Programme Review
Commercial Buildings

Document purpose:	This document is the result of the programme reviews EECA and MBIE conducted across EECA's programme portfolio in 2016. The reviews were in response to a requirement to reprioritise the EECA's portfolio in the context of the new NZEECS, the new EV programme, and expanded levy. The framework for the review is available here. The reviews were based on existing documentation and workshops with MBIE, PwC and EECA staff.

About the Commercial Buildings programmes

EECA has created two programmes to intervene in the commercial building market to address the problems and correct the market failures. The first is the National Australian Built Environment Rating System New Zealand (NABERSNZ), an energy efficiency rating scheme for existing commercial buildings. The second is Commercial Building Performance Advice (CBPA) for new buildings and large refurbishments.

NABERSNZ measures an existing building's energy and/or environmental performance on a star scale of 1 to 6 and provides an indication of how that building compares to others based on energy use and CO_2 emissions. It was licensed and adapted from the National Australian Built Environment Rating System (NABERS) programme in Australia.

Commercial Building Performance Advice funds Programme Partners to provide advisory services to owners and developers of new commercial buildings to ensure that energy efficient options are embedded in the design and fit-out of new buildings. This includes major refurbishments on existing buildings.

Conclusions

Both of EECA's programmes in this sector (NABERSNZ and Commercial Building Performance Advice) were developed to address identified problems. However, the mandate for government intervention is not yet clear for either programme.

The potential scale of public benefits in the commercial building sector is relatively low and does not support a strong role for government intervention. This is due to the large proportion of New Zealand's electricity that is from renewable sources. The private benefits from pursuing energy efficiency in the areas of cost reduction and productivity improvement are strong.

The role for government is stronger for Commercial Building Performance Advice than for NABERSNZ. This is because of the costs of technology lock-in over the market life of building assets and the opportunity to address the early stage information failure in this market. Tackling the problem of split incentives in the commercial building market before and during construction is much easier than attempting to do so after the building is complete, potentially making this a valuable endeavour.

While uptake for NABERSNZ seems low, it is tracking the same as it did in Australia during the first four years. This is despite the constraint of commercial building supply creating market conditions that generate significant headwinds for the programmes.

To demonstrate value for money and programme performance, the Commercial Buildings programmes are dependent on data collection and analysis which is difficult for industry players to provide (before and after baselines, metering issues etc.), and subject to significant time delays (between implementation and performance impact). The effect is twofold:

- the absence of motivating information for programme participants (it is difficult for owners and tenants to appreciate the impact of energy efficiency measures)
- an inability to monitor and track programme success by EECA.

It is important to consider the commercial building programmes as tools within a wider business engagement programme. These programmes provide opportunities to 'get a foot in the door' and engage with businesses which may then go on to take larger steps which generate greater benefits.

Recommendations

EECA could conduct a wider discussion of potential intervention options for the Commercial Building Performance Advice Programme, given the potential benefits which can be realised before and during construction. Such discussion would be across government and involve private actors in the market.

Further, the potential benefits from energy efficiency in the public sector are public benefits. EECA could therefore evaluate the potential public benefits of targeting NABERSNZ to government tenants and public buildings such as hospitals, schools, and local council offices. Targeting NABERSNZ in this way, and allowing for an adequate number of re-ratings, will provide EECA with sufficient evidence on any productivity benefits of the programme and any value in making NABERSNZ mandatory.

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1 The problem

1.1 The problem description

The owners/developers of commercial buildings are not making the most efficient long-term energy usage decisions, although their decisions might be rational or efficient in other ways. This is occurring because:

- developers/owners do not know about the potential benefits of energy efficiency and therefore do not prioritise it when building commercial buildings
- tenants/prospective tenants cannot observe energy efficiency information about commercial buildings and therefore do not demand it
- there are split incentives created in this market between owners/developers and tenants
- low building code standards minimise incentives to build using energy efficient elements
- once a building has been built there is a limited ability to increase energy efficiency
- there is misinformation in the market about the risks of building an energy efficient building. Therefore, developers reuse old plans that have proven to be successful in the past and don't optimise existing technology or try new, potentially more energy efficient options.

1.2 Why is it a problem?

Commercial buildings represent about 9% of New Zealand's energy use[1] and 5% of energy-related greenhouse gas emissions (2% of total greenhouse gas emissions)[2]. The BRANZ Building Energy End Use Study 2014 estimates that 6.4GWh per year of electricity is consumed by non-residential office and retail buildings. This constitutes around 16% of New Zealand's electricity consumption.

There is evidence to suggest cost-effective savings of 10-15% are achievable in the commercial building sector, with international experience showing savings of 20-40% are achievable[3].

1.3 The programme

EECA has created two programmes to intervene in the commercial building market to address the problems and correct the market failures. First is the National Australian Built Environment Rating System New Zealand (NABERSNZ), an energy efficiency rating scheme for existing commercial buildings. The second is Commercial Building Performance Advice for new buildings and large refurbishments. These interventions together sit across three of the broad categories of EECA's intervention strategies:

- Provision of information/advice.
- Provision of funds.
- Brokering/credentialing expertise.

The programmes are designed to provide support throughout the life of the building, that is, Commercial Building Performance Advice for designing, building and commissioning and NABERSNZ for the running of the building.

[1] EECA's energy end-use database, and Building Energy Rating Scheme Concept Study, June 2009, page V.
[2] Assuming all 45 PJ are electricity.
[3] Building Energy Rating Scheme Concept Study, June 2009, page V.

1.3.1 NABERSNZ

1.3.1.1 Origins

The New Zealand Energy Efficiency and Conservation Strategy (NZEECS) 2007 prescribed the action to investigate the use of a Building Energy Rating Scheme (BERS) to measure and rate energy performance of commercial buildings. In 2009, Concept Consulting was engaged to complete the investigation. They recommended that:

- the New Zealand Government support the development of a BERS scheme for non-residential buildings
- the chosen scheme should be consistent with the existing Australian scheme (the National Australian Built Environment Rating System, or NABERS) to leverage off their experience and recognise the fact that many property owners have portfolios in both countries.
- that the Government should join forces with the New Zealand Green Building Council (NZGBC)[4] to maximise efficiency and avoid confusion.

As a result, NABERS, owned by the New South Wales Office of Environment and Heritage, was adapted to New Zealand conditions by EECA and the NZGBC. It was introduced in June 2013, and the administration of the programme is contracted to the NZGBC. The roles and responsibilities of EECA and NZGBC are outlined in Appendix One.

