Wind and Water: impacts of wind farms on freshwaters in New Zealand

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Wind Energy in New Zealand

Growing industry in NZ -- NZ Energy Strategy: 90% renewable energy by 2025

20% of renewable energy = wind by 2030

2011 - NZ Policy Statement Renewable Energy – driver of growth

16 wind farms operating or under construction ~ 4% NZ demand

Growth from 622 MW in 2012 to 3,500 MW by 2030, = 82% over current levels

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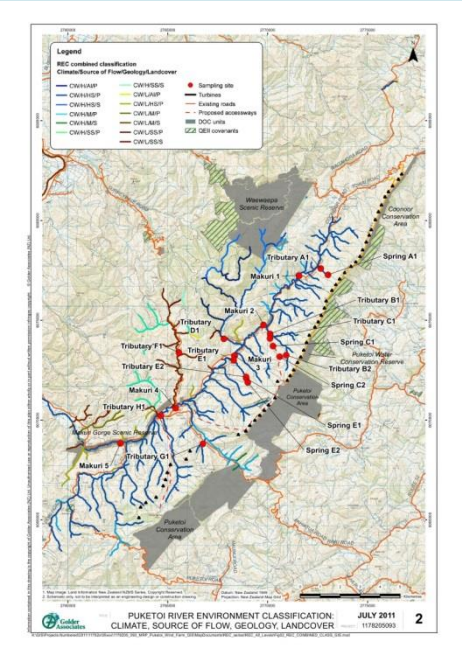
Wind Farms in New Zealand



- Typically linear infrastructure/routes
  aka – road or transmission route projects
- In New Zealand along ridges or ‘saddles’ between ridges (cf: valley floor, slopes)
- Typically steep dissected topography
- Typically cross a large number of waterways, gullies, springs and wetlands
- Typically headwater freshwater ecosystems

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Wind Farms in New Zealand

- Linear infrastructure
- Potential for multiple impacts
- Or same impact many times at many locations
- Potential headwater habitat loss
- Potential habitat fragmentation
- Potential downstream impacts
- Access for migratory species
- Potential for invasion of pest or unwanted species

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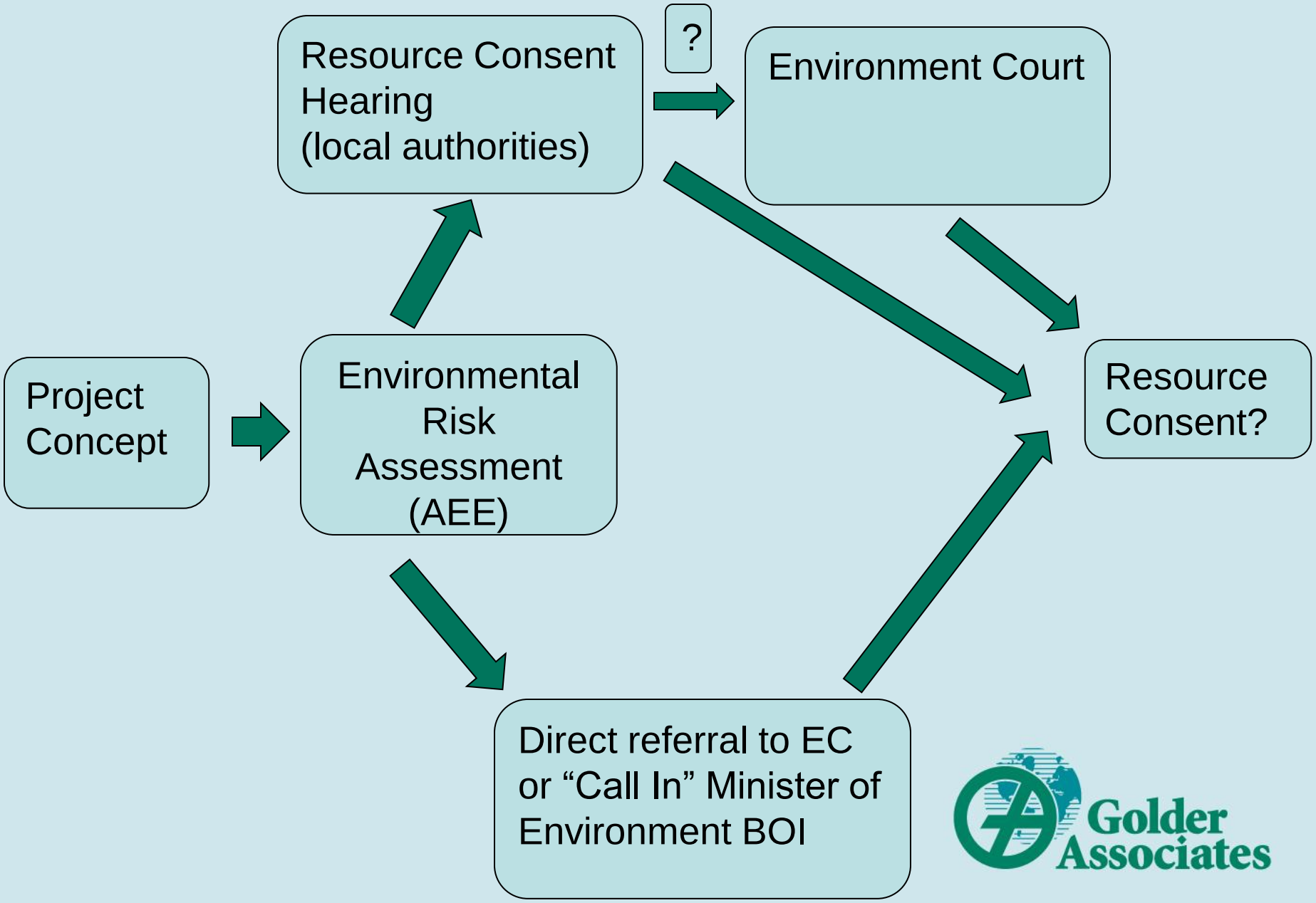
NZ Permitting Process – Resource Consent



