Regulatory Impact Statement

1. Proposal to revise the existing minimum energy performance standards for distribution transformers.

Agency Disclosure Statement

2. This Regulatory Impact Statement has been prepared by the Ministry of Business Innovation and Employment. It provides an analysis of options to further improve the energy performance of distribution transformers on the New Zealand market.

3. The analysis includes an assessment of:
   - current requirements and the state of the market
   - barriers to the purchase of more energy efficient models of distribution transformers
   - the impact on industry and distribution transformer owners of purchasing more efficient models
   - the impact of requiring more efficient models on suppliers and manufacturers (including the cost of compliance).

4. The recommended option is to revise the existing minimum energy performance standards (MEPS) in New Zealand regulation, in alignment with Australia. The standards are joint Australia-New Zealand ones that draw on international standards. Aligning regulations for this product between the two countries will contribute to the objectives of the Trans-Tasman Mutual Recognition Arrangement (TTMRA) and the Closer Economic Relations (CER) Agreement.

5. This proposal has been developed within the parameters of a joint work plan with Australia, which investigates the introduction of measures that are a variation on MEPS and/or energy labelling. This effectively rules out some alternative options from consideration. The variations include different timeframes for introduction, energy efficiency levels, or whether to introduce voluntary or mandatory standards.

6. The proposed measures are not expected to restrict competition or impose significant costs. Local manufacturers in the New Zealand market also supply Australia. Market data and feedback from industry stakeholders indicates that suppliers can easily source compliant products. Products will not need to comply if they have been locally manufactured or imported before the date the standards are incorporated into regulation. Industry will incur administration costs to register their products (but no registration fee) and may incur costs to test their product (if it has not already been tested to the revised standard).

(Signature of person) (Date)

Status Quo and Problem Definition

7. Transformers are devices that change the voltage between the different stages of electricity generation, transmission, distribution, and consumption. Distribution transformers step down voltage to levels suitable for use of electrical equipment by end users. Most distribution transformers are embedded in the distribution network, but some are also used by large consumers in commerce, industry, mining, and renewable energy generation such as wind power.

8. There are around one million distribution transformers in Australia and New Zealand and they are a significant source of energy losses and corresponding greenhouse gas emissions. It is estimated that 1.4 percent of total electricity generation can be attributed to losses from distribution transformers, which is about 575 GWh per year in New Zealand.

9. Minimum energy performance standards (MEPS) have been in place for distribution transformers sold in New Zealand since 2004. The current requirements cover single phase[1] (up to 50 kVA) and three phase (up to 2500kVA) transformers. The MEPS also specify voluntary high efficiency levels. The same requirements are in place in Australia.

10. The introduction of the current MEPS for distribution transformers was estimated to result in greenhouse gas emission savings of 65 mega tonnes of CO2-e in Australia and New Zealand over a 30 year period[2]. Current technology means that the original targets are unchallenging and there is now room for further cost-effective improvement. However, voluntary high efficiency MEPS have not been adopted.

11. Market failures (described below) hinder the use of more efficient and currently available technology. Existing regulation of electricity distribution businesses by the Commerce Commission, and the Emissions Trading Scheme, do not directly address these failures. Left unaddressed, these failures will incur greater costs as electricity consumption and related losses increase.

Market failures

12. There are no direct incentives on electricity distribution businesses to invest in measures to reduce electricity losses from transformers because they do not bear the direct cost of the losses, nor do they directly benefit from a reduction in losses. This is due to the way the electricity market is structured. Ultimately, the cost of electricity losses is passed on to consumers by electricity retailers, as is the benefit from any reduced losses.

13. Where distribution transformers are used in commercial buildings, the separation between the investor/builder who makes the purchasing decision and the ultimate user can be a barrier to the purchase of more efficient equipment. Lower cost and low efficiency distribution transformers may be favoured in the industrial and mining industries, as the nature of these industries necessarily places an emphasis on capital cost rather than operating costs.

14. Also relevant are existing contracts for supplying equipment, products already held in storage as spares, and consulting engineers who use previous design specifications. Decisions based on these criteria can be rational from the perspective of the individual decision-maker but may incur societal costs.

[1] Includes Single Wire Earth Return (SWER) transformers, which are low capacity single phase units used in rural areas.

