



EVENT BRIEFING

Meeting with X, a subsidiary of Alphabet Inc, and Vector, September 2021

Date:	10 September 2021	Priority:	High
Security classification:	In Confidence	Tracking number:	2122-0795

Action sought		
	Action sought	Deadline
Hon Dr Megan Woods Minister of Energy and Resources	Note the contents of this briefing.	10 September 2021

Contact for telephone discussion (if required)			
Name	Position	Telephone	1st contact
Justine Cannon	Manager, Energy Markets Policy	04 901 8597	✓
Grace Skene	Graduate Policy Advisor	04 830 7378	

The following departments/agencies have been consulted

Minister's office to complete:

- | | |
|---|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Declined |
| <input type="checkbox"/> Noted | <input type="checkbox"/> Needs change |
| <input type="checkbox"/> Seen | <input type="checkbox"/> Overtaken by Events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn |

Comments

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EVENT BRIEFING

Meeting with X, a subsidiary of Alphabet Inc, and Vector, September 2021

Date:	10 September 2021	Priority:	High
Security classification:	In Confidence	Tracking number:	2122-0795

Purpose

This briefing provides background information and suggested talking points for your meeting with Audrey Zibelman, Vice President and General Manager of X's electric grid team, a subsidiary of Alphabet Inc, and Simon Mackenzie, Chief Executive of Vector on Friday 10 September, from 11:00 am to 11:30 am.

Recommendations

The Ministry of Business, Innovation and Employment (MBIE) recommends that you:

- a **Note** the contents of this briefing and the suggested talking points ahead of your meeting with Audrey Zibelman, Vice President and General Manager of X's electric grid team, and Simon Mackenzie, Chief Executive of Vector on Friday 10 September.

Noted

Justine Cannon
Manager, Energy Markets Policy
Building, Resources and Markets, MBIE

9 / 09 / 2021

Hon Dr Megan Woods
Minister of Energy and Resources

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Background

1. You have agreed to meet with Audrey Zibelman, Vice President and General Manager of X's electric grid team, a subsidiary of Alphabet Inc, and Simon Mackenzie, Chief Executive of Vector, on Friday 10 September, from 11:00 am to 11:30 am. This meeting will be conducted via Zoom.
2. In addition to Ms Zibelman, and Mr Mackenzie, attendees include:
 - Sarah Williams – Chief Marketing and Communications Officer, Vector
 - Libby Leahy – Head of Communications, X.
3. Biographies for all attendees are provided in Annex One.
4. The purpose of this meeting is to:
 - a. provide an introduction to Audrey Zibelman
 - b. provide an overview of X's technology and the strategic collaboration between X and Vector
 - c. discuss an approach to the upcoming press release about the strategic collaboration between X and Vector
 - d. discuss the opportunity for you to participate in a meeting of energy ministers at the United Nations Climate Change Conference (COP26), hosted by X, and
 - e. discuss the opportunity for the Prime Minister to announce the collaboration between X and Vector at COP26 as an example of New Zealand leading energy sector innovation for affordable and accelerated electrification.
5. Officials understand that X may be looking to expand the reach of its technology demonstration project beyond the current partnership with Vector, s 9(2)(b)(ii)
6. The partnership between X and Vector has not been publicly announced and should be treated as "commercial-in-confidence".

Background on X, a subsidiary of Google's Alphabet Inc.

7. Known by its eponymous final letter, X is a semi-secretive corporate research laboratory founded by Google in 2010 and now operating under parent company Alphabet. It refers to itself as a Moonshot Factory.
8. X attempts to create new technologies and solutions for key challenges facing the modern world. It is also tasked with producing new business ventures for parent company Alphabet. New ventures 'graduate' from X's laboratory, and go on to form separate companies under the Alphabet umbrella.
9. In 2019, you met with Dr Elliott Grant, General Manager at X during his tour of New Zealand to identify potential partnership opportunities for computational agriculture technologies. This was facilitated by MBIE's innovative partnerships team.

Background on Vector

10. Vector is a multi-network infrastructure company. It is the largest provider of electricity distribution, gas distribution, and electricity and gas metering services in New Zealand.
11. You last met with Vector's Group Chief Executive, Simon Mackenzie on Wednesday 25 August. Mr Mackenzie provided you with an update on Vector's strategic partnership with X, a subsidiary of Google's Alphabet Inc. [Refer 2122-0511].
12. In previous meetings, Vector's innovation partnerships, distributed energy resources (DER) and demand response issues have been raised. [Refer 2021-3305 and 2021-2390].

13. According to Vector, the rise in renewable energy sources, growth in electric vehicles, and higher consumer expectations for lower prices and sustainable energy sources require the energy industry to transform and harness the power of data to make smarter, consumer centric decisions.
14. In light of this, Vector is looking at options to assimilate and process data from a wide variety of smart devices and metering systems in order to optimise energy use on its networks to avoid unmanageable demand peaks. Demand response will also help Vector avoid a more costly replacement of distribution infrastructure.
15. The strategic partnership with Google X are part of Vector's strategy to meet these future challenges.

X's Moonshot for the Electric Grid

X's prototype technology

16. X's moonshot for the electric grid was announced on 24 April 2021 to coincide with the White House Leaders Summit on Climate.
17. Although X is a semi-secretive organisation, and information about the technology has not been explicitly communicated to us, officials understand that the technology X is seeking to trial with Vector is an electricity infrastructure virtualisation tool.
18. X's goal is to design the computational tools required to virtualise power systems so that world-wide operators and owners of physical grids can rapidly and seamlessly share critical learnings required for rapid decarbonisation.
19. The questions X has been investigating include:
 - a. Is it possible and useful to create a virtualization of the electric grid that is so detailed it can understand all the power coming onto the grid and all the power being pulled from the grid, in real time?
 - b. Is it possible to forecast the weather so accurately that we could know when and where the sun will be shining and the wind will be blowing?
 - c. Is it possible to create tools that can rapidly predict and simulate what might *actually* happen on the grid, whether it's in the next few nanoseconds or decades in the future?
 - d. How do we make information about the grid — in its past, present, and possible future states — useful to everyone who is involved in building, planning, updating and managing the grid?
20. X has argued that a simulated, end-to-end map of the grid would provide each sector participant with a consistent view of what is happening on the electric grid, covering the flow of energy from power plants as well as contributions made by distributed generation. The simulation will draw on Google's expertise in machine learning, artificial intelligence and advanced computing to deliver a system wide view, ideally in real-time.¹ This would allow system operators to make better informed decisions about balancing the grid, therefore improving security of electricity supply.