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Key impacts to aquatic ecosystems

- Turbine/ridge road location(s)
- Earthworks/sediment control
- Stream crossings from access routes
- Stream/river crossing modifications
- Gully crossings…allowing for overland surface flows
- Damming of waterways
- Residual flows, mimic natural hydrology
- Loss of stream habitat
- Loss of Spring tributaries
- Transport route/Transmission Line…….bed disturbance…stream crossings…earthworks/sediment

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Wind and Water – Earthworks - Access Roads

Large number of roads

Travel up hills and cross gullies and wetlands

Maybe more than one access route

Wind and Water: Downstream environments

Lake Mahinerangi

Wind and Water – Transport route – river/estuarine crossings

ELDORADO TRACK
MAHINERANGI ROAD
SH 87
ALLANTON ROAD
SH 87
SH 1
SH 1
SH88
DUNEDIN

LEGEND
PRIMARY TRANSPORT ROUTE
SECONDARY TRANSPORT ROUTE
SITE LOCATION

Earthwork disposal: Wetland/gullies

Seepage wetlands at some upper tributaries..other dry gullies with surface flows in rainfall ‘events’.

Earthwork disposal: Wetland/gullies

Avoidance of high quality gullies and waterways

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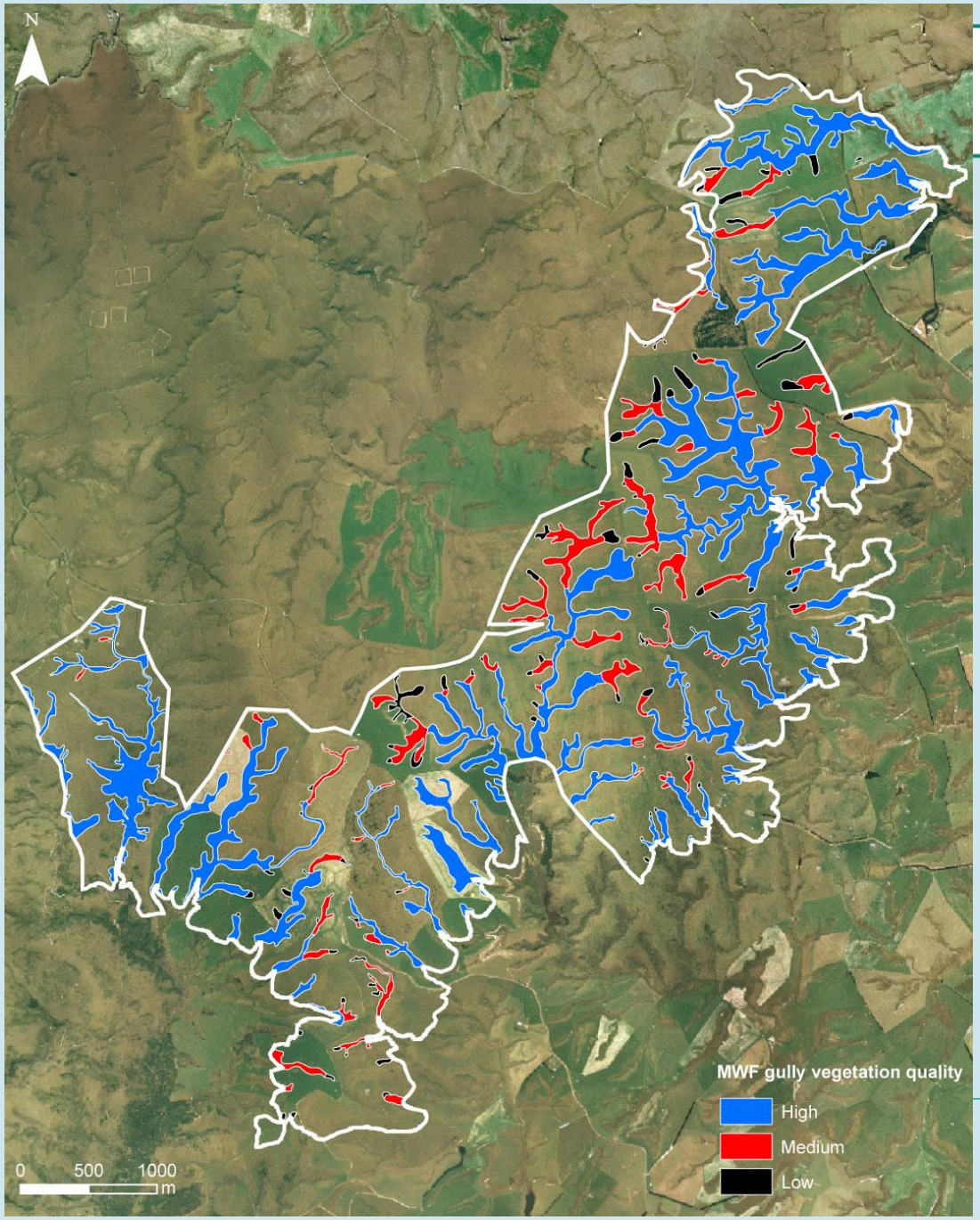

Gullies

Network of small watercourses and ephemeral stream gullies.

Gully Vegetation Quality	Total Area ha	Percentage
High	270.0 ha	75.2%
Medium	63.0 ha	17.6%
Low	26.0 ha	7.2%

- Low - highly degraded, little or no ecological values.
- Medium - moderately degraded, moderate ecological values.
- High - minimal degradation, significant ecological values.

Potential Effects

Disposal of fill in gully headwaters

Construction of tracks

Management

Avoidance of high quality gullies and waterways

Criteria for gully selection developed

Rehabilitation of fill sites

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Wind and Water – Earthworks – Turbine locations at a minimum distance from gullies and wetlands; protected areas around gullies and wetlands

Access for migratory aquatic biota

- Multiple stream crossings
- Potential restriction for migratory fish or other biota movements (e.g., koura)
- Design of culvert important incl. gradient
- Opportunity to retrofit culverts e.g., spat rope

Earthworks – Avoidance, remediation and mitigation

- Avoiding earthworks directly in streams were possible.
- Minimising the area of disturbance and exposure of soils.
- Minimising fill site catchment area.
- Staging the earthworks
- Reinstating any disturbed areas as soon as practical.
- Implementing sediment treatment measures such as sediment pits, decant ponds etc.
- Collecting and treating sediment laden runoff before it can enter the subsurface drainage networks.
- Minimal alteration to flow paths, or redirect flows from one stream catchment to another

