



Ministry for the
Environment
Manatū Mō Te Taiao

Value Case for Green Star-rated Fitting Out of Central Government Office Accommodation

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Executive Summary

The Ministry for the Environment commissioned this study to help central government organisations take practical action to reduce their impacts on the environment, economy and society. One obvious action is to fit-out government buildings to match current best practice for sustainability, and in response to this need the pilot of the New Zealand Green Building Council Green Star Fit Out rating tool was issued in December 2008. The tool defines more sustainable fit-outs based on a six-star scale.

This study investigates the value case for Green Star 4-, 5- and 6-star rated government office tenancy fit-outs. Formal accreditation of sustainable office fit-outs can be given only to the top half of the rating scale, including 4-, 5- and 6-star fit-outs. Accreditation should be possible by the middle of 2009, when the final tool will be released to the New Zealand market. A further optimised 4-star with energy focus rating, representing a 4-star rating with an enhanced score in the energy category, has also been investigated by this report.

Sustainable fit-outs can make a large environmental impact because they can be carried out on both new buildings (5 per cent of buildings) and existing buildings (the remaining 95 per cent). They provide the opportunity to improve the sustainability of the built environment from the inside out, and to overcome the barrier of how to upgrade the majority of existing buildings with life spans of 50 years or more within a relatively short period (10 years).

This value case recommends a minimum 4-star with energy focus Green Star office fit-out rating for 4-star Green Star rated office buildings and unrated office buildings. It also recommends a minimum 5-star office fit-out rating for 5-star office buildings. The following table summarises the costs and benefits of these recommended minimum standards.

Table 1: Cost–benefit analysis for recommended minimum Green Star fit-out standards

Base building rating	Recommended tenancy fit-out rating	Average cost premium %	Simple payback (years)	9-year NPV \$/m ² NLA	IRR %
Unrated	4-star with energy focus	+2.6–3.6	2.7–3.4	30–38	30–38
4-star	4-star with energy focus	+2.1–2.9	2.2–2.7	34–42	38–48
5-star	5-star	+4.0–5.3	4.1–5.0	4–28	17–23

Notes:

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a time period, converted into an equivalent value today.

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Taking into account energy and water cost savings alone, these recommended minimum standards have a short payback period and a positive nine-year net present value (NPV) of approximately one to two times the original cost premium for a 4-star with energy focus rated fit-out, and approximately zero to one times for a 5-star rated fit-out. However, combining this with occupant health and productivity benefits to staff costs, the recommended minimum standards have a positive nine-year NPV approximately four to five times the original capital cost investment for a 4-star with energy focus rated fit-out, and approximately four times for a 5-star rated fit-out.

Sustainable fit-out principles are closely associated with improvements in workplace efficiency and therefore workplace performance. These benefits and associated operating cost savings can also be substantial, but have not been factored into these value cases. Sustainable fit-outs also provide the opportunity to reinforce sustainable behaviour by the building owner or operator and the building occupants.

Given the costs of full Green Star accreditation, it would be advisable to limit accreditation to fit-outs greater than 2000 m². This cut-off is consistent with other limits on the application of government property guidelines. Sustainable fit-out features similar to those recommended by this report should still, however, be included as far as practicable.

The energy efficiency measures included in these minimum fit-out standards represent the easily achieved or 'low-hanging fruit' of carbon abatement. By adopting these minimum standards a 25 per cent reduction in current central government office accommodation energy use, greenhouse gas emissions and associated operating costs is possible. Given that office fit-outs typically have a life expectancy of six to nine years, this reduction could feasibly be achieved within 10 years.

The development of the Green Star Office – Interiors rating tool has been sponsored by 10 commercial/construction industry partners contributing over 80 per cent of the funding, and a contribution from the Ministry for the Environment of just over 15 per cent. These partnerships exemplify the public and private sector working together to promote sustainable development. In contrast to government regulation via the New Zealand Building Code, the New Zealand Green Building Council (NZGBC) Green Star rating system is voluntary and promotes significantly higher standards than the minimums prescribed by regulation.

Since the New Zealand Green Building Council released the first Green Star rating tool, Office Design (Version 1), in April 2007, the uptake of this rating tool has been a considerable success. Over 50 office building projects totalling over 400,000 m² in floor space have now registered to achieve a Green Star rating, and eight of these have already achieved certification. This represents around 40 to 50 per cent of all new building work currently underway and approximately 13 per cent of the total office space available in the three main centres.

1 Introduction

The Ministry for the Environment commissioned this report to help central government organisations take practical action to reduce their impacts on the environment, economy and society. This report follows on from *A Guide to Sustainable Office Fit-Outs* (Ministry for the Environment, 2005a), and also links with the *Value Case for Sustainable Building in New Zealand* (Ministry for the Environment, 2005b) and *Value Cases for Achieving Green Star NZ 4 Star, 5 Star and 5 Star+ Environmental Ratings* (Ministry for the Environment, 2007).

The New Zealand Green Building Council released the Green Star Office Design rating tool (Version 1) in April 2007. The uptake of this rating tool has been a success, with around 40 to 50 per cent of new office buildings being registered for a Green Star rating. Further tools have recently been released or are in the process of being developed, including office as-built, office interiors, office in-use, residential, industrial and educational. All of the rating tools define a sustainable building performance based on the following 6-star scale:

- 6 stars – world excellence
- 5 stars – New Zealand excellence
- 4 stars – best practice
- 3 stars – good practice
- 2 stars – average practice
- 1 star – minimum practice.

Formal accreditation of sustainable office buildings can only be given to the top half of the rating scale; that is, 4-, 5- and 6-star equivalent buildings. This study investigates the value case for 4-, 5- and 6-star tenancy fit-outs. A further optimised 4-star with energy focus rating was also developed.

For new office buildings there is significant benefit in terms of the score on the fit-out tool if the associated base building has achieved the same or better Green Star rating. Note that it is theoretically possible to achieve any of the Green Star ratings on the tenancy fit-out regardless of the rating of the base building, but it becomes significantly more difficult to achieve a high fit-out rating with a low base building rating. A value case study has already been carried out (see Ministry for the Environment, 2007), and the previous government mandated a minimum 4- or 5-star rating for new leased government accommodation, for A-grade and B-grade buildings, respectively.

For fit-outs of existing office buildings it is likely that the base building will currently be unrated. Also, any retrospective rating using the existing building tool is likely to result in a rating less than 4 stars without a significant upgrade and re-investment by the building owner. Significant upgrading of an existing base building with a corresponding fit-out to achieve complementary Green Star ratings is possible while the tenant remains *in situ*, although a rating above 4 stars is unlikely.

Not all the costs associated with achieving a fit-out rating are building-related or involve capital expenditure. Other examples include:

- the purchase of new computer equipment and the disposal of existing equipment (the costs of IT are generally accounted for outside the building fit-out costs)
- a commitment to the ongoing monitoring and management of energy and water use and waste generation and to environmentally friendly operating and maintenance practices (the costs of these requirements are attributable to the operating costs of the organisation).

