for the team were to work in the physically demanding environment, adhere to landowners' requirements and meet all the key project milestones.

Over 20 km of roadways would need to be constructed and 40 km of underground cabling installed. The terrain of the 1150 hectare site presented many additional challenges: there were numerous gullies, streams, steep drop-offs and unstable soil, and a major Natural Gas Corporation pipeline ran through the site.

The plan called for Te Apiti to be the first wind farm in New Zealand connected directly into the national power source grid, and be one of the first new power stations subject to the requirements of the Electricity Governance Rules.

Meridian therefore had to demonstrate compliance with the technical requirements of the system operator in order to ensure that the operation and security of the grid would not be compromised.

From its commencement in November 2003, the project suffered adverse weather conditions with double the expected rainfall. On 6 February 2004, rainfall peaked with a 50-year storm record, followed by a 100-year storm on 16 February. The rainfall brought the area's highest recorded flooding, and a civil emergency was declared.

However, the floods caused little problems on-site due to diligent environmental management, although the main access bridge was swept away, and the Manawatu Gorge—the main water route—was closed for four months, limiting site access to a single route.

Due to the flood and resulting infrastructure damage, key challenges included:

- working with the local government to restore the destroyed bridge;
- revising the work schedule when all contractors, facilities and staff were required to assist with flood recovery in compliance with the Civil Emergency Act;
- stabilizing existing roads to ensure consistent delivery of materials;
- maintaining and updating daily and weekly schedules to meet program targets; and
- acquiring additional resources to support the project team.

Solutions

Meridian Energy, its consultants and its contractors worked as a seamless team to meet the Te Apiti project challenges. A well-defined, all-encompassing project plan provided clear direction and purpose. The skilled and proficient project management team, which was committed to designing and constructing a first class project, formed the foundation for the structured approach.

The team used project management practices to develop the project plan and charter and integrate actions to develop a strong team culture, and ensure good management practices, transparent and positive decision making processes and delivery, and clear communication between all parties. Daily on-site meetings and weekly senior management meetings with all vendors helped achieve these

goals.

According to the project charter, the project team, equipment suppliers and subcontractors were to take a collaborative approach. Project management practices facilitated this approach and enabled the team to anticipate, define and solve broader system problems. This was essential to getting the work done before the target completion date.

The project team also applied project management skills to risk management using *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*–Third Edition, which outlines methods to determine potential project risks and provides techniques for incorporating those risks into the project plan. The Te Apiti project team avoided many of the risks common to large civil engineering projects by using these established methods. For example, there were no lost time incidents in the project's 250,000 man hours.

Results

The project team completed the Te Apiti Wind Farm Project five days ahead of schedule, with an exemplary safety record and within its \$200 million (NZ) budget.

Te Apiti is currently the largest wind farm in the southern hemisphere, with 55 turbines, each capable of generating 1.65 megawatts each, up to 90 total megawatts combined. These are the first wind turbines rated over 1 megawatt to be used in New Zealand.

Creating the wind farm was a major infrastructure undertaking with approximately 60,000m³ of concrete poured, 1,200,000m³ of soil and fill shifted, over 20 km of site roading constructed and 40 km of underground cabling installed.

The Te Apiti project provided first power on 26 July 2004, and was fully commissioned by 25 October 2004. It currently has an output of 369GWh per annum.

By completing the project on-time and within budget, the Meridian project team proved wind power is a highly viable option for renewable energy in New Zealand, and more wind farms are now planned.

Meridian uses the Te Apiti project as a benchmark to stakeholders, and future wind farm projects can use it as a blueprint.

Key Achievements

- Largest wind farm in the southern hemisphere;
- constructed within one year from commission to completion, on-time and within budget;
- first wind farm connected to New Zealand national grid;
- OSH ideal rating for management of project's health and safety; and
- received high recommendation from Horizons Regional Council for environmental management and compliance in all aspects of environmental management for duration of project.

Key Facts on Te Apiti wind turbines

- Capacity: 90 megawatts from 55 turbines produce enough power for 45,000 average homes.
- Tower: 3 sections:
- Base: 17.25 meters in length, weighing 46.6 tons;
- Middle: 19.04 meters long, weighing 33.5 tons; and
- Top: 31.4 meters, weighing 38.5 tons.
- Blades: 3 per tower, each 35 meters in length weighing 6 tons:
- Circumference of these could contain a Boeing 747.
- Foundation: 375 cubic meters of concrete, about 75 truckloads.