¹ Astro Teller. (2021). *Why the electric grid needs a moonshot*. Medium. <https://blog.x.company/why-the-electric-grid-needs-a-moonshot-6dbac9b8b2c2>

21. To run a successful virtual simulation, vast quantities of data, or observations, are fed into computer models, creating a digital twin of real world phenomena. Over time, the simulations become adept at accurately predicting real-world outcomes. This type of technology is already used in weather forecasting. It is possible that achieving an equivalent technology for the global electric grid is a long term goal for X.
22. Because a virtualization tool requires data to test and strengthen its simulation, X has reached a point where it needs to collaborate with national and regional organizations who operate electric grids in the real-world. The collaboration with Vector is part of this strategy.
23. It is unclear whether X and Vector have exclusivity contracts relating to testing the prototype technology. However, in August 2021, X announced a collaboration with United States utility company, AES Corporation, to simulate and virtualize its distribution grids in Indiana and Ohio. So an exclusivity agreement may be unlikely.
- *You may wish to congratulate both companies on their partnership, noting that it is encouraging to see new technology being trialled in New Zealand.*
 - *You may wish enquire further about the nature of the partnership between X and Vector. You may wish to ask:*
 - *What is the nature and aim of this partnership or collaboration between X and Vector?*
 - *What are the timeframes or key milestones for this project? How will the project be implemented?*
 - *You may also wish to ask:*
 - *What are the potential applications of this technology in the New Zealand context?*
 - *You may wish to ask if X has trialled this technology elsewhere.*

s 9(2)(b)(ii)

24. Unlike some overseas territories, New Zealand's electricity generation, transmission and distribution happens within one jurisdiction. This, alongside X's existing relationships with Vector, may position New Zealand as the ideal testbed for a whole of grid technology demonstration project.

s 9(2)(b)(ii)

Risks and Mitigation

X has faced criticism for a low rate of successfully commercialised projects

28. There is some criticism that X has not been able to successfully commercialise many of its moonshot initiatives.² In 2013, X trialled stratospheric internet balloon technology in New Zealand. However, New Zealand's connectivity providers, such as Vodafone NZ, rejected the technology on the grounds that it had not been sufficiently proven to be safe and commercially viable. In January 2021, the project was closed.

X and Vector seek Ministerial endorsement for their strategic partnership

29. X and Vector have indicated that they wish to discuss whether you would like to provide commentary on the public release of their strategic collaboration.
30. You may also be invited to a meeting of Energy Ministers at COP26, which X will host.
31. X and Vector may also suggest the opportunity for the Prime Minister to announce the strategic collaboration between X and Vector at COP26 as an example of New Zealand leading energy sector innovation.

X may be looking for Ministerial endorsement to expand its technology demonstration prototype to other New Zealand grid participants

s 9(2)(g)(i)

33. As indicated above, X is looking to expand its technology demonstration prototype, either to other New Zealand electricity distribution businesses, or to grid owner and system operator, Transpower. X may be seeking your endorsement for the technology demonstration project on the basis that it may encourage other electricity distribution businesses, or Transpower, to consider their own involvement.
34. If X directly requests your endorsement to facilitate or encourage this, you may wish to encourage them to contact:

s 9(2)(b)(ii)

- *MBIE's Innovative Partnerships team, noting that Innovative Partnerships programme helps international companies connect with the right people, businesses, agencies, research organisations and universities in New Zealand.*

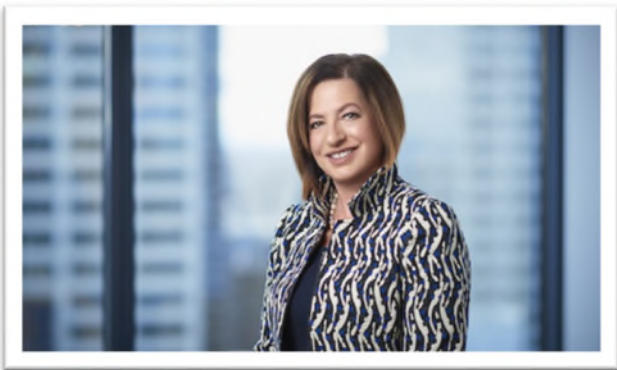
Annexes

Annex One: Biographies

Annex Two: Suggested talking points

² Oliver Franklin-Wallis. (2020). Wired. Retrieved from <https://www.wired.co.uk/article/ten-years-of-google-x>

Annex One: Biographies



Vice President and General Manager for X's electric grid, Moonshot

Audrey Zibelman

Ms Zibelman is an experienced energy sector professional, with expertise in power system transformation, regulation, markets and operations. She has been a utility executive, regulator, system operator and entrepreneur. Areas of interest include distributed generation and demand response.

Audrey joined X from the Australian Energy Market Operator (AEMO) where she was the Managing Director and CEO. AEMO plans and operates the electricity and gas systems and markets for Australia. Prior to AEMO, Audrey was the Chair of the New York Public Service Commission where she was a member of the Governor's cabinet and oversaw the electric, gas, water, steam and communication utilities in New York.

Audrey has also held executive roles at utilities companies PJM and Xcel Energy and was the founder and CEO of Viridity Energy – a startup which sought to aggregate distributed energy resources into virtual power plants.



Head of Communications at X

Libby Leahy

Ms Leahy currently leads the Communications and Content team at X, the moonshot factory. She has worked for technology companies and non-profits in Australia, Asia and the United States. She was previously communications manager for Google in Australia. And have been a communications executive at MySpace and IGN Entertainment.

She has a bachelor of arts in Media and Communications from the University of Sydney.



Group Chief Executive, Vector

Simon Mackenzie

As Group Chief Executive, he has expanded and driven Vector's portfolio of businesses to embrace innovative technologies and strategies to deliver efficient, sustainable energy solutions to consumers. Simon was appointed Vector's Group Chief Executive in 2008. His tertiary qualifications include engineering, finance and business studies, and the Advanced Management Programme at the Wharton School, University of Pennsylvania.