1.3.1.2 Purpose

NABERSNZ was designed to address the split incentives problem and the lack of information held by tenants regarding the energy efficiency of commercial buildings. The rating provides an independent picture of the energy efficiency for tenants and prospective tenants. It also begins to address the split incentives by creating a way for prospective tenants to observe the energy efficiency of the building and therefore create demand for it. Energy efficiency can be priced into rents of the building and create the monetary incentive needed for building owners to invest in energy efficiency. The idea is that it will drive building owners and tenants to improve the energy efficiency of their buildings/tenancies through actions such as LED lighting, HVAC optimisation and building management system optimisation[5].

1.3.1.3 Key components

NABERSNZ measures an existing building's energy and/or environmental performance on a star scale of 1 to 6 and provides an indication of how that building compares to others based on energy use and CO_2 emissions. A 6-star rated building represents best practice and a 3-star building represents average building performance. A very poor performing building can receive a 0-star rating.

The key activities EECA undertakes are:

- developing technical specifications
- developing and maintaining web tools
- managing the contractual relationship with the Australian Government

[4] The New Zealand Green Building Council is a not-for-profit, industry organisation which promotes healthy, efficient and productive buildings in a sustainable built environment.

[5] Building management systems provide control of the building systems. These typically include heating, ventilation, air-conditioning and refrigeration (HVAC/R), electrical power, lighting, fire suppression and alarm, and security systems, etc. Building controls also have the ability to monitor and control systems to improve performance, conserve energy, conserve water, and control lighting.

- managing the relationship with the NZGBC
- training and accrediting assessors and practitioners
- developing relationships with property trusts, councils, etc.
- engaging with industry
- adapting licensing materials
- developing support and information material
- marketing and promotional activities.

1.3.1.4 Targeting

NABERSNZ is targeting the largest buildings, where the greatest savings are available.

1.3.2 Commercial Building Performance Advice

1.3.2.1 Origins

The programme was launched by the Christchurch Agency for Energy (CAfE) in partnership with EECA as the 'Energy First' commercial building design programme in mid-2012. EECA subsequently assumed full responsibility for the programme when CAfE discontinued operations at the end of June 2013.

1.3.2.2 Purpose

The objective of the programme is to fund approved energy management service providers (Programme Partners) to provide advisory services to owners and developers to ensure that energy efficient building and plant options[6] are embedded in the design and fit-out of new commercial buildings. This includes major refurbishments. This step is critical for implementing efficiency elements that are cost prohibitive or impossible (e.g. building orientation) to retrofit.

Transparency is low about 'free money' available for developers during the building process. It can both cost less in the short term and be cheaper in the long run but developers aren't optimising existing technologies or using new technologies due to a lack of demand or knowledge. The Commercial Building Performance Advice programme is designed to address this through the provision of information about energy efficient alternatives and provide funding to de-risk investments in new approaches.

1.3.2.3 Key components

The Commercial Building Performance Advice programme was designed to address the information problems for developers/owners and the split incentive problems. By having an independent professional outline the upfront and long term cost savings of energy efficiency, the information barrier can be overcome and create an incentive to exceed the minimum standards in the Building Code for new builds. EECA's contribution to the cost of this advice enhances the likelihood of the advice being undertaken and implemented.

The programme intervenes at four different stages of the commercial building design process to have maximum impact:

[6] For example, optimising the efficiency of the building envelope, LED lighting, designing and sizing HVAC (not overspecing), more energy efficient water heating systems.

- Initial concept and design review (2A) – Input at the embryonic stages to ensure consideration of energy efficiency in the concept design of the building (e.g. building fabric and orientation).
- Fit-out design and construction (2B) – Once the initial design phase is complete and construction may have started, detailed work begins on the interior design and fit-out (e.g. HVAC and lighting).
- Commissioning (2C) – Working with the end user to ensure that the opportunities identified in design phase are being realised.
- Assessing energy performance after occupation (2D) – Ensuring the building is being operated as designed.

The programme has now been in operation for over three years and EECA has committed $2.5m over the period from July 2012–September 2015.

1.3.2.4 Targeting

The programme initially targeted new builds in Christchurch but has expanded to other main centres (e.g. Wellington and Auckland).

1.4 Market structure

1.4.1 NABERSNZ

There are approximately 1,250 office buildings in New Zealand with a floor area larger than 1,500 square metres[7]. These buildings comprise a total net lettable office floor area in the order of 5.25 million square metres.

At an average whole building energy consumption (base building plus tenancy energy use) of 260 kWh per m² per year[8], 4.91 PJ of energy is consumed annually in New Zealand office buildings targeted by NABERSNZ[9]. Almost all of the energy used and controlled by office tenants is electricity, and the majority of that energy is typically consumed by lighting systems. The majority of energy typically used and controlled by the building owner varies – typically according to building size. While heating, ventilation and air conditioning (HVAC) is most often the dominant energy demand, a combination of electricity and natural gas is used. For smaller buildings electricity may be the only source, however for the majority of larger buildings with central HVAC systems, natural gas plays a substantial role in heating water for system use.

A substantial portion of office building energy use has largely been locked in since the 1980s and 1990s – when more than 40% of our commercial building stock was built. We are currently in the midst of a long period of greater upgrade activity as major pieces of building equipment reach the end of their useful life.

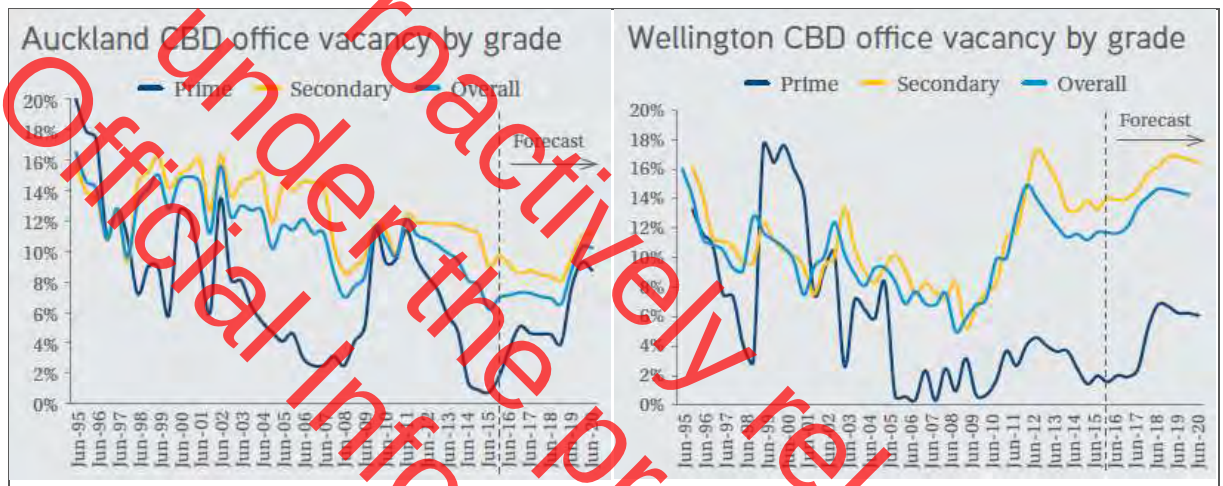
[7] The Building Energy End Use Study (BEES) was completed by BRANZ in 2014. There is greater benefit from targeting the larger buildings and for this reason the programme will not target buildings smaller than 1,500m².