[2] E3 Decision Regulatory Impact Statement, Revising Minimum Energy Performance Standards for Distribution Transformers, September 2012

Other regulation of distribution transformers

15. The Commerce Commission (the Commission) regulates electricity distribution businesses under Part 4 of the Commerce Act 1986. The regime consists of price-quality regulation and information disclosure requirements[3]. Section 54Q of the Commerce Act requires the Commission to consider how price-quality regulation can promote incentives and avoid disincentives for investment in energy efficiency and demand side management, and in reducing energy losses[4].

16. To date, the Commission has not included any specific mechanism to address section 54Q in the default price-quality path it has developed due to the complexity involved, and other priorities. It does recognise though that there are potential initiatives available to distribution businesses to influence energy efficiency that may be consistent with the purpose of Part 4, and identifies the alternative option of customised price-quality paths as more appropriate for implementing a sophisticated and robust energy efficiency mechanism.

17. While no specific mechanism to address section 54Q has been included the default price-quality path, the Commission has recently developed revised requirements for the information that should be disclosed by distribution businesses in 10-year Asset Management Plans. They include a requirement to disclose any asset purchasing strategies that promote the energy efficient operation of the network.

Recent decisions and trans-Tasman issues

18. Cabinet endorsed the Equipment Energy Efficiency (E3) forward work plan in August 2009 [EGI Min (09) 17/5 refers]. This is a joint work plan for Australia and New Zealand to develop and adopt common energy efficiency standards for products sold on both markets. The work plan includes investigation of revised minimum energy performance standards (MEPS) for distribution transformers and a range of other products.

19. This proposal has been developed within the parameters of the E3 forward work plan, which effectively rules out some alternative options from consideration. All the options investigated for E3 work plan items are a variation on minimum energy performance standards (MEPS) and/or energy labelling. The variations considered may include different timeframes for introduction, energy efficiency levels or product coverage, or whether to introduce voluntary or mandatory standards.

20. MEPS and energy labelling standards become mandatory in New Zealand when they are incorporated into the Energy Efficiency (Energy Using Products) Regulations 2002 (the Regulations). Distribution transformers are already subject to MEPS under the Regulations. The same requirements apply in Australia.

Emissions Trading

21. The Emissions Trading Scheme (ETS) is currently the primary intervention to reduce greenhouse gas emissions across all sectors of the economy, including the energy

[3] Some distribution businesses are exempt from price-quality path regulation due to being "consumer" owned. See www.comcom.govt.nz/treatment-of-consumer-owned-electricity-distribution-businesses/ for further information. For those 12 distribution businesses not subject to price-quality regulation, the information disclosure requirements are the only tool the Commission has to influence energy efficiency.

[4] The Commission can promote these only to the extent that doing so is consistent with the purpose statement of Part 4, which includes promoting outcomes consistent with those of competitive markets such that distribution businesses have incentives to invest and innovate, improve efficiency and provide services at a quality that reflects consumer demands.

sector. The ETS places a price on carbon emissions in the energy sector, and it is already a feature of investment decisions and a factor in improving the competitiveness of low emissions alternatives.

22. The ETS effectively sets a carbon price and increases the price of electricity to reflect that price. However, as the users of distribution transformers do not bear the cost of lost electricity, the ETS does not provide any incentive for distribution businesses to purchase efficient transformers. Given the long lifetime of most transformer equipment (over 30 years), there is merit in supplementing a carbon price with direct measures to correct those market failures. Introducing more stringent MEPS for transformers is such a measure.

Objectives

23. The main objectives of the proposal are to:

- address the market failures that prevent voluntary deployment of efficient distribution transformers
- reduce transformer energy losses without compromising quality and reliability of supply
- realise the wider economic benefits that come from closer economic relations with Australia by maintaining consistent standards, with respect to commercially traded goods, in accordance with the TTMRA and CER Agreement
- promote even more energy efficient transformers by providing voluntary high efficiency levels.

Options

24. The preferred option is to increase existing mandatory MEPS levels to the current voluntary high efficiency levels for distribution transformers at the same time as Australia, which is at a date to be confirmed. It is also proposed that the scope of the MEPS is expanded to include transformers up to 3150kVA and system voltages up to 36kV so that it covers a wider range of transformers, such as those use in wind farms.