Chief Marketing and Communications Officer, Vector

Sarah Williams

Ms Williams has a broad range of experience in corporate communications and marketing in New Zealand. She has held roles at Vodafone NZ, was Executive Director of PR firm Porter Novelli and has also been Group Public Affairs and Marketing Manager for Vector.

Ms Williams has a Bachelor of Arts in English and Philosophy from The University of Auckland and a diploma in Journalism from Auckland Institute of Technology.

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Annex Two: Suggested talking points

X's prototype technology

- *You may wish to congratulate both companies on their partnership, noting that it is encouraging to see new technology being trialled in New Zealand.*
- *You may wish enquire further about the nature of the partnership between X and Vector. You may wish to ask:*
 - *What is the nature and aim of this partnership or collaboration between X and Vector?*
 - *What are the timeframes or key milestones for this project? How will the project be implemented?*
- *You may also wish to ask:*
 - *What are the potential applications of this technology in the New Zealand context?*
 - *You may wish to ask if X has trialled this technology elsewhere.*

X may be looking for Ministerial endorsement to expand its technology demonstration prototype to other New Zealand grid participants

If X directly requests your endorsement to facilitate or encourage this, you may wish to encourage them to contact:

s 9(2)(b)(ii)

- *MBIE's Innovative Partnerships team, noting that Innovative Partnerships programme helps international companies connect with the right people, businesses, agencies, research organisations and universities in New Zealand.*



EVENT BRIEFING

Dinner with X and Vector

Date:	30 June 2022	Priority:	Medium
Security classification:	In Confidence	Tracking number:	2122-4971

Action sought		
	Action sought	Deadline
Hon Dr Megan Woods Minister of Energy and Resources	Note the background information and suggested talking points ahead of your dinner with X and Vector on Tuesday 5 July from 6.00 pm – 8.00 pm.	5 July 2022

Contact for telephone discussion (if required)			
Name	Position	Telephone	1st contact
Osmond Borthwick	Acting Manager, Energy Markets Policy	04 462 4239	✓
Grace Skene	Policy Advisor, Energy Markets Policy	04 830 7378	

The following departments/agencies have been consulted
N/A

Minister's office to complete:

- | | |
|---|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Declined |
| <input type="checkbox"/> Noted | <input type="checkbox"/> Needs change |
| <input type="checkbox"/> Seen | <input type="checkbox"/> Overtaken by Events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn |

Comments

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EVENT BRIEFING

Dinner with X and Vector

Date:	30 June 2022	Priority:	Medium
Security classification:	In Confidence	Tracking number:	2122-4971

Purpose

You have agreed to meet with Audrey Zibelman, Vice President of X's moonshot for the electric grid, and Simon Mackenzie, Group Chief Executive at Vector for dinner on Tuesday 5 July from 6.00 pm to 8.00 pm.

This briefing provides logistical details and suggested talking points.

Recommendations

The Ministry of Business, Innovation and Employment recommends that you:

- a **Note** the background information and suggested talking points ahead of your dinner with X and Vector on Tuesday 5 July from 6.00 pm – 8.00 pm.

Noted

Osmond Borthwick
Acting Manager, Energy Markets Policy
Buildings, Resources and Markets, MBIE

30 / 06 / 2022

Hon Dr Megan Woods
Minister of Energy and Resources

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Logistics

1. You have agreed to have dinner with Audrey Zibelman, Vice President of X's moonshot for the electric grid, and Simon Mackenzie, Group Chief Executive at Vector on Tuesday 5 July from 6.00 pm to 8.00 pm.
2. The dinner will be held at 5th Street Restaurant, 5 Elgin Street, Sydenham, Christchurch.

Background

3. Through the strategic partnership with Vector, X is trialling its grid virtualisation platform in West Auckland and is looking to do a 'moonshot' project, which would trial the technology across New Zealand's entire electricity grid. X and Vector have indicated that they wish to update you on this collaboration.
4. Audrey Zibelman will also update you on the uses being developed for the virtualisation platform in the United States, Chile and Australia and will provide her view on the challenges facing the energy system both long and short term.
5. Suggested talking points are provided in **Annex Two and Annex Three**. These include some generalised talking points (**Annex Three**) to support you in discussion on the role of innovation and technology in the energy system, government initiatives to support decarbonisation in the electricity system and addressing strategic challenges through development of an energy strategy.

X's virtualisation technology for the electric grid

6. X's goal is to design the computational tools required to virtualise power systems so that world-wide operators and owners of physical grids can rapidly and seamlessly share critical learnings required for rapid decarbonisation.
7. X has argued that a simulated, end-to-end map of the grid would provide each sector participant with a consistent view of what is happening on the electric grid, covering the flow of energy from power plants as well as contributions made by distributed generation. The simulation will draw on Google's expertise in machine learning, artificial intelligence and advanced computing to deliver a system wide view, ideally in real-time.¹ This would allow system operators to make better informed decisions about balancing the grid, therefore improving security of electricity supply.
8. To run a successful virtual simulation, vast quantities of data, or observations, are fed into computer models, creating a digital twin of real-world phenomena. Over time, the simulations become adept at accurately predicting real-world outcomes.
9. Because a virtualization tool requires data to test and strengthen its simulation, X has reached a point where it needs to collaborate with national and regional organizations who operate electric grids in the real-world. The collaboration with Vector is part of this strategy.

Previous engagement with X and Vector

10. You last met with Audrey Zibelman and Simon Mackenzie on Friday 10 September 2021. At this meeting you were briefed on the electric grid virtualisation technology being developed

¹ Astro Teller. (2021). *Why the electric grid needs a moonshot*. Medium. <https://blog.x.company/why-the-electric-grid-needs-a-moonshot-6dbac9b8b2c2>

by X and the strategic collaboration agreement between X and Vector [Briefing 2122-0795 refers].

11. On Tuesday 28 September, your office released a press statement to coincide with Vector's announcement of its strategic collaboration with X to virtualize Tāmaki Makaurau's electricity distribution network.
12. On Wednesday 20 October you attended an online breakfast event hosted by Vector focused on how technology and digitalisation can transform the energy sector and accelerate affordable decarbonisation for New Zealand and beyond.
13. X subsequently requested a meeting with Hon James Shaw, Minister for Climate Change, and yourself during the 2021 United Nations Climate Change Conference (COP26) to describe its vision for the potential grid virtualisation project in New Zealand [briefing 2122-1509 refers]. This meeting was unable to go ahead due to differing schedules.

