

SUSTAINABLE ENERGY AUTHORITY OF VICTORIA

ENERGY EFFICIENCY IMPROVEMENT in the COMMERCIAL SUB-SECTORS

Prepared by



EMET Consultants Pty Limited

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Disclaimer

This document contains predictions and estimates of energy use and potential savings. The information is calculated by EMET Consultants Pty Ltd using available and specifically sourced data; and proprietary analysis techniques. The results are provided by EMET in good faith and are believed to be the best available estimates at the time of producing this report. However the results are subject to variable influences such as weather patterns, relative energy costs, consumer expectations etc. and therefore EMET makes no guarantee in relation to the repeatability of the these results and estimates in their application to the intended target sector(s).

Sustainable Energy Authority of Victoria

**ENERGY EFFICIENCY IMPROVEMENT
in the COMMERCIAL SUB-SECTORS**

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1 Introduction

In November 2002, the Ministerial Council on Energy (MCE), comprising commonwealth, state and territory energy ministers, endorsed a proposal for development of a National Framework for Energy Efficiency (NFEE or National Framework) to define future directions for energy efficiency policy and programs in Australia. The objective of the National Framework is to unlock the significant economic potential associated with increased implementation of energy efficient technologies and processes, to deliver a least cost approach to energy provision in Australia.

As part of the work on the National Framework, the Sustainable Energy Authority (SEAV), in conjunction with the consultant Graham Armstrong, undertook a project to assess the demand-side energy efficiency improvement potential and costs for the residential, commercial and industrial sectors⁽⁵⁾. This data was used as the basis for the economic modelling presented in the NFEE Discussion Paper.

To assist with the on-going development of the NFEE, SEAV commissioned EMET Consultants Pty Ltd (EMET) to undertake some case studies of the energy efficiency improvement potential in a number of key commercial sub-sectors. This would be an extension of the work EMET reported at the ABARE workshop (December 2002)⁽¹⁾, by concentrating on a number of key commercial sub-sectors.

The aim of the project was to refine the preliminary energy efficiency potential estimates developed in the Armstrong/SEAV work in some key commercial sub-sectors.

More specifically, the objectives of this project were to:

- (1) identify the readily achievable energy efficiency measures in each of the chosen commercial sub-sectors;
- (2) produce graphs of energy efficiency potential and cost relationship for the chosen commercial sub-sectors.

The EEIs were to be based on measures that can be implemented in existing buildings, refurbishments and new buildings, using the same methodology as in EMET's initial study. The EEIs should be based on measures that are beyond business as usual.

Commercial sub-sector for case studies

The key commercial sub-sectors proposed to be used as case studies represent a significant proportion of overall energy consumption in the commercial sector and comprise:

- ANZSIC Div K & L – Finance & Insurance / Property & Business Services (Sub-Sector A)
- ANZSIC Div F & G – Wholesale Trade / Retail Trade (Sub-Sector B)
- ANZSIC Div M, N, O – Govt Admin / Education / Health & Community (Sub-Sector C)
- ANZSIC Div H – Accommodation, Cafes & Restaurants (Sub-Sector D)
- ANZSIC Div P & Q – Culture & recreation / Personal & other services (Sub-Sector E)
- ANZSIC Div J – Communication services (Sub-Sector F)

1.1 Analysis Methodology

The source data for this project has been derived from EMET's existing databases and models of the Commercial Sector, as well as ABARE's forecasts for sector growth and trends. The analysis tools have been developed by EMET and proven over a number of energy management projects and programs involving various portfolios of buildings across the Commercial Sector.

The key tasks of the project's methodology were to adapt the databases, models and analysis tools to the sub-sectors being targeted and to use these to simulate and analyse the various scenarios being investigated. More specifically, the methodology included the following tasks:

- Prepare the database and modelling tools to be used by:
 - Extracting the relevant information for each building type being analysed.
 - Reconstructing a model of energy use for each building type.
 - Fine tuning the models to correlate with the overall Commercial Sector models, energy source breakdowns and respective trends between the agreed analysis period.
- Update the analysis tool as follows:
 - Review energy efficiency measures for each building type to incorporate current and forecast technologies and review the scope and penetration factors for energy efficiency initiatives as they apply to each building type.
 - Review savings and costs in light of current costs of technologies and energy.
 - Update the model to include recently introduced energy management measures.
 - Classify individual measures in relation to the summary outputs required.

