

Schedule F4 - Grid Investment Test

Making of Electricity Governance Rule

1. In accordance with rule 6.6, section III of part F of the **rules**, and s172H of the **Act**, the **Minister**, on the recommendation of the **Board**, makes this **grid investment test** a schedule to section III of part F of the **rules** with effect from 11 February 2005.

Preamble

2. Rule 6.1, in section III of part F of the **rules**, requires the **Board** to determine the most appropriate **grid investment test** and in so doing must have regard to the objectives in rule 6.3, as required by rules 6.1 and 6.3.
3. Pursuant to rule 6.2, the **grid investment test** is to be applied:
 - 3.1. by the **Board**, in developing **grid reliability standards**, to review and approve **reliability investments** and **economic investments** and to review **transmission alternatives**, and
 - 3.2. by **Transpower**, to determine proposed **economic investments** for inclusion in the proposed **grid upgrade plan**.

The grid investment test

4. A **proposed investment** satisfies the **grid investment test** if the **Board** is reasonably satisfied that:
 - 4.1. for a **proposed investment** that is necessary to meet the reliability standard set out in clause 4.2 of the **grid reliability standards**:
 - 4.1.1. the **proposed investment** maximises the **expected net market benefit** or minimises the **expected net market cost** compared with a number of **alternative projects**; and
 - 4.1.2. if sensitivity analysis is conducted, a conclusion that a **proposed investment** satisfies clause 4.1.1 is sufficiently robust having regard to the results of that sensitivity analysis; or
 - 4.2. for any other **proposed investment**:
 - 4.2.1. the **proposed investment** maximises the **expected net market benefit** compared with a number of **alternative projects**;
 - 4.2.2. the **expected net market benefit** of the **proposed investment** is greater than zero; and
 - 4.2.3. if sensitivity analysis is conducted, a conclusion that a **proposed investment** satisfies clauses 4.2.1 and 4.2.2 is sufficiently robust having regard to the results of that sensitivity analysis.

Methodology for application of the grid investment test

5. The **market benefits** and **costs** of a **proposed investment** or **alternative project** are determined for each of the **market development scenarios** for the future with that **proposed investment** or **alternative project** by comparing that **market development scenario** with the corresponding **market development scenario** developed for the **base case**.

6. In applying this **grid investment test**:
 - 6.1. the **market development scenarios** must be the possible future scenarios outlined in the **statement of opportunities** unless the **Board** determines that **market development scenarios** proposed by **Transpower**, the proponent of a **transmission alternative** or the **Board** are more appropriate;
 - 6.2. the probability of occurrence of a **market development scenario** must be as set out in the **statement of opportunities** in respect of the relevant possible future scenario; and
 - 6.3. the number of **market development scenarios** used in applying this **grid investment test** must be same as the number of **market development scenarios** set out in the **statement of opportunities**.
7. The **supply-side** of any **market development scenario** must include:
 - 7.1. **committed projects**;
 - 7.2. the decommissioning, removal or de-rating of **decommissioned assets**; and
 - 7.3. **modelled projects**.
8. The **base case** must be reasonable having regard to:
 - 8.1. the **grid reliability standards**;
 - 8.2. any possible future scenarios outlined in the **statement of opportunities**;
 - 8.3. the current state of the electricity industry, including the following elements of the current state of the electricity industry:
 - 8.3.1. the size and location of **demand**;
 - 8.3.2. historical nodal prices for **electricity**;
 - 8.3.3. the **grid reliability standards**;
 - 8.3.4. the value(s) of unserved energy (which value(s) will be the value or values **published** by the **Board** for this purpose from time to time or, if no such value or values is **published** by the **Board**, \$20,000/MWh);
 - 8.3.5. the operating and maintenance costs of efficiently supplying **demand** from **existing assets**;
 - 8.3.6. transfer capacities and capabilities of the **grid**; and
 - 8.3.7. the cost of providing sufficient **ancillary services** and the cost of **losses** involved in efficiently supplying **demand**;