MBIE's Innovative Partnerships has initiated early conversations with X on potential collaboration opportunities

14. Following your engagement with X and Vector last year, MBIE's innovative partnerships team met with representatives from X to progress initial discussions about other areas of potential collaboration.
15. X indicated its interest in projects active in the New Zealand electricity sector, different to what it already was exploring with Vector. In meetings with Innovative Partnerships X did not propose expanding the grid virtualisation trial beyond its collaboration with Vector.
16. MBIE last met with Page Crahan from X (based in Los Angeles) and Adarsh Pagolu from Google (based in Auckland) on 17 March 2022, and discussed projects underway in the energy hardship space, including clean energy projects that could benefit iwi/Māori and rural communities.

s 9(2)(b)(ii)

s 9(2)(b)(ii)

s 9(2)(b)(ii)

19. X has also indicated that it may be able to provide access to artificial intelligence technology which it feels may assist agencies participating in the Carbon Neutral Government Programme (CNGP) with assimilating and processing data, to identify the best routes toward decarbonisation.

s 9(2)(b)(ii)

Suggested talking points

s 9(2)(b)(ii)

X has initiated technology partnerships in other jurisdictions

22. Audrey Zibelman may brief you on how other jurisdictions have been collaborating with X to trial the electric grid virtualisation technology.

United States, AES Corporation

23. In August 2021, X announced a collaboration with United States utility company, AES Corporation, to simulate and virtualise its distribution grids in Indiana and Ohio. Kristina Lund, AES president and CEO for U.S. utilities, has said that the project will be focused on the distribution side at first, while also maintaining reliability with more renewable generation. Beyond that, she said, the visualization tool could support the transmission side, with a goal of eventually giving a real-time model of the grid, showing every generation and demand source.
24. The announcement came amid a 10-year alliance between AES and Google, in which AES is providing carbon-free energy for Google data centres in Virginia and the technology giant is using Google Cloud technology to spur innovation in energy management.

Australia, AU\$1 billion invested over 5 years in digital economy

25. In November 2021, Google announced it would be investing AU\$1 billion over 5 years into Australia's digital infrastructure. Sundar Pichai, Chief Executive Officer of Alphabet, and subsidiary Google, said that the money would go toward further developing Australia's cloud infrastructure, would include the creation of a Google Research Hub, and establish local partnerships that tackle local and global issues like clean energy production and protecting the Great Barrier Reef.

Chile, Coordinador Eléctrico Nacional

26. X has partnered with Coordinador Eléctrico Nacional (CEN), the Chilean system operator to virtualize the country's electrical transmission grid and develop new grid planning tools. CEN will also draw on its expertise in renewable energy sources to build scenario planning tools that can envision what the country's electrical grid of the future might look like without coal and with its increased reliance on renewable energy sources.

Suggested talking points

You may wish to ask X about current findings from its existing grid virtualisation trials in other jurisdictions:

- *What have been your key findings so far from the trial of virtualisation technology in the United States and Chile?*
- *What has made countries like Chile and New Zealand attractive to X when identifying partners for technology trials?*

- *What tangible benefits have you seen from the virtualisation trial in Chile and for Indiana and Ohio?*

You may wish to ask X about its long-term investment in Australia's digital economy:

- *Do you expect to run a similar technology trial in Australia?*
- *Is the recent AU\$1 billion Google investment in Australia related to X's ambition to achieve a 'moonshot' for the electric grid?*
- *What qualities made Australia an attractive investment location for Google?*

Risks and mitigations

X may be looking for Ministerial endorsement to expand its technology demonstration prototype to other New Zealand grid participants

27. X may be looking to expand its technology demonstration prototype, either to other New Zealand electricity distribution businesses, or to grid owner and system operator, Transpower. X may be looking for your endorsement of this project.

Suggested talking points

- *You may wish to ask X what opportunities it is looking to pursue in New Zealand.*
- *I am interested to hear more about your proposed grid virtualisation project and what you see as being the key benefits for New Zealand?*
- *Have you begun any conversations with New Zealand businesses you might want to partner with on a project like this?*

X has faced criticism for a low rate of successfully commercialised projects

28. There is some criticism that X has not been able to successfully commercialise many of its moonshot initiatives.² In 2013, X trialled stratospheric internet balloon technology in New Zealand. However, New Zealand's connectivity providers, such as Vodafone NZ, rejected the technology on the grounds that it had not been sufficiently proven to be safe and commercially viable. In January 2021, the project was closed.

Suggested talking points

- *What degree of success have you had in operationalising the grid virtualisation tool in the Auckland trial thus far?*
- *What do you see as the next steps for the grid virtualisation technology following various trials?*
- *Is there a timeline or set of milestones that you are working toward with respect to commercialising this technology?*
- *Have you identified whether the trial is producing the benefits that you expected it would, such as the network operators' ability to enhance security of supply or manage network congestion?*

² Oliver Franklin-Wallis. (2020). Wired. Retrieved from <https://www.wired.co.uk/article/ten-years-of-google-x>

Other issues

Vector is completing a strategic review of its smart metering business

29. On Wednesday 6 April, Vector announced it would be undertaking a strategic review of its smart metering business. This followed the company receiving unsolicited interest from several organisations in partnering with Vector and/or investing in the New Zealand and Australia metering business.
30. Vector has appointed financial services company Citi to assist with the review and has committed that no decisions will be made on the future of its smart metering business until the review is finalised.

Suggested talking points

- *I understand that Vector is currently undertaking a strategic review of its smart metering business. How is this progressing?*
- *Vector's smart metering business is a considerable earner for your organisation. What factors do you expect to weigh up as Vector undertakes this review?*
- *What do you feel is driving such significant interest from other parties in the 2 million smart meters that make up Vector's current business?*

Annexes

Annex One: Biographies of Audrey Zibelman, Vice President at X, and Simon Mackenzie, Group Chief Executive at Vector

Annex Two: Suggested talking points

Annex Three: General talking points on potential discussion topics

Annex One: Biographies of attendees



Vice President and General Manager for X's electric grid, Moonshot

Audrey Zibelman

Ms Zibelman is an experienced energy sector professional, with expertise in power system transformation, regulation, markets and operations. She has been a utility executive, regulator, system operator and entrepreneur. Areas of interest include distributed generation and demand response.

