

TARANAKI

2050

ENERGY

TRANSITION PATHWAY ACTION PLAN

DECEMBER 2019

venture
TARANAKI
Te Puna Umanga

ENERGY

TRANSITION PATHWAY ACTION PLAN

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Context

New Zealand, as a nation, is moving towards a low-emissions economy.

In April 2018, the coalition Government announced it would grant new petroleum exploration permits only for onshore Taranaki and nowhere else. This decision has the potential for significant negative impact on the economies of both Taranaki and New Zealand if we do nothing. This is particularly true for Taranaki, given the energy sector represents 28% of the regional economic output¹.

The exploration decision is part of a much wider picture. The world has committed to taking action to lower greenhouse gas emissions. In 2016, New Zealand ratified the Paris Agreement. Under this agreement, New Zealand needs to reduce emissions to 30% below 2005 levels by 2030.

Both the New Zealand Productivity Commission, in its final report on transitioning New Zealand to a low-emissions economy in August 2018 and the Interim Climate Change Committee in its reports released in July 2019, recommend a series of actions that can be taken to reduce emissions.

In 2016, New Zealand's two largest contributing sectors for emissions were agriculture and energy (including transport)². These sectors are a key part of Taranaki's economy, and while forestry has considerable potential to offset emissions, a significant transition to a low-emissions economy will be required.

The past shows us that the impact of large transitions, such as what we need to do to lower our emissions, can lead to a legacy of negative impacts for some. A just transition is about managing these effects to continue to build a fair and inclusive New Zealand. For Taranaki it means ensuring we keep what is great about our region while planning for more people to share in this. A just transition requiring system-wide behavioural and institutional change to ensure more parity in outcomes for people is needed. Co-creation with communities, iwi, local and central government, businesses, educators, unions and workers is the cornerstone of the approach we are taking in Taranaki.

Our vision for 2050: a low-emissions economy

Our vision for Taranaki in 2050 has been co-designed by the region. It considers not just how our economy will change, but all aspects of our lives, and provides the opportunity to plan for inclusive growth as we transition to a low-emissions economy.

The Taranaki 2050 Roadmap was launched as a draft on 9 May at the Just Transition Summit in New Plymouth and issued in its final form in August 2019 after input from the public.

The Roadmap is the first step taken as a region in developing a just transition plan to a low-emissions economy. The draft was the culmination of 29 workshops on 12 transition topics, plus surveys and community outreach, as well as a creative challenge and specialist workshops/engagement for youth. More than 14,000 people viewed the introductory online video, and the process engaged ideas from more than 1,000 people. The workshops mixed the diversity and talent of our region with specialist expertise from around the country.

¹ *Tapuae Roa: Make Way for Taranaki Strategy, August 2017, p.52*

² *The New Zealand Productivity Commission, Low-emissions economy: Final report, August 2018, p.30.*

Following the launch of the draft Roadmap, public consultation included visits to more than 40 locations with over 1,000 people. Twenty-five separate email submissions were received from individuals and organisations that represented thousands of individuals, as well as 135 submissions via our online interactive tool.

The final Taranaki 2050 Roadmap is the first step taken as a region in developing a transition plan to a low-emissions economy. It is the creation of over 40 workshops with more than two thousand people, plus surveys, community outreach, as well as a creative challenge and engagement for youth.

Themes

The people of Taranaki have a vision for 2050 that includes:

- *A strong sustainable environment;*
- *Education options that move and flex with a changing world;*
- *Attractive jobs;*
- *A similar lifestyle to the one we enjoy now;*
- *Leading the way in sustainable, low-emissions energy; and*
- *A region that looks out for and cares for itself and its people.*

While there were some divergent views for the future of Taranaki across participants, there were also many common themes. What unites us as a region is stronger than what divides us as a region. The main consistent themes were: sustainability, inclusivity and enterprise.

These themes reflected the Māori values of guardianship of people and our environment (similar to kaitiakitanga), the importance of community and caring (similar to manaakitanga), and the need for collective action in our move forwards (similar to kotahitanga). They also signified a focus on long-term outcomes that span generations.

To read more about the co-design process used for creating the Taranaki 2050 Roadmap, visit www.taranaki2050.org.nz

Taranaki 2050 Roadmap

The following is an excerpt from the Taranaki 2050 Roadmap – our Just Transition to a low-emissions future, specifically from the section on “Energy”.

To read the full introduction, vision, co-design themes and emerging opportunities that were co-designed by the region in the Taranaki 2050 Roadmap, visit

[http://about.taranaki.info/Taranaki2050/Taranaki-2050-Roadmap-\(1\).pdf](http://about.taranaki.info/Taranaki2050/Taranaki-2050-Roadmap-(1).pdf).