[8] Average energy consumption was determined when NABERSNZ was adapted from the Australian tool in 2012. The determination was taken from early BEES work. There is no reason to depart from the adaptation determination of average energy consumption. *Whole building* comprises energy consumed in providing base building services like air conditioning and lifts, combined with tenancy energy loads like those from lighting and IT/appliance plug-loads.

[9] Source: BEES. Total energy consumed for office buildings with floor area greater than 1,500m².

The increased influence of global institutional capital at the top end of the New Zealand market has introduced a stronger sustainability driver for the main group of owners targeted by NABERSNZ. Major corporate occupiers are also aware of the role energy efficiency plays as a marker of building quality. Alignment of quality and staff productivity, attraction, and retention has become a prevalent influence at the top end of the occupier market.

Vacancy levels for prime and A-grade buildings in both Auckland and Wellington are currently at structural low levels. There is little supply available, and substantial new stock will not reach the market until 2018-19. This leaves prime and A-grade tenants few immediate options. The implication for NABERSNZ is that limited choice for tenants reduces their propensity to seek rating information on prospective premises and reduces the incentive for owners to differentiate on energy performance.



Source: Colliers International NZ CBD Office Report September 2015

Most major market commentators are forecasting relatively constant market conditions for the duration of this NABERSNZ strategy period[10]. But external market risks still have the potential to reduce tenant investment and to reduce capital market liquidity. Both are likely to reduce demand for NABERSNZ ratings.

Office building owners

Office building owners can be active or passive investors taking varying degrees of management responsibility. They can be classified the following way:

- Major NZX listed office entities, i.e. Precinct, DNZ, Kiwi, Goodman, Argosy
- Large privately held entities, e.g. Newcrest, Robt. Jones Holdings, Cooper and Company
- Syndicates, e.g. Oyster, Augusta
- Institutional (overseas) owners, e.g. Deka Immobilien which owns the Lumley Centre, Auckland
- Developers, e.g. Mansons TCLM, Willis Bond, Waterfront Auckland
- Small privately held entities

[10] For example, from the recent Colliers International New Zealand Capital Markets report (Q2 2015): "there is little evidence that investor confidence and rising prices will not continue for an extended period at its current rate, at least." Accessed 27 July 2015: www.colliers.co.nz/find%20research/specialty%20reports/new%20zealand%20capital%20markets%20report%20q2%202015/

- Small/single asset owners

Office building tenants

Larger tenants, including government agencies, have significant influence over how a building owner manages their asset. Prime and A-grade buildings are often managed by the owner and tenant in partnership.

Building owners seek to satisfy tenants in their provision of effective office accommodation.

The Government is by far the most substantial single tenant in New Zealand. Since 2011, the Government Property Group (formerly the Property Management Centre of Expertise) has been the central government body which leads and assists "agencies in meeting the goals set by Government for the efficient and effective management of the Crown estate."[11]

1.4.2 Commercial Building Performance Advice

There are three main players in the building construction industry:

- Building owners
- Builders/engineers/architects
- Building tenants

Building owners

Building owners put out an RFP for someone to build the building. Builders compete to offer the lowest price while still being compliant with the Building Code, creating a 'race to the bottom'.

Builders/engineers/architects

Builders, engineers and architects bid for the work to build the building and try to offer the lowest cost project in order to win the contract. There are often a number of different companies involved (builders, engineers, other sub-contractors), but responsibility for energy efficiency usually lies with the engineers. There is significant time pressure for the build and penalty payments for not finishing on time. This causes trade-offs to be made during the build that may deviate from the original design.

Building tenants

Tenants have an interest in the operating costs but generally have no control over the design and build quality. A building may or may not be tenanted prior to finishing the build.

2 Strategic fit

***Table 1:** Alignment with government priorities*

NZEECS 2011-2016	Alignment

[11] http://www.mbie.govt.nz/info-services/nz-govt-procurement-and-property/government-property-group/purpose, accessed 13 December 2016.

Objective: "Enhanced business growth and competitiveness from energy intensity improvements"	Both programmes focus on efficient energy use by commercial buildings in New Zealand
Business Growth Agenda	**Alignment**
"Improve energy efficiency and use of renewable energy to raise productivity, reduce carbon emissions and promote consumer choice"	The programmes help businesses make better decisions around the efficient use of energy to increase the productivity of the industry. The programmes also aim to reduce carbon emissions associated with inefficient energy use.

EECA noted a tension in the strategic fit for government in the commercial building market. The government strives to ensure affordability of buildings; however, energy efficient approaches to the building can generate additional costs. EECA has a role to support developers, in some cases financially, in building energy efficient buildings affordably.

3 Role for government

There is a potential role for government where there are market failures and barriers which can lead to public benefits not being produced by private market agents, and also where the government can help the markets work better and more efficiently. The primary failures and barriers preventing the efficient use of energy in the commercial building market are:

- a lack of information/understanding
- split incentives
- risk aversion
- priorities

3.1 Market failures

3.1.1 A lack of information/understanding

Both developers/owners and tenants lack information about energy efficiency opportunities.

It is likely that the commercial buildings market undersupplies information about energy efficiency because there is little private return on expressing that information in a way that would be most useful to consumers[12]. In turn, tenants do not know enough about the potential benefits to be able to demand energy performance information. Furthermore, even if tenants did demand information to understand and compare the energy performance/operating costs of different office spaces, it is not readily available.