These costs have been excluded from this value case.

Costs of fitting out are usually split into hard fit-out and soft fit-out. Hard fit-out items include modifications to base building services to facilitate the tenant's fit-out, together with base building changes such as permanent office partitioning, additional stairs, additional built-in joinery and high-load areas. Soft fit-out items normally include office furniture and fittings, screens, IT and audiovisual equipment, cabling and signage. Both hard and soft fit-outs will have attendant design, project management and contractors' preliminaries, and general costs and margins in addition to the direct costs.

The cost of the hard fit-out can be met entirely by the tenant as a capital contribution, but more normally it is amortised into the rental with or without a building owner contribution. The tenant almost exclusively meets the costs of the soft fit-out directly, with no amortisation or contribution by the building owner.

Some potential costs of a Green Star fit-out rating will vary considerably while achieving the same number of points towards a Green Star rating. For example, reused furniture and screens and environmentally preferable new furniture and screens could score similarly under the Green Star system. However, the cost of the options will be either cost-neutral or attract a premium. The choice between reuse or new will be specific to each organisation and will depend on the products' age, condition and suitability for refurbishment.

Care needs to be taken to avoid double counting of either the costs or benefits that are separately attributable to the base building and to the fit-out. The *Value Cases for Achieving Green Star NZ 4 Star, 5 Star and 5 Star+ Environmental Ratings* (Ministry for the Environment, 2007) recognised all the benefits attributable to the building, including those of the base building and fit-out. This fit-out value case considers the benefits attributable to the fit-out only.

Given the costs of full Green Star accreditation, it would be advisable to limit accreditation to fit-outs greater than 2000 m². This cut-off is consistent with other limitations on the application of government property guidelines. Sustainable fit-out features similar to those recommended by this report (but for building areas less than 2000 m²) should still, however, be included as far as practicable.

2 The Motivation

2.1 Central government energy use and CO₂ emissions, and associated costs

Government, including overseas accommodation, has an annual energy use of 673 GWh¹ with associated CO₂ emissions of 110kt-e.

Central government is the most significant owner and lessee of commercial buildings in New Zealand. Following is a snapshot of current office accommodation and energy use and CO₂ emissions, and their associated costs. Central government:

- occupies approximately 900,000 m² of office-type accommodation
- consumes 135–170 GWh energy per annum
- emits 22,000–28,000 tonnes of CO₂ per annum
- incurs \$20–25 million, or \$22–28/m², energy costs per annum
- incurs \$0.66–0.84 million, or \$0.73–0.93/m², potential carbon charges per annum.

Government also has a significant role in new construction and is responsible for 16 per cent of commercial construction undertaken annually.

2.2 Potential for central government office fit-outs to reduce costs and improve environmental performance

There are significant advantages to sustainable fit-outs of buildings for housing government tenants, including:

- lower hard operating costs (energy, water and other operating costs)
- lower soft operating costs (healthier, more comfortable, satisfying and productive workplaces for employees)
- increased workplace performance (more efficient, flexible office space with better space use).

Typically, total occupancy cost savings of 20–25 per cent can be achieved by a sustainable building fit-out, as demonstrated by these value cases.

There is also the potential for fit-outs to make a large-scale impact in the short term on central government occupancy costs. This is due to their application to both new buildings (5 per cent of buildings) and existing buildings (the remaining 95 per cent), and to the frequency of renewal, which is typically six to nine years.

¹ 2006 EECA data.

In environmental terms, fit-outs present the opportunity to improve the sustainability of the built environment from the inside out and to overcome the barrier of how to upgrade the majority of existing buildings with life-spans of 50 years or more in a relatively short period. Adopting minimum Green Star standards for all government accommodation provides a far greater opportunity than the previously mandated minimum standards for new leased government buildings.

2.3 Demonstrating government leadership

Internationally, governments are pursuing opportunities to mitigate greenhouse gas emissions and improve energy efficiency by setting targets for their agencies and mandating best practice. This activity has helped drive wider, market-led changes. In New Zealand, examples in the building sector have shown how government leadership can prompt positive change in the market.

The New Zealand Energy Efficiency and Conservation Strategy (EECA, 2007) has a target for all new government buildings to meet a minimum 5-star Green Star rating from 2012.

2.4 Leveraging government spending power to support more sustainable development

Government spending power can help drive innovation, cleaner production and improved cost-effectiveness over the whole life cycle of goods and services. In sectors associated with office fit-outs – such as building, office supplies and IT equipment – central government purchasing in New Zealand comprises the single largest share of the market. Core public service agencies and some other entities are responsible for approximately \$6 billion a year of operational expenditure. This expenditure can be leveraged to support more sustainable development.

2.5 Driving more sustainable development through public and private sector participation

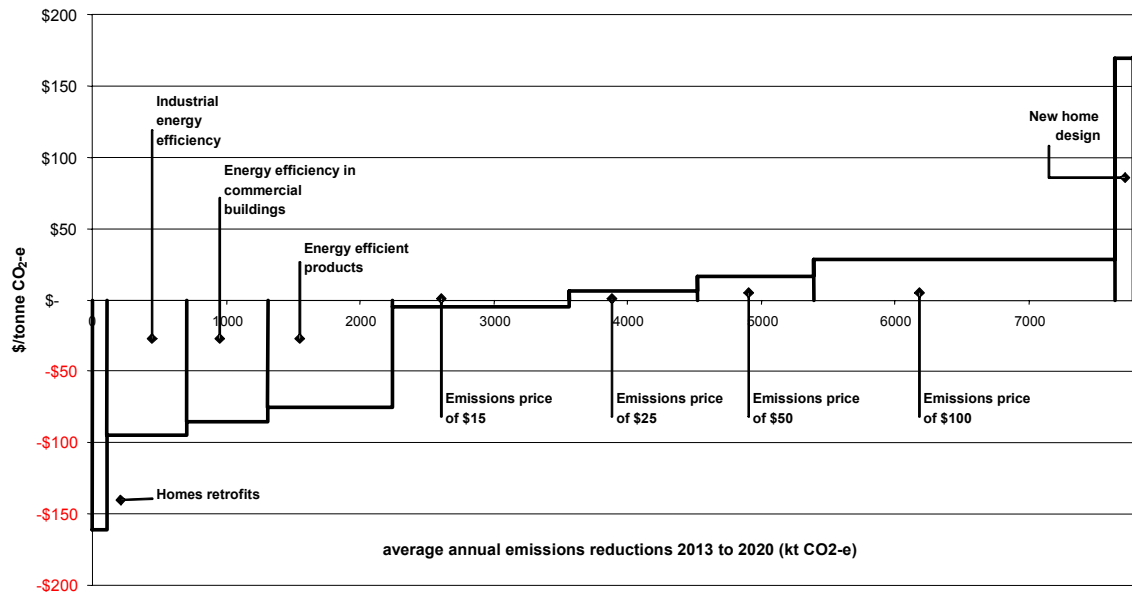
The development of the Green Star Office – Interiors rating tool has been sponsored by 10 commercial/construction industry partners contributing over 80 per cent of the funding and the Ministry for the Environment contributing just over 15 per cent. These partnerships exemplify the public and private sector working together to promote sustainable development.