- 8.4. reasonably expected future market development, including:
 - 8.4.1. the size, timing and location of **demand** growth;
 - 8.4.2. forecast nodal prices for **electricity**;
 - 8.4.3. the value of unserved energy (which value(s) will be the value or values **published** by the **Board** for this purpose from time to time or, if no such value or values is **published** by the **Board**, \$20,000/MWh);
 - 8.4.4. the size, location and timing of **committed projects** and **modelled projects**;
 - 8.4.5. the operating and maintenance costs of efficiently supplying demand by means of **existing assets**, **committed projects** and **modelled projects**;
 - 8.4.6. the capital costs of efficiently supplying **demand** by means of **modelled projects**;
 - 8.4.7. the timing of decommissioning, removing or de-rating **decommissioned assets**;
 - 8.4.8. transfer capacities and capabilities of the **grid**; and
 - 8.4.9. the cost of providing sufficient **ancillary services** and the cost of **losses** involved in efficiently supplying **demand**; and
- 8.5. the **proposed investment** to which the **grid investment test** is to be applied.
9. Where a material **market benefit** or **cost** cannot be quantified, the direction of the **market benefit** or **cost** and likely magnitude of the **market benefit** or **cost** must be identified.
10. **Competition benefits** may be included in the **market benefits** of a **proposed investment** or **alternative project** if the **Board** reasonably considers this appropriate, provided the **competition benefits** can be separately identified and calculated.
11. The **alternative projects** used in applying this **grid investment test** must be limited to those appropriate in number and technology given the cost magnitude of the **proposed investment**, the complexity of the required modelling and the urgency of the **proposed investment**.
12. The rigour and comprehensiveness of the analysis undertaken in applying this **grid investment test** must be commensurate with the estimated capital expenditure required for the **proposed investment**.
13. Either standard net present value analysis or real options analysis must be applied in assessing the **expected net market benefit** of a **proposed investment** or

alternative project. The type of analysis to be used in applying the **grid investment test** to a particular **grid investment** must be whichever of standard net present value analysis or real options analysis is more appropriate having regard to the likelihood of occurrence of any real options during the economic life of the **proposed investment** or **alternative project**.

14. The discount rate used in all present value calculations must be:
 - 14.1. the discount rate determined by the **Board**, from time to time, for the purposes of this **grid investment test**; or
 - 14.2. if the **Board** has not determined a discount rate for the purposes of clause 14.1, a discount rate of, or equivalent to, a pre-tax real rate of 7%.
15. If real options analysis is used, all material real options must be taken into account in determining the **market benefits** and **costs** of a **proposed investment** or **alternative project**.
16. Subject to clause 17, sensitivity analysis must be applied in assessing the **expected net market benefit** of a **proposed investment** or **alternative project**.
17. In applying sensitivity analysis, a number of alternative reasonable scenarios should be developed for each of the **market development scenarios** using reasonable variations in all of the following variables, with the exception of those variables in respect of which sensitivity analysis is either not reasonably practicable or not reasonably necessary:
 - 17.1. forecast **demand**;
 - 17.2. the size, timing, location, and operating and maintenance costs of:
 - 17.2.1. the **proposed investment** or **alternative project**; and
 - 17.2.2. **existing assets, committed projects** and **modelled projects**;
 - 17.3. the capital cost of:
 - 17.3.1. the **proposed investment** and the **alternative projects**; and
 - 17.3.2. **modelled projects**;
 - 17.4. the timing of decommissioning, removing or de-rating **decommissioned assets**;
 - 17.5. the value(s) of unserved energy (which varied value or values will be the value or values **published** by the **Board** for this purpose from time to time or, if no such value or values is **published** by the **Board**, \$10,000/MWh and \$30,000/MWh);
 - 17.6. the discount rate used in all present value calculations;
 - 17.7. the discount rate used in present value calculations in relation to a particular **alternative project** that is a **transmission alternative**;

- 17.8. a range of consistent hydrological inflow sequences, as defined in the **statement of opportunities** and **centralised data set**;
- 17.9. **generator** and **demand**-side bidding strategies;
- 17.10. key input variables in the calculation of **competition benefits**;
- 17.11. the forecast amount of carbon charges associated with operating the **proposed investment, alternative projects, existing assets, committed projects** and **modelled projects**; and
- 17.12. the probability of occurrence of a **market development scenario**.