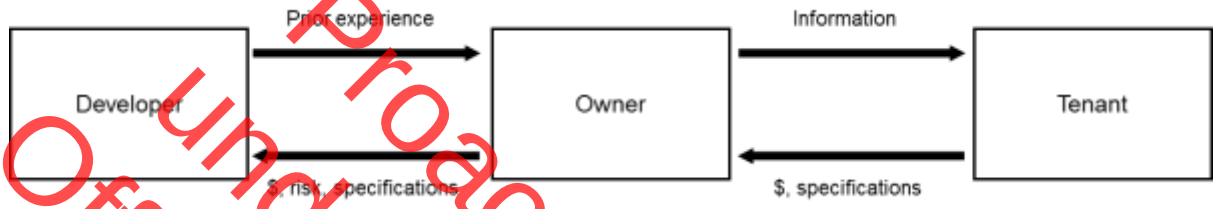
Unlike many other goods and services, there are very many different uses of energy in very many different situations and it can be costly for organisations to seek the specialist information required to evaluate the best energy option for each of their energy requirements.[13]

[12] Addressing Market Barriers to Energy Efficiency in Buildings. (2012). Congressional Budget Office Working Paper.
[13] Study of non-residential building energy-rating schemes (BERS). (2009). Concept Consulting.

3.1.2 *Split incentives*

In the commercial building market, the benefits of an energy efficiency investment lie with the end user (the tenant) and not with the person in the position to make the initial investment (the developer/owner). Therefore, the market may not reach the optimal level of efficiency (Figure 1). This is compounded by Building Code standards lowering incentives to build using energy efficient elements and the low supply of quality office space reducing consumer power. There is a role in these circumstances for government to align the incentives of the different parties and overcome this market failure.

Figure 1: *Interactions between market actors in the commercial building market*



In traditional economic theory, this is done through information provision. In practice however, information alone is often not enough to change behaviour. The role for government in this case could be broader than this, potentially including provision of funds to encourage energy efficiency investment by developers/owners. The Commercial Building Performance Advice programme attempts to overcome split incentives by encouraging developers to consider the benefits for future tenants in order to encourage building energy efficiency into the building. The NABERSNZ programme is designed to overcome the split incentives by providing independently verified information to tenants to observe and demand energy efficiency.

In addition to the direct responses to the problems in this market, there are some potential productivity gains in the commercial buildings market that creates a role for government.

3.2 Market barriers

3.2.1 *Risk aversion*

Decision makers faced with significant uncertainty are likely to delay investment decisions or opt for incumbent technologies where uncertainty is minimal[14]. Bringing in an expert to provide relevant, quality energy efficiency information for decision making comes with a cost and uncertainty about the return. This puts firms off seeking this information, even if the potential savings far exceed the expense.

3.2.2 *Priorities*

Tenants do not prioritise energy efficiency, or operating costs in general, when looking for office space.[15]

[14] Technology Roadmap - Energy-efficient buildings: Heating and Cooling Equipment. (2011).
[15] An investigation into the perception and preparedness of property owners for the NABERSNZ rating process. (2016). University of Auckland.

In the vast majority of cases, energy costs represent a small fraction (1%) of an organisation's overall costs. Therefore, whilst individual energy efficiency initiatives may achieve much higher rates of return than other uses of capital, their absolute returns will be relatively small, and thus they find it hard to compete for scarce management time.[16]

3.3 Potential benefits

***Table 2:** Type of expected benefits*

Public benefits	Private benefits
• Avoided greenhouse gas emissions (primary)	• Increased productivity • Reduction in energy and maintenance costs • Increased capital value of the building (signal to the market) • Increased occupant comfort levels (staff retention) and improved productivity

Avoided greenhouse gas emissions – primary public benefit
The combustion of fossil fuels used to produce a portion of the electricity used in commercial buildings releases greenhouse gases (GHG), contributing to climate change.

Increased productivity – private benefit
Energy efficiency projects can result in increased firm-level productivity through improved lighting, temperature control, reduced noise, and improved air quality.[17]

Reduction in energy and maintenance costs – private benefit
Energy efficiency gains can reduce energy expenses for a tenant long-term.

Increased capital value of the building – private benefit
Quality energy efficiency technologies in a building and a signal to show this to the market (NABERSNZ) can increase the capital value of the building through increasing demand and potential rent yields. Australian research shows that private benefits can accrue to a building owner once an energy efficiency rating is obtained. The "Better Building Returns" report shows that a 5 star NABERS rating increased the capital value by 9% and a 3-4.5 star rating increased the value by 2-3%. In addition, rents in the Sydney CBD were 9% lower for those with a low NABERS rating. In addition, a better NABERS rating led to reduced vacancy in a building. Through informing the market of these benefits, uptake can increase, leading to energy efficiency benefits.

Increased occupant comfort levels (staff retention) and productivity – private benefit
Energy efficient, 'green' buildings have positive impacts on the health, wellbeing and productivity of

[16] Study of non-residential building energy-rating schemes (BERS). (2009). Concept Consulting.
[17] Productivity Gains from Energy Efficiency. (2013). Building Efficiency Initiative.

their occupants[18]. For example, greater natural light reduces energy consumption and has a relationship with reduced sick leave.[19]

3.4 Potential costs

EECA outlines that no crowding out has been reported as a result of its involvement in this market. In fact, EECA has been able to help foster the market for energy efficiency consultants through the Commercial Building Performance Advice intervention and boost supply for this service.

4 Intervention

4.1 Intervention logic

4.1.1 NABERSNZ

The intervention logic is outlined in Appendix Two.

4.1.2 Commercial Building Performance Advice

There is currently no intervention logic diagram for Commercial Building Performance Advice. The short term goals of the programme are:

- to make connections with commercial building developers through industry professionals
- inform developers of the short- and long-term benefits of building energy efficient buildings.

The industry professional programme partners have specific skills to provide advice at each of the four stages of the commercial building design process.

In the medium term, the outcomes expected for the programme include the design and building of energy efficient commercial buildings. The large number of new builds and renovations occurring in Christchurch presented an opportunity to include energy efficiency measures that would not be economic at other times, so the programme focused particularly (but not exclusively) on Christchurch.

The long term outcomes expected are the energy and greenhouse gas and savings from more energy efficient commercial buildings in New Zealand. Another long term outcome is the development of professional engineering tools and the skills to evaluate and optimise building performance.

4.2 Options

Discussions in the programme review workshop highlighted the following alternative options for intervention in the commercial building market (these were not found in supporting documentation):

1. Targets, check lists, and audits.
2. Subsidies – EECA has previously provided subsidies and loans to the public sector for spending on energy efficiency.

[18] Health, Well-being and Productivity in Offices, World Green Building Council.
[19] Elzeyadi I. (2011) Daylighting-Bias and Biophilia: Quantifying the Impact of Daylighting on Occupant Health.

3. Improve the minimum building standard. Will be complicated as commercial buildings are more heterogeneous than residential.
4. A commercial equivalent to the *Residential Tenancies Act 1986* that sets minimum standards similar to the earthquake 'sticker' system. However, this would be costly and significantly devalue all those buildings not up to standard.