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Earthwork fill sites

Sedimentation effects from fill sites

Avoidance and mitigation of the potential for sediment to enter waterways and underground drainage networks is through the location of fill sites to avoid:

- Areas where there is (or will be) no surface drainage (post filling) (i.e., large sink holes or blind valleys).
- Sink holes.
- Exposed limestone surface outcrops (other than remnant boulders that can be moved).
- High quality

Management and Monitoring

- **Management Protocols**
  - Selection of Fill Disposal Sites
  - Culvert design guidelines
  - Sediment management plan
- **Monitoring and Mitigation**
  - Monitoring of Fill Disposal Sites:
    - Integrity
    - Downstream water quality/turbidity
  - Fish monitoring
  - Instream sediment monitoring
- **Adaptive management**

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Wind and Water: Less focus on water issues

The southern stoush over harnessing power of wind

With lake levels dropping and a power crisis looming, energy reporter **Grant Bradley** heads south to see if the answer is blowing in the wind

The Elliots have been farming Lammermoor Station for the past three generations and want to see their children do the same.

Tired of being battered by the crippling fluctuations in prices for the fine wool, sheep meat and beef they farm in the Maniototo, they want to harvest something with a more reliable return — wind.

Sue Elliot, Maniototo born and bred, reckons Project Hayes, Meridian Energy's plan to site the country's biggest wind farm on her farm and those of four neighbours, will mean salvation for them and the community.

"For us, it's about a dependable income. This is the kind of thing that could really help our community," she says.

The Elliots regularly work 16-hour days and see farm returns dip by 50 per cent between seasons. They are not following the swing to dairying sweeping through Central Otago and the Mackenzie Country further north.

Turbines on the property would provide tens of thousands of dollars in revenue and would not have the impact in the vast Lammermoor Range that opponents claim, says Elliot.

"We try and work with our land we don't work against it. We want to be here for generations."

This is country where mail is delivered three times a week, cellphone coverage is patchy and the local Paerau School has five pupils. The construction workforce would breathe new life into the area, she says.

Like other farmers, the Elliots are not given to speaking out but feel they have no choice given the campaign run by the project's foes.

While the landowners are backed by Meridian might, they face powerful opponents in a battle looking less like David versus Goliath by the week.

Artist Grahame Sydney, famed for his central Otago landscapes, told the Environment Court that given the choice he would rather see New Zealand consider building a nuclear power station — preferably near Auckland — rather than a windfarm in the area. Former All Black captain Anton Oliver has described the windfarm as a "Government-sanctioned corporate rort" and recent poet laureate Brian Turner says on the Save Central website the project is "a return to 'Think Bigism'."

Sue Elliot also runs a fly-fishing business in the Taieri River which meanders through the Maniototo Plain on her front door and is aghast at any thought of going nuclear.

"It would be a disaster for our green image."