A large range of energy management measures are used in the analysis tool. Generally, they fall into the following classifications:

- Thermal performance of building fabric.
- Heating, ventilation and Air Conditioning (HVAC) – technical and control improvements.
- HVAC – management, maintenance and operational improvements
- Lighting – technical and control improvements.
- Lighting – management, maintenance and operational improvements.
- Hot Water Services.
- Lifts.
- Other Services and Plant.

A list of initiatives used in this analysis and a more detailed description of the analysis methodology is included in Appendix 1.

- Conduct the analysis of models as follows:
 - Run the model to identify the impact of specific energy efficiency initiatives.
 - Calculate the savings and costs achieved by the application of the individual initiatives to the target sector database (note that total savings take into account the impact of changes to maintenance costs – eg. if maintenance is reduced additional cost savings are achieved and used in the cost-effectiveness calculations; if maintenance costs are increased, their effect is similarly incorporated into the results)

- Evaluate the overall impact, cost-effectiveness, etc for each action applied independently.
- Combine initiatives based on the perceived desirable order of adoption (payback is used for this process) and revised the estimates of savings based on the interactive effect of initiatives.
- Evaluate the impact of level of natural adoption of energy efficiency measures based on improved cost-effectiveness and availability of technologies (Business as Usual scenario).
- Complete the analyses and report as per the requirements of the project.

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ENERGY EFFICIENCY IMPROVEMENT in the COMMERCIAL SUB-SECTORS

2 Energy Use and Trends in the Commercial Sector

The Australian Commercial sector consumed 218 PJ of energy in 2000 and its Business As Usual forecast consumption for the year 2010 is 289 PJ⁽¹⁾.

Figure 2.1 shows the trends in energy use within the Commercial Sector between 1990 and 2010 and breakdown by energy source during that period. Under current predictions, no significant change is expected in the application of fuels within the sector. Growth in energy use is expected to remain relatively steady throughout the period.

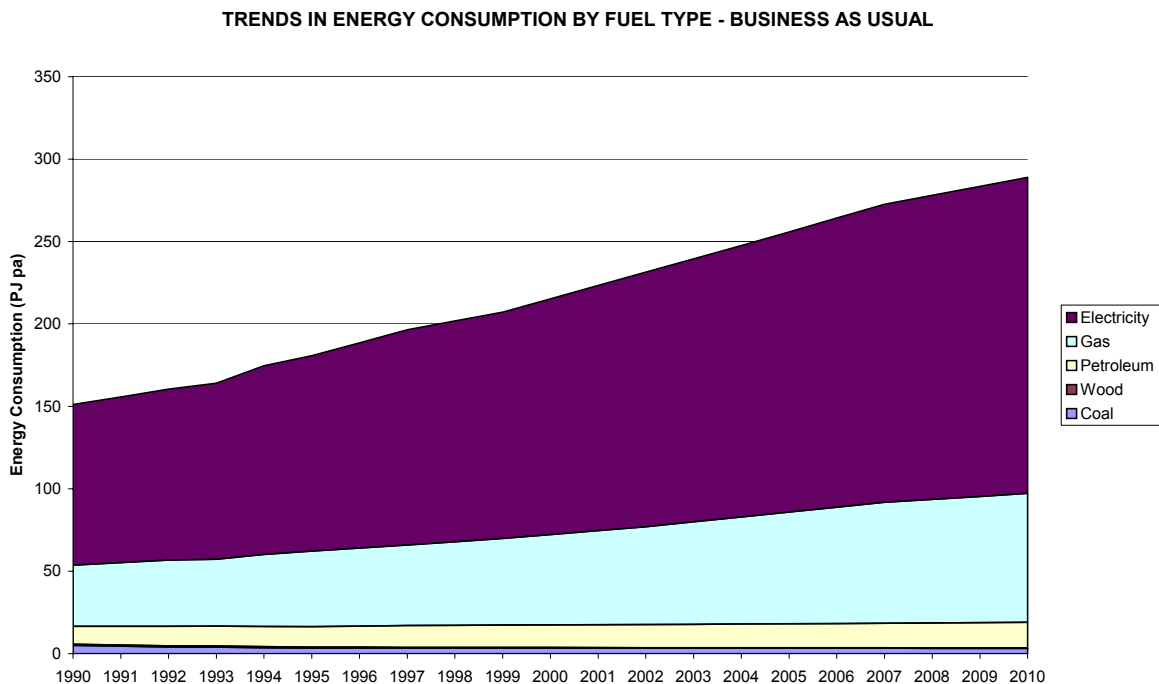


Figure 2.1: Australian Commercial Sector – Trends in Energy Consumption by Energy Source
(EMET⁽¹⁾)