Energy and the Taranaki 2050 Roadmap

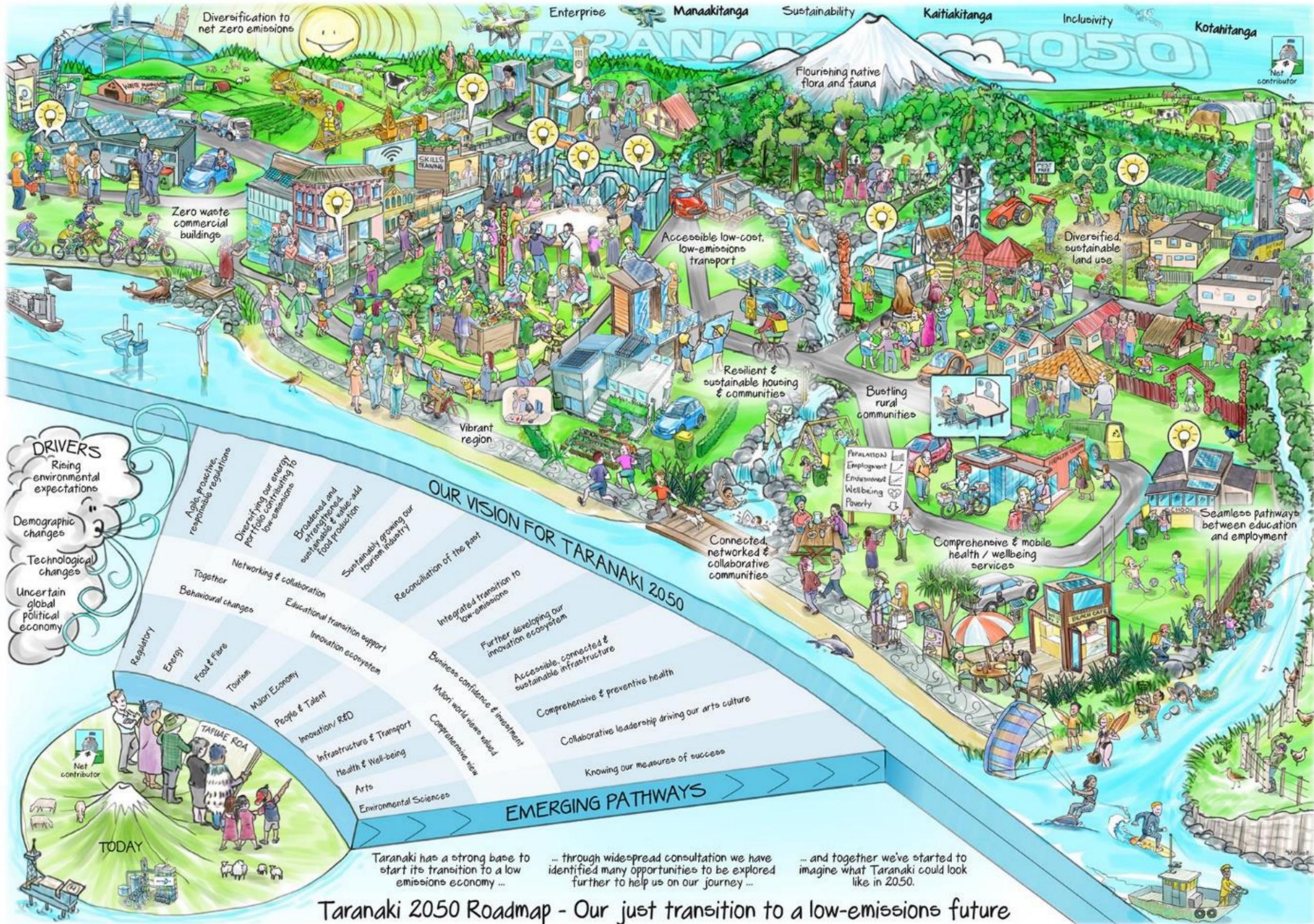
Introduction

- *The energy sector dominates Taranaki’s economy, producing 28% of our GDP and generating \$2.08 billion annually³.*
- *The fossil fuel component of the energy sector, including transport, is a significant contributor to greenhouse gas emissions. It is widely recognised the global energy system will undergo a fundamental transformation over the coming decades towards low-emissions energy sources.*
- *Efforts have begun in Taranaki and across New Zealand to transition our economy to low-emissions. These efforts include reducing emissions from existing infrastructure and making sure we have a secure, affordable and sustainable energy sector (the energy trilemma) over the medium and long term.*
- *Taranaki has existing assets to help drive new clean energy innovations for New Zealand. These include high-quality energy infrastructure, strong engineering and health and safety skills and knowledge, international networks, established energy firms and supply chain, and a natural resource base to support new energy development.*

Energy vision for Taranaki 2050

- *In 2050, Taranaki has positioned New Zealand as a leading light on the world stage for new energy developments*
- *In 2050, Taranaki is recognised as a centre of new energy excellence*
- *In 2050, Taranaki makes a significant contribution to a coherent New Zealand energy system that is secure, affordable, and sustainable.*
- *Our existing resources help support a transition to renewable energy while using existing infrastructure.*

³ Tapuae Roa: Make Way for Taranaki Strategy, August 2019, p.52.



Taranaki 2050 Roadmap - Our just transition to a low-emissions future

National strategies and plans

Wider national strategies⁴ and plans will reflect and influence what happens through the Taranaki 2050 Road Map and the subsequent Transition Pathway Action Plans (TPAPs).

Transition Pathway Action Plans (TPAPs)

Following the finalisation of the Taranaki 2050 Roadmap, the Lead Group (20 volunteers from the seven pou of local business, iwi, community, unions, education, and local and central government who guided the co-creation of the Roadmap) and a sub-group known as the Design Council, developed a 'framing' process commonly used in the energy sector. Participants of the Energy workshops that helped co-design the 2050 Roadmap, representing a broad mix of the seven pou and with subject matter expertise, were invited to attend TPAP workshops whilst others attended via an expressions of interest process on the Taranaki 2050 website.

In September 2019, the Energy TPAP framing workshops were held.

Based on the Co-design themes and the emerging opportunities identified in the Taranaki 2050 Roadmap, the methodology took the divergent thinking and opportunities identified in the Roadmap and channelled them into a more convergent set of tangible actions and outputs to define the short-term actions and medium-term strategy needed to achieve the region's long-term vision for 2050.

Action Framing

Action Framing is a process of gaining alignment on 'where we want to be?' and 'how to get there'. It's a structured dialogue that creates common understanding on what the opportunity is and agreement and commitment on the path forward.

The process results in a series of outputs that can be applied consistently across all Transition Pathway topics to produce action-oriented outcomes. The outputs are as follows:

- Action Statement
- Givens
- Critical Success Factors
- Threats and Opportunities analysis
- Stakeholder Analysis
- Draft Action Plan.

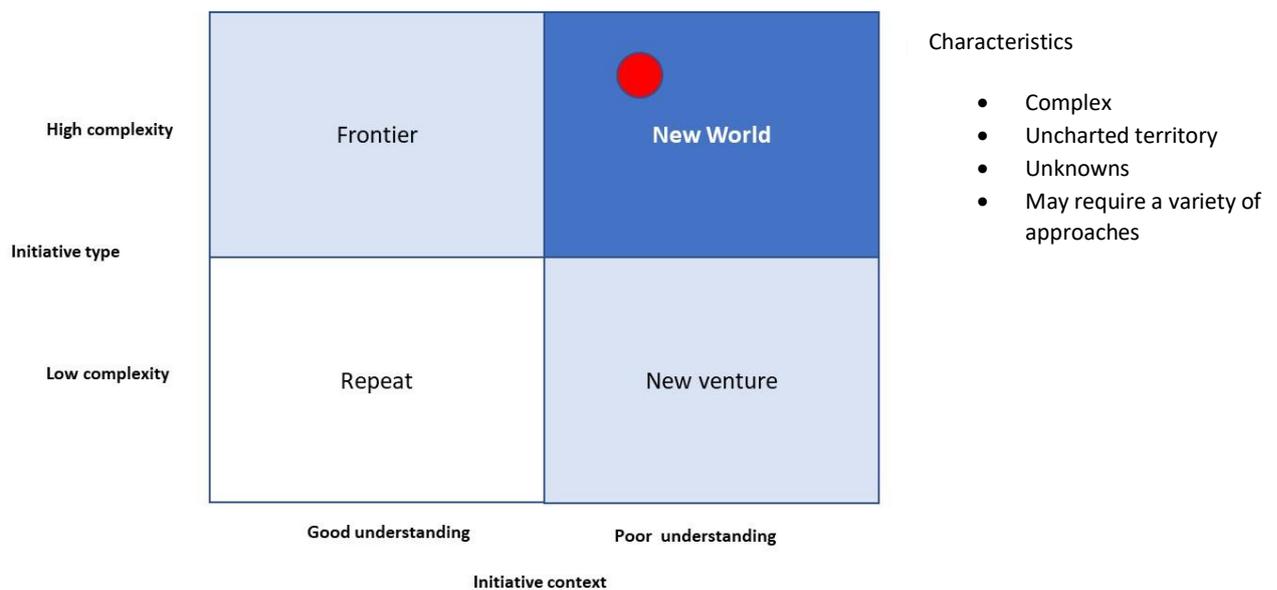
⁴<https://www.beehive.govt.nz/release/govt-plan-productive-sustainable-and-inclusive-economy>
<https://www.mbie.govt.nz/assets/868e03d347/transitioning-to-more-affordable-and-renewable-energy-the-energy-markets-work-programme.pdf>
<https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-strategies-for-new-zealand/>

