

Tidal Power Generation: The Kaipara Harbour

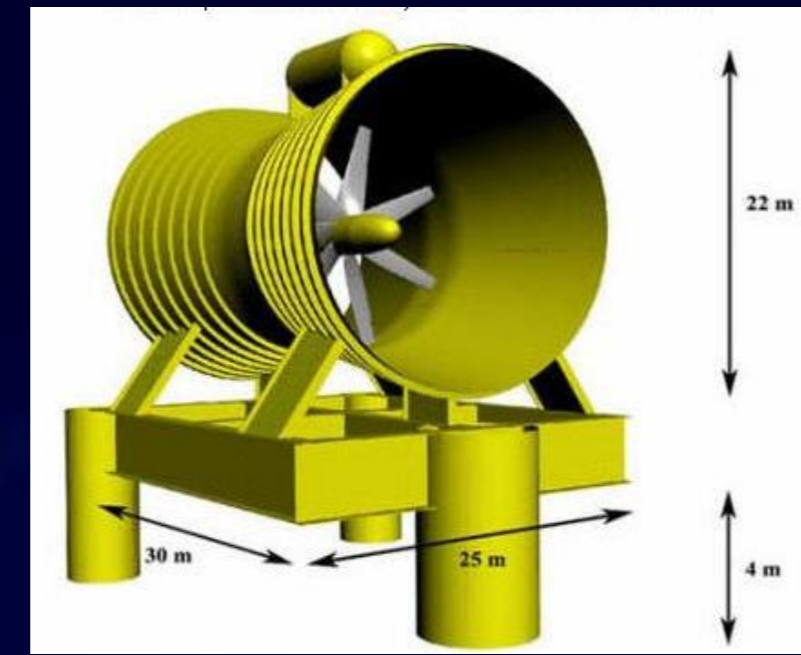
As of March 17, 2011, Crest Energy was granted resource consent to build a tidal power project with 200 turbines producing an estimated peak output of 200MW and costing \$600 million. This is enough power for around 250,000 homes. It is arguably the most reliable form of renewable energy and is aligned with New Zealand's goal to have 90% electricity generation from renewable resources by 2025. However the project may significantly affect local Tangata Whenua whom feel they were not consulted adequately during the consent process and have concerns for the marine environment.

What is Tidal Power?

Tidal power harnesses the kinetic energy of tidal currents produced mainly by the gravitational pull of the moon and sun. Due to the consistency in the moon's orbit the variations in the tides can be accurately calculated.

Tides in New Zealand range between one and two metres. They are particularly strong at the entrance to the Kaipara Harbour.

In this case study, tidal power is produced by placing marine turbines on the ocean floor 30m deep over a 10km stretch of the channel. They will be supplied by the Irish company OpenHydro, a pioneer in marine turbine technology. They manufacture the open centre turbine which is lubricant free posing less risk of pollution and its rotor is slow moving posing less risk to marine life.