Table 2.1 shows the breakdown of energy use by fuel type. Electricity dominates as the major energy source within this sector, with over 66% of total consumption. Greenhouse gas management policies may consider strategies to substitute electricity with more greenhouse-friendly fuels, however this can only occur in a small proportion of heating and hot water services. All other services are generally exclusive to electricity.

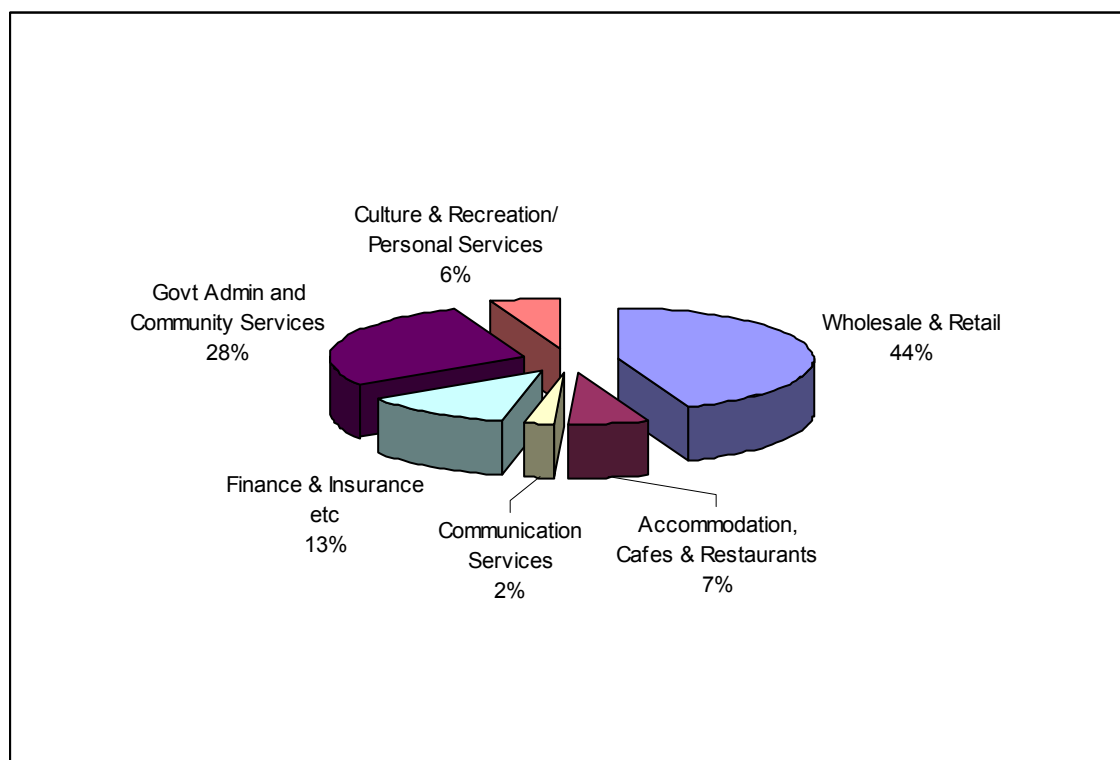
Table 2.1: Energy Consumption in the Australian Commercial Sector(Source – ABARE-EMET 2002^(1,2))

Energy Source	Energy Consumption (PJ pa)
	Year 2000
Elec	150
Gas	50
Petroleum Products	14.1
Coal	2.9
Wood	0.4
Total – PJ	218.1

Note: numbers do not add due to rounding off

2.1 Applications of Energy

Figure 2.2 shows the breakdown of energy use across the six sub-sector components of the Commercial Sector.

