
New Zealand Energy Efficiency and Conservation Strategy – making it happen; draft strategy

Submission to the Energy Efficiency and Conservation Authority (EECA), 30 March 2007

Background to IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national professional body representing the engineering profession in New Zealand. It has approximately 10,000 Members, including a cross-section from engineering students to practising engineers to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.

Executive Summary

IPENZ strongly supports all initiatives to implement energy efficiency in a cost-effective manner. As such we support the draft New Zealand Energy Efficiency and Conservation Strategy (NEECS) and its recognition of the importance of sound economic analysis, though we note that this appears to have been restricted by a lack of data.

IPENZ recommends a research-informed, risk management approach to developing energy strategies. We consider that any intervention must be justified by cost: benefit or risk: benefit analysis. IPENZ has developed a framework for analysing and comparing options for government action and considers that the essence of a suitable New Zealand Energy Strategy can be defined via a set of premises, technology propositions and principles, and that all detailed actions must be consistent with them. We have outlined them in our submission on the National Energy Strategy (NES) and included them below. We have also responded more specifically to the draft energy efficiency and conservation strategy.

In our view the approach outlined above will show a strong case for immediate roll-out of a range of minimum standards targeting minimum life cycle costs for consumers. Such standards should be incrementally increased as technology allows, thereby ensuring that New Zealand's energy efficiency also increases.

We also note that there appears to be little recognition within the NEECS of the impact that transformational technologies are likely to have. Such technologies could produce a paradigm shift in how we use and produce energy in New Zealand. The draft NEECS focuses very heavily on "business as usual" and how to improve its efficiency. The NEECS needs to be much more forward-looking and incorporate the likely evolution of transformational technologies and the need to prepare for their uptake.

We are happy to meet with EECA to further discuss any of the points raised in this submission.

Submission

Premises, propositions & principles

IPENZ considers that the essence of a suitable New Zealand energy strategy, including an efficiency and conservation strategy, can be defined via a set of premises, technology propositions and principles, and that all detailed actions must be consistent with them.

- The appropriate approach, both in terms of ongoing security of energy supply and long-term sustainability (including movement towards a carbon-neutral economy), must be based on risk management.
- The weight of scientific opinion on climate change blames human activities but this is not yet proven. While New Zealand may wish to demonstrate leadership on global issues, risk management analysis suggests that it would be unwise to move significantly ahead of the rest of the world by undertaking actions that are not otherwise economically reasonable, or that cannot be justified by a risk: benefit analysis that considers only the New Zealand context.
- Very worthwhile gains can be made by energy efficiency and conservation measures that target minimum life cycle costs for consumers (ie achieve the lowest possible total cost over the full life cycle of the product/activity). Policies and programmes to implement these measures should be put in place without delay.
- Energy efficiency and conservation programmes currently in place should be revised to ensure they target minimum life cycle costs to consumers. This will require higher level interventions than public education or price-based measures. Vigorous campaigns to introduce minimum standards for a wide range of energy end-users, in both transport and stationary energy, are justified and should be introduced immediately. The exception is large, technically competent industry players, which are capable of responding appropriately to pricing signals.
- As well as immediate minimum standards programmes, there is a need to implement urban design improvements (including but not limited to greater access to public transport) to minimise New Zealanders' future energy demands.
- Picking technologies is far inferior to driving up minimum standards continuously as technologies improve. For example, solar water heating is only economically viable in particular circumstances and other technologies that are more beneficial in other circumstances may not be implemented unless a standards approach is used.
- A minimum standards approach could be applied to the incoming (imported) vehicle fleet, and could be accommodated without any major disruption to our economy or the creation of adverse social effects. We note that clean diesel is currently the most efficient technology, and we would expect a major shift to this over about 10 years if minimum standards were introduced.
- Efficiency in the existing building stock must be tackled if a real difference is to be made. This will require either a compulsory building rating system designed to create a capital value for energy efficiency, or building upgrades to a minimum standard at the time of sale.