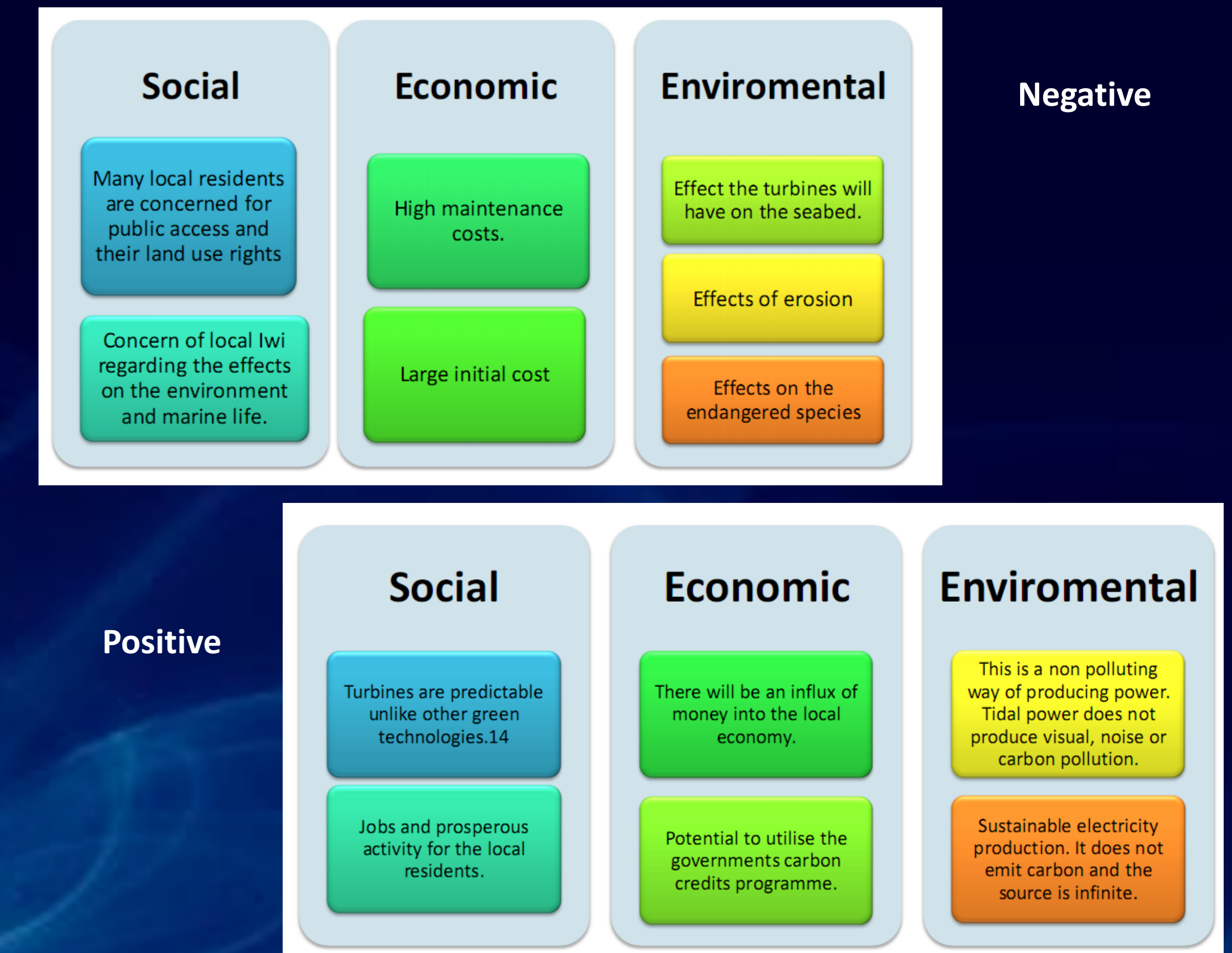
The controversy involves the approval and communication process. This year resource consent was granted to Crest Energy Ltd by the Environment Court with strict restrictions on how fast they can build the farm and the amount of environmental monitoring that must take place.¹⁰ However, after consent was granted many locals felt they were not informed sufficiently during the application process.

What is the Controversy?

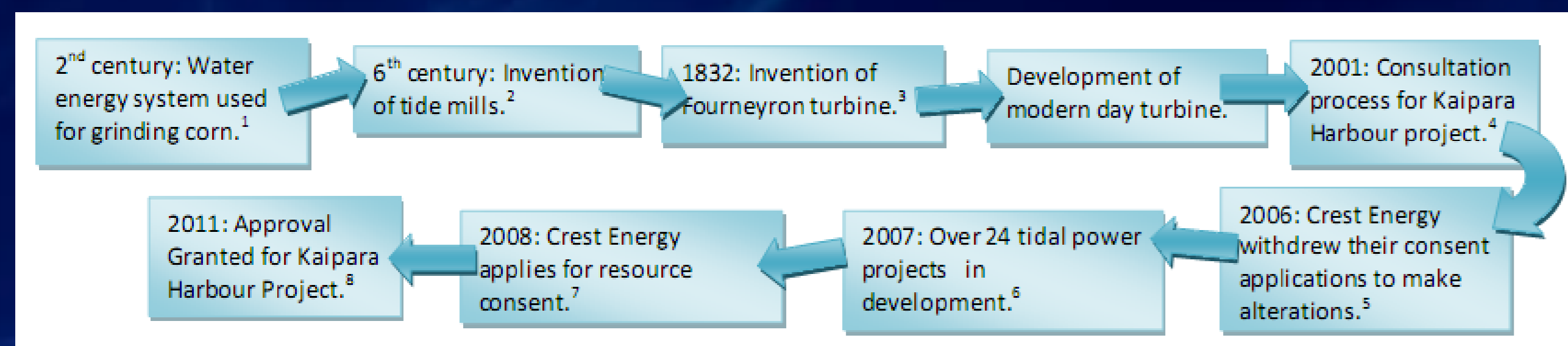
The concern of the local groups included the marine life in the harbour, the effect on the seabed and what it will mean for access to the harbour entrance.¹¹ This has led to many groups getting together for meetings and Ngāti Whātua calling for protest and a citizen imposed ban.