**Figure 2.2: Commercial Sector 2000 – Breakdown in Energy Consumption by Sub-Sector**(Source – ABARE 2003⁽⁴⁾)

The highest levels of consumption are attributed to the “Wholesale and Retail” sub-sector (ANZIC Div F & G) at 96.2 PJ per annum [44%], followed by “Government Administration and Community Services” (ANZSIC Div M, N & O) at 61.6 PJ per annum [28%]. The smaller energy user sub-sectors consist of: “Finance and Insurance” (Div K & L), “Accommodation, Cafes and Restaurants” (Div H), “Culture, Recreation and Personal Services” (Div P & Q), and “Communication Services” (Div J) which are responsible for 13%, 7%, 6% and 2% of the sector consumption respectively.

Tables 2.3 and 2.4 show the assumed application of energy within each sub-sector, as developed through the integration of the EMET models for the relevant building types and the overlying ABARE data. The figures shown in the tables are sub-sector averages. The specific application of energy within buildings of each sub-sector will vary substantially between climatic zones, and in relation to the combination of services provided and the specific design characteristics.

Table 2.3: Annual Energy Use by the key Commercial Sector Sub-Sectors by Application and Energy Type –PJ pa (Year 2000)

Application & Energy Type	Wholesale & Retail	Accommodation, Cafes & Restaurants	Communication Services	Finance & Insurance etc	Govt Admin and Community Services	Culture & Recreation/ Personal Services
Electricity						
Office Equipment	2.3	0.1	0.5	3.2	3.9	0.4
Other Miscell.	1.6	0.6	0.1	0.9	1.3	0.2
Hot Water	8.5	1.4	0.0	1.5	2.7	1.4
Lighting: Int.	19.1	1.1	0.6	6.3	8.9	2.3
Lighting: Car Park	0.2	0.0	0.0	0.4	0.4	0.0
Lighting: Ext	10.8	0.7	0.2	1.9	2.5	1.2
Air Handling	5.9	1.4	1.2	4.5	6.0	1.2
Heating	1.0	0.4	0.2	0.8	1.1	0.3
Cooling	7.9	1.9	1.3	4.8	5.8	1.5
Pumping	0.8	0.3	0.1	0.6	0.9	0.1
Cooking	3.4	2.9	0.2	1.3	1.9	0.7
Process Motors	0.0	0.6	0.0	0.4	0.9	0.3
Total Electric	61.5	11.5	4.5	26.6	36.4	9.7
Other Fuels						
Hot Water	2.8	1.0	0.0	0.2	7.5	0.7
Heating	5.8	0.5	0.6	0.7	15.6	0.8
Cooking	26.1	2.0	0.0	0.2	2.1	1.4
Total Other	34.7	3.5	0.6	1.1	25.2	2.9
Grand Total	96.2	15.0	5.1	27.7	61.6	12.6

Table 2.4: Annual Energy Use by the key Commercial Sector Sub-Sectors by Application and Energy Type –PJ pa (Year 2010)

Application & Energy Type	Wholesale & Retail	Accommodation, Cafes & Restaurants	Communication Services	Finance & Insurance etc	Govt Admin and Community Services	Culture & Recreation/ Personal Services
Electricity						
Office Equipment	3.1	0.1	0.6	4.2	5.1	0.6
Other Miscell.	2.1	0.8	0.2	1.2	1.8	0.3
Hot Water	11.2	1.9	0.0	2.0	3.5	1.8
Lighting: Int.	25.3	1.5	0.8	8.4	11.9	3.0
Lighting: Car Park	0.2	0.0	0.0	0.5	0.5	0.0
Lighting: Ext	14.3	0.9	0.2	2.5	3.4	1.7
Air Handling	7.8	1.9	1.5	6.0	7.9	1.6
Heating	1.3	0.6	0.3	1.1	1.5	0.4
Cooling	10.4	2.5	1.7	6.3	7.7	2.0
Pumping	1.1	0.4	0.2	0.8	1.2	0.1
Cooking	4.6	3.9	0.2	1.7	2.6	1.0
Process Motors	0.0	0.8	0.0	0.5	1.2	0.4
Total Electric	81.4	15.3	5.9	35.2	48.3	12.9
Other Fuels						
Hot Water	3.8	1.3	0.0	0.3	10.0	1.0
Heating	7.6	0.6	0.8	1.0	20.6	1.1
Cooking	34.6	2.6	0.0	0.2	2.8	1.8
Total Other	46.0	4.6	0.9	1.5	33.4	3.8
Grand Total	127.5	19.9	6.8	36.7	81.6	16.7

2.2 Change in Building Status during the Analysis Period

The building stock within the commercial sector grows at a steady rate as new buildings are added to the marketplace. In addition, existing buildings within the commercial sector are refurbished at a regular rate. Figure 2.3 shows the change in the status of the commercial buildings sector in the 10 year period to 2010, based on steady refurbishment rate of 4% per annum.