Interpretation and definitions

- 18. For the purposes of this **grid investment test**, unless the context calls for another interpretation:
 - 18.1. terms defined in part A of the **rules** take that defined meaning;
 - 18.2. terms defined in clauses 19 to 32 of this **grid investment test** take that defined meaning;
 - 18.3. a reference:
 - 18.3.1. to the singular includes the plural and conversely;
 - 18.3.2. to a person includes an individual, company, other body corporate, association, partnership, firm, joint venture, trust, or Government Agency;
 - 18.4. the word including or includes means including, but not limited to, or includes, without limitation; and
 - 18.5. where a word or phrase is defined in clauses 19 to 32 of this **grid investment test**, its other grammatical forms have a corresponding meaning.
- 19. "**Alternative projects**" means any alternative transmission augmentation projects and **transmission alternatives** to the **proposed investment**, including any variant of the **proposed investment** that involves a non-negligible change in the timing of that **proposed investment**, that are:
 - 19.1. technically feasible;
 - 19.2. reasonably practicable having regard to the matters set out in clauses 8.1 to 8.4;
 - 19.3. reasonably likely to proceed if neither the **proposed investment** nor any other **alternative project** proceeds and unlikely to proceed if the **proposed investment** does proceed;

- 19.4. reasonably expected to provide similar benefits, in type but not necessarily in magnitude, to relevant nodes, as the **proposed investment**; and
- 19.5. reasonably expected to enable the deferment of investment of the type contemplated by the **proposed investment** for a period of 12 months or more.
20. **"Base case"** means the **market development scenarios** developed for the reasonable future state of the electricity industry without the **proposed investment** or any **alternative project**.
21. **"Committed projects"** means transmission augmentation projects and **non-transmission projects**, other than the **proposed investment** and **alternative projects**, which are reasonably likely to proceed in a similar timeframe regardless of whether or not the **proposed investment** or any **alternative project** proceeds and in relation to which either:
 - 21.1. all of the following are satisfied:
 - 21.1.1. the proponent has obtained all required planning consents, construction approvals and licences, and fulfilled any other regulatory requirement that must be met before commencing construction;
 - 21.1.2. construction has commenced or a firm commencement date has been set;
 - 21.1.3. the proponent has acquired or executed an agreement to acquire land (or commenced legal proceedings to acquire land), or has executed an agreement for the leasing of land, for the purposes of construction;
 - 21.1.4. contracts for supply and construction of the major components of the plant and equipment (including any **generating units**, turbines, boilers, transmission towers, conductors, terminal station equipment) have been executed (i.e. all the necessary formal legal requirements have been observed to make the contract valid and complete); and
 - 21.1.5. contracts for the financing of the project, including any debt plans, have been executed (i.e. all the necessary formal legal requirements have been observed to make the contract valid and complete); or
 - 21.2. in the case of transmission augmentation projects, the **Board** has unconditionally approved the project following application of this **grid investment test**.
22. **"Competition benefits"** means the direct or indirect effects of greater competition between **generators** resulting from a **proposed investment** or **alternative project**, including as a result of the associated introduction of additional **demand-side** management initiatives, on:
 - 22.1. the cost of **dispatch**;
 - 22.2. forecast **demand** growth; and
 - 22.3. the timing of **modelled projects**.

23. **"Cost"** means the present value of the costs of a **proposed investment** or **alternative project** to those persons who produce, distribute, retail and consume electricity in New Zealand over a period of 20 years from the commissioning date (unless significant **market benefits** or **costs** are expected to arise from the **proposed investment** or **alternative project** after that time, in which case the then-present value of any future costs may also be included in the **cost** of the **proposed investment** or **alternative project**) and includes:
- 23.1. capital costs incurred prior to the commissioning of the **proposed investment** or **alternative project** (as the case may be), including interest during construction;
 - 23.2. operating, maintenance and dismantling costs over the operating life of the **proposed investment** or **alternative project** (as the case may be);
 - 23.3. costs to **participants** associated with testing of the **proposed investment** or **alternative project** (as the case may be);
 - 23.4. any additional amount, approved by the **Board**, that could reasonably be considered to be a cost related to the commissioning of a **proposed investment** or **alternative project** (as the case may be); and
 - 23.5. costs of complying with or arising pursuant to all applicable existing and anticipated laws, regulations and administrative determinations.
24. **"Decommissioned assets"** means **existing assets** that are reasonably likely to be decommissioned, removed or de-rated in a similar timeframe regardless of whether or not the **proposed investment** or **alternative project** proceeds and in relation to which either:
- 24.1. both of the following are satisfied:
 - 24.1.1. a final decision to decommission, remove or de-rate the **existing asset** after a specified date has been made and has been publicly announced; and
 - 24.1.2. contracts to directly or indirectly facilitate the decommissioning, removal or de-rating of the **existing asset** have been finalised and executed; or
 - 24.2. consents or contracts for the operation and maintenance of the **existing asset** have been terminated or have expired with no reasonable prospect of renewal, or in relation to which agreements for early termination have been finalised and executed.
25. **"Existing assets"** means transmission **assets** and **non-transmission projects** that have been commissioned prior to, and are in operation at the time of, the application of this **grid investment test**. For the avoidance of doubt, an investment in the expansion of generating capacity of an existing **generating unit** is not an **existing asset** or part of an **existing asset**, unless the additional generating capacity associated with that capacity expansion has been commissioned prior to, and is in operation at the time of, the application of this **grid investment test**.