The Kaipara Harbour is the largest on the planet and home to many endangered species. The harbour has one entrance with masses of water going through it daily, making it ideal for tidal power.¹² However, it is a marine reserve except for a small section at the harbour mouth. This is the proposed spot for the farm.¹³ If the majority of an area is a reserve then why risk turbines near it? Lastly, with the harbour only having one entrance, local users are concerned as they have not been informed on how the turbine farm will affect their use of the harbour.

Positive and Negative Effects



Historical Timeline



Analysis of Evidence

Evidence For Tidal Power	Evidence Against Tidal Power
<p>Tidal power is a sustainable and renewable way to produce power: Renewable energy is considered to be "Any source of energy that can be used without depleting its reserves".¹⁸ Additionally, sustainability is "meeting the needs of today, without impacting on the needs of tomorrow".¹⁸ Tidal power is renewable and sustainable because it is an infinite source. Furthermore, evidence shows that tidal power is the best form of energy in regards to emitting the least amount of CO₂. A study by Auckland University students funded by Crest Energy has shown that tidal in comparison to wind, hydro and geothermal energy, is the cleanest form of renewable energy in terms of CO₂ emissions.²⁰</p> <p>Economic gain for locals of the area: Although many of the technical jobs for the planning and construction of the project will be taken from people overseas, there will be the opportunity for ship building and construction labour jobs during this 10 year period.</p> <p>In 2006, a study was carried out by Business and Economic Research Ltd (BERL) for a unit of Trade and Enterprise called The Industry Capability Network.²¹ It was revealed that for every \$1 million spent on manufacturing activity in New Zealand generates 11 extra jobs. It also creates NZ\$117,000 in tax revenue, \$195,000 of purchasing power and \$119,000 saving of government welfare payments.²² As this project's budget is NZ\$600 million, the number of jobs available for those living in the Northland area is substantial.²³</p> <p>Meeting New Zealand's Electricity Needs: Tidal power generation will help New Zealand keep to policies and commitments on renewable energy. New Zealand is committed to sourcing 90% of it's power needs from sustainable sources by 2025²⁴ and further through international treaties such as the Kyoto protocol to reduce carbon emissions.²⁵ This agreement is to encourage global interest and initiatives in mitigating climate change and was signed by New Zealand in 1997. The turbine farm would help meet these targets and obligations.</p> <p>New Zealand currently has a growing population and an increasing demand for power. Even without our population's natural increase we still need to supply more power due to our everyday consumption increasing.²⁶ It is currently predicted that by 2025 New Zealand will need a power supply 20% greater than today.²⁷ This project, when at full capacity will be able to supply power for 4% of the country.²⁸ Though this does not seem like a lot, it translates to enough power to supply Cape Reinga to Albany. Furthermore, if this farm proves successful, there could be future applications in the Cook Strait.</p>	<p>Potential Adverse Effects on the Maui Dolphin: There are concerns that the noise created by the turbines will disturb the Maui dolphin.²⁹ One of the most endangered fish species with around 150 individuals, the Maui dolphin uses sonar to navigate, find food and suitable breeding locations. There is a plan to monitor the dolphins via a satellite tracking device however research is still being carried out as to the effectiveness of this³⁰.</p> <p>Economic Viability: It is questionable whether or not the project is economically viable: •Tidal power is 3 times more expensive than onshore wind power generation³¹. •Turbines to be removed for one week every four years for maintenance³² •Replacement every 10 years due to silting and corrosion •Costs will be drawn out •No foreseeable short term profit for Crest Energy •Potential cost of removing turbines if adverse environmental affects arise •High cost due to infancy of technology</p> <p>Maori traditions: The hapū, Uri O Hau, from the tribe Ngāti Whātua, are concerned about the implications on their spiritual culture.³³ This includes concerns for all animals in particular the West Coast Snapper.</p> <p>There are also historical legacies about boats being shipwrecked around the Kaipara Harbour heads. Approximately 32 shipwrecks occurred in the harbour from between 1830 and 1880 alone³⁴. This area is very culturally sensitive to Maori because they deem the wreck sites as tapu, meaning they hold spiritual values and should not be disturbed.</p> <p>The importance of the Maori cultural values has resulted in many well-attended tribal meetings to make the inlet of the harbour a sacred site, or Wahi tapu³⁴. Uri O Hau have decided to show their strong opposition by enforcing a traditional cultural ban known as an aukati or "no trespass" ban on Crest Energy if the project goes ahead. This will prevent Crest Energy and its contractors from entering an area 7km long and 2km wide at the harbour mouth, but will still be open to the public.³⁵</p>