4.3 Investment objectives

4.3.1 NABERSNZ

The business case performance targets are outlined in Tables 3 and 4. The most important focus for the NABERSNZ programme is office building owners. The four key NABERSNZ engagement strategies are:

- direct engagement with potential rating clients and influencers
- securing greater government commitment
- aligning with other EECA Business engagement channels
- seeding and supporting communities of influence.

***Table 3:** NABERSNZ targets*

Target	2013-14 business plan	2013-14 SOI	2014-15 Business plan
Certified ratings	25	50	30
Assessors trained	40	30	20
Self-assessments completed	200	200	200

***Table 4:** NABERSNZ targets for market change*

Four-year change metrics (set June 2014 in EECA Business Team's *Strategic Direction 2025* document)				
Outcome	**2014-15**	**2015-16**	**2016-17**	**2017-18**
90% of major portfolio owners recognise NABERSNZ	10%	30%	60%	90%
20% of tenants who move seek ratings	1%	5%	10%	20%

4.3.2 Commercial Building Performance Advice

The programme comprises four discrete stages, each requiring a different set of skills and involving a different set of duties. These stages are as follows:[20]

- Initial concept design review (2A) – savings target of 25 kWh per square metre per annum
- Fit-out design and construction (2B) – savings target of 20 kWh per square metre per annum
- Commissioning (2C) – savings target of 13 kWh per square metre per annum

[20] Page 3, pages 16-17, Review of EECA Commercial Building Design Advice Programme. (2015).

- Assessing energy performance after occupation (2D) – savings target of 13 kWh per square metre per annum

4.4 Potential impact

4.4.1 NABERSNZ

Energy savings demonstrated by the NABERS programme in Australia provide a compelling indicator of the potential for New Zealand. Over the first five years of NABERS, the programme secured approximately 10% market penetration. By the time NABERS was mandated by the Federal Government in 2009, market penetration had reached 50%, and by 2013 it was approaching 80%. The average building has been rated eight times and has reduced its energy use by 29%[21]. Applying these figures to the New Zealand context suggests that 1.14 PJ of annual savings is possible if the programme were mandated. EECA analysis suggests that economically realisable energy savings potential is 1.4 PJ; if this is assumed to be all electricity then this equates to 54 $ktCO_2e$.

EECA has frequently communicated that 20% of commercial building energy use can be saved. This is based on EECA research conducted well before the launch of NABERSNZ. A 20% saving for the target market represents a potential energy savings pool of around 1 PJ.

EECA analysis asserts that over the course of the strategy period NABERSNZ can expect to save 161 GJ of energy[22]. The analysis has included preliminary consideration of the energy savings impact of greater NABERSNZ uptake as a result of stronger government adoption of Certified Ratings. Under this scenario, with a 50% increase in ratings from 2017, NABERSNZ can expect energy savings in the order of 205 GJ.[23]

4.4.2 Commercial Building Performance Advice

As outlined in Programme plan and business case for commercial sector programmes, the objective of the Commercial Building Performance Advice programme was to extract energy efficiency improvements in new buildings of 26 GWh by 2015.

4.5 Market readiness

For both programmes there are suppliers in the market who can deliver the services required.

There is an undersupply of commercial premises which makes the market less ready for voluntary commercial buildings interventions; where tenants are struggling to find appropriate premises they are less able to be discerning and choose based on 'extra features' like energy efficiency.

The commercial building market in Auckland is likely to be more prepared to take advantage of NABERSNZ due to the higher number of companies that will also have premises in Australia where it is now mandated.

Government has not shown a readiness to participate in NABERSNZ as they do not demand ratings of their tenancies.

[21] Sam McLean presentation to the NABERS & CBD Assessors Conference, Sydney, 5 May 2014.
[22] NABERSNZ Strategy 2015-2020
[23] Savings would be greater still should a mandatory disclosure regime similar to the one in place in Australia since 2010 be implemented in New Zealand. Investigating the energy potential of mandatory disclosure will be undertaken early in the strategy period.

4.6 Risks of failure

EECA identified a series of risks to the NABERSNZ and Commercial Building Performance Advice programmes in their respective business cases. These are outlined in Appendix Three.

4.7 Interdependencies

NABERSNZ and Commercial Building Performance Advice have clear interdependencies with each other and with EECA's Top 200 and Next 1000 business programmes. As part of EECA's tool-kit of offerings to businesses, these commercial buildings programmes help EECA influence businesses to adopt comprehensive energy management practices. A key role for the NABERSNZ programme is market signalling. For businesses participating in other EECA programmes, obtaining a NABERSNZ rating for their building can add legitimacy in the market for the actions taken.

There is also interdependency with Crown Loans, especially with regard to influencing public sector organisations to improve the energy efficiency of Crown buildings and assets.

There are also potential interdependencies with the Building Information Modelling initiative from MBIE designed to increase productivity gains in the building and construction sector.

4.8 Resource allocation

4.8.1 NABERSNZ

NABERSNZ takes staff time in the order of 1.2 FTE and has cost $2.6 million over 4 years.

4.8.2 Commercial Building Performance Advice

Commercial Building Performance Advice takes 0.4 FTE and has cost $3.14 million over 4 years.

5 Performance

5.1 Effectiveness

5.1.1 NABERSNZ

NABERS performance trajectory

Given that NABERSNZ is modelled on the Australian NABERS programme, it is useful to look at the success of that programme to provide context on NABERSNZ's performance. The Australian programme started off voluntary and there were a number of policy events that resulted in increased uptake until it was finally mandated in 2009/10 (Figure 2). In Australia, NABERS is well regarded by industry and is considered a very effective mechanism to improve building energy performance. The average building has been rated eight times and has reduced its energy use by 29%[24].

Figure 2: *NABERS uptake in Australia*

[24] Sam McLean presentation to the NABERS & CBD Assessors Conference, Sydney, 5 May 2014.

Comparison against New Zealand performance

At August 2016, there had been 34 NABERSNZ ratings and 11 re-ratings. In absolute terms, this is less than the number Australian NABERS had achieved at this stage, but Australia is approximately five times larger than New Zealand. Tables 5 and 6 show that, when taking this into account, NABERSNZ ratings and re-ratings uptake seems appropriate for the early stages of a long-term programme; in all cases, New Zealand uptake has been more than 1/5 that of NABERS Australia.

EECA's targets were optimistic, as in some cases they were higher than what Australia achieved at the beginning of their programme.

NABERS Australia has assessed its outcome-level success by looking at the differences between ratings and re-ratings. This requires a number of re-ratings before any significant energy savings can be detected and it is too early in NABERSNZ to be able to do this.