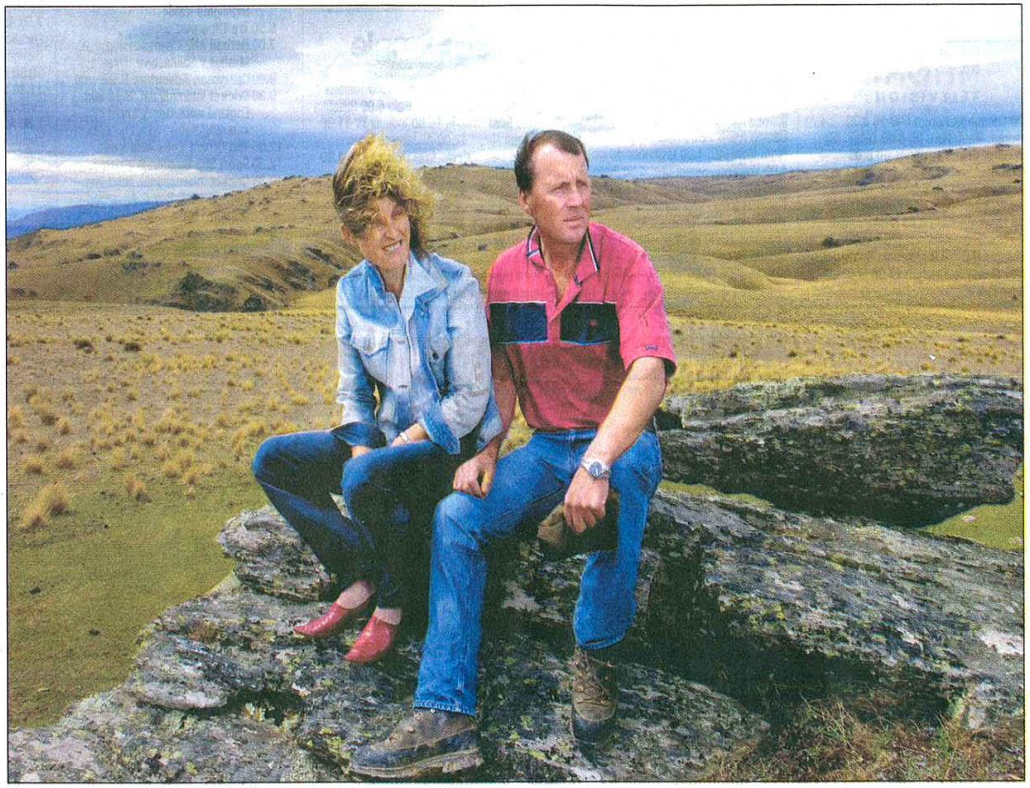
In Environment Court evidence last month, Meridian made a point of stressing the wind farm site did not prominently feature in an art archive produced by 30 artists expressing Central Otago landscapes. Sydney said: "To say that demonstrates any lesser significance is churlish."

The latest big name to lend weight to opposition is another former All Black, David Kirk, who is the head of Fairfax Australia and a friend of Grahame Sydney.

He personally paid for an advert in a Sunday newspaper which featured a defaced version of a landscape painting by Sydney under the headline "100% Vandalism". On Friday Sydney said Kirk's support gave opponents "another layer of seriousness".

He said the growing threat to power supplies had helped his group because public attention was now on power planning and, by extension, the reliability of wind.

Sue Elliot is bemused by the attention the area is now getting.



WINDY COUNTRY: Sue and John Elliot on their property in the Lammermoor range, potentially the future home of New Zealand's largest wind farm.

"People used to look up the Maniototo and say 'that's where all the crap weather comes from'.

From the road, anyone driving into the area will only be able to get glimpses of the wind farm which is on private land, she says.

When the *Herald* visited last week, in a Meridian-run media visit, access to the 200sq km windfarm site was restricted by poor road conditions.

While not giving details, Meridian says Hayes is a notch down from prime wind sites around the country but the Elliots say it's nearly always blowing on the top of the farm in country already extensively modified by an irrigation scheme.

It is especially windy in spring.

"While the wind was howling we could be using it and leaving water in the lakes," says Sue Elliot.

The Project Hayes scrap is a variation on theme for Meridian.

It cancelled its $1.2b Project Aqua hydro development further north on the lower reaches of the Waitaki in March 2004, after strong opposition from some of the same figures involved in the present fight. Aqua would have been almost the same size as Hayes and its power would have been close to coming on-stream now.

Spokesman Alan Seay says wind could provide up to 30 per cent of the country's power needs, as long as the wind farms were spread far and wide.

Apart from high-profile opposition, there had been strong support from locals who see power use soaring, driven by demands for warmer homes and the South Island dairy boom.

"New Zealand's got to get its power from somewhere, and most people realise this."

PROJECT HAYES

- Meridian Energy wants to build what will be a world-scale wind farm on the Lammermoor Range, 70km north-west of Dunedin.
- The wind farm on five properties will have 176 high turbines capable of generating 670MW — and at maximum output could supply up to 263,000 homes.
- Meridian says it is the perfect complement to hydro generation, allowing it to conserve lake water when the wind's blowing, particularly in spring.
- Opponents say the area's beauty will be spoiled by access roads and turbines over 100m high at blade tip. They also question the reliability of wind power.
- The Environment Court is now holding hearings on the project.

> 'We try and work with our land we don't work against it. We want to be here for generations.'
>
> Sue Elliot

Acknowledgements

- I thank NZWEA for their support and organisation of this Wind and Wildlife session.

Potential multiple impacts on freshwater ecosystems from wind farm construction but careful management will avoid or minimise impacts

Thank You!

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