Audrey joined X from the Australian Energy Market Operator (AEMO) where she was the Managing Director and CEO. AEMO plans and operates the electricity and gas systems and markets for Australia. Prior to AEMO, Audrey was the Chair of the New York Public Service Commission where she was a member of the Governor's cabinet and oversaw the electric, gas, water, steam and communication utilities in New York.

Audrey has also held executive roles at utilities companies PJM and Xcel Energy and was the founder and CEO of Viridity Energy – a startup which sought to aggregate distributed energy resources into virtual power plants.

Known by its eponymous final letter, X is a semi-secretive corporate research laboratory founded by Google in 2010 and now operating under parent company Alphabet. It refers to itself as a Moonshot Factory. It is tasked with producing new business ventures for parent company Alphabet. New ventures 'graduate' from X's laboratory, and go on to form separate companies under the Alphabet umbrella.



Group Chief Executive, Vector

Simon Mackenzie

As Group Chief Executive, he has expanded and driven Vector's portfolio of businesses to embrace innovative technologies and strategies to deliver efficient, sustainable energy solutions to consumers. Simon was appointed Vector's Group Chief Executive in 2008. His tertiary qualifications include engineering, finance and business studies, and the Advanced Management Programme at the Wharton School, University of Pennsylvania.

Vector is a multi-network infrastructure company. It is the largest provider of electricity distribution, gas distribution, and electricity and gas metering services in New Zealand.

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Annex Two: Suggested talking points

Previous engagement with X and Vector

s 9(2)(b)(ii)

X has initiated technology partnerships in other jurisdictions

Suggested talking points

You may wish to ask X about current findings from its existing grid virtualisation trials in other jurisdictions:

- *What have been your key findings so far from the trial of virtualisation technology in the United States and Chile?*
- *What has made countries like Chile and New Zealand attractive to X when identifying partners for technology trials?*
- *What tangible benefits have you seen from the virtualisation trial in Chile and for Indiana and Ohio?*

You may wish to ask X about its long-term investment in Australia's digital economy:

- *Do you expect to run a similar technology trial in Australia?*
- *Is the recent AU\$1 billion Google investment in Australia related to X's ambition to achieve a 'moonshot' for the electric grid?*
- *What qualities made Australia an attractive investment location for Google?*

X may be looking for Ministerial endorsement to expand its technology demonstration prototype to other New Zealand grid participants

Suggested talking points

- *You may wish to ask X what opportunities it is looking to pursue in New Zealand.*
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Suggested talking points

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- *What do you see as the next steps for the grid virtualisation technology following various trials?*

- *Is there a timeline or set of milestones that you are working toward with respect to commercialising this technology?*
- *Have you identified whether the trial is producing the benefits that you expected it would, such as the network operators' ability to enhance security of supply or manage network congestion?*

Vector is completing a strategic review of its smart metering business

Suggested talking points

- *I understand that Vector is currently undertaking a strategic review of its smart metering business. How is this progressing?*
- *Vector's smart metering business is a considerable earner for your organisation. What factors do you expect to weigh up as Vector undertakes this review?*
- *What do you feel is driving such significant interest from other parties in the 2 million smart meters that make up Vector's current business?*

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Annex Three: General talking points on potential discussion topics

Talking points on energy transition, distributed energy resources and the role of technology in aiding decarbonisation

- *We can all accept that the energy system is changing. It will not be untouched by the rapid advancement in digitalisation that has taken place over the past few decades.*
- *Whilst it will be hard to fully transition away from fossil fuels in the coming years, I would like to reassure you that the Government is focussing on getting the settings right to promote innovation and accelerate the uptake of technology that can move us closer to a low-emissions economy.*
- *We recognise that to accelerate impact from innovation we need to coordinate and align research and development, frontier firms, investment, talent, regulation and market development.*
- *This coordination needs to extend beyond the research community, so that there is a fluid exchange of knowledge, talent and solutions between the innovation system and all sectors.*
- *Responding to these changes and uncertainty requires astute management and governance.*
- *EDBs also have a role to play to enable the emergence of new competitive flexibility markets, and, to drive wider consumer participation in these. I'm confident the sector understands the need to rise to the challenges the future brings.*
- *It is clear to me that our energy system must look to a wider range of market and technological solutions to deliver an affordable, reliable system that is up to the task of rapid, renewable electrification. We cannot just rely on 'the same but more' to achieve this – but rather we must also incorporate new technology.*
- *For many decades the electricity industry was largely stable and secure with little change. Digitalisation and increasing use of smart technology will lead to an increase in consumer expectations for what the energy system will deliver. New technologies, markets and infrastructure should aim to deliver tangible benefits to New Zealanders.*

Talking points on challenges facing the energy system

If asked about the Government's approach to challenges facing the energy system you might like to highlight work programmes such as:

Electricity market measures

- *The government has an aspirational target for 100 per cent renewable electricity by 2030 to assist with achieving climate goals through decarbonisation.*
- *To move towards this target will require an acceleration in the rate at which new electricity generation is built. It will require building at a rate sufficient to displace existing fossil fuelled generation plants and reduce associated emissions. It will also be important to carefully consider impacts on the electricity market from retirement of fossil-fuelled generation.*
- *Unless supported by carefully designed market measures, accelerated investment in renewable generation risks reducing electricity reliability, increasing prices, and increasing emissions.*

- Similarly, any sudden closure of fossil fuelled plant could lead to elevated security of supply risks, particularly in a period of low hydro inflows, and have impacts on wholesale electricity prices. This will be the case at least until additional low-emissions sources of flexible electricity are developed, such as pumped hydro generation and/or other options under investigation in the New Zealand Battery project.
- MBIE is kicking off work to investigate whether electricity market measures and policies are needed to ensure that risks relating to increasing renewability in the electricity system are well managed as we transition towards a 100 percent renewable electricity system.
- Policy development to address these issues is in its early stages, focusing on regulation and incentives. Most of the policy work on regulation is focused around removing barriers to investment, while work on incentives includes:
 - investigating options to promote new generation investment without significantly distorting market investment
 - how to keep thermal plant from closing prematurely to manage security of supply risks but ramp its usage down over time.
- While there are views that achieving 100 per cent renewable electricity is too difficult and expensive and/or that the Government should focus on decarbonising other areas of the energy system first, these views assume that we can only achieve progress on one thing at a time, and this Government is focused on setting foundations across all levers at our disposal to decarbonise.