- Energy efficiency programmes are likely to reduce direct fossil fuel consumption but will probably increase electricity use. This will mean that we need to continue to increase our generation capacity.
- A transition towards electricity is likely to be as apparent in transport as it will be in stationary energy. Once electrical storage technologies are available to enable 100-150kWh to be stored compactly and recharged quickly, private passenger transport worldwide could well move to electrically-driven vehicles as they offer solutions to wider problems than just economic fuel supply. Thus the international need for liquid fuel for many types of transport (except for shipping and air transport) might reduce significantly in the longer term.
- Once electrical storage technologies for vehicles are available, use of those technologies in houses would provide at least a partial solution to the problem of matching unreliable electricity supply with demand. It also brings the potential of direct photo-voltaic generation much more into the mix.
- To meet growing electricity demand it is vital that policy and regulatory environments encourage rational long-term decision making in the private sector, ensuring we realise as much as possible of the potential for increased hydro and geothermal generation.
- Supplying a significant part of an increasingly electrically driven economy with unpredictable renewables such as wind and waves, or cyclical renewables such as tides, will only be possible with the development of economically viable electricity storage technologies. There is potential to increase hydro storage, but other forms of storage may also be needed – without storage technologies the only currently available back up is thermal generation. Having sufficient storage capacity may prove pivotal to achieving the Government’s goal of carbon neutrality.
- A robust electricity transmission system will remain vital to enable generation and demand to be efficiently coupled. The nature of the transmission system may change dramatically over time if distributed generation and storage become economically viable.
- Rescinding moratoria on certain rivers for hydro development and the possible use of nuclear energy may need to be widely debated in our communities to see whether the values of New Zealanders have changed or will change – they may prefer one of these options to more thermal power plant. However, a watching brief on the technical and economic viability of carbon sequestration or other CO₂ mitigation technologies is also important – using our large coal reserves might then be more publicly acceptable.
- Liquid transport fuel must be considered internationally. Subsidising local transport fuel supply or requiring uneconomic investments in transport fuel production to be made through mandatory obligations is very questionable because it risks capital stranding. A biofuels sales obligation set too high may inadvertently increase life cycle costs for consumers, consume substantial energy in production and implementation costs, and be overtaken by more beneficial technologies in the longer term.
- Public R&D spending on energy should be directed towards:
 - operational research to inform ongoing minimum standard development and updating

- the adaptation of energy efficiency technologies to any special New Zealand circumstances
- support for New Zealand researchers undertaking energy research of international class
- technology development that assists New Zealand to maximise energy recovery from naturally occurring fluid flows (geothermal, hydro, wind, waves, tides)

Response to discussion paper

Following are our responses to the *Consultation Questions* contained in the draft strategy. These comments are consistent with the previous essence statement, and also draw on IPENZ 2006 Publication *Engineering a National Energy Strategy* (available at www.ipenz.org.nz/ipenz/media_comm/Additional_publications.cfm).

Questions 1 & 2 - Selecting and prioritising actions:

In *Engineering a National Energy Strategy*, IPENZ identified five ways in which the Government may choose to act to achieve its energy objectives: clarification of market rules, minimum standards, education, compulsory information and pricing policies. We recommend a framework where the classes of possible intervention are listed against sectors to provide clarity in selecting, assessing and prioritising different interventions and to facilitate review by relevant parties.

It is imperative that any actions selected provide certainty of both process and timescale for those making energy-related decisions. The greater the certainty, the greater the likelihood of good long-term decision making and investment by New Zealanders.

The selection of the best intervention should be based on sound and transparent research. This will require a government commitment to supporting or facilitating operational research to quantify the total impact and cost: benefit ratio (benefit: risk for some security issues) for various options. There needs to be public confidence that the research is robust (through public scrutiny and expert peer review) and that proposed interventions have net economic benefit to New Zealand and to consumers affected by the interventions. In our view the research will show a strong case for immediate roll-out of a range of minimum standards targeting minimum life cycle costs for consumers.

We note in appendix 3 that EECA has used a research-informed approach in certain cases. However, many of the actions and targets proposed in the draft do not appear to be supported by such research.

IPENZ is pleased to see the commitment throughout the document (for instance in the objective *Smart electricity*) to consider all viable alternatives, including the construction of new supply assets and energy efficiency. However, we are concerned because adequate data is currently not available to accomplish this. We recommend that the strategy includes a component to undertake the necessary operational research to optimise energy efficiency in New Zealand. The cost of such research would be minimal compared to the cost if poor interventions are chosen.

As well as improvements to *existing* technologies, there must be flexibility to allow for rapid deployment of *breakthrough* technologies. This aspect needs more consideration, as we will discuss later.

Allowance also needs to be made for options that significantly reduce national energy security risk even if they do not have a good cost: benefit ratio. Linkages with the NES will be necessary to make decisions on the appropriate level of these options. The optimal mix of supply technologies may change over time with advances in technology.

- Solar water heating

In relation to the solar water heating initiative in the draft objectives *Healthy Homes* and *Clean Electricity and Heat*, we recommend that a cost: benefit analysis is urgently undertaken to ensure that this intervention is really worthwhile, that is, it will lead to the lowest possible life cycle costs for supplying hot water and a net economic benefit to the nation. It may be that other actions are at least as valuable or are needed to make the solar water heating proposal viable. For example, the development of a national environmental standard on solar access or a requirement to improve household energy efficiency by utilising the most appropriate technology for the circumstances could be implemented.