Stakeholders

Stakeholders	Gains and Losses
Crest Energy	<p>Gains: -The Emissions Trading Scheme may mean the spot market electricity price line rises 10% over time.⁹ -Provide Voluntary Emission Reductions (VERs) which are likely to trade at a discount to Kyoto carbon credits.¹⁰ -Potential to lead tidal power generation in New Zealand and advance development of renewable power technologies. -Economic gain due to the demand of power generation expecting to rise by 2% annually.¹¹ -Awarded \$1.85 million from the New Zealand Marine Energy Deployment Fund with the potential to be awarded \$8 million.¹²</p> <p>Losses: -Had to withdraw original consent applications and create a revised application with many modifications from community and stakeholders' feedback. E.g. the cables, substation and reducing the amount of turbines to three to monitor any environmental impacts.¹³ -Te Uri O Hau Settlement Trust are uncooperative with Crest Energy and successfully prevented them from getting a priority hearing. -Will have to maintain the turbines and replace them each decade due to corrosion. If the project is closed down they will suffer a significant economic loss.</p>
Ngāti Whātua and Te Uri O Hau Settlement Trust	<p>Gains: -Te Uri O Hau Settlement Trust place a percentage of shares in the company under community ownership so the Maori population has a chance to voice opinions within the company.¹⁴ -Te Uri O Hau Settlement Trust supply free and/or subsidised domestic power supply to the Pouto community.¹⁵</p> <p>Losses: -Project could be a catalyst for irreversible environmental harm to their precious taonga such as land, water and animals. -Unsure as to who owns the project area due to the Seabed and Foreshore Act.</p>
Local Residents	<p>Gains: Get energy to power 250,000 houses.¹⁶ Job opportunities for the community.</p> <p>Losses: Anchoring problems for boats because of underwater cables and turbines alongside difficulty in navigation due to the artificial sandbar created by the turbines.</p>
Northland Regional Council	<p>Losses: This underfunded council has the responsibility of monitoring impacts of turbines which is expected to cost between \$500,000 and \$1,000,000 per year.¹⁷</p>
Department of Conservation	<p>Gains: Supporting renewable and sustainable electricity source.</p> <p>Losses: Concern that construction will lead to degradation of the marine reserve and the remaining environment.</p>

Discussion

The evidence suggests that Kaipara Harbour may not be the most appropriate environment for an experimental technology. There are no case studies of seawater turbine farms with environmental conditions quite like the Kaipara Harbour anywhere in the world. With many unknown effects, especially in relation to the evidence for the Maui Dolphin, this new technology should be put in an environment with less factors of risk. Furthermore, with the vast majority of this harbour being a marine reserve, it goes against basic protective principles outlined by DOC. It doesn't seem economically viable to have experimental turbines situated at the single inlet to the harbour. Lastly the connection that local Ngāti Whātua have with the land, is a driving factor for preserving this environment and may affect the outcome Crest Energy and the government may want.