Energy strategy

- The Government is developing an Aotearoa New Zealand Energy Strategy to support the transition to a low carbon economy, address strategic challenges in the energy sector, and signal pathways away from fossil fuels.
- The Energy Strategy will help set the pathways to navigate our way through the energy trilemma and to provide certainty for the sector, industry and consumers. It will set the direction for New Zealand's pathway away from fossil fuels and towards greater levels of renewable electricity and other low emissions alternatives.
- During previous consultation on the Emissions Reduction Plan submitters expressed a desire for the Energy Strategy to provide long term signals about the broader sector's direction of travel, the interconnected nature of the energy system, and the role of the energy system in driving decarbonisation more widely across the economy.
- Submitters also noted that an Energy Strategy must consider broader objectives beyond decarbonisation to ensure the energy system manages the trilemma of security, affordability, and sustainability. The development of a Gas Transition Plan, a Hydrogen Roadmap, and a regulatory framework for offshore renewable energy will take place alongside the Energy Strategy and will provide key inputs into the strategy.
- MBIE has begun early engagement focused on how people want to be involved and what they want from an energy strategy. This will continue over the next few months. Early and ongoing engagement will involve one-on-one meetings, meetings organised with industry bodies, and workshops.
- High level timing is as follows:
 - Early engagement - between now and August
 - Development of strategy and full engagement - starting September
 - Finalise strategy - by the end of 2024

Meeting Brief: **Google X (San Francisco)**

Time: 8.30 am – 10.00 am, 20 September 2022

Venue: X's premises Mountainview, California


Purpose and Key objectives

- You are visiting X's premises in Mountainview, California.

- s 9(2)(f)(iv)




Background


- X is a research and development facility founded by Google in January 2010.
- X has identified various 'moonshots', one of which is to virtualise power systems so that operators and owners of physical grids can rapidly and seamlessly share critical learnings required for rapid decarbonisation.
- X already has a partnership underway in New Zealand with Vector Group 
s 9(2)(b)(ii)

Key points


- s 9(2)(f)(iv)



- X will discuss with you s 9(2)(b)(ii)



s 9(2)(b)(ii)

- Your visit to X's premises at Mountainview represents an opportunity for X 
s 9(2)(b)(ii)

Schedule


<u>Time</u>	<u>Activity</u>
8.30 am – 8.40 am	Check in at X's premises
8.40 am – 9.00 am	Tour of X's Museum, providing an overview of the history of X
9.00 am – 10.00 am	Overview of s 9(2)(b)(ii)

	s 9(2)(b)(ii)
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Next steps

- In addition to this visit, you are meeting with Ms Audrey Zibelman, Vice President and General Manager for X's electric grid and Mr Ivo Stivoric, a Vice President at X, during the Clean Energy Ministerial event in Pittsburgh, Pennsylvania.
- Information for this meeting is provided in a separate briefing.
- s 9(2)(f)(iv)

Biographies

	<p>Vice President and General Manager for X's electric grid, Moonshot</p> <p>Audrey Zibelman</p> <p>Audrey joined X from the Australian Energy Market Operator (AEMO) where she was the Managing Director and CEO.</p> <p>Audrey has also held executive roles at utilities companies PJM and Xcel Energy and was the founder and CEO of Viridity Energy – a startup which sought to aggregate distributed energy resources into virtual power plants.</p>
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Suggested talking points

- *Thank you for inviting me to visit your premises in Mountainview.*
- *I am excited to learn more about the innovative concepts you are pioneering here.*
- *Innovation will be crucial in the global effort to combat climate change, particularly in the energy sector.*
- *What kind of information does your virtual grid technology provide and how could this be used to help decarbonise?*

IN CONFIDENCE

- *What plans do you have to engage with and include Māori communities in your projects in New Zealand?*

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Meeting Brief: **Google X (Pittsburgh)**

Time:

Venue:

Purpose and Key objectives

- You will be meeting with Audrey Zibelman, Vice President of X's moonshot for the electric grid, and Ivo Stivoric, a senior technical leader at X, to discuss opportunities for collaboration between X, the New Zealand Government and Ara Ake.


- s 9(2)(f)(iv)
- 

Background

- X is a research and development facility and organization founded by Google in January 2010, which now operates as a subsidiary of Alphabet Inc. X has its headquarters about a mile and a half from Alphabet's corporate headquarters, the Googleplex, in Mountain View, California.

Key points

s 9(2)(f)(iv)



s 9(2)(f)(iv)





Next steps

- In addition to this meeting with Ms Zibelman and Mr Stivoric, you are visiting X's premises in Mountainview, California.

- s 9(2)(f)(iv)
[Redacted]
[Redacted]
[Redacted]
[Redacted]

Biographies

	<p>Vice President and General Manager for X's electric grid, Moonshot</p> <p>Audrey Zibelman</p> <p>Audrey joined X from the Australian Energy Market Operator (AEMO) where she was the Managing Director and CEO.</p> <p>Audrey has also held executive roles at utilities companies PJM and Xcel Energy and was the founder and CEO of Viridity Energy – a startup which sought to aggregate distributed energy resources into virtual power plants.</p> <p>X is a semi-secretive corporate research laboratory founded by Google in 2010 and now operating under parent company Alphabet.</p>
	<p>Senior technical leader at X</p> <p>Ivo Stivorc</p> <p>Ivo is a senior technical leader at X and runs some of X's early stage projects.</p> <p>Before joining X, Ivo was Vice President of Research and Development at Jawbone, where he delivered new consumer and healthcare applications for wearable and sensor technology. Ivo has worked in the wearable computing space since 1999, including co-founding BodyMedia alongside X's Captain of Moonshots, Astro Teller.</p> <p>He has over 90 patents to his name and was recognized by EE Times as one of 40 innovators building the foundation of the next-gen electronics industry. He holds an M.S. in Interaction Design and a B.F.A. in Industrial Design with a concentration in sculpture, both from Carnegie Mellon University.</p>

Suggested talking points

s 9(2)(f)(iv)

[REDACTED]

General talking points on energy transition, distributed energy resources and the role of technology in aiding decarbonisation