25. The proposed revised MEPS levels are a significant improvement over the current MEPS, but the levels are modest compared with standards in place or being considered in other countries. The levels are considered an appropriate minimum standard, but it is also proposed that more stringent voluntary high efficiency MEPS are introduced as a target. Both MEPS levels are set out in the draft transformers standard AS/NZS 60076.99. This standard is in the final stages of development. It is due to be released for public comment and is planned to be finalised early in 2013.

26. The existing transitional provisions in New Zealand would apply to this proposal – that is, any distribution transformers manufactured in, or imported into, New Zealand before the new requirements are introduced can still be sold without meeting the revised requirements.

27. Introducing more stringent MEPS is a simple and direct intervention to improve the energy efficiency of distribution transformers.

Alternative Options

28. The alternative options to introducing more stringent MEPS for a wider range of transformers are the status quo (business as usual), or introducing even more stringent requirements than those proposed.

29. The business as usual case is a continuation of the current MEPS that includes voluntary high efficiency levels. However, these voluntary levels have not yet been adopted due to the previously discussed market failures, so this option is unlikely to lead to energy efficiency improvements. It would also result in misalignment with Australian requirements once they are revised.

30. Further increases in the stringency of the MEPS above those currently proposed[5] were also examined. However, the average incremental costs of meeting more stringent levels using current technologies were found to nearly outweigh the benefit of additional loss reductions making the cost benefit ratio very marginal. Industry also had technical concerns with this option. These levels are instead proposed to be the new voluntary high efficiency targets in the preferred option.

Impact analysis

31. Cumulative energy savings from the proposal are estimated at 2,000 GWh for the period 2010–2039 with a net present value of $5.5 million. The energy savings are estimated to result in 1.8 million tonnes of avoided greenhouse gas emissions (CO_2 equivalent).

32. The energy savings are estimated based on the reduction in energy losses resulting from increased MEPS. Analysis shows that implementing the revised standards could deliver an additional 10 percent reduction in energy losses from distribution transformers across the board (over and above the reductions delivered under the existing standards). The analysis is based on the following assumptions:

    - the average life of a transformer is 30 years, with a retirement rate of two percent for distribution businesses and three percent for the private sector
    - there were 228,000 transformers in 2010, and the rate of increase in installed transformers is 2.5 percent per year
    - an 8.82 percent discount rate is used to calculate net present value
    - the cost of losses is calculated at $135 per MWh.

33. The estimated costs and benefits of the proposal are set out in Table 1 below. The “total loss cost difference” of $56 million represents the value of the energy savings[6].

34. While there would be a significant reduction in losses from each transformer installed once the revised MEPS take effect, the long lifespan of transformers means that it will take a long time to replace existing transformers. This means the reduction in energy losses will be gradual, and the benefit-cost ratio is marginal in the first 30 years from implementation.

[5] To the higher efficiency levels set out in the draft transformers standard AS/NZS 60076.99

[6] Valued using an estimate of the upstream energy and network costs at the location in the network where most distribution transformers operate

Table 1: Cost and benefit summary of revised MEPS levels (at present value)[7]

Benefit of loss reduction	$ million
Losses from existing MEPS	496.0
Losses from proposed revised MEPS	439.9
Reduced losses from revised proposed MEPS	56.1
Costs of loss reduction	
Increased transformer capital costs	50.0
Government costs	0.5
Business costs	0.1
Total cost	50.6
Total Net Present Value (NPV) 2010-39	**5.5**
Benefit-Cost Ratio	**1.11**

35. The MEPS revision for distribution transformers would impact on New Zealand manufacturers, and importers of transformers for use in New Zealand. It would also impact on businesses that purchase transformers, who are primarily electricity distribution businesses, but also private owners in the manufacturing, commercial, mining and processing sectors.

36. Implementing the revised MEPS levels will have the following benefits:

- a reduction in the lifetime cost of a distribution transformer when capital and energy costs are taken into account
- similar reductions are likely for transformers used in private industry and in wind farms, even though the owners are faced with somewhat different incentives and cost conditions
- a reduction in electricity losses, which reduces the net cost of electricity paid by consumers (albeit by a very small amount)
- consistent standards between Australia and New Zealand that align with international best practice.