The evidence promoting tidal power has shown to be significantly in favour of it. Evidence of tidal power being a good initiative is seen through its sustainability, its renewability, and that it upholds New Zealand's obligations both politically and environmentally. As the world moves away from the age of oil and into an era battling against climate change, technology that meets the above key requirements will be essential for the future. Exploiting tidal energy is soon going to become a technological and economic necessity as we change to the extensive use of electricity, to power technologies such as electric cars. Considering there are no greenhouse gas emissions once completed, tidal energy can significantly benefit New Zealand.

In the near future, tidal power will be a major contributor to New Zealand's power supply. As a country we are committed to our clean green image, in order to keep this, we require our energy source to be environmentally friendly. Though the Kaipara Harbour may not be the best place to experiment with tidal power technology there is definitely a place for it in New Zealand's future. There are other places in New Zealand that would be more suitable for tidal power, the largest of these being the Cook Strait. The Cook Strait has the potential to supply large quantities of power and has an area large enough to chose from without impacting on the Marlborough Sounds. Tidal power is a great technology with huge potential to help New Zealand achieve green energy targets and meet rising demands for power. It will be essential in our future energy development but a different experimental site should be chosen.

¹ Ahni. 2011. *New Zealand: Kaipara Guardians Planning Cultural Ban Against Tidal Power Project*. Retrieved from <http://www.kaipara.govt.nz/~/media/Files/2011/08/17/kaipara-guardians-planning-cultural-ban-against-tidal-power-project.pdf>

² Crest Energy. (2011). *Frequently Asked Questions*. Retrieved from <http://www.crest-energy.com/~/media/Files/2011/08/17/FAQs.pdf>

³ Argo Environmental. (2009). *Crest Energy Kaipara Harbour Marine Turbine Project*. Retrieved from http://www.argoenv.com/~/media/Files/2009/08/17/Argo_Environmental_Summary_111100.pdf

⁴ Blarum, A. (2003). *What is renewable energy?* Issues (64), 3-4

⁵ Ibid

⁶ Crest Energy (2011).

⁷ Energy, C. (2010). *Tidal Power*. Retrieved 9 7, 2011, from Crest Energy: <http://www.crest-energy.com/>

⁸ Northern Advocate. (2011). *Ngāti Whātua call for ban on turbines*. Retrieved 9 3, 2011, from <http://www.nzherald.co.nz/nzherald/story.cfm?storyid=1011780>

⁹ Energy, C. (2010). *Tidal Power*. Retrieved 9 7, 2011, from Crest Energy: <http://www.crest-energy.com/>

¹⁰ Energy, C. (2010). *Tidal Power*. Retrieved 9 7, 2011, from Crest Energy: <http://www.crest-energy.com/>

¹¹ Clark, L. (2007). *Harnessing the power of the sea*. NZ Energy, 1 (1)

¹² Crest Energy (2011).

¹³ Crest Energy (2011).

¹⁴ Crest Energy (2011).

¹⁵ Authority, E. E. (2011, 08 31). *Energy Strategy sets direction for New Zealand's energy future*. Retrieved 9 3, 2011, from Energy Efficiency and Conservation Authority: <http://www.eeca.govt.nz/node/13340>

¹⁶ Environment, M. f. (2010, 4 15). *International forums and agreements*. Retrieved 9 3, 11, from Ministry for the Environment: <http://www.mfe.govt.nz/issues/climate/international/kyoto-protocol.htm>

¹⁷ Authority, E. E. (2011, 08 31). *Energy Strategy sets direction for New Zealand's energy future*. Retrieved 9 3, 2011, from Energy Efficiency and Conservation Authority: <http://www.eeca.govt.nz/node/13340>

¹⁸ Ibid

¹⁹ Ibid

²⁰ Authority, E. E. (2011, 08 31). <http://www.eeca.govt.nz/node/13340>

²¹ Radio New Zealand. 2011. *Protest at Tidal Power Project Planned*. Retrieved from <http://www.rnz.co.nz/news/national/122793/protest-at-tidal-power-project-planned>