The change in status provides two opportunities for energy efficiency improvement and related policy making. Firstly, energy management initiatives are more cost-effective (and often only possible) during new construction and/or refurbishment; and secondly, such works create a “hold-point” such as building approval systems, at which energy efficiency criteria can be applied. An example of this is the design efficiency review process, which a number of local government bodies require before a building or development application is approved.

Issues which need to be addressed in the wider application of design efficiency reviews include:

- Uniformity in the review process is required, as each Council/body currently uses its own process methodology.
- The application of a more comprehensive and equitable targeting system, which provide a specific target for the building being reviewed (eg. the EMET~IBER system), rather than the use of a generic target for all building developments.

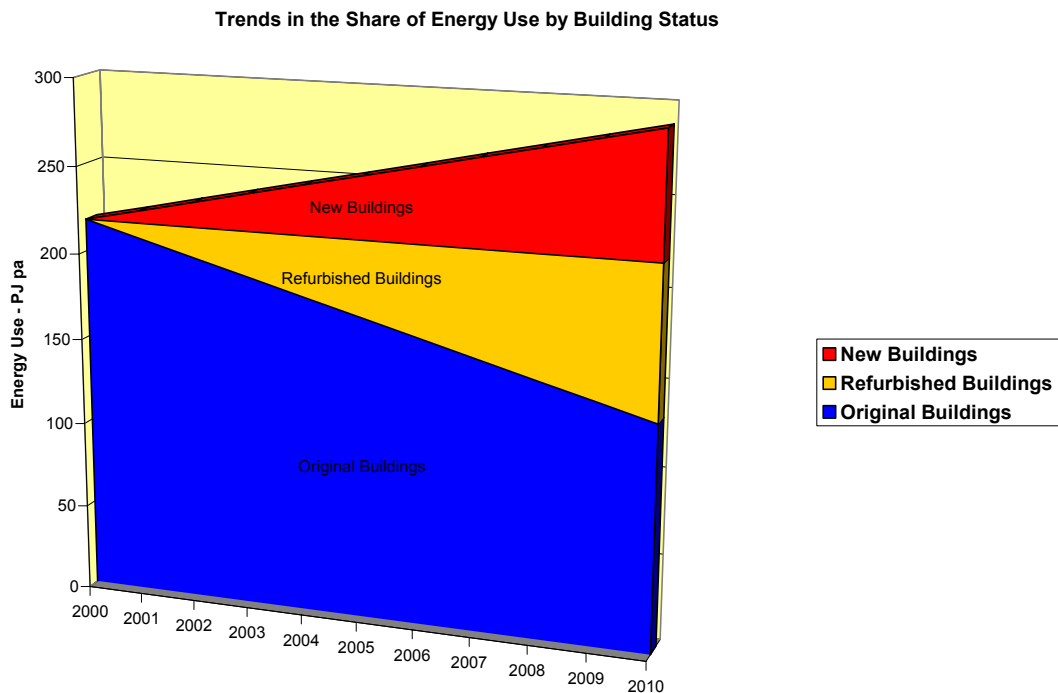


Figure 2.3: Trends in the Share of Energy Use by Building Status

Notes:

- *Retrofits – These are buildings and services for which no upgrade is planned to occur within the period of analysis. The cost of implementing initiatives in these cases is higher, and the savings usually apply over a smaller scope compared to the other two scenarios.*
- *Refurbishments – buildings undergoing refurbishment provide better opportunities for energy management compared to those which are not planned to be upgraded in any way. Cost advantages and additional impact potential are reflected in the estimated figures for these options. For the purposes of this analysis a 4% annual building refurbishment rate has been assumed.*
- *New Buildings – the cost of implementing energy management features in new buildings is lower than existing. Marginal costs only are generally used for these applications. Some initiatives are only available to new buildings, as they are prohibitive in existing situations.*

Sustainable Energy Authority of Victoria**ENERGY EFFICIENCY IMPROVEMENT
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Energy saving potential within each of the six Commercial Sub-Sectors was calculated on the following basis:

1. 4 Year combined payback – including all EEIs which combined produce an average payback period of 4 years.
2. 4 Year simple payback – including all EEIs with individual paybacks of less than or equal to 4 years.
3. 6 Year combined payback – including all EEIs which combined produce an average payback period of 6 years.
4. 6 Year simple payback – including all EEIs with individual paybacks of less than or equal to 6 years.