Energy TPAP report

The output from the 1.5 day TPAP workshop and the Energy Transition Pathway Action Plan are described in this document. In preparing it, the Taranaki 2050 team would like to thank everyone who has been part of the process. Your contribution has made a real difference in defining the short-term actions and medium-term strategy needed to meet the goals and vision of the Roadmap. We recognise your time commitment, but more importantly, your respect for the value of manaakitanga during the process. By showing respect, generosity, and care for others, you helped create an environment where people felt comfortable sharing diverse opinions.

Energy Transition Pathway Action Plan: Outputs

The participants of the Energy TPAP workshops carried out an assessment as to the complexity of the initiative to get to a low-emissions energy economy. This was plotted below. Participants identified that the project is complex with many unknowns that may require a variety of different approaches given the project was marked as being in 'New World' territory.



Action Statement

It was important for the workshop participants to agree on what the Energy Transition Pathway Action Plan would be about. It would provide boundaries as to what was in scope and the objective of the project. The Action Statement developed aims to define the essence of the action, for example:

- What do we want to do?
- What, precisely, is the Action?
- What value does it bring the region?
- How does it align to low-emissions?
- It had to have many characteristics of the elevator pitch:
 - Creates common understanding
 - Used for communication
 - Describes the full life cycle of the opportunity.

The Action Statement developed at the Energy TPAP workshop was:

“Using our knowhow and resources we will transition to a world-leading energy eco-system that provides sustainable, secure and affordable low-emissions energy by 2050, while creating meaningful work⁵, community well-being and prosperity for generations to come.”

⁵ Meaningful work – As defined by relevant national and international standards, such as the United Nations and the International Labour Organisation’s definition of decent work.

Critical Success Factors

Critical Success Factors are the supporting activities or requirements that need to happen for the Action Statement to be realised. Participants at the Energy TPAP workshop defined the following critical success factors:

1. We need an appropriately regulated environment (policy and legislation)
2. We need measurement and accountability against the Taranaki 2050 Roadmap, with some quick wins and targets
3. Accountability and ownership with governance and leadership
4. We need significant investment and funding in the actions that we identify
5. We need to have retention, attraction and development of diversified skills and talent in Taranaki
6. We need engagement, participation and ownership from the seven pou of the Just Transition and other stakeholders
7. New Zealand Incorporated thinking framework and partnership.

These Critical Success Factors were finalised into the following:

- a. Governance and leadership that ensures ownership and accountability for committed outcomes
- b. Participation, ownership, collaboration, trust and commitment from all stakeholders
- c. An agreed action plan, approach and targets against which progress can be monitored and evaluated
- d. An environment that supports retention, attraction and development of skills in Taranaki
- e. Appropriate Government support through policy, legislation and funding of pilot projects and programmes
- f. New Zealand/Taranaki Incorporated mindset and approach that is connected with other regions and Government.

Givens

Givens are known elements that will not change. Participants at the Energy TPAP workshop identified the following givens:

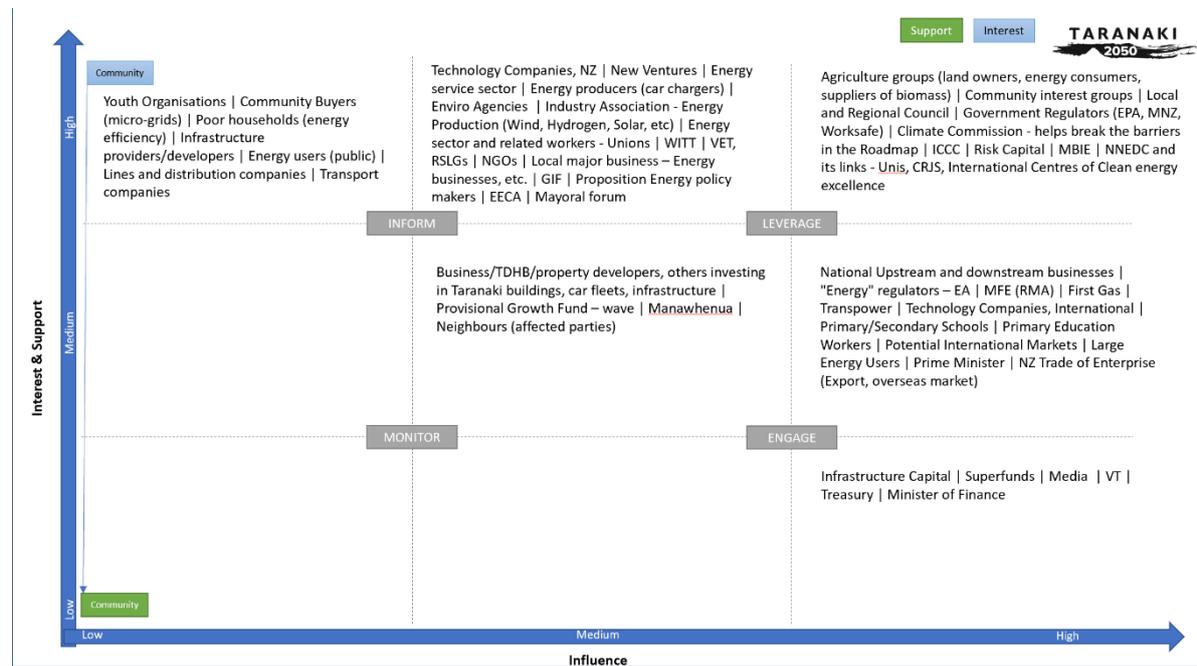
- Energy efficiency can contribute to low-emissions
- The future will not be like the past
- There is no one silver bullet
- People do not want their standard of living to decline
- Technology will continue to change
- For transport fuels we must progressively move away from hydrocarbons
- The cost of carbon is increasing
- We are going to need to change faster and further than most people think
- We have a responsibility to future generations
- All energy technologies have environmental and economic challenges
- Planning helps transitions to be just
- NZ has plentiful renewable resources along with constraints on their development
- The economics we use today will be challenged through transition
- We will not always be successful, so we need to fail safely and fast
- We will get better results from whole system thinking, experimentation and iteration
- Social licence is changing
- Constant economic growth is unsustainable
- Gas will be fundamental to a successful transition.