- We can all accept that the energy system is changing. It will not be untouched by the rapid advancement in digitalisation that has taken place over the past few decades.
- Whilst it will be hard to fully transition away from fossil fuels in the coming years, the New Zealand Government is focused on getting the settings right to promote innovation and accelerate the uptake of technology that can move us closer to a low-emissions economy.
- We recognise that to accelerate the impact of innovation we need to coordinate and align research and development, frontier firms, investment, talent, regulation and market development.
- This coordination needs to extend beyond the research community, so that there is a fluid exchange of knowledge, talent and solutions between the innovation system and all sectors.
- Responding to these changes and uncertainty requires astute management and governance.
- It is clear to me that our energy system must look to a wider range of market and technological solutions to deliver an affordable, reliable system that is up to the task of rapid, renewable electrification. We cannot just rely on 'the same but more' to achieve this – we must also incorporate new technology.
- For many decades the electricity industry was largely stable and secure with little change. Increasing use of digital technology will lead to an increase in consumer expectations for what the energy system will deliver. New technologies, markets and infrastructure should aim to deliver tangible benefits to New Zealanders.



EVENT BRIEFING

Meeting Tapestry (Google X) and Vector

Date:	7 December 2022	Priority:	Medium
Security classification:	In Confidence	Tracking number:	2223-2092

Action sought		
	Action sought	Deadline
Hon Dr Megan Woods Minister of Energy and Resources	Note the background information and suggested talking points ahead of your meeting with Tapestry and Vector on Thursday 8 December from 4.00 pm to 4.30 pm	8 December 2022

Contact for telephone discussion (if required)			
Name	Position	Telephone	1st contact
Daniel Brown	Acting Manager, Energy Markets Policy	s 9(2)(a)	✓
Samuel Martin Treceno	Policy Advisor, Energy Markets Policy	04 901 8212	

The following departments/agencies have been consulted
N/A

Minister's office to complete:

- | | |
|---|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Declined |
| <input type="checkbox"/> Noted | <input type="checkbox"/> Needs change |
| <input type="checkbox"/> Seen | <input type="checkbox"/> Overtaken by Events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn |

Comments

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EVENT BRIEFING

Meeting Tapestry (Google X) and Vector

Date:	7 December 2022	Priority:	Medium
Security classification:	In Confidence	Tracking number:	2223-2092

Purpose

This briefing provides background information and talking points ahead of your meeting with Andy Ott, Director of Tapestry, Google X's moonshot for the electric grid, and Simon Mackenzie, Group Chief Executive at Vector on Thursday 8 December from 4.00 pm to 4.30 pm.

Recommendations

The Ministry of Business, Innovation and Employment recommends that you:

- a **Note** the contents of this briefing and suggested talking points

Noted

Daniel Brown
Acting Manager, Energy Markets Policy
Building, Resources and Markets, MBIE

07/12/2022

Hon Dr Megan Woods
Minister of Energy and Resources

..... / /

Background

1. You have agreed to meet with Andy Ott, Director of Tapestry, and Simon Mackenzie, Group Chief Executive at Vector, on Thursday 8 December from 4.00 pm to 4.30 pm. Biographies for the attendees are provided in **Annex One**.
2. The meeting will be held on Zoom.
3. Andy will be in Auckland meeting with Vector. He has significant experience in the energy sector and was the CEO of PJM Interconnection, the largest electricity market in the United States of America (USA). This meeting provides an opportunity to get an update on Tapestry and Vector's partnership, and also to gain some insights on how the USA is addressing strategic challenges in its electricity system, as well as the future role of innovation and technology. Suggested talking points are provided in **Annex Two**.
4. You have met with Google X and Vector before this year. You first met with Audrey Zibelman, Vice President of Google X, in Christchurch in July [2122-4971 refers] and in September during your trip to the USA [2122-0795 refers].

About Tapestry (Google X's moonshot for the electricity grid)

5. Google X is a corporate research laboratory founded by Google in 2010 and is now operating under parent company Alphabet. It refers to itself as a 'Moonshot Factory'. It is tasked with producing new business ventures for parent company Alphabet. New ventures 'graduate' from X's laboratory and go on to form separate companies under the Alphabet umbrella.
6. Tapestry's goal is to design the computational tools required to virtualise power systems so that operators and owners of physical grids can rapidly and seamlessly share critical information required for rapid decarbonisation.
7. Tapestry has argued that a simulated, end-to-end map of the grid would provide each sector participant with a consistent view of what is happening on the electric grid, covering the flow of energy from power plants as well as contributions made by distributed generation. The simulation will draw on Google's expertise in machine learning, artificial intelligence and advanced computing to deliver a system wide view, ideally in real-time.¹ This would allow system operators to make better informed decisions about balancing the grid, therefore improving security of electricity supply.

Tapestry is trialling its grid virtualisation platform in West Auckland through a partnership with Vector

8. To run a successful virtual simulation, vast quantities of data, or observations, are fed into computer models, creating a digital twin of real-world phenomena. Because a virtualisation tool requires data to test and strengthen its simulation, Tapestry has reached a point where it needs to collaborate with national and regional organisations who operate electric grids in the real-world. The collaboration with Vector is part of this strategy.
9. Through the strategic partnership with Vector, Tapestry is trialling its grid virtualisation platform in West Auckland and is looking to do a 'moonshot' project, which would trial the technology across New Zealand's entire electricity grid.
10. Tapestry and Vector have indicated that they wish to update you on this collaboration.

¹ Astro Teller. (2021). *Why the electric grid needs a moonshot*. Medium. <https://blog.x.company/why-the-electric-grid-needs-a-moonshot-6dbac9b8b2c2>

Tapestry has initiated technology partnerships in other jurisdictions

11. Other jurisdictions have been collaborating with Tapestry to trial the electric grid virtualisation technology.
12. In August 2021, Google X announced a collaboration with USA utility company, AES Corporation, to simulate and virtualise its distribution grids in Indiana and Ohio. The project will be focused on the distribution side at first, with a goal of eventually giving a real-time model of the grid, showing every generation and demand source.
13. Google X has also partnered with the Chilean system operator, Coordinador Eléctrico Nacional (CEN), to virtualise the country's electrical transmission grid and develop new grid planning tools. CEN will build scenario planning tools that can envision what the country's electrical grid of the future might look like without coal and with its increased reliance on renewable energy sources.