37. There should be no negative impact on product quality and function as more energy efficient transformers are overall a higher quality product. No significant negative impacts on manufacturers and suppliers are expected as potential issues have been recognised and dealt with through the development of this proposal and the related standard.

38. The cost to the taxpayer is estimated at $45,000 per year and is included in the cost-benefit analysis. This is a conservatively high estimate of the marginal costs that will be incurred in addition to administration of the existing MEPS programme[8].

Supplier costs

39. Responsibility for MEPS compliance lies with the seller (generally the importer or local manufacturer) of the transformer. This analysis assumes that any increases in product design and construction costs will be passed to customers as higher purchase prices (discussed below). The estimated costs for MEPS compliance and costing assumptions are set out in Table 2 below.

[7] Source: 'Proposed Revised Minimum Energy Performance Standards for Distribution Transformers" EECA, December 2010

[8] Consisting of salary and overheads for administering the programme, research and other costs, education and promotional activities

Table 2: Business Compliance Cost Components[9]

Category	Task	Cost Inputs
Education	Training staff, maintaining awareness of regulations and keeping up-to-date with changes	80 hours/year per supplier
Compliance	Applying for and maintaining MEPS registration	8 hours per transformer model
Record Keeping	Keeping statutory documents updated for 5 years	8 hours/5 years per supplier
Other inputs		Staff costs $40/hr

40. The costs of all materials, equipment and other items purchased to comply with the regulation were not included in the business compliance cost category as they are explicitly included in the cost-benefit analysis as increased costs to the purchaser of the product.

41. The total cost of business compliance for the MEPS depends on the number of businesses manufacturing and importing transformers and the number of models supplied. There are 45 different models within scope of the current MEPS, 30 of which are supplied to Australia and New Zealand in significant numbers. As the market details were not known, cost estimates were made on the following assumptions:

    - eight major local manufacturers in Australia and New Zealand supply about 20 different models in large numbers; and
    - 15 importers supply 30 different models in lower numbers.

42. The costs to business of the proposal were estimated at AU$12,000 per manufacturer/importer. Six of the manufacturer/importers supply to the New Zealand market, so the cost is estimated at $85,000 (using A$1 = $NZ1.18). It is assumed that new models will be introduced regularly over time, so amortization of the costs over a period of ten years (10 percent interest rate) results in a cost of $13,800 per year. After 10 years, the annual cost is estimated to be $3,500.

43. These costs are relatively low, explained to some extent by the fact that most local manufacturers already have a compliance regime in place under the current MEPS. Manufacturers that may have avoided MEPS compliance in the past may need to do more than some others to set up their systems to comply with the proposed revised MEPS.

Manufacturer costs

44. Improving transformer efficiency involves reducing losses by using improved materials in the core and/or windings, or more of the same material in these components, for example by using conductors with a larger cross-sectional area. Conductors are now generally made of aluminium instead of copper. Copper has greater electrical conductivity than aluminium, which reduces losses, but it has become increasingly more expensive relative to aluminium. There may be consequential additional manufacturing costs and certainly some costs in revising designs, although these would be one-off.

45. It is difficult to obtain detailed costing figures for transformers because of commercial in confidence considerations, but some costs were obtained from industry. It was possible

[9] Source: Estimated from other MEPS programmes and staff costs from Australian Jobs 2006

to develop a capital cost for each size of transformer based on information provided by one manufacturer on a confidential basis.

46. For the purpose of this analysis, the incremental cost of compliance to the revised MEPS was linked to the level of loss reduction for each transformer size. The percentage reduction in losses is inversely proportional to the quantity and hence cost of material required, either through conductor diameter or core volume. Estimates were made of the increase in capital cost for each transformer size[10] that were in the range of five to ten percent. This enabled an estimate to be made of the total incremental capital cost of all oil-immersed and dry type transformers expected to be installed between 2010 and 2039.

47. The total increased capital cost for New Zealand is estimated at $50 million over the assessed period of 2010 to 2039. This is slightly less than 10 percent of the total capital cost of transformers expected to be installed over the period and is considered to be conservative on average.

48. Incremental costs for smaller units could be as little as a few percent and for larger units, up to 20 percent or higher[11]. There was broad consensus from stakeholders that around 10 percent is likely to be close to the average increase across all units from a MEPS revision.