Stakeholders

It is important to identify all the relevant stakeholders in the Energy Transition Pathway Action Planning process. The workshop participants spent time collectively:

- Identifying all internal and external stakeholders
- Assessing their influence on the project
- Assessing the issues and needs for each of the key stakeholders
- Developing an engagement plan to obtain all necessary approvals from them.

The stakeholders and their expected interest in the work and their influence on it are documented in the plot below:



Qualifications of some of these stakeholders are captured below:

- Community Buyers (micro-grids)
- Poorer households (energy efficiency)
- Energy users (public)
- Agriculture groups (land owners, energy consumers, suppliers of biomass)
- Climate Commissions - helps break the barriers in the roadmap
- NZ Trade of Enterprise (Export, overseas market)

A key step in the process is to review these stakeholders and build an engagement plan with each to ensure the right level of engagement is attained throughout the Action Planning timeframe. It should be noted that over time some stakeholders level of influence and interest/support will change, the stakeholder engagement plan will need to be updated regularly.

The National New Energy Development Centre

One of the key stakeholders in the Energy TPAP is the National New Energy Development Centre (NNEDC).

In May 2019, the Government announced that a National New Energy Development Centre would be established in Taranaki, as part of the region and New Zealand's transition to a low-emissions future.

The NNEDC will be an institution of national importance, playing an integral role in leading and facilitating energy innovation and supporting New Zealand's transition to a low-emissions economy, by fostering a new-energy eco-system, leveraging national and global knowledge and expertise and reducing the time, cost and risk associated with the development and commercialisation of new energy opportunities.

The NNEDC could have a significant role in leading and coordinating many of the actions set out in this action plan. Because of the depth of energy industry, infrastructure and expertise in Taranaki, which is fully contained in a very small geographic footprint, Taranaki has the opportunity to be a globally significant testbed for new energy innovation, focused on leveraging and repurposing the traditional oil and gas sector, providing both Taranaki and New Zealand a point of difference in the global shift to a low-emissions future. The NNEDC will play a lead role in supporting Taranaki's businesses and communities to transition to a low-emissions economy, position the region at the forefront of the energy transition and be an international success story.

Threats and Opportunities

At the workshops, participants worked collectively to think about the project as defined in the Action Statement and identified all the potential opportunities and threats that would need to be addressed in order to deliver a successful plan. Each were reviewed through the lens of PESTEL (Political, Economic, Social, Technological, Environmental and Legal).

436 post-its were collected in this phase of the workshop and have been summarised into 11 common opportunities and 20 common threats with corresponding mitigations.

Opportunities

The Opportunities identified are summarised as per below:

Political

- Sufficient funding for: investment in low-emissions technology, pilots, research
- Local Government and Venture Taranaki Trust (VTT) collaborating with other regions and internationally
- Enabling legislation and regulation in an agile world.

Economic

- Attract venture capital funding from businesses
- Ensure we are participating in the global shift to a low-emissions economy
- Opportunity for Government to fund and develop new energy infrastructure.

Social

- Working collaboratively and inclusively with community, stakeholders, Māori, unions, Government and local authorities
- New education and training delivery and platforms to upskill and retrain people
- Educate New Zealand on the just transition required and how it will occur and why it needs to occur, to achieve a low-emissions economy
- Use local capability, talent, leadership and innovation
- Don't miss the opportunity for communities to be empowered to solve the problems and enable community energy schemes.

Threats

A significant number of Threats were identified for all categories of the PESTEL. These are captured in separate spreadsheets and are summarised in the table below:

Taranaki 2050: Threat and Mitigation Summary

Type	Threat	Mitigation
Political	<ul style="list-style-type: none"> Lack of funding and budget for this multi-faceted project 	<ul style="list-style-type: none"> Appropriate Government funding for diverse range of low-emissions technologies
	<ul style="list-style-type: none"> Lack of continuity and certainty across political cycles 	<ul style="list-style-type: none"> Bi-partisan agreement to the energy transition programme to endure changes of Government
	<ul style="list-style-type: none"> Decision-making by any government causing negative medium-long term consequences 	<ul style="list-style-type: none"> Using an evidence-based approach to select investment opportunities
	<ul style="list-style-type: none"> World geopolitics impacting on New Zealand due to our island nation status 	<ul style="list-style-type: none"> We monitor and adapt
	<ul style="list-style-type: none"> Taranaki becomes irrelevant 	<ul style="list-style-type: none"> Local Government and VTT to collaborate with other regions and internationally
	<ul style="list-style-type: none"> Current legislation and regulation do not support the transition 	<ul style="list-style-type: none"> Legislation and regulation need to be enabling and agile
	<ul style="list-style-type: none"> Changes to legislation are too slow to keep pace with energy transition 	<ul style="list-style-type: none"> Legislation and regulation need to be enabling and agile
Economic	<ul style="list-style-type: none"> Not enough diversity of reliable and affordable energy 	<ul style="list-style-type: none"> Using an evidence-based approach of a diverse range of energy solutions/types to select investment opportunities
	<ul style="list-style-type: none"> Loss of existing business/ infrastructure causes a negative impact on local economy 	<ul style="list-style-type: none"> A locally integrated and collaborative approach to optimise infrastructure, skills, outages, technology changes, economics
	<ul style="list-style-type: none"> Increased future costs through importation of fossil fuels or poor decision-making and policy 	<ul style="list-style-type: none"> Understand supply and demand, full economic analysis and evidence-based approach to select investment opportunities
	<ul style="list-style-type: none"> Don't understand gaps in New Zealand supply and demand through transition 	<ul style="list-style-type: none"> Understand supply and demand, full economic analysis and evidence-based approach to select investment opportunities
Social	<ul style="list-style-type: none"> Impact of change on work skills, number of people employed 	<ul style="list-style-type: none"> New education, training delivery and platforms to upskill and re-train people Support and enable skill and capability retooling of operations and supply chain companies involved in oil and gas industry to extend skills and capabilities into broader energy platforms and complementary industries to ensure retention and growth
	<ul style="list-style-type: none"> Threat to well-being during transition 	<ul style="list-style-type: none"> Reduce impact of the transition through evidence-based approach to select investment opportunities to maintain affordability Educate New Zealand on the transition required and how it will occur and why it needs to occur to achieve a low emissions economy
	<ul style="list-style-type: none"> Energy becomes unaffordable 	<ul style="list-style-type: none"> Understand supply and demand, full economic analysis and evidence-based approach to select investment opportunities Government provides more support to vulnerable communities
Environment	<ul style="list-style-type: none"> The effects of the transition to a low-emissions economy have a negative impact on the environment 	<ul style="list-style-type: none"> All pilots, projects and new activities must have an Environmental Impact Assessment to support any proposals for funding Existing infrastructure must show its contribution to a low-emissions economy Educate New Zealand individuals on their own personal environmental effects
	<ul style="list-style-type: none"> Continuing to extract fossil fuels: delays transition and continues to emit GHGs 	<ul style="list-style-type: none"> Existing infrastructure must show its contribution to a low emissions economy
	<ul style="list-style-type: none"> Stepped conversion from coal to gas to renewable results in higher cost structure rather than converting coal to renewables directly 	<ul style="list-style-type: none"> Robust evidence-based economics must be carried out in support of energy investment changes

Energy Actions

During the workshop participants broke into four areas to build an agreed high-level action plan for each of the major areas:

1. Threats and Mitigation
2. Opportunities
3. Energy forms, for example; Hydrogen, Wind, Wave, Solar, Natural gas, Storage, Tide
4. Other, for example; Infrastructure, Manufacturing, Biogas/Biofuel, Integration, Geothermal, Carbon Capture Utilisation and Storage (CCUS) and Digital.