In contrast to government regulation via the New Zealand Building Code, the New Zealand Green Building Council Green Star rating system is voluntary and promotes significantly higher standards than the minimums prescribed by regulation. The Ministry for the Environment has encouraged the Green Star system by sponsoring the initial establishment of the New Zealand Green Building Council and its rating tools and by promoting the adoption of its standards for government buildings. This is seen as an important and continuing catalyst by the market and has encouraged a much wider uptake by the construction industry.

2.6 Cost-effective carbon abatement

The cost abatement curve in Figure 1 shows there is considerable cost-effective potential for reducing emissions using energy efficiency measures with a ‘negative cost’ (ie, measures that finance themselves through reduced energy costs). The curve identifies the easily achieved or ‘low-hanging fruit’ of energy efficiency in commercial buildings and energy-efficient products. These two opportunities are directly related to the sustainable fitting out of commercial office buildings.

Figure 1: New Zealand energy sector carbon abatement curve



2.7 Ensuring the predicted outcomes are achieved

The Green Star system provides an easily recognisable standard and quality assurance system for delivering the predicted outcomes of this value case. As evidence that the predicted outcomes can be achieved by adopting these standards, the new Ministry for the Environment head office in Wellington has measured a 60 per cent reduction in energy use compared to Property Council measured averages. The new Meridian corporate office in Wellington has measured a 65 per cent reduction in energy use in its first year of use (with improvements targeted through further building tuning), and user satisfaction improved from -6 to +9 compared to previous premises (on a -10 to +10 scale).

The replacement of Housing New Zealand’s nationwide network of 450 older computers was carried out successfully using sustainable procurement principles. Replacement computers were selected for their energy efficiency, low environmental impact and cost-effectiveness. As part of the replacement programme, a specialist company was also contracted to reuse, recycle and dispose of the existing computers in an environmentally friendly manner.

3 Green Star New Zealand – Scope of Building Features Assumed in the Value Case

The following sections list the building features assumed under each of the recognised 4-, 5- and 6-star ratings analysed. A further 4-star with energy focus standard has also been developed.

3.1 4-star rating

The following items of tenant fit-out are equivalent to a 4-star best practice standard in accordance with the New Zealand Green Building Council Green Star (NZ) Interiors rating system (pilot). In everyday practice a total score of 50 points (minimum) is required, including a 10 per cent contingency above the minimum score of 45 points, for a 4-star rating.

Management measures

- A Green Star New Zealand-accredited professional is appointed to the design team from the start of the project design.
- A Green Star New Zealand-accredited professional is appointed to the contractor's site team from the start of the project construction.
- No significant modifications or additions to the base building services are made.
- Thirty per cent of the fit-out waste is either recycled or reused.
- A tenancy fit-out guide is provided.
- A project-based environmental management plan is provided by the fit-out contractor and integrated with the base building plan, as appropriate.
- Ongoing operational environmental management is in place. This includes monitoring and managing energy and water use, waste generation, and operating and maintenance regimes.

Indoor environmental quality measures

- The base building has achieved a 4-star rating or greater.
- The outdoor ventilation rate meets Building Code NZS4303 requirements.
- Certified low-VOC² tenancy finishes are used, including paints and varnishes, carpets and floor coverings.
- The air-conditioning system is controllable down to 75 m².

² VOC = volatile organic compound. These are chemicals that are released from items such as paints, carpets, furniture, ceiling tiles, cleaning products, and consumer products. They contribute to indoor air pollution and research has shown that they may have a harmful effect on the building occupant's health.

- Offices are open plan, allowing good natural lighting to 30 per cent, and external views from 60 per cent, of the workplace.
- Manually controlled blinds are used, with visual light transmission of less than 10 per cent.
- An illuminance of 400 lux average is maintained at the working plane, with careful attention paid to surface reflectances. A proportion of the light is directed towards walls and ceilings.
- High-frequency ballasts are used in 95 per cent of the tenancy area.
- Noise levels due to building services do not result in office noise levels being greater than 43 dB LAeqT³ for open plan offices.

Energy efficiency measures

- The base building is 4-star rated.
- An overhead down-lighting system is used, with manual lighting controls to individual offices and 100 m² open-plan zones.
- Desktop computers have LCD⁴ screens.
- EnergyWise whiteware is used.
- Power outlets are integrated into partitioning above desk level.
- Electrical sub-metering of tenancy loads is used, if not provided under the base building.
- Moderately energy-efficient air-conditioning systems are used in communications equipment rooms (servers, etc).

Transport measures

- The allowance of car parking spaces, compared to local council requirements is reduced.
- The tenancy is chosen for excellent public transport accessibility.

Water efficiency measures

- Tenancy water metering is provided if it is not provided under the base building.
- The base building or upgraded building uses reduced-flow (5 star WELS rated)⁵ sanitary fixtures.
- 3 star WELS-rated dishwashers are used.
- Local hot-water generation is used.
- Under-sink-mounted boiling-water units are used.

³ LAeqT is the average energy of the noise level considered over a period of time as defined by AS/NZS 1269.1:1998.

⁴ Liquid crystal display.

⁵ WELS is the Water Efficiency Labelling Scheme under which manufacturers can have their products tested and given a star rating in accordance with AS/NZS 6400:2005.

Materials measures

- There is integrated fit-out to 90 per cent of the net lettable area.
- Finishes (paints, floor coverings, etc) have reduced environmental impact.
- Maximum reuse is made of existing tables, chairs, workstations and storage. New furniture is selected for durability and lower environmental impact.
- Low environmental impact flooring is used.
- The operational office waste management facilities, waste management plan, and collection and separation services are contracted.
- The base building ceilings are retained.

Land use and ecology

- 4-star certified base building is used.
- The tenant recycles or reuses computer hardware.
- The tenant recycles or reuses lamps.

Emissions

- Zero ozone-depleting-potential refrigerants and insulants are used.

3.2 5-star rating

The following items of tenant fit-out are nominally equivalent to a 5-star 'New Zealand excellence' standard in accordance with the New Zealand Green Building Council Green Star (NZ) Interiors rating system (pilot). In everyday practice a total score of 66 points (minimum) is required, including a 10 per cent contingency above the minimum score of 60 points, for a 5-star rating.

Management measures

- A Green Star New Zealand-accredited professional is appointed to the design team from the start of the project design.
- A Green Star New Zealand-accredited professional is appointed to the contractor's site team from the start of the project construction.
- A high standard of commissioning of tenancy fit-out building services is maintained.
- Tenancy fit-out services are fine-tuned.
- Fifty per cent of fit-out waste is either recycled or reused.
- The base building and tenancy fit-out guides are coordinated and integrated, and are issued to the building owner and operator and tenants.