26. **"Expected net market benefit"** means the probability-weighted average of the **net market benefit** or **net market cost** for each of the **market development scenarios** developed for the future with the **proposed investment** or **alternative project**. Where this probability-weighted average is less than zero, it is referred to as the **"expected net market cost"**.
27. **"Market benefit"** means the present value of the benefits to those persons who produce, distribute, retail and consume electricity in New Zealand from a **proposed investment** or **alternative project** over a period of 20 years from the commissioning date (unless significant **market benefits** or **costs** are expected to arise from the **proposed investment** or **alternative project** after that time, in which case the then-present value of any future benefits may also be included in the **market benefit** of the **proposed investment** or **alternative project**) and includes:
- 27.1. changes in fuel costs of **existing assets, committed projects** and **modelled projects**;
 - 27.2. changes in the value of involuntary **demand** curtailment;
 - 27.3. changes in the costs of **demand**-side management;
 - 27.4. changes in costs resulting from the deferral of capital expenditure on **modelled projects**;
 - 27.5. changes in costs resulting from differences in the amount of capital expenditure on **modelled projects**;
 - 27.6. changes in costs resulting from differences in operations and maintenance expenditure on **existing assets, committed projects** and **modelled projects**;
 - 27.7. changes in costs for **ancillary services**;
 - 27.8. changes in **losses**, including **local losses**;
 - 27.9. subsidies or other benefits provided under or arising pursuant to all applicable laws, regulations and administrative determinations;
 - 27.10. the value of any material real options associated with the **proposed investment** or **alternative project**; and
 - 27.11. subject to clause 10, **competition benefits**.
28. **"Market development scenarios"** means the reasonable future states of the electricity industry, developed for use in determining the **market benefits** and **costs** of a **proposed investment** and **alternative projects**, for each of:
- 28.1. the future with a **proposed investment**;
 - 28.2. the future with each **alternative project**; and
 - 28.3. the future without the **proposed investment** or any **alternative project**.

29. **"Modelled projects"** means transmission augmentation projects and **non-transmission projects**, other than the **proposed investment** and **alternative projects**, which are:
- 29.1. likely to occur in a **market development scenario**;
 - 29.2. reasonably expected to occur in that **market development scenario** within the time horizon for assessment of the **market benefits** and **costs** of the **proposed investment** and **alternative projects**; and
 - 29.3. the likelihood, nature and timing of which will be affected by whether the **proposed investment** or any **alternative project** proceeds.
30. **"Net market benefit"** means the **market benefit** of a **proposed investment** or **alternative project** in a **market development scenario** less the **cost** of that **proposed investment** or **alternative project** in that **market development scenario**. Where the **cost** exceeds the **market benefit** in a **market development scenario**, this is referred to as the **net market cost** for that **market development scenario**.
31. **"Non-transmission projects"** includes investments in:
- 31.1. generation;
 - 31.2. energy efficiency;
 - 31.3. **demand-side** management;
 - 31.4. **local network** augmentation;
 - 31.5. improvements to the systems and processes of the **system operator**; and
 - 31.6. the provision of **ancillary services**.
32. **"Proposed investment"** means a **reliability investment** or **economic investment** proposed by **Transpower** and submitted by it to the **Board** for approval under rules 13 or 14, respectively, of section III of part F of the **rules**. For the avoidance of doubt, an investment that is to be fully funded under an **investment contract** by one or more **designated transmission customers** that are party to that **investment contract** is not a **proposed investment**.