The Transition Pathway Action Plan was to identify:

- What activities should be undertaken and when
- The timeline, with dates for key milestone decisions
- The key decision points
- Any intermediate decisions between key decisions points
- The deliverables required to support the decisions.

Often a Transition Pathway Action Plan covers a detailed description of the activities in the next phases and an outline of activities in later phases; it is then updated as the Action progresses. Collectively, these actions are intended to move the region towards the Taranaki 2050 Roadmap vision and to give effect to the workshops Action Statement. Since the workshop, the actions have been grouped into five areas. By the time the actions are completed, we will have achieved the following:

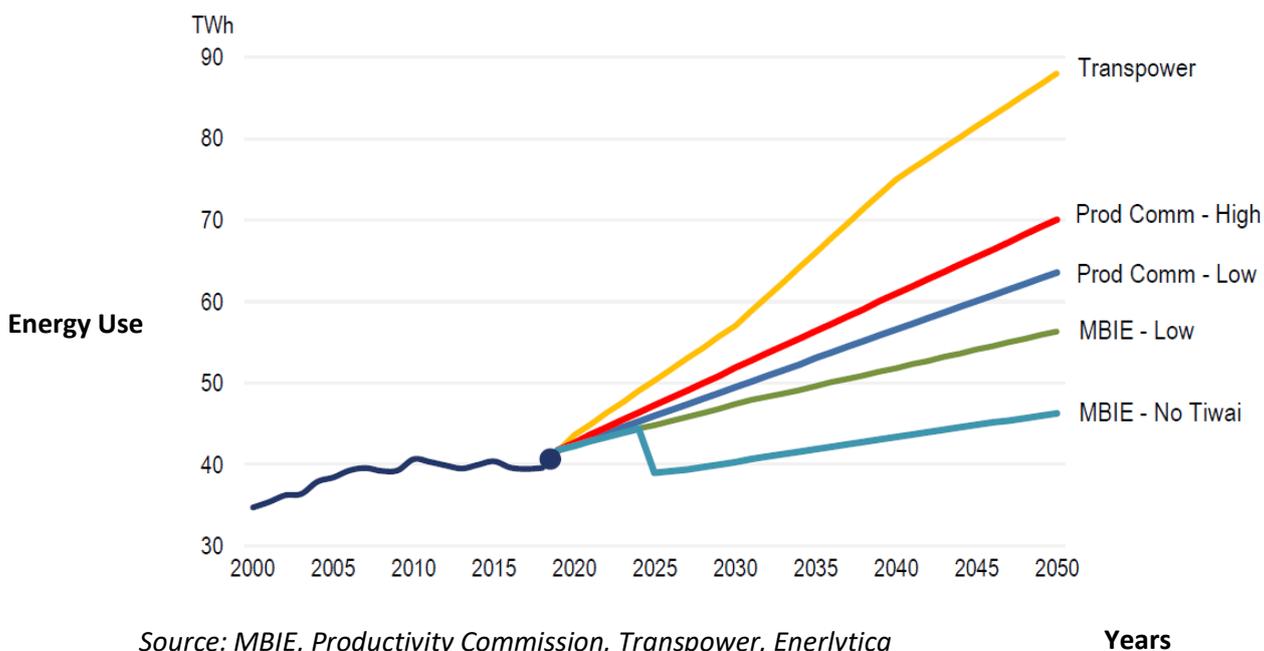
1. **Energy generation:** We know the mix of different energy generation types that we will pursue in Taranaki on behalf of the region and New Zealand. We will have identified which will be economic and what will be most suitable for the different energy requirements. We will know where they could be located, when they could be economically developed, and who could be developing them.
2. **Energy storage:** New energy storage processes are vital as we transition to greater use of variable renewable electricity generation. We will explore the potential for the Taranaki region to play an increasingly important role in energy storage.
3. **Energy and infrastructure:** We know whether, when, and how we could develop and use Carbon Capture Utilisation and Storage economically in New Zealand. We know how to optimise our existing energy assets across Taranaki. Our new generation types and infrastructure are being used and grown to scale and possibly used for export opportunities. We are building resilient energy systems across our communities.
4. **Energy adoption and education:** Our households, whānau, communities, schools and businesses understand and discuss the importance of energy, development and efficiency. Taranaki is a leader in positive collective behavioural changes towards low-emissions practices. Businesses and schools have tools and resources they can access to improve their energy efficiency and contribute to energy solutions for Taranaki.
5. **Energy investment:** We identify what funding is available, from whom, and for what purpose, and we have identified the gaps and likely returns on investment. We have developed solutions where there are gaps.

Energy generation

The Taranaki 2050 Roadmap describes Taranaki will be proactive in lowering New Zealand’s national emissions by displacing high-emissions from coal, enabling multiple new sources of energy such as wind, solar, wave, biofuel and related technologies. At the workshops, discussions have been about all the different technologies that could be used to make power in Taranaki (and New Zealand). We recognise that for energy generation in Taranaki there is no silver bullet – multiple types of energy generation will be needed to be combined to achieve our energy potential.

Energy generation is important for electricity use (especially with the electrification intensification New Zealand is expected to undergo⁶), and for its ability to convert to other types of energy and storage.

Work to date has identified several promising sources of energy generation that could be used in Taranaki. Some types of generation are more developed and proven than others. Some types of generation will be more appropriate for different uses than others. One fundamental issue that needs to be addressed is the likely electricity requirement of New Zealand out to 2050 given there are currently a wide range of forecasts as per the graph below.



⁶ Interim Climate Change Committee – Electricity inquiry, Final Report: <https://www.iccc.mfe.govt.nz/what-we-do/energy/electricity-inquiry-final-report/>

A summary of the different technologies available and our understanding of them in New Zealand is provided in the table below.