- A project-based environmental management plan is provided by the fit-out contractor and integrated with the base building plan, as appropriate.
- Ongoing operational environmental management is in place. This includes monitoring and managing energy and water use, waste generation, and operating and maintenance regimes.

Indoor environmental quality measures

- The base building has achieved a 4-star rating or better.
- Outdoor ventilation rate is 50 per cent above Building Code NZS4303 requirements.
- Certified low-VOC tenancy finishes are used, including paints and varnishes, carpets and floor coverings.
- Low-formaldehyde wood composite products and ceiling materials are used.
- Tenancy exhaust systems are provided for largely enclosed photocopy areas.
- The air-conditioning system is controllable down to 75 m².
- Offices are open plan, allowing good natural lighting to 60 per cent, and external views from 90 per cent, of the workplace.
- Manually controlled blinds are used, with a visual light transmission less than 10 per cent.
- An illuminance of 400 lux average is maintained at the working plane, with careful attention paid to surface reflectances. A proportion of the light is directed towards walls and ceilings.
- High-frequency ballasts are used in 95 per cent of the tenancy area.
- Noise levels due to building services and external noise do not result in office noise levels being greater than 43 dB LAeqT for open-plan offices.
- A plant supply and maintenance contract is maintained, with one plant per 15 m² net lettable area and plants in 15 cm diameter pots.

Energy efficiency measures

- A 5-star rated base building is used.
- An overhead up/down lighting system with occupancy control and perimeter dimming capabilities is used.
- Desktop computers have LCD screens.
- EnergyWise whiteware is used.
- Power outlets are integrated into partitioning above desk level.
- Electrical sub-metering of tenancy loads is used, if not provided under the base building.
- Moderately energy-efficient air-conditioning systems are used in communications equipment rooms (servers, etc).

Transport measures

- The allowance of car parking spaces compared to local council requirements is reduced.
- Cycling facilities are provided for 5 per cent of staff.
- Visitor bicycle parking is provided.
- The tenancy chosen has excellent public transport accessibility.

Water measures

- Tenancy water metering is provided if it is not provided under the base building.
- The base building or upgraded building uses reduced-flow (5-star WELS-rated) sanitary fixtures.
- 4-star WELS-rated dishwashers are used.
- Local hot-water generation is used.
- Under-sink-mounted boiling-water units are used.

Materials measures

- An integrated fit-out is provided to 90 per cent of the net lettable area.
- Finishes (paint, floor coverings, etc) with reduced environmental impact are used.
- Low environmental impact timber is used.
- PVC⁶ use is reduced 30 per cent by cost.
- Maximum reuse is made of existing tables, chairs, workstations and storage units. New furniture is selected for durability and lower environmental impacts.
- Low-environmental-impact flooring is used.
- The operational office waste management facilities, waste management plan, and collection and separation services are contracted.
- Base building ceilings are retained.

Land use and ecology

- 5-star certified base building is used.
- The tenant recycles or reuses computer hardware.
- The tenant recycles or reuses lamps.

Emissions

- Zero ozone-depleting-potential refrigerants and insulants are used.

⁶ Polyvinyl chloride, a thermoplastic polymer.

3.3 6-star rating

The following items of tenant fit-out are nominally equivalent to a 6-star ‘world excellence’ standard in accordance with the New Zealand Green Building Council Green Star (NZ) Interiors rating system (pilot). In everyday practice a total score of 82 points (minimum) is required, including a 10 per cent contingency above the minimum score of 75 points, for a 6-star rating.

Management measures

- A Green Star New Zealand-accredited professional is appointed to the design team from the start of the project design.
- A Green Star New Zealand-accredited professional is appointed to the contractor’s site team from the start of the project construction.
- A high standard of commissioning of tenancy fit-out building services is maintained.
- Tenancy fit-out services are fine-tuned.
- Seventy per cent of fit-out waste is either recycled or reused.
- Base building and tenancy fit-out guides are coordinated and integrated, and issued to the building owner and operator and tenants.
- A project-based environmental management plan is provided by the fit-out contractor and integrated with the base building plan, as appropriate.
- Ongoing operational environmental management is in place. This includes monitoring and managing energy and water use, waste generation, and operating and maintenance regimes.

Indoor environmental quality measures

- The base building has achieved a 4-star rating or greater.
- Outdoor ventilation rate is 100 per cent above Building Code NZS4303.
- Certified low-VOC tenancy finishes are used, including paints and varnishes, carpets and floor coverings.
- Low-formaldehyde wood composite products and ceiling materials are used.
- Tenancy exhaust systems are provided for largely enclosed photocopy areas.
- The base building air-conditioning system allows individual comfort control to 90 per cent of workstations.
- Offices are open plan, allowing good natural lighting to 60 per cent, and external views from 90 per cent, of the workplace.
- Manually controlled blinds are used, with a visual light transmission of less than 10 per cent.
- An illuminance of 400 lux average is maintained at the working plane, with careful attention paid to surface reflectances and a proportion of the light directed towards walls and ceilings.
- High-frequency ballasts are used in 95 per cent of the tenancy area.

- Noise levels due to building services and external noise do not result in office noise levels being greater than 43 dB LAeqT for open-plan offices.
- A plant supply and maintenance contract is maintained, with one plant per 15 m² net lettable area and plants in 30 cm diameter pots.

Energy efficiency measures

- A 5-star rated base building is used.
- Task/up/down ambient lighting is used, with full occupancy and lighting control by a digital addressable lighting interface (DALI) lighting control system.
- Lap-tops with LCD screens are used.
- EnergyWise whiteware is used.
- Power outlets are integrated into partitioning above desk level.
- Electrical sub-metering of tenancy loads is used if not provided under the base building.
- A highly energy-efficient air-conditioning system is used in communications equipment rooms (servers etc).

Transport measures

- The allowance of car parking spaces compared to local council requirements is reduced.
- Cycling facilities are provided for 10 per cent of staff.
- Visitor bicycle parking is provided.
- The tenancy is chosen with excellent public transport accessibility.

Water efficiency measures

- Tenancy water metering is provided if it is not provided under the base building.
- The base building or upgraded building uses reduced-flow (5-star WELS-rated) sanitary fixtures.
- 5-star WELS-rated dishwashers are used.
- Local hot-water generation is used.
- Under-sink-mounted boiling-water units are used.

Materials measures

- Integrated fit-out is supplied to 90 per cent of the net lettable area.
- Finishes (paint, floor coverings, etc) with reduced environmental impact are used.
- Low environmental impact timber is used.
- PVC use is reduced 90 per cent by cost.

- Ninety per cent of timbers are either reused or certified as having a lower environmental impact and the lowest standard of timber treatment required by the Building Code.
- Maximum reuse is made of existing tables, chairs, workstations and storage. New furniture is selected for durability and lower environmental impact.
- Low environmental impact partitions and joinery designed for disassembly are used.
- Low environmental impact flooring is used.
- Operational office waste management facilities, the waste management plan and collection and separation services are contracted.
- Base building ceilings are retained.