49. Because additional costs relate mainly to materials, increased manufacturing costs will be similar in New Zealand and Australia, as will any increase in imported transformer costs when converted at the prevailing exchange rate.

Consultation

50. New Zealand suppliers of distribution transformers were advised of the proposal to revise MEPS in November 2008, and a stakeholder meeting was held in Auckland in November 2008. EnergyNews distributed this advice in an email newsletter. Stakeholders were advised of the proposal to include wind turbine transformers in May 2009 and a notification was available on the Wind Energy Association website.

51. A discussion paper "Proposed Revised Minimum Energy Performance Standards for Distribution Transformers" was released by the Energy Efficiency and Conservation Authority (EECA) in December 2010 for public comment. EECA met with local manufacturer ABB, the Electricity Networks Association, the Electrical Engineers Association, and Wind Energy Association in January 2011, and recently engaged again with the Wind Energy Association.

52. Submitters were initially concerned at the proposal because they thought that the proposed implementation date of October 2011 was too soon. The implementation date was delayed and industry is now confident that it can meet the requirements in time. Some submitters felt that the inclusion of distribution transformers used in wind farms was unnecessary due to existing incentives. They are now comfortable with the proposal since compliant product is now more widely available (in anticipation of the increased MEPS).

[10] It was assumed that material cost was 70 percent of total cost, with labour and other costs comprising 30 percent.

[11] This variability and uncertainty clouds the analysis somewhat, but a factor that tends to work in the opposite direction is that larger units tend to be more highly loaded on average than smaller ones, because larger loads are typically an amalgam of smaller loads and are inherently less variable. Thus for larger units, the relatively high incremental costs would be partially offset by the relatively larger loss reduction because of the higher than average loading, and vice versa for smaller units.

53. The proposal is consistent with New Zealand's international obligations under the World Trade Organisation's (WTO) Technical Barriers to Trade Agreement and have been notified through the WTO notification process. The Australia and New Zealand Standard applies equally to products produced locally and overseas.

54. Stakeholders have also had the opportunity to participate in the development of the standards through representation on standards committees, and when the draft standards are released for public comment.

Conclusions and Recommendations

55. Cumulative energy savings from the MEPS revision are estimated at 2,000 GWh for New Zealand for the 30-year period to 2039. The electrical energy saved is equivalent to the annual electricity use of the Bay of Plenty region, and will avoid approximately 1.8 million tonnes of greenhouse gases. Taking business and regulatory overheads into account, the benefits are estimated to outweigh the costs, with a benefit/cost ratio of about 1.11.

56. While the economic and environmental benefits are modest, increasing the stringency of the existing MEPS is a simple and direct intervention for improving the energy efficiency of distribution transformers. Further, maintaining alignment with Australia will uphold the principles of the TTMRA and the CER Agreement, and reduce business compliance costs.

57. Consumers will ultimately benefit from improvements to the energy efficiency of distribution transformers through a reduction in the cost of electricity (albeit by a very small amount).

58. The recommendation is to revise MEPS for distribution transformers to the levels proposed in the draft standard AS/NZS 60076.99.

Implementation

59. An amendment will need to be made to the Energy Efficiency (Energy Using Products) Regulations 2002 to incorporate the relevant Australia/New Zealand Standards by listing them under Schedule 1 (for MEPS) of the Regulations. Industry stakeholders will be notified well in advance of the proposed introduction date to allow them to prepare for the introduction of revised requirements.

60. Compliance will be achieved primarily though raising awareness of the regulations, helping industry members understand their obligations, and working cooperatively with business to achieve compliance. Businesses that repeatedly fail to meet their obligations could incur penalties of up to $10,000 for each instance of non-compliance under the Regulations. Fines would be pursued as a last resort, and publicised to create a disincentive for further non-compliance and to instil public confidence that the Regulations are effectively policed.

Monitoring, evaluation and review

61. Sales data for distribution transformers is collected annually and used to compare actual and forecast energy savings under MEPS. A report on the impacts of MEPS will be prepared annually and shared with stakeholders. The relevant standards will be reviewed every three to five years. Monitoring and compliance activities will be shared with Australia.