Table: TPAP Workshop and Taranaki 2050 Roadmap outputs showing focus of different energy generation

Proven technology, commercialised energy – discussion focused on how best to use these types of generation	Proven technology, unproven commercialisation – discussion focused on how to establish this in Taranaki	Not heavily focused on in workshops but used elsewhere in New Zealand	Not heavily focused on in outputs but raised in workshops
Onshore wind Small-scale solar Hydro	Offshore wind Wave energy Grid-scale solar	Hydro Geothermal (high temperature) Biofuels/bioenergy	Tidal Waste to energy Geothermal (low temperature)
<p>Actions should answer these questions:</p> <ul style="list-style-type: none"> • Are there locations in Taranaki with potential for these forms of generation? • What they will contribute to the energy supply? • How they will be linked and coordinated with other energy initiatives? (e.g. hydrogen production sites, energy resilience actions). 	<p>Actions should answer these questions:</p> <ul style="list-style-type: none"> • Can they produce energy economically? • Are they viable in Taranaki? • What is the role these will play in the Taranaki energy story? • What is the plan for getting these energy types to play their role? What barriers need to be addressed, and what is the plan for addressing any barriers? • How will they be linked with other energy initiatives? 	<p>Actions should answer these questions:</p> <ul style="list-style-type: none"> • Are they viable and economic in Taranaki? • What is the role they should play in the Taranaki energy story? • How will their role in Taranaki complement and strengthen the New Zealand energy story? 	<p>Actions should answer these questions:</p> <ul style="list-style-type: none"> • Are they viable and economic for Taranaki? • Is there a role for these in the Taranaki energy story?

A further question needs to be asked across all areas: will this create a sufficient amount of meaningful, secure income/work for the people of Taranaki?

The following sections provide some analysis of the electricity generation in New Zealand and what needs to be done to move each forward.

Wind (onshore)

Wind technology is already commercially viable and used to a reasonable extent (0.83% of total energy supply in 2018⁷) in New Zealand's energy generation. Two wind farms are currently under development including Tilt Renewables 130MW Waipipi Wind Farm currently being developed (at a cost of \$277m) located between Patea and Waverley in South Taranaki. A 16MW Wind Farm has also been proposed at Kapuni in association with a green hydrogen project involving Balance Agri Nutrients and Hiringa Energy.

Our workshops identified the key reasons to develop more wind generation in Taranaki were because of its proven commercial readiness in the region, and because the climate in Taranaki is conducive for wind generation.

- **Action:** A regional stocktake of planned wind farms and assessment of suitable locations for future wind farm development. The assessment should look at technical feasibility, commercial viability, consider the proximity to other energy infrastructure, and work with communities about their wants, secure meaningful employment opportunities and suitability. The stocktake and assessment should also identify the initial barriers to development – for example, the Resource Management Act (RMA), regulatory, finance issues.
- **Subsequent Action:** Make a plan for a coordinated network of potential wind sites (as part of the overall Taranaki energy plan). Clarify barriers to development, such as RMA or legislation and identify actions that will be taken to address barriers.

Small-scale Solar

Small-scale solar generation is currently a small proportion of New Zealand's energy supply making up only 0.07% of our total renewable energy.⁸ Taranaki 2050 Roadmap and TPAP discussions focused on how solar energy could be used more in Taranaki, with discussions focused on its use for households, schools and businesses, and areas where micro-grids and weather-resilient energy systems would be of high value (e.g. some rural communities).

- **Action:** Undertake an assessment of how solar could be used in the Taranaki context, aligned with the Taranaki 2050 Roadmap vision (e.g. schools, community facilities, where education, resilience or community wellbeing, including meaningful secure job creation, would benefit from its use). This also needs to include an assessment of the availability of trained installers and a plan to train new apprentices. The assessment should be informed by the views and support of stakeholders.
- **Subsequent action:** Make a plan for a connected network/coordinated plan for solar use across Taranaki.
- **Subsequent action:** Identify and secure funding for solar network.

⁷MBIE – Energy in New Zealand 2018 - <https://www.mbie.govt.nz/assets/d7c93162b8/energy-in-nz-18.pdf>

⁸ MBIE – Energy in New Zealand 2018 - <https://www.mbie.govt.nz/assets/d7c93162b8/energy-in-nz-18.pdf>

Hydro

The 32 MW Patea Hydro development owned by Trustpower is currently Taranaki's largest renewable energy project. There are also several other small hydro developments in the region including Trustpower's 4.5MW Mangorei development just outside New Plymouth

Taranaki does not have the large rivers and suitable geography that are required for large-scale hydro development similar to the Waikato River or the South Island. There is potential for some further hydro development, most likely "run-of-river" projects that do not require dams.

Wind (offshore)

Currently there is no offshore wind energy production in New Zealand. A study completed out of the University of Canterbury in early 2019⁹ suggests there is potential for offshore wind development as the region's seas have apparently favourable geographic and climatic conditions.

More than 18G of offshore wind generation has been installed internationally since 1991 (mostly in and around the North Sea). Recent improvements in capacity and efficiency mean current projects are now producing cost-competitive electricity.

- **Action:** Understand the potential and challenges of offshore wind generation in New Zealand and Taranaki, building on the work already carried out by Venture Taranaki Trust's Offshore Wind Report.
- **Action:** Investigate how offshore wind farms have become commercially viable overseas and assess whether this is feasible in a New Zealand context.
- **Action:** Undertake an initial study on the feasibility of offshore wind in Taranaki. This should include whether there is technology or companies in New Zealand already with capabilities in this sector, whether existing offshore oil and gas infrastructure could be considered to assist with offshore wind generation, whether the swell in the sea is too strong too often for support vessels to maintain facilities, whether the seafloor is too hard to be able to place turbines given its volcanic nature, etc.
- **Action:** Understand the short, medium and long-term roles that offshore wind could play in Taranaki, including meaningful and secure job creation, and for New Zealand. For example, in the short term a demonstration turbine could be built to understand how it works in the local conditions and to understand what would be involved in building to scale in Taranaki. In the medium and long term, a plan could then be made to build offshore wind to scale.

⁹ Ishwar C.A "Assessment of the Potential for Offshore Wind in New Zealand", University of Canterbury (2019).

Grid-scale solar

Internationally grid-scale solar is providing some of the cheapest electricity. For example, large scale onshore solar developments are underway in Australia.

Taranaki, particularly north Taranaki, has amongst the highest sunshine hours in the country and could certainly generate considerable electricity from solar resources. Counting against grid-scale solar in New Zealand is the relatively high cost of land which is taken out of productive use, and that peak generation occurs in the middle of the day in summer whereas New Zealand's greatest demand is in winter evenings.

Nevertheless, despite these factors there is interest in grid-scale solar in New Zealand at present. The first grid-scale project is underway at Marsden Point (27MW) servicing the Refining NZ site and there are commercial investigations of grid-scale solar projects underway, including in Taranaki.

- **Action:** Investigate how solar farms have become commercially viable overseas and assess whether this is feasible in a New Zealand context.
- **Action:** Undertake an initial study on the feasibility of solar farms in Taranaki.

Wave

The waves that flow around our coastline have great potential as a source of renewable energy. There are currently no offshore wave operations at scale in New Zealand. The technologies that could be used to convert the resource into electricity are yet to get funding.

Taranaki is already home to one company that is pioneering offshore wave energy and has international connections to support its mission, and that could create a significant number of meaningful and secure local jobs.