Suggested talking points

You might like to say:

- *Thank you for meeting with me today. I am excited to hear an update on your grid virtualisation project.*
- *I also interested to hear from you, Andy, on how the Unites States of America is addressing challenges in its electricity system, and the role of innovation and technology moving forward.*

You may wish to ask:

- *What degree of success have you had in operationalising the grid virtualisation tool in the Auckland trial thus far?*
- *What do you see as the next steps for the grid virtualisation technology following various trials? Is there a timeline or set of milestones that you are working toward?*
- *What have been your key findings so far from the trial of virtualisation technology in the United States and Chile? Is this technology producing the benefits that you expected it would?*

s 9(2)(b)(ii)

Risks and mitigations

18. **Ministerial endorsement** - Tapestry is likely to be looking to expand its technology demonstration prototype, either to other New Zealand electricity distribution businesses, or to grid owner and system operator, Transpower. Tapestry may be looking for your endorsement of this project. s 9(2)(b)(ii)

Annexes

Annex One: Biographies

Annex Two: Suggested talking points

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Annex One: Biographies

 A portrait of Andy Ott, a middle-aged man with dark hair, wearing a dark suit jacket, a light blue shirt, and a patterned tie. He is smiling slightly and looking towards the camera.	<p>Andy Ott - Director, Tapestry, Google X's moonshot for the electric grid</p> <p>Since 2021, Andy has been the Director, Technical Operations, for Tapestry. He has vast experience in market design and power system operations from 2015 through 2019 as the President and CEO of PJM Interconnection, the largest power grid in North America and the largest electricity market in the world.</p> <p>Andy received a Bachelor of Science in electrical engineering from The Pennsylvania State University and a Master of Science in applied statistics from Villanova University.</p>
 A portrait of Simon Mackenzie, a middle-aged man with a balding head and a goatee, wearing a blue and white checkered button-down shirt. He is smiling and looking slightly to the right.	<p>Simon Mackenzie - Group Chief Executive, Vector</p> <p>As Group Chief Executive, Simon has expanded and driven Vector's portfolio of businesses to embrace innovative technologies and strategies to deliver efficient, sustainable energy solutions to consumers. Simon was appointed Vector's Group Chief Executive in 2008. His tertiary qualifications include engineering, finance and business studies, and the Advanced Management Programme at the Wharton School, University of Pennsylvania.</p> <p>Vector is a multi-network infrastructure company. It is the largest provider of electricity distribution, gas distribution, and electricity and gas metering services in New Zealand.</p>

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Annex Two: Suggested talking points

Tapestry is trialling its grid virtualisation platform in West Auckland through a partnership with Vector


You might like to say:

- *Thank you for meeting with me today. I am excited to hear an update on your grid virtualisation project.*
- *I also interested to hearing from you, Andy, on how the Unites States of America is addressing challenges in its electricity system, and the role of innovation and technology moving forward.*

You may wish to ask:

- *What degree of success have you had in operationalising the grid virtualisation tool in the Auckland trial thus far?*
- *What do you see as the next steps for the grid virtualisation technology following various trials? Is there a timeline or set of milestones that you are working toward?*
- *What have been your key findings so far from the trial of virtualisation technology in the United States and Chile? Is this technology producing the benefits that you expected it would?*

s 9(2)(b)(ii)



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Meeting Tapestry (Google X) and Vector

08/12/22

- Update on Energy Market in US
- Development of Aotearoa Energy Strategy

Andy Ott - Director Tapestry Google X

Opportunities

- better tech to plan and operate the Grid

- lack of ability for customer response

- changes to allow consumers to adapt ^{use} to power cost

- Demand response

Design of incentives

- healthy demand side

* Work on quantifying foregone generation through demand side measures.

Importance of digitalisation → X work will helpfully feed into.

Data clean up → to ensure high value model to build upon

Any barriers to data collection?

Orisk system operator data is publicly available

Consumption data from retailers

- consumption and other dynamic data.

Prices of electricity Europe

Meeting with X as vector 10/29/21

- Helps enable that transition to net zero and helps move to complex feed.

In order of 50 people work on it.

Andy - goal is to get a whole system up and running in the next year or two.

As decarbonizing and de-centralizing the grid need more technology to manage it. Need a model.

Worked with several distribution companies in US and vector.

Can we make it a universal tool. Make a data and learnings available.

Could NZ be one of the early partners they work with.

How do you scale and innovate quickly.

Minister asked about security.

Grids still have control environment.

Distribution in every system is to future.

Minister - real useful to get security agencies involved.

A lot of tech can be controlled remotely.

- Leave team to get security agencies together.

Minister is very excited in the work.

15 mid

CoP

- get together at a dinner with Chilean Minister - how we can get this to work

Minister - not doing minister travel.

Our Comrade Minister is going.

But Minister is keen for virtual opportunities though

Also happy to work with South Africa

Minister to be keen to have opportunity to discuss with other jurisdictions.

9(2)(f)(iv)

9(2)(b)(ii)

Talk has been confidential - but following press release will be able to talk to other EDB's and Transpower more openly.

Minister -

Mechanics of announcement - office no need to move on this with netor.

Announcement of ways to come in and exercise this.

Also having discussions in Australia.

Aus - NZ how do we do this together -

could be good discussions would have some interesting case law.

Meeting with vector and X

Opportunity For X to update global context from their viewpoint.

Andy Ott

- NZS Market is unique - significant vertical integration.

Opportunities:

- Better tech to plan and operate grid
- Can transform the decision support skills.
- Curran

x When did time of use prices come into effect

MW A number of value of forgone generation through demand side measures? Maybe a piece piece of work that we need to do

MW Need to think about regulators for EU smart charging.

Specific update

- Data cleanup is taking longer.
- Need to press model - make sure its highly accurate.
- Still working on data cleanup.
- Share models with vector team.

MW Have you experienced any road blocks?
No. No particular issues.

But in case system operator's data is publicly available.

X

"Google Maps for electrons"

Tapestry trial already u/way with Vector in N2.

- have six Tapestry p/ships worldwide

9(2)(b)(ii)

Meeting on sidelines of CEM in Pittsburgh in a few days. Keen to u/stand how can support N2 meet its ambitious climate goals.