Table 5: *Comparison of number of New Zealand and Australian NABERS ratings in the first four years of the programme*

	Ratings		NZ as % of Australian ratings
	Australian NABERS	NABERSNZ	
Year 1	31	15	48%
Year 2	32	10	31%
Year 3	10	6	60%
Year 4	42	3 (to date)	7%
Total	**115**	**34**	**30%**

Table 6: *Comparison of number of New Zealand and Australian NABERS re-ratings in the first four years of the programme*

	Ratings	NZ as % of

			Australian ratings
	Australian NABERS	NABERSNZ	
Year 1	0	0	
Year 2	4	3	75%
Year 3	3	5	167%
Year 4	5	3 (to date)	60%
Total	12	11	108%

NABERSNZ performance trajectory

There have been 3,296 self-assessments under NABERSNZ. Thirteen ratings came from self-assessments and therefore the conversion rate from self-assessments to ratings is 0.39%.

An issue faced by the NABERSNZ programme in reaching its long term goals is the lack of spare capacity in the commercial building markets. For the NABERSNZ programme to help overcome the split incentives problem, tenants must be able to observe energy efficiency in buildings and make leasing decisions based on this information. However, with a low stock of available commercial buildings, tenants have limited choice of available property and are therefore unlikely to make decisions based on energy efficiency. An exacerbating issue is that local government zoning rules limit the areas in which commercial buildings can be constructed and therefore limit supply. In addition to these issues, EECA identifies that seismic strengthening required for many buildings is crowding out investment in energy efficiency.

The University of Auckland undertook interviews with commercial building companies to understand the perception of NABERSNZ in the commercial buildings market.[25] Key insights from this study include:

- As NABERSNZ is not mandated, commercial building owners see that only market forces will drive uptake in the scheme. They outline that the only tenant companies demanding NABERSNZ are those with Australian parents, some multi-nationals and those with carbon footprint requirements. The consensus amongst those interviewed was that awareness with tenants would be required to drive market demand.
- Commercial building owners are not seeing tenants demand energy efficiency in their buildings. Instead tenants' key concerns are seismic ratings, location, quality amenities, rent, operating expenditure costs and harbour views.
- Commercial building owners described some concerns relating to NABERSNZ:
    - Some found the systems and rules used to generate the ratings confusing and unfair.
    - Some found it unclear which type of building is best suited for a NABERSNZ rating.
    - Some owners expressed concerns about the cost of undertaking the metering required to obtain a rating particularly when compared with an unclear added value received from the rating.

[25] An investigation into the perception and preparedness of property owners for the NABERSNZ rating process. (2016). University of Auckland.

- Owners, in general, were concerned about the negative signal of a bad rating and were likely to invest in improvements before rating their building.

For the small number of buildings that have been rated, understanding the energy savings generated is problematic. It is difficult to define the baseline energy use, as some buildings make improvements before being rated and some after being rated. Australia makes use of re-ratings to assess change and therefore the impact of the rating, but there have been few re-ratings in New Zealand. This is partly due to not enough time having elapsed since the programme began. Twelve months of data is needed to grant a rating and a further 12 months of data is needed to assess any changes. In the small sample of seven re-ratings, five resulted in rating improvements and the remaining two resulted in deterioration of the ratings.

5.1.2 Commercial Building Performance Advice

The Commercial Building Performance Advice programme has experienced success in providing energy savings advice to building developers. However, an evaluation in 2015[26] found the data is limited in demonstrating performance at this early stage.

As at September 2015, the Commercial Building Performance Advice programme has had success in reaching 274 building projects since 2012, representing 1.3 million square metres of commercial floor space. The majority of these projects have been at stage 2A (initial concept and design review), driven by a focus on new builds in Christchurch. No 2D (assessing energy performance after occupation) projects have been undertaken to date. EECA offers to cover 50% of the cost of the work at this later stage of the process, which along with the long delays between building concept and building occupation, may contribute to the slower uptake.

Understanding the energy savings from the Commercial Building Performance Advice project is also difficult. There are two reasons for this:

- Not enough time has elapsed for many of the buildings to be built then have energy use recorded.
- The building advice programme also has an issue of defining the baseline. Understanding the expected energy use of a building without the energy improvements in the design is difficult.

Despite these issues, EECA has made some rough estimates based on some partial data received so far that indicate that identified savings are around 48 million kWh per annum (48 GWh). At $0.12 per kWh this represents $5,760,000 worth of annual savings identified. The identified savings exceed target levels overall and particularly in stages 2A (initial concept design review) and 2B (fit-out design and construction). In addition, some of the organisations with which EECA has developed a relationship have sites outside of Christchurch. EECA has indicated that there are potential diffusion effects where the organisations are taking the lessons from design advice to more buildings around New Zealand, at no additional cost to EECA.

[26] Review of Commercial Building Design Advice Programme by Strategic Energy.

5.2 Achieved benefits

5.2.1 NABERSNZ

The way to establish benefits is to compare re-ratings with initial ratings. At this relative early stage in the programme there have not been enough re-ratings to be able to make a reasonable estimate.

5.2.2 Commercial Building Performance Advice

Estimated savings can be taken from the service providers' recommendations and adjusted by the rates of implementation assumed by Strategic Energy in the recent evaluation (see Section 5.1.2). This results in avoided greenhouse gas emissions of 1,629 tCO_2e.

5.3 Value-for-money

5.3.1 NABERSNZ

As described in Section 5.2.1 it is not possible make this assessment at this time.

5.3.2 Commercial Building Performance Advice

A cost-benefits analysis was conducted for the period from programme inception through to the end of the 2015/16 financial year. The results are presented in Table 7 and a more complete summary is available in Appendix Four.

Table 7: Value-for-money metrics for Commercial Building Performance Advice

Metric	Description	Value
Net present value		$9.3m
Benefit-cost ratio	PV all benefits/PV all costs	1.36
ROI-Government	PV public (government) benefits/PV public (government) costs	0.33

5.4 Programme future

5.4.1 NABERSNZ

An alternative approach for the NABERSNZ voluntary system would be to make the NABERSNZ mandatory for all commercial buildings. EECA highlights that this is a long term goal for the programme, but that testing that it is the right tool and putting in place the infrastructure first is more important. This is supported by the initial BERS study in 2009 which stated that whilst there may be merit to adopting a mandating approach, there was at that stage insufficient analysis to determine whether some form or regulatory mandate is appropriate for New Zealand.

5.4.2 Commercial Building Performance Advice

After the programme review which was completed in 2015, it was decided to integrate the programme better with NABERSNZ given the interdependencies .