- **Action:** Understand the potential and challenges of wave energy generation in New Zealand building on the work already carried out by local company, EHL. Understand technical viability, commercial viability, and applications –e.g. to support large use (national network,) or small-scale community projects.
- **Action:** Understand the short, medium- and long-term roles that wave energy could play in Taranaki and for New Zealand.

Bioenergy (biofuels, biowaste and bio gas)

Globally, there is a lot of promise in bio-energy generation. However, there are other places across New Zealand leading and developing this, so it may be that Taranaki coordinates with other areas to support, complement and leverage their advantages.

- **Action:** Investigate potential use of bioenergy as an energy generator in Taranaki. Project to understand technical viability, commercial viability and meaningful secure job creation, and applications.
- **Action:** Coordinate with bio-energy leaders and locations across New Zealand to understand their role and how Taranaki can complement and strengthen the New Zealand energy story.
- **Action:** Work with New Plymouth District Council to understand if the council's waste water treatment plant could play a part in Taranaki's burgeoning bioenergy economy through potential utilisation of energy that exists within the municipal wastewater, and the waste streams of selected local businesses in order to power the waste water treatment plant.

Geothermal (high temperature)

Taranaki is a volcanic region. While, historically there have been hot springs near Mt Taranaki there is no currently obvious high temperature close to surface geothermal resource. GNS Science is about to investigate the potential for deeper geothermal resources in New Zealand. It is not known if they are intending to explore any deep resource in Taranaki.

Action: Work with GNS Science to investigate potential use of high temperature geothermal as an energy generator in Taranaki.

Geothermal (low temperature)

While all New Zealand's current geothermal electricity generation uses high temperature geothermal resources there is potential for geothermal resources using lower temperature (less than 150°C). Initial investigations were carried out by GNS Science and the University of Auckland and suggested there was potential for this low temperature geothermal resource to be utilised¹⁰.

Taranaki has many old oil and gas wells with records of temperature at depth. This is a resource that could be repurposed for clean energy generation.

Action: Work with GNS Science to investigate potential use of low temperature geothermal as an energy generator in Taranaki.

¹⁰ www.gns.cri.nz/Home/News-and-Events/Media-Releases/Low-temp-geothermal-energy

Energy storage and infrastructure

Just as important as the energy generation is the energy storage in New Zealand. Many of the new and renewable energy technologies that Taranaki is planning on developing (such as wind, wave and solar energies) have variable outputs, meaning the energy supply from these sources may not match the energy demand. Energy storage technologies have great potential for smoothing out the electricity supply and ensuring that energy generation supply can match demand.

Importantly for Taranaki's many rural communities, energy storage and infrastructure resilience also become more important the further they are from the electrical grid. Homes, schools, marae and community centres that are further away from the transmission grid are more vulnerable to disruption than homes in urban areas.

Action: Investigate potential energy storage options.

Infrastructure resilience

A secure and resilient energy system was identified as part of the Taranaki 2050 vision. Understanding the resilience of Taranaki energy infrastructure is a concern for many, including communities. Understanding the state of Taranaki's energy infrastructure is the key first step in being able to plan for actions that will enhance resilience.

- **Action:** Undertake a study and map out energy resilience in Taranaki. This study will be most useful broken down by lenses – e.g. resilience for businesses, resilience for rural communities, resilience for different locations, and possibly resilience for particular sectors (e.g. energy sector, primary sector).
- **Subsequent Action:** Build a plan to improve energy resilience for the different groups identified in the earlier action. Improvements can include both overall enhancements (e.g. infrastructure enhancements and upgrades) as well as addressing gaps identified in the study (e.g. back up energy sources for adverse weather events affecting rural communities).

Carbon Capture Utilisation and Storage (CCUS)

The International Energy Agency describes CCUS as “one of the only technology solutions that can significantly reduce emissions from coal and gas power generation and deliver the deep emissions reductions needed across key industrial processes¹¹”. While CCUS has been raised in workshops, there remains division within New Zealand about its use, and mitigations against risks. The Taranaki 2050 Roadmap acknowledges that CCUS should be explored before committing to development.

- **Action:** Create a CCUS Roadmap building on the work already carried out by Waikato University and GNS Science.
- **Action:** Update the existing technical and commercial feasibility study based on the ~20 commercial CCS projects already in existence worldwide.
- **Action:** Assess the legislative barriers for CCUS and build a plan to address those barriers.

¹¹ <https://www.iea.org/topics/carbon-capture-and-storage/>

Hydrogen infrastructure and applications

Taranaki is already leading New Zealand on the development and adoption of hydrogen as a new energy storage medium. The H₂ Taranaki Roadmap issued in March 2019 envisages a series of complementary projects to develop infrastructure and hydrogen applications in the period through to 2030. The short-medium term projects are summarised below.

The key project is getting industrial-scale production of green hydrogen in place in Taranaki – as proposed by Hiringa and Ballance Agri-Nutrients at Kapuni. This will provide a source of hydrogen that can be utilised in other projects. For a full list of the proposed actions, see the H₂ Taranaki Roadmap¹².

Actions with regards to industrial scale production of hydrogen include:

- **Action:** Implement proposed Ballance-Hiringa project at Kapuni¹³.
- **Action:** Gas infrastructure – feasibility study into the potential use of gas infrastructure for use in hydrogen production.
 - **Subsequent action:** Gas infrastructure - Network trials to assess viability of existing gas infrastructure use in production of hydrogen.
 - **Subsequent action:** Gas infrastructure – providing outcomes/reporting to allow evidence-based regulation development.
 - **Subsequent action:** Gas infrastructure – Front end engineering design / permitting work to be started.

Refuelling and Distribution:

- **Action:** Develop refuelling sites in Taranaki and in other regions.

For both industrial scale production and refuelling and distribution, once both have been achieved, ongoing discussions with international partners can be continued on the use of H₂.

Transport:

- **Action:** Trial and establish most appropriate and economic use of H₂ in industrial equipment (e.g. forklifts), light transport and medium/heavy transport e.g. buses and trucks.

Large Scale Storage and power generation:

- **Action:** Trial H₂ injection in natural gas pipeline.
- **Action:** Trial hydrogen blends in peaker plant electricity generation.

Stationary and remote energy generation:

- **Action:** Trial backup fuel cell applications for key infrastructure.
- **Action:** Trial fuel cell backup for remote infrastructure.

¹² <http://about.taranaki.info/Tapuae-Roa/H2.aspx>

¹³ Designed to produce green hydrogen for production of ammonia and urea, and as vehicle fuel

Energy adoption and education

While Taranaki will continue to be a leader in energy supply, the Taranaki 2050 Roadmap vision also sets out a future in which people in Taranaki are leaders in how they think about and use energy too. Education on the importance of energy and its role in Taranaki will be an important part of the future. Behaviours and practices that support collective energy efficiency and best use of energy should also be developed.