Land use and ecology

- 6-star certified base building is used.
- The tenant recycles or reuses computer hardware.
- The tenant recycles or reuses lamps.

Emissions

- Zero ozone-depleting-potential refrigerants and insulants are used.

3.4 4-star with energy focus rating

The following items of tenant fit-out are nominally equivalent to a 4-star best practice rating with an enhanced energy category score based on the New Zealand Green Building Council Green Star (NZ) Interiors rating system (pilot). In everyday practice a total score of 50 points (minimum) is required, including a 10 per cent contingency above the minimum score of 45 points, for a 4-star rating. A 4-star with energy focus rating would also require a minimum unweighted total of 14 points in the energy category.

Management measures

- A Green Star New Zealand-accredited professional is appointed to the design team from the start of the project design.
- A Green Star New Zealand-accredited professional is appointed to the contractor's site team from the start of the project construction.
- No significant modifications or additions to base building services are made.
- Thirty per cent of fit-out waste is either recycled or reused.
- A tenancy fit-out guide is provided.
- A project-based environmental management plan is provided by the fit-out contractor and integrated with the base building plan, as appropriate.
- Ongoing operational environmental management is in place. This includes monitoring and managing energy and water use, waste generation, and operating and maintenance regimes.

Indoor environmental quality measures

- The base building has achieved a 4-star rating or greater.
- The outdoor ventilation rate only meets Building Code NZS4303 requirements.
- Certified low-VOC tenancy finishes are used, including paints and varnishes, carpets and floor coverings.
- The air-conditioning system is controllable down to 75 m².
- Offices are open plan, allowing good natural lighting to 30 per cent, and external views from 60 per cent, of the workplace.
- Manually controlled blinds are used, with visual light transmission of less than 10 per cent.
- An illuminance of 400 lux average is maintained at the working plane, with careful attention paid to surface reflectances. A proportion of the light is directed towards walls and ceilings.
- High-frequency ballasts are used in 95 per cent of the tenancy area.
- Noise levels due to building services do not result in office noise levels greater than 43 dB LAeqT for open-plan offices.

Energy measures

- A 4-star rated base building is used.
- An overhead down-lighting system with occupancy control and perimeter dimming capabilities is used.
- Desktop computers have LCD screens.
- EnergyWise whiteware is used.
- Power outlets are integrated into partitioning above desk level.
- Electrical sub-metering of tenancy loads is used if not provided under the base building.
- A moderately energy-efficient air-conditioning system is used in communications equipment rooms (servers, etc).

Transport measures

- The allowance for car parking spaces compared to local council requirements is reduced.
- The tenancy is chosen with excellent public transport accessibility.

Water efficiency measures

- Tenancy water metering is provided if it is not provided under the base building.
- The base building or upgraded building uses reduced-flow (5-star WELS-rated) sanitary fixtures.
- 3-star WELS-rated dishwashers are used.

- Local hot-water generation is used.
- Under-sink-mounted boiling-water units are used.

Materials measures

- Integrated fit-out is supplied to 90 per cent of the net lettable area.
- Finishes with reduced environmental impact are used.
- Maximum reuse is made of existing tables, chairs, workstations and storage. New furniture is selected for durability and lower environmental impact.
- Low environmental impact flooring is used.
- Operational office waste management facilities, the waste management plan and collection and separation services are contracted.
- Base building ceilings are retained.

Land use and ecology

- 4-star certified base building is used.
- The tenant recycles or reuses computer hardware.
- The tenant recycles or reuses lamps.

Emissions

- Zero ozone-depleting-potential refrigerants and insulants are used.

4 Green Star New Zealand – Environmental Key Performance Indicators

In developing this value case for Green Star tenancy fit-outs, the following energy, CO₂ and water key performance indicators have been developed for a typical conventional and unrated fit-out compared to 4- star, 5-star and 6-star fit-outs. A further 4-star with energy focus standard has also been developed.

Table 2: Recognised Green Star energy and CO₂ emissions – key performance indicators (KPIs)

Environmental key performance indicator (KPI)	Unrated fit-out	4-star fit-out	5-star fit-out	6-star fit-out	4-star with energy focus fit-out
Tenancy lighting and small power energy use	95 kWh/m ² NLA pa	58 kWh/m ² NLA pa	52 kWh/m ² NLA pa	43 kWh/m ² NLA pa	52 kWh/m ² NLA pa
Associated CO ₂ emissions*	15.68 kg CO ₂ /m ² NLA pa	9.57 kg CO ₂ /m ² NLA pa	8.58 kg CO ₂ /m ² NLA pa	7.1 kg CO ₂ /m ² NLA pa	8.58 kg CO ₂ /m ² NLA pa
Tenancy water use excluding base building shower/ changing, and toilets	0.09 m ³ /m ² NLA pa	0.045 m ³ /m ² NLA pa	0.045 m ³ /m ² NLA pa	0.045 m ³ /m ² NLA pa	0.045 m ³ /m ² NLA pa

* Based on 0.165 kgCO₂-e/kWh (Ministry for the Environment, 2007).

Notes:

kWhr (kilowatt hour) = a unit of energy equal to the work done by a power of 1000 watts operating for one hour.

pa (per annum) = in each year.

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Energy, water and CO₂ reductions and associated operating cost savings based on these key performance indicators are given in Table 3.

Table 3: Energy, water and CO₂ reductions and potential cost savings

Fit-out rating	Energy use reduction kWh/m ² NLA pa	Energy cost saving \$/m ² NLA pa*	Water-use reduction m ³ /m ² NLA pa	Water cost saving \$/m ² NLA pa**	CO ₂ reduction kg CO ₂ /m ² NLA pa	CO ₂ cost savings \$/m ² NLA pa***
4-star	37	6.66	0.045	0.2	6.1	0.18
5-star	43	7.74	0.045	0.2	7.1	0.21
6-star	52	9.36	0.045	0.2	8.58	0.26
4-star with energy focus	43	7.74	0.045	0.2	7.1	0.21

* Based on assumed energy cost of \$0.18/kWh.

** Based on assumed water cost of \$4.5/m³.

*** Based on assumed price of carbon of NZ\$30/tonne.

Notes:

pa (per annum) = in each year.

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

5 Value Case Assumptions

5.1 Fit-out scenarios

Three scenarios have been assumed for this value case analysis. Scenario 1 considers the four possible levels of Green Star fit-out and assumes that the base building is new and has attained the following associated ratings.

Table 4: Scenario 1: 4-, 5- and 6-star, and 4-star with energy, focus fit-outs of new 4- and 5-star rated base buildings

Tenancy fit-out rating	Associated base building rating
4-star	4-star
5-star	5-star
6-star	5-star
4-star with energy focus	4-star

A 6-star rated office base building has not been considered because no building in New Zealand has attained this rating and it is not currently mandated for government accommodation.