6 Lead organisation

Given EECA's statutory mandate to promote energy efficiency and its role in the NZEECS, it is best placed to be the lead government agency for the commercial buildings programmes.

6.1.1 NABERSNZ

EECA has the mandate, capability and willingness to deliver NABERSNZ and does so in partnership with the NZGBC who administer the programme. This partnership model allows both agencies to bring their strengths to programme delivery. EECA brings the value of government and energy efficiency expertise while the NZGBC brings extensive rating tool experience and strong industry connections. Private sector service providers deliver NABERSNZ ratings on the ground and any associated energy efficiency interventions.

The NZGBC is the only other logical lead organisation but at this time still require leadership from EECA. It is possible that in time the NZGBC could run the whole programme.

6.1.2 Commercial Building Performance Advice

This programme fits with EECA's mandate under the *Energy Efficiency and Conservation Act 2000* and EECA's experience brokering and providing advice and information on building energy efficiency is well within its capability. There is no more logical lead.

7 Conclusions

Both of EECA's programmes in this sector (NABERSNZ and Commercial Building Performance Advice) were developed to address identified problems. However, the mandate for government intervention is not yet clear for either programme.

The potential scale of public benefits in the commercial building sector is relatively low and does not support a strong role for government intervention. This is due to the large proportion of New Zealand's electricity that is from renewable sources. The private benefits from pursuing energy efficiency in the areas of cost reduction and productivity improvement are strong.

The role for government is stronger for Commercial Building Performance Advice than for NABERSNZ. This is because of the costs of technology lock-in over the market life of building assets and the opportunity to address the early stage information failure in this market. Tackling the problem of split incentives in the commercial building market before and during construction is much easier than attempting to do so after the building is complete, potentially making this a valuable endeavour.

While uptake for NABERSNZ seems low, it is tracking the same as it did in Australia during the first four years. This is despite the constraint of commercial building supply creating market conditions that generate significant headwinds for the programmes.

To demonstrate value for money and programme performance, the Commercial Building programmes are dependent on data collection and analysis which is difficult for industry players to

provide (before and after baselines; metering issues etc.), and subject to significant time delays (between implementation and performance impact). The effect is twofold:

- the absence of motivating information for programme participants (it is difficult for owners and tenants to appreciate the impact of energy efficiency measures)
- an inability to monitor and track programme success by EECA.

It is important to consider the commercial building programmes as tools within a wider business engagement programme. These programmes provide opportunities to 'get a foot in the door' and engage with businesses which may then go on to take larger steps which generate greater benefits.

8 Recommendations

EECA could conduct a wider discussion of potential intervention options for the Commercial Building Performance Advice Programme, given the potential benefits which can be realised before and during construction. Such discussion would be across government and involve private actors in the market.

Further, the potential benefits from energy efficiency in the public sector are public benefits. EECA could therefore evaluate the potential public benefits of targeting NABERSNZ to government tenants and public buildings such as hospitals, schools, and local council offices. Targeting NABERSNZ in this way, and allowing for an adequate number of re-ratings, will provide EECA with sufficient evidence on any productivity benefits of the programme and any value in making NABERSNZ mandatory.

9 Appendices

9.1 Appendix One –Roles and responsibilities of EECA and the New Zealand Green Building Council

EECA is responsible for:	The NZGBC is responsible for:
Managing the overarching NABERSNZ project	Administration and operational delivery of NABERSNZ
Holding the licence and managing the contractual relationship with Office of Environment and Heritage	Completing quarterly and annual reports for EECA
Developing the annual business plan and budget with NZGBC in accordance with the Administration Agreement	Developing the annual business plan and budget with EECA in accordance with the Administration Agreement
Leading Government engagement, in collaboration with the NZGBC to ensure no overlap	Leading private sector engagement, in collaboration with EECA to ensure no overlap
Leading Wellington engagement work	Leading Auckland engagement work
Contributing to the marketing and communications activities	Implementing marketing and communications plan with EECA
Implementing the Industry Engagement Strategy with the NZGBC	Implementing the Industry Engagement Strategy with EECA
Managing the NABERSNZ website in collaboration with the NZGBC	Delivering the certification and auditing processes and supporting services
Providing resource for training (including supervision) and Level 2 auditing	Delivering training for Accredited Assessors and Practitioners, and managing the e-learning tool
Leading the relationship with the NABERS National Steering Committee (NSC) and NABERS Stakeholder Advisory Group (NSAG)	Seek active participation on the NSAG as the administrator
Implementing a Quality Control Plan in collaboration with the NZGBC	Implementing a Quality Control Plan in collaboration with EECA
Adapting licensed materials including facilitating approvals by OEH of rulings and rules revisions	Conducting Level 1 and Level 2 Audits in accordance with the NABERSNZ Quality Control Plan
	Ensuring there are sufficient Accredited Assessors, Supervisors, Trainers and Auditors (Level 1 and 2) to carry out the Certified Ratings

9.2 Appendix Two – Intervention logic

9.3 Appendix Three – Programme risks

9.3.1 NABERSNZ

Risk	Explanation	Mitigation
Low NABERS uptake	EECA fails to meet the targeted number of ratings in the private and/or public sector	Maintain positive industry relationships; leverage uptake (e.g. Government Property Group); seek industry partnerships
NABERS doesn't drive energy efficiency improvements	Building owners or tenants don't seek to improve their NABERS rating by undertaking energy efficiency actions	Good programme design and implementation, including thorough programme review/re-design if necessary
OEH continues to amend NABERS	Rules and algorithms constantly change requiring the NABERSNZ to be updated	Future proof NABERS, (e.g. ring fence changes relevant to New Zealand)
NZGBC non-performance	NZGBC fails to deliver on private sector rating targets or perform obligations such as training or accreditation of assessors, certification of ratings or reporting to EECA	Ensure the contract is clear and allows for termination for non–performance, leaving EECA free to bring the delivery "in house" if required
Costs (e.g. penalties) associated with not continuing the programme after three years	OEH or EECA decides not to renew the license agreement after three years	s 9(2)(i)
Insufficient quantity and/or quality of assessors	Suitable individuals fail to seek training and accreditation as NABERS assessors	Promotion of training and benefits to candidates, accessibility to Australian assessors
Early termination of the License	s 9(2)(i)	s 9(2)(i)
Source code is late or incomplete	The website user interface takes longer to design and create due to late or incomplete source code	Obtain access to source code from OEH as soon as possible and ensure web developers are fully briefed and supported by the Adaptation consortium to build the user interface