- **Action:** Undertake a study/audit of businesses across Taranaki to understand what the opportunities are for local businesses (e.g. energy efficiency, technology adoption, usage).
- **Action:** Using the results from the audit/study, develop a handbook or electronic learning platform for Taranaki businesses on energy. The handbook would include information on new energy technologies that businesses can adopt energy efficiency information, resources and support available.
- **Action:** Develop a resource kit for schools and businesses about energy in Taranaki.
- **Action:** A study on how digital energy technology could be used and applied in Taranaki.

Social Inclusivity

In order to meet the goals of the Taranaki 2050 Roadmap that include lifting parity across the region, and building community resilience, the following actions were identified:

Action: Undertake a feasibility study/audit of ways to achieve parity in energy resilience for the lower socio-economic groups in Taranaki, looking at ways to provide buffers for those groups. For example, this could explore ways to increase the uptake of domestic insulation and energy-efficient heating for low socio-economic households (such as by promoting and facilitating access to EECA's Warmer Kiwi Homes grant funding for low-income owner-occupiers).

Action: Undertake a feasibility study/audit of ways to develop a micro-energy generation project in local communities, for example, at a local Marae (as a demonstration project for other community groups) or community/worker cooperatives.

Action: Support Iwi, Māori, hapū and whānau by providing funding for a full time employed co-ordinator to ensure that the Māori world-view is properly reflected across energy-related initiatives in this TPAP.

A range of Government agencies could play a role in supporting Taranaki business and communities in undertaking these actions, given their capability and capacity.

Energy investment

A key issue that has been raised throughout the planning process is how the plans for the energy future will be funded. While much of the investment, especially running trials, will likely be carried out by private investors there is a role for Government in encouraging investment as the energy sector transitions. This could be similar to the support provided to the digital sector to roll out fibre and rural broadband in New Zealand. More than \$2b in government support has been provided via Crown Infrastructure Partners. Much of this has been provided as an underwrite to take risk away from associated private sector investment. A similar initiative by Government would facilitate the transition of the energy sector.

The next steps to mature this conversation are to identify what funding is needed, for what initiatives, and how it can be accessed.

In keeping with the principles of a just transition, this action plan is premised on co-contributions from those pou who are able to contribute.

- **Action:** Develop an energy funding landscape gap analysis and map for Taranaki, including what funds are available, from who and for whom.
- **Action:** Study of how cross-party investments work in other energy centres around the world. Many established energy centres in other parts of the world promote the various investment flows that they have catalysed and brought about. Understanding how other leaders have achieved it will help inform our investment plans in the future.
- **Action:** Investigate the design and purpose of an investment fund for a just transition.

Taranaki 2050 Transition Pathway Action Plans implementation from 2020

Work to date has been part funded through the Provincial Growth Fund (PGF) and supported with some resource from the Ministry of Business Innovation and Employment (MBIE). The work has been carried out by a large number of volunteers, as well as a small amount of private funding from local businesses to support workshops, facilitation, printing etc.

Future work needs to be funded at two levels:

- Co-ordination resourcing (to drive implementation)
- Funding for the specific projects and initiatives that action plans set out.

Funding needs to be through:

- Government (central and local) funding – new and existing
- Private sector.

Taranaki 2050 Energy funding

The following investigatory projects have been identified as ready for kick off/completion in 2020:

Opportunity	Description	Cost
On/offshore wind	<ul style="list-style-type: none"> • Stocktake/coordinate wind sites (onshore) • Investigate how offshore wind farms have become commercially viable overseas and assess whether this is feasible in Taranaki. 	\$100K
Solar Energy	<ul style="list-style-type: none"> • Identify feasible sites for commercial and public buildings. Investigate domestic use of solar panels and storage options to share back into the grid. Opportunity to partner with private enterprise. 	\$100K
Carbon Capture Utilisation and Storage	<ul style="list-style-type: none"> • Update existing analysis, monitor overseas developments and applicability to NZ, assess NZ regulations and develop more enabling policies. 	\$100K
Wave Energy	<ul style="list-style-type: none"> • Understand the potential and challenges of wave energy generation in NZ, building on the work by local company, EHL. 	\$100K
Bio Energy (biofuels, biowaste and biogas)	<ul style="list-style-type: none"> • Investigate potential use as an energy generator in Taranaki. 	\$100K
Energy Storage and Infrastructure	<ul style="list-style-type: none"> • Undertake a study and map out energy resilience in Taranaki • Investigate energy storage options. 	\$100K \$100K
Energy adoption and education	<ul style="list-style-type: none"> • Supporting Taranaki enterprises to understand the opportunities for local businesses – develop a handbook for Taranaki businesses on energy – including information on new energy technologies businesses can adopt, energy efficiency information, resources and support. 	\$300K (over two years)
Other – low-temp geothermal etc	<ul style="list-style-type: none"> • Investigate other options for energy as they relate to Taranaki. 	\$60k
Energy Needs	<ul style="list-style-type: none"> • Study investigating how much energy NZ needs now we are electrifying, and what energy needs are solved with different renewables – e.g.: hydrogen for heavy transport, electricity for domestic vehicles. 	\$100K

Taranaki 2050 funding – Core co-ordinating resourcing

Resourcing needs are required for five people to facilitate and drive workstreams, as well as measure and track progress over five years.

Resources are to be Taranaki-based, with the suggested positions:

- 1 x leader
- 1 x administrator
- 3 x workstream leads

As well as facilitate and drive workstreams and measure/track progress, the team would be tasked with refreshing the Taranaki 2050 Roadmap in 2024.

Funding required for core co-ordination and resourcing: \$3.75m over five years.

Requests will be submitted to government for funding.



Acknowledgements

The Energy Transition Pathway Action Plan process has been a significant undertaking. We would like to acknowledge the Provincial Growth Fund and the Ministry for Business, Innovation and Employment for their financial and resource support.

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We would also like to thank the Taranaki 2050 Lead Group, and their organisations for supporting their involvement. The organisations included Ngāi Maru, Ngāruahine, Ngāti Mutunga, Te Atiawa, the Western Institute of Technology at Taranaki, TSB Community Trust, Federated Farmers, the South Taranaki District Council, the New Plymouth District Council, NZEI, the Wells Group, the Ministry of Business, Innovation and Employment, Sustainable Taranaki, Velocite, the Taranaki Chamber of Commerce, Etū, Taranaki Futures, Fonterra, Port Taranaki, Todd Corporation and Venture Taranaki Trust.

As a final acknowledgement, the Taranaki 2050 team would again like to thank everyone who has been part of the process – many people gave up significant hours to participate in workshops.

The team has been overwhelmed with people's passion and commitment to this region. It is clear there is an excitement and energy to achieve our vision for Taranaki 2050.

venture
TARANAKI

Te Puna Umanga

25 Dawson Street, New Plymouth

New Plymouth 4310

T: +64 6 759 5150

E: info@venture.org.nz

www.taranaki.info

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