Scenario 2 assumes that the base building exists and that some upgrading is included to address the principle environmental features that affect the fit-out. These include upgraded lighting and on-floor heating, ventilation and air conditioning (HVAC) systems; new ceilings; new shower facilities for cyclists; and waste-recycling facilities.

The upgrading is assumed to meet a 4-star base building standard for all four levels of fit-out, as indicated in Table 5. The 4-star minimum rating has been chosen to reflect the potential difficulties of upgrading an existing building.

Table 5: Scenario 2: 4-, 5-, 6-star, and 4-star with energy focus, fit-outs of upgraded minimum 4-star rated existing base buildings

Tenancy fit-out rating	Associated base building rating
4-star	4-star
5-star	4-star
6-star	4-star
4-star with energy focus	4-star

Scenario 3 assumes that the base building exists and that no upgrading (and hence no rating of the base building) has been achieved, as indicated in Table 6.

Table 6: Scenario 3: 4-, 5- and 6-star, and 4 star with energy focus, fit-outs of existing unrated base buildings

Tenancy fit-out rating	Associated base building rating
4-star	Unrated
5-star	Unrated
6-star	Unrated
4-star with energy focus	Unrated

5.2 Fit-out and building location

It has been assumed that the fit-out and base building are centrally located in a major New Zealand city with good public transport links. This should be the situation for the vast majority of the larger government accommodation solutions.

5.3 Building fit-out size

For the purposes of this value case, a fit-out of 3000 m² has been assumed. For fit-outs below this size the economics are likely to be marginally worse, and for fit-outs above this size the economics are likely to be marginally better. Given the costs of full Green Star accreditation, it would be advisable to limit application for accreditation to fit-outs greater than 2000 m². This cut-off is consistent with other limits on the application of government property guidelines.

5.4 Capital cost investment

5.4.1 Typical ranges of cost for interior fit-outs

Based on data obtained from a number of interior architects and designers, the fit-out costs for offices vary depending on the standard to which the interior is fitted out. Typical ranges of cost are given in Table 7.

Table 7: Typical range of costs for office interior fit-outs

Fit-out quality level	Hard fit-out \$/m ²	Soft fit-out \$/m ²
High quality	550–750	400–600
Medium quality	450–550	300–400

The base building costs are assumed to include flooring, ceiling and HVAC costs. Hard fit-out includes internal walls, small power and data wiring, base building HVAC modifications, and built-in joinery. Soft fit-out includes workstations, chairs, storage, and meeting-room and reception furniture. The above fit-out costs exclude GST, audiovisual equipment, IT equipment and moving costs. It should, however, be noted that some Green Star points are awarded for the energy efficiency of IT equipment. Allowance for energy-efficient IT equipment has also been made in the key performance indicators included in section 4.

For the purposes of this value case, the lower range of a medium-quality fit-out has been assumed, consistent with a government tenant giving an average fit-out cost allowance of \$750/m², assuming reuse of suitable workstations and general office furniture. Reuse of furniture is encouraged by the Green Star interiors rating system.

5.4.2 Capital cost investment for Green Star 4-, 5- and 6-star, and 4-star with energy focus, fit-outs

The following capital cost investments, expressed both in monetary terms and as a percentage of the total fit-out cost, have been estimated.

Table 8: Scenario 1: capital cost investment for 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of new 4- and 5-star rated base buildings

Tenancy fit-out rating	Associated base building rating	Capital investment cost to achieve stated Green Star fit-out rating (\$/m ² NLA)	Capital cost investment as a percentage of the total fit-out cost to achieve stated Green Star fit-out rating (%)
4-star	4-star	9.4	1.25
5-star	5-star	32.8	4.37
6-star	5-star	46.7	6.23
4 star with energy focus	4-star	17.6	2.34

Note: NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Table 9: Scenario 2: capital cost investment for 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of upgraded minimum 4-star rated existing base buildings

Tenancy fit-out rating	Associated base building rating	Capital investment cost to achieve stated Green Star fit-out rating (\$/m ² NLA)	Capital cost investment as a percentage of the total fit-out cost to achieve stated Green Star fit-out rating (%)
4-star	4-star	9.4	1.25
5-star	4-star	N/A	N/A
6-star	4-star	N/A	N/A
4-star with energy focus	4-star	17.6	2.34

Note: NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

N/A = not applicable.

Table 10: Scenario 3: capital cost investment for 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of existing unrated base buildings

Tenancy fit-out rating	Associated base building rating	Capital investment cost to achieve stated Green Star fit-out rating (\$/m ² NLA)	Capital cost investment as a percentage of the total fit-out cost to achieve stated Green Star fit-out rating (%)
4-star	Unrated	13.45	1.79
5-star	Unrated	N/A	N/A
6-star	Unrated	N/A	N/A
4-star with energy focus	Unrated	21.8	2.91

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

N/A = not applicable.

5.5 Energy and water cost savings

Energy and water costs of \$0.18/kWh (based on predominant electricity use) and \$4.5/m³ (based on Auckland data) have been assumed.

5.6 User satisfaction, health and staff retention savings

Improved workplace environments in well-designed, new, sustainable government buildings will offer soft benefits and cost savings to organisations as a result of increased staff satisfaction and retention, and improved health. A building's workplace environment can affect:

- time staff waste complaining
- sickness
- absenteeism
- length of time working
- staff turnover, and thus recruitment and training costs
- mental and physical performance of base activities (typing, reading, etc)
- errors and repetition (efficiency of tasks)
- wasted time (due to waiting, or unnecessary extra work)
- document access (finding papers, archive retrieval)
- interaction versus distraction
- work style and team working
- attitude to the organisation – feelings of belonging, loyalty
- motivation
- costs of regular internal office moves/re-arrangements or 'churn'
- impression on visitors and the general public.

Various post-occupancy studies from around the world have identified productivity effects due to workplace environmental factors of approximately 5 to 15 per cent. What this means, however, is open to some interpretation. More specific studies on 'green buildings' have confirmed a positive correlation between these buildings and workplace environmental quality and user satisfaction. The Kats report on the costs and financial benefits of green buildings for the Californian Sustainable Building Task Force (Kats and Capital E, 2003) suggests that a 1 per cent productivity and health gain could be attributed to silver LEED-rated buildings (equivalent to a 4-star New Zealand rating) and a 1.5 per cent productivity and health gain to gold and platinum LEED-rated buildings (equivalent to 5- and 6-star New Zealand ratings respectively).

For the purposes of these value cases, the productivity and health gain effect has been conservatively limited to the non-productive proportion of the average annual staff salary costs related to sickness and staff recruitment and training. Based on a previous assessment of government accommodation (Inland Revenue) by eCubed Building Workshop Ltd, these non-productive costs are estimated to be approximately 10 per cent of the annual salary cost. On this basis, a soft-cost benefit of 0.5 per cent is derived for a 4-star building and 0.8 per cent for a 5- or 6-star building.