In our submission to EECA on increasing the uptake of solar water heating, we stated that we would have preferred to see the proposed initiative considered in a wider policy framework. There are a number of competing technologies for water heating which may provide a lower life cycle cost and we believe that the consultation should have considered all forms of improved efficiency of residential water heating, which could be implemented by setting a performance standard to be achieved. IPENZ firmly holds the view that setting performance standards is always better than mandating technologies. We do realise that such an approach will require substantial analysis, which is why we have highlighted the need to enhance the operational research capability for energy in New Zealand. Such analysis needs to take a long-term view and consider the likely development of other technologies, such as electricity storage systems, which may make household roof area more valuable for photovoltaic cells than for hot water heating.

- Biofuels sales obligation

IPENZ considers that it is much more preferable to introduce minimum standards than impose a specific technology and therefore has some concerns regarding the biofuel sales obligation under the objective *Introducing Renewable Transport Fuel*. We consider that it would be appropriate to monitor the implementation of the first stage of the sales obligation scheme, as well as emerging technologies (we are pleased to see that monitoring other technologies is included in the objective) before making a decision on whether to increase the level at later stages. As in our submission of 20 October 2006 to the Ministry of Transport, IPENZ only supports a biofuel sales obligation if the following conditions are met:

1. Only activities which are, or are expected to become, economically viable in the longer term are introduced.
2. The policies introduced will not inadvertently lead to perverse or undesirable practice, for example activities that fail to decrease CO₂ emissions overall. It is our view that a biofuel requirement should be carefully restricted, with provisions included to circumvent biofuel options that do not provide favourable life cycle balances for greenhouse gases.

It is our understanding that any reductions in CO₂ emissions from the *use* of biofuels might well be partially countered by the emissions used in the *production* of such fuel.

Requiring non-economic activity to occur through a biofuels requirement also increases the potential for expensive capital stranding if other energy-efficient vehicle technologies that do not use internal combustion advance rapidly. In these circumstances we could have wasted large amounts of capital for little benefit in terms of reduction of net emissions. We would suggest that, rather than introducing a mandatory sales obligation that goes beyond the bounds suggested above, government could support further research aimed at identifying breakthrough technologies and highlighting commercial opportunities.

3 - Accountability:

IPENZ considers that government should redefine the roles of relevant agencies (especially the Electricity Commission [EC] and EECA), empower them, and demand high levels of performance from them in order to make progress on high priority items.

If a programme of minimum standards is to be introduced, EECA is the logical agency to undertake development work, and to assist regulators in other government agencies with implementation. Regardless of where ultimate responsibilities lie within government, they must be clearly defined and should encourage co-operation between departments. The best results for the country will only be achieved if all departments work closely together.

4 - Setting targets:

IPENZ agrees that it is necessary to set measurable targets for the NEECS, but debate over the setting of targets should not detract from what is most important – doing something now to make efficiency gains. We note that EECA and the EC are carrying out ongoing work to estimate the size of the realisable energy gains for New Zealand and hope that this will be ready for the final NEECS document. We note that the realisable gains are likely to change as technology improves.

Efficiency targets need to link with overarching goals such as those suggested by the NES and New Zealand's commitment to CO₂ reduction. The interventions proposed should be proven on a cost: benefit basis and compared against all other options. Without this, it will not be possible for the NEECS to set an optimum target for the nation in terms of how much energy and greenhouse gas emissions can be reduced by efficiency and conservation measures, and the country could face unnecessary costs in meeting its greenhouse gas and energy objectives, with the penalties outweighing the environment gains.

It is not clear to us how many of the targets in the draft NEECS have been arrived at. While Appendix 4 does mention past experience and experience from other countries, it appears the targets are based on resource limitations affecting the rate of implementation rather than research to determine how objectives can most cost-effectively be met. Should there be a sufficient economic imperative, many of the resource limitations could presumably be overcome through targeted programmes. As an example, it is not clear that the target under the *Clean Electricity and Heat* objective – installing 15,000 to 20,000 new solar water heating units by 2010 – has been satisfactorily derived. As we recommend that a cost: benefit analysis (as outlined previously) be urgently undertaken.

5 - Progress indicators and monitoring:

We consider it is important to focus on implementing efficiency measures that create, and attempt to measure success against, numerical targets. We suggest monitoring the performance of the relevant agencies, the roll-out of policies and programmes, and the take-up of relevant programmes.

6 - Local government and non-government agencies:

Through their regional or district plans, and the setting of technical requirements for new land development, local governments can play an important role in managing urban design so that people do not become unnecessarily reliant on the need for inefficient or low value travel. We recommend a whole-of-government, research-based approach to examining policies promoting urban design of integrated communities to encourage living styles with little need for low value travel.