EECA fails to count energy efficiency gains achieved before the first certified rating	Energy efficiency actions taken after a free online rating and before the first certified rating my not be attributed to EECA's energy savings results, thus underestimating the value of the programme	Assessors will ask owners and tenants whether any energy efficiency actions were undertaken before a certified rating was requested and, if so, what measures were actioned
s 9(2)(h) s 9(2)(a)	s 9(2)(h)	s 9(2)(h) s 9(2)(a) s 9(2)(h)

9.3.2 Commercial Building Performance Advice

Risk	Consequence	Likelihood	Mitigation
Market disinterest	Moderate Lack of coverage that undermines the uptake of energy efficiency in new commercial buildings.	Possible	Generate market interest through quality promotion to building and architects
Quality of service delivery is compromised	Major Undermines confidence in the programme and the energy services industry	Possible	Thorough evaluation and selection process arising out of the contestable RFP Peer reviews of sample projects to ensure quality outcomes
The advisory services do not result in the implementation of energy efficiency considerations in new buildings	Moderate	Unlikely	Ensure the advice is provided at an early stage of the design to avoid any major design rework Buildings owners to contractually commit to implementing recommended measures provided they meet specified payback criteria and do not compromise the design or performance of the building

9.4 Appendix Four – Cost-benefit analysis summary (Commercial Building Performance Advice)

This review cost-benefit analysis assesses the quantifiable outcomes of EECA's expenditure from programme inception through to the end of the 2015/16 financial year. General assumptions applied in the analytical framework used in this review:

- EECA costs include all direct internal costs and payments and grants to service providers and client companies. General EECA overheads have not been included.
- All third party capital and operating costs, whether actual or estimated, are included. Estimated/budget costs and benefits are used in the absence of actual measured benefits. Source, granularity and attributed confidence of this data are noted.
- Only expenditure to year end 2015/16 is included, anticipated subsequent payments are omitted.
- Future benefits (e.g. energy savings) accruing from EECA expenditure to year end 2015/16 are included. Benefits from future expenditure omitted.
- Comment is made on the likely additionality of the EECA programmes.
- Cash flows are expressed in NZ$2016 discounted at the default Treasury rate of 7%.

Specific inputs used in the review of the Commercial Design Advice Programme:

- EECA direct costs of running the programme and payment to service providers for energy efficiency recommendations to building developers. These are treated as public costs and are taken from EECA's internal records.
- Data used in this analysis only includes projects falling within the Next 1000 Programme. Equivalent data for Top 200 projects has not been accessed to date but the number of projects and potential energy saving are relatively small compared to those in Next 1000.
- Third party costs for the incremental costs of incorporating the energy efficiency measures recommended by the service providers. Total building floor area affected is taken from the service providers' recommendations and the incremental costs of the efficiency measures and their rate of implementation from the estimates of EECA's consultant[27] when reviewing the programme. These are designated private costs.
- The principal quantifiable benefit is the reduction in energy consumption in the building designs investigated. This is a private benefit. Estimated savings have been taken from the service providers' recommendations and adjusted by the rates of implementation assumed by EECA's consultant.
- Reduced carbon dioxide emissions are directly determined from the energy savings. This is a public benefit.
- Fuel savings arising from the programme are assumed to continue for 25 years, consistent with the consultant's report.

[27] s 9(2)(a) (December 2015 and May 2016 with data updated 4 August 2016) assumed 75% completion of buildings investigated and 65% uptake of measures recommended for 2A projects. For 2B projects these estimates were 100% and 65% respectively. Incremental costs arising from the measures are 1% and 0.5% of total building costs for 2A and 2B projects.

- MBIE's price monitors have been used for deriving economic prices for fuels. Carbon dioxide prices are set at the average value of a NZU in each year of the programme and valued at $25 per tonne thereafter.

Costs and benefits are summarised in the table below.

	2013	2014	2015	2016	2017	2018	2019	2020
Energy Savings GWh	0.00	0.00	2.08	9.72	21.87	31.99	33.21	33.21
CO2 Reduction tpa	0	0	287	1341	3018	4414	4584	4584
Expenditure $ million (nominal dollars)								
EECA								
Payment to Service Providers	-0.57	-0.57	-1.10	-0.81				
Direct Operating Costs	-0.15	-0.15	-0.15	-0.15				
Third Parties								
Additional Building Capex $M	0.00	-1.06	-5.78	-7.24	-6.50	-1.61	0.00	0.00
Value of Energy Saved $ million (nominal dollars)	0.00	0.00	0.18	0.85	1.92	2.81	2.92	2.92
Value of Emissions Reduction $ million (nominal dollars)	0.00	0.00	0.00	0.02	0.08	0.11	0.11	0.11

Key conclusions to draw under these assumptions:

- Based on the assumptions noted above, the net present value of the programme is $9.3 million (benefit/cost ratio of 1.36, see table below) for the 182 2A and 76 2B projects to date. This result is highly dependent on the assumptions used regarding uptake of the service providers' recommendations and the estimated costs of implementation. Doubling the costs of implementation or halving the energy savings or project completion rates will each reduce the benefit/cost ratio to less than unity.

Cash Flow: $2016 million	PV 2016 $M	2013	2014	2015	2016	2017	2018	2019	2020
EECA Costs	-3.986	-0.727	-0.700	-1.251	-0.955	0.000	0.000	0.000	0.000
Third Party Costs	-22.096	0.000	-1.038	-5.784	-7.235	-6.502	-1.610	0.000	0.000
Energy Saved	34.059	0.000	0.000	0.183	0.855	1.923	2.813	2.921	2.921
CO2 Reduction	1.318	0.000	0.000	0.003	0.020	0.075	0.110	0.115	0.115
Net Present Value	9.295								
Ratios									
All Benefits/All Costs	1.36								
Public Benefits/Public Costs	0.33								
Public Benefits/Private Benefits	0.04								
Private Costs/Public Costs.	5.54								

- The public benefit to public cost ratio for the programme to date is 0.3:1. Whilst this will vary significantly with the input assumptions, it will not reach unity within the ranges noted above.
- Benefits fall principally to the private sector through fuel cost savings. This reflects the relatively low emission factor and high price of electricity, the predominant energy form used in commercial buildings.
- The programme design (funding business cases for client companies to invest in energy efficiency measures) results in a high leverage of private investment from public costs – the

private costs to public cost ratio is about 6:1. This ratio will vary directly with the implementation cost assumptions noted above

The level of confidence in the outputs of this analysis is relatively low:

- Little information exists regarding the level of uptake of the projects recommended by the service providers. This applies to both the numbers of projects actually implemented and, in the case of those that have, the extent to which they have conformed to the recommendations of the service providers. It is acknowledged that a project is underway to rectify this situation.
- In the absence of credible information on project uptake, comment on programme additionality is not possible.