The relative contribution of the base building and fit-out to this soft-cost benefit has been assessed at 55 per cent and 45 per cent, respectively. This gives a fit-out soft-cost benefit of 0.225 per cent for a 4-star or 4-star with energy focus fit-out, and 0.36 per cent for a 5 or 6-star fit-out. These percentages have been applied to the annual average salary cost. An average salary of \$75,000 and occupancy of one person per 15 m² have been assumed for a government central office-type tenancy. The resultant soft benefits are half those assumed by the Californian Sustainable Building Task Force Report and are therefore considered to be conservative.

5.7 Workplace efficiency

A number of sustainable building principles are closely associated with improvements in workplace efficiency and their potential impact on workplace performance. Factors such as increased building floor-plate efficiency and more open-plan office space offer opportunities for increased occupancy density from the current typical government accommodation densities of one person per 18–20 m² to more typical industry averages of one person per 15 m². Occupational cost savings of \$35–60/m² are achievable by more efficient building designs and increased occupational densities.

Similarly, greater flexibility in building services systems, partitioning and workplace furnishings can offer opportunities to reduce staff relocation, or ‘churn’, rates. Office churn can typically cost \$20–35/m² pa, and savings of \$6–10/m² are achievable by more flexible designs.

Increased workplace efficiency allied to more sustainable fit-outs can therefore result in operational associated savings of \$45–70/m². These potential cost benefits have been excluded from this value case.

5.8 Workplace expression

Workplace design and culture can be used to reflect or express the values of an organisation such as a government department. This has no direct or tangible operating costs or benefits, but it will reinforce and demonstrate a department’s role and accountability both to staff and to the wider community. A 2003 survey by *Management Today* magazine found that 94 per cent of respondents regarded their place of work as a symbol of whether they were valued by their employer, yet only 39 per cent thought their offices had been designed “with people in mind”.

Values that could be expressed by the fit-out of a sustainable government office building include:

- sustainability
- connectedness
- openness and accountability
- professionalism and authority
- modernity – being in touch and forward-looking.

No financial value has been included in this value case for workplace expression.

5.9 Fit-out life

Office fit-outs have a typical life expectancy of six to nine years, consistent with the termination of typical lease periods. Given the nature of a government tenancy with longer lease periods and the aim of a sustainable fit-out to be more durable, this value case assumes a fit-out life of nine years.

5.10 Discount rate

The value case uses a discount rate of 6 per cent per annum. This is in accordance with the public sector discount rate for general purpose office and accommodation buildings given in Treasury Circular 2008/13. The *New Zealand Energy Efficiency and Conservation Strategy* (EECA, 2007) recommends a public sector discount rate of 5 per cent for assessing the costs and benefits of energy-efficiency programmes.

5.11 Carbon dioxide emission factor

The value case assumes an average carbon dioxide emission factor of 0.165 kgCO₂-e/kWh (Ministry for the Environment, 2007).

5.12 Cost of carbon

The value case uses the New Zealand Treasury price estimate of carbon of €12.50/tonne at 30 June 2008, converted to NZ\$30/tonne (December 2008).

6 Value Case Results

The value case results are summarised in the following cost–benefit analysis tables in terms of capital cost investment, hard- and soft-cost savings, simple paybacks and nine-year net present values, based on the assumptions given in section 5. Table 11 provides a cost–benefit analysis for scenario 1: 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of new 4- and 5-star rated base buildings. Table 12 provides a cost–benefit analysis for scenario 2: 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of an upgraded minimum 4-star rated existing base building. Table 13 provides a cost–benefit analysis for Scenario 3: 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of an existing unrated base building.

Table 11: Cost–benefit analysis for scenario 1: 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of new 4- and 5-star rated base buildings

Green star NZ fit-out rating	Average capital cost premium \$/m ² NLA	Annual energy cost saving \$/m ² NLA	Annual water cost saving \$/m ² NLA	Total hard cost savings \$/m ² NLA	Hard cost savings simple payback (years)	Hard cost savings 9 year NPV \$/m ² NLA	Hard cost savings IRR %	Annual soft cost savings \$/m ² NLA	Total hard and soft cost savings \$/m ² NLA	Hard and soft cost savings simple payback (years)	Hard and soft cost savings 9 year NPV \$/m ² NLA
4-star	9.4	6.66	0.2	6.86	1.4	42	78	11.25	18.11	0.5	125
5-star	32.8	7.74	0.2	7.94	4.1	28	23	18	25.94	1.3	160
6-star	46.7	9.36	0.2	9.56	4.9	26	18	18	27.56	1.7	159
4-star with energy focus	17.6	7.74	0.2	7.94	2.2	42	48	11.25	19.19	0.9	125

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a period, converted into an equivalent value today.

Table 12: Cost–benefit analysis for scenario 2: 4-, 5- and 6-star, and 4-star with energy focus, fit-outs of upgraded minimum 4-star rated existing base building

Green star NZ fit-out rating	Average capital cost premium \$/m ² NLA	Annual energy cost saving \$/m ² NLA	Annual water cost saving \$/m ² NLA	Total hard cost savings \$/m ² NLA	Hard cost savings simple payback (years)	Hard cost savings 9 year NPV \$/m ² NLA	Hard cost savings IRR %	Annual soft cost savings \$/m ² NLA	Total hard and soft cost savings \$/m ² NLA	Hard and soft cost savings simple payback (years)	Hard and soft cost savings 9 year NPV \$/m ² NLA
4-star	9.4	6.66	0.2	6.86	1.4	42	78	11.25	18.11	0.5	125
5-star	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-star	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-star with energy focus	17.6	7.74	0.2	7.94	2.2	42	48	11.25	19.19	0.9	125

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a period, converted into an equivalent value today.

N/A = not applicable.

Table 13: Cost–benefit analysis for scenario 3: 4-, 5- and 6-star, and 4-star with energy, focus fit-outs of existing unrated base building

Green star NZ fit-out rating	Capital cost premium \$/m ² NLA	Annual energy cost saving \$/m ² NLA	Annual water cost saving \$/m ² NLA	Total hard cost savings \$/m ² NLA	Hard cost savings simple payback (years)	Hard cost savings 9 year NPV \$/m ² NLA	Hard cost savings IRR %	Annual soft cost savings \$/m ² NLA	Total hard and soft cost savings \$/m ² NLA	Hard and soft cost savings simple payback (years)	Hard and soft cost savings 9 year NPV \$/m ² NLA
4-star	13.45	6.66	0.2	6.86	2	38	54	11.25	18.11	0.7	121
5-star	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-star	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-star with energy focus	21.8	7.74	0.2	7.94	2.7	38	38	11.25	19.19	1.1	121

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a period, converted into an equivalent value today.

7 Conclusions

7.1 New leased office accommodation

The previous government mandated the following minimum standards for the base buildings of new leased office accommodation:

- 5 stars for A-grade buildings
- 4 stars for B-grade buildings.