National Policy Statements (NPSs) on public transport, preferential transport corridors and urban design should be considered. In giving effect to such NPSs under the Resource

Management Act, local authorities would ensure improved urban design for the benefit of New Zealanders.

Planning rules can also play an important role in defining the potential for solar heating in buildings. There need to be planning rules that ensure sunshine is not unreasonably shadowed, and that in subdivision design the potential benefits of orienting homes to the sun is maximised. The development of an NES would ensure that councils give effect to these matters in their district plans, thereby assisting in lowering heating demand.

7 - Non-government organisations and business organisations:

No government policy will ever be successful unless those affected by it are involved in its development and the country's best experts are used. IPENZ believes non-government and business organisations can play a very important role in facilitating this. They have the advantage of impartiality so can act, inter alia, as information conduits between government, experts and members of industry bodies, making it easier for government to get the opinion of the industry or expert groups.

8 - Technical efficiency v modifying behaviour:

We are pleased to see recognition in the NEECS that purchasers tend to make choices that "minimise cost at the time of purchase rather than considering the costs incurred continuously throughout the life of the product" (Objective: *Better Products* p22, *Healthy Homes*, p42). IPENZ recommends that one of the key principles for assessing interventions is that they must move consumer decisions on technologies to the minimum life cycle cost based on cost: benefit and risk: benefit analyses. We would like to see this principle incorporated and highlighted as a key component of the NEECS.

IPENZ agrees with the emphasis in the NEECS on education and information to modify behaviour – these are two of the groups of interventions in *Engineering a National Energy Strategy*. However, we consider that greater intervention through minimum standards may be needed to ensure minimum life cycle cost decisions are made.

IPENZ believes the effectiveness of energy efficiency and conservation measures will rely more on exposure to market prices to encourage the best technical choices, an economic matter, rather than on the attitudes of New Zealanders to environmental matters.

9 - Energy conserving behaviour to reduce energy use and carbon emissions:

There is evidence from IEA studies that, with a strong governmental commitment based on minimising life cycle costs of electricity, end-users can significantly reduce the growth in demand for electricity without any economic loss to the nation. In general, the costs of well-targeted efficiency and conservation schemes are much lower than the costs of installing more generation and transmission.

IPENZ believes a properly engineered contingency plan is justified for dry years. As part of this, appropriate subsidies should be applied to reduce demand and ensure security. This is discussed more in our document *Engineering a National Energy Strategy*.

10 - Targets for transport sector:

The strategy needs to be far more forward-thinking when setting targets for the transport sector. Targets cannot only be based on improving the efficiency of current "business-as-usual" options but, as we have already explained, must allow for paradigm shifts through transformational technologies – such as immediate wider uptake of clean diesel vehicles, and future development of electricity-storage devices leading to widespread uptake of electric or hybrid cars.

Only through such paradigm shifts will New Zealand ever take very large steps towards true sustainability in transport energy use.

11 - Freight movement:

An integrated freight strategy needs to be developed, considering road, rail and sea, rather than a strategy for shipping developed in isolation. For example, we need to consider whether ports should be moved to relieve urban congestion in road systems where freight and passengers both contribute to peaks.

12 - Renewable energy target(s):

We are pleased to see that the draft rightly recognises the enormous potential for renewable energy in New Zealand. We believe New Zealand has an opportunity far greater than most countries to use energy produced only by renewable means, provided this is proven to be cost-effective. The strategy needs to take a far bolder approach in setting targets for renewables, incorporating the uptake of transformational technologies as they evolve. Storage technologies will also be important to maximise renewable use whilst ensuring security.

13 - Other targets:

As above, targets need to be driven by and linked to higher-level strategies.

14 - Other opportunities:

It is necessary to develop a comprehensive and costed plan for the data collection and operational research necessary to fully develop and implement the NEECS.

As stated earlier, it is necessary to include in the draft much greater consideration of how New Zealand will prepare itself to deal with transformational technologies when and if breakthroughs occur.

Conclusion

IPENZ agrees with the intent of the draft and most of the principles on which it is based; however, we note that the principles stated in the draft strategy often do not appear to have been adhered to in the development of the strategy's detailed activities.

We strongly recommend that all proposals are consistent with all of the principles that we have outlined, and that possible interventions are compared by robust, research-informed cost-benefit analysis.

We also think the strategy needs to be much bolder in proposing the use of regulatory and other measures, particularly the introduction of minimum standards.

In addition, we consider that the strategy should give much greater consideration to the likely emergence of transformational technologies, which will make substantial gains possible, and may need to be planned for in advance.