A 6-star standard has therefore been discounted from further analysis. It would also be reasonable to assume that the fit-out rating should match the base building rating, although a higher rating is theoretically possible. On this basis, a 4-star fit-out is appropriate to a 4-star base building and a 5-star fit-out to a 5-star base building.

A further 4-star with energy focus standard, representing a 4-star rating with an enhanced score in the energy category, was also developed given the Government's particular concern for cost effectiveness and carbon abatement. This results in an identical NPV over a nine-year period. Given the additional benefits of carbon abatement and demonstrating government leadership for the same investment performance, a 4-star with energy focus minimum standard is recommended.

Based on the results of this value case, the following minimum fit-out standards are recommended.

Table 14: Recommended minimum fit-out standards for new leased office accommodation

Base building rating	Recommended tenancy fit-out rating
4-star	4-star with energy focus
5-star	5-star

7.2 Existing leased office accommodation

There are currently no mandated minimum standards for the base buildings of existing leased office accommodation. Ideally the base building should be upgraded to at least a 4-star minimum standard as a condition of a new or extended lease. Where this is not feasible, upgraded lighting and on-floor HVAC systems are recommended. Again a 4-star with energy focus minimum standard is recommended for similar reasons to the new leased accommodation case above.

Based on the results of this value case and the overview above, the following minimum fit-out standards are recommended.

Table 15: Recommended minimum fit-out standards for existing leased office accommodation

Base building rating	Recommended tenancy fit-out rating
4-star	4-star with energy focus
Unrated	4-star with energy focus

7.3 Sensitivity analysis

Given the varying nature of government departments and their accommodation needs, there is likely to be some variation in the cost–benefit analyses given in section 6. Two further refinements to the cost–benefit analyses for the recommended minimum standards have therefore been undertaken.

As a general rule investment costs tend to be underestimated and operating cost benefits overstated in studies of this nature. The effect of a 10 per cent increase in the capital cost investment for achieving the stated Green Star fit-out rating and a 10 per cent reduction in the potential operating cost savings have therefore been included in the cost–benefit analysis in Table 16. Based on these results, the further effect of a +/- 10 per cent variation in total fit-out costs from the \$750/m² assumed in the value case in section 6 have been included in Table 17. This gives a likely range of potential fit-out costs of \$675–825/m².

Table 16: Cost–benefit analysis for 4-star, 5-star and unrated base building with 10 per cent increase in capital cost investment and 10 per cent reduction in cost savings

Base building rating	Fit-out rating	Capital cost investment \$/m ² NLA	Annual energy cost saving \$/m ² NLA	Annual water cost saving \$/m ² NLA	Total hard cost savings \$/m ² NLA	Hard cost savings simple payback (years)	Hard cost savings 9 year NPV \$/m ² NLA	Hard cost savings IRR %	Annual soft cost savings \$/m ² NLA	Total hard and soft cost savings \$/m ² NLA	Hard and soft cost savings simple payback (years)	Hard and soft cost savings 9 year NPV \$/m ² NLA
4-star	4-star-e	19.36	6.97	0.18	7.15	2.7	34	38	10.13	17.28	1.1	109
5-star	5-star	36.08	6.97	0.18	7.15	5	4	17	16.2	23.35	1.5	138
Unrated	4-star-e	23.98	6.97	0.18	7.15	3.4	30	30	10.13	17.28	1.4	105

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a period, converted into an equivalent value today.

Table 17: Capital cost investment for 4-star, 5-star and unrated base building with 10 per cent increase in capital cost investment and 10 per cent reduction in cost savings

Base building rating	Fit-out capital cost (\$/m ² NLA)	Fit-out rating	Capital cost investment (\$/m ² NLA)	Capital cost investment (%)
4-star	675	4-star with energy focus	17.6	2.6
			19.36	2.9
	825		17.6	2.1
			19.36	2.3
5-star	675	5-star	32.8	4.8
			36.08	5.3
	825		32.8	4.
			36.08	4.4
Unrated	675	4-star with energy focus	21.8	3.2
			23.98	3.6
	825		21.8	2.6
			23.98	2.9

Note: NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

7.4 Fit-out value case final results

Based on Tables 16 and 17, the final results of this value case are given in Table 18. This summarises the likely range of costs and benefits of the recommended minimum standards.

Table 18: Cost–benefit analysis for recommended minimum fit-out standards

Base building rating	Recommended tenancy fit-out rating	Average cost premium %	Simple payback (years)	9 year NPV \$/m ² NLA	IRR %
Unrated	4-star with energy focus	+2.6 to 3.6%	2.7–3.4	30–38	30–38
4-star	4-star with energy focus	+2.1 to 2.9%	2.2–2.7	34–42	38–48
5-star	5-star	+4 to 5.3%	4.1–5	4–28	17–23

Notes:

NLA (net lettable area) = the area for which a tenant could be charged for occupancy under a lease.

Simple payback = the amount of time it will take to recover the initial cost premium, ignoring the time value of money, inflation and the life of the investment.

IRR (internal rate of return) = the discount rate with an NPV of 0 over a period of time.

NPV (net present value) = the stream of costs and benefits over a period, converted into an equivalent value today.

7.5 Magnitude of savings possible if minimum standards were applied to all central government accommodation

Central government is the most significant owner and lessee of commercial buildings in New Zealand. Their buildings use between 20 and 25 per cent of government’s total energy use. Adopting these new standards across all central government accommodation over the next 10 years as new fit-outs progressively fall due could result in the macro outcomes given in Table 19.

Table 19: Estimated outcomes if minimum standards are applied to all government office accommodation

Energy reduction per annum	CO ₂ reduction per annum
38.7 GWh	6380 tonnes
Energy cost reduction per annum	CO ₂ cost reduction per annum
\$5.8 million	\$191,165
% Reduction – energy, CO ₂ and associated operating costs	
23–29%	

Note: GWh (gigawatt hour) = unit of electrical energy equal to one billion watt hours.

Based on Table 19, the average projected reductions in energy, CO₂ and associated operating cost savings are estimated to be approximately 25 per cent of current use.

References

Energy Efficiency and Conservation Authority. 2007. *New Zealand Energy Efficiency and Conservation Strategy*. www.eeca.govt.nz

Kats G, Capital E. 2003. *The Costs and Financial Benefits of Green Buildings*. A report to California's Sustainable Building Task Force.

Ministry for the Environment. 2005a. *A Guide to Sustainable Office Fit-outs*. Wellington: Ministry for the Environment.

Ministry for the Environment. 2005b. *Value Case for Sustainable Building in New Zealand*. Wellington: Ministry for the Environment.

Ministry for the Environment. 2007. *Value Cases for Achieving Green Star NZ 4 Star, 5 Star and 5 Star+ Environmental Ratings*. Wellington: Ministry for the Environment.

New Zealand Green Building Council. 2008. *Green Star Pilot Office: Interiors Rating Tool*. www.nzgbc.org.nz