The analysis showed that using the combined 4 year payback criteria, a total potential energy saving of 96.6 PJ per annum (63.8 PJ pa above BAU) would be achieved, compared to 102.9 PJ per annum (70.1 PJ pa above BAU) for the 6 year combined payback period. The expected business-as-usual component for the period 2000 to 2010 is 32.8 PJ pa.

The 4 year and 6 year simple payback criteria show a potential energy saving of 63.0 PJ per annum and 65.4 PJ per annum respectively (30.2 PJ and 32.6 PJ pa above BAU savings respectively).

Tables 3.1a and 3.1b summarise the key results of the sub-sectoral analyses contained in the following sections. The sub-sector with the largest proportion and absolute quantity of energy savings based on the “combined payback” principle is the Wholesale and Retail sector with a beyond BAU saving potential of 25.5% (32.5 PJ pa) for a combined 4-year payback.

The “Accommodation, Cafes & Restaurants” sub-sector shows the highest beyond BAU saving proportion, at 14.1% of the forecast 2010 consumption for all measures up to and including a 4-year payback.

Table 3.1a: Summary of Annual Energy Savings by Sub-Sector for the 4 Year Payback period

Commercial sub-sector	Payback criteria	2010 Energy Use (PJ)	Raw EEI potential			Beyond BAU Potential		
			Savings (PJ)	Savings (%)	BAU uptake (PJ)	Net Savings (PJ)	Net Savings (%)	Avg Payback*
Wholesale & Retail Trade	4-year combined	127.46	46.41	36.4%	13.93	32.48	25.5%	
	<= 4-year	127.46	29.14	22.9%	13.93	15.21	11.9%	0.92
Accommodation, Cafes & Restaurants	4-year combined	19.87	7.34	36.9%	2.47	4.87	24.5%	
	<= 4-year	19.87	5.27	26.5%	2.47	2.81	14.1%	1.19
Communication Services	4-year combined	6.76	1.50	22.2%	0.54	0.96	14.2%	
	<= 4-year	6.76	1.05	15.5%	0.54	0.51	7.6%	1.05
Finance, Insurance & Business Services	4-year combined	36.70	11.03	30.1%	3.69	7.35	20.0%	
	<= 4-year	36.70	7.77	21.2%	3.69	4.08	11.1%	1.04
Govt. Admin, Education, Health & Community	4-year combined	81.62	24.34	29.8%	9.82	14.52	17.8%	
	<= 4-year	81.62	15.78	19.3%	9.82	5.95	7.3%	0.64
Culture & Recreation, Personal Services	4-year combined	16.69	5.95	35.7%	2.33	3.62	21.7%	
	<= 4-year	16.69	3.98	23.9%	2.33	1.65	9.9%	1.01

Table 3.1b: Summary of Annual Energy Savings by Sub-Sector for the 6 Year Payback period

Commercial sub-sector	Payback criteria	2010 Energy Use (PJ)	Raw EEI potential			Beyond BAU Potential		
			Savings (PJ)	Savings (%)	BAU uptake (PJ)	Net Savings (PJ)	Net Savings (%)	Avg Payback*
Wholesale & Retail Trade	6-year combined	127.458	49.53	38.9%	13.93	35.59	27.9%	
	<= 6-year	127.458	29.26	23.0%	13.93	15.33	12.0%	0.93
Accommodation, Cafes & Restaurants	6-year combined	19.874	7.66	38.6%	2.47	5.20	26.1%	
	<= 6-year	19.874	5.28	26.6%	2.47	2.81	14.2%	1.19
Communication Services	6-year combined	6.757	1.73	25.5%	0.54	1.19	17.6%	
	<= 6-year	6.757	1.05	15.5%	0.54	0.51	7.6%	1.06
Finance, Insurance & Business Services	6-year combined	36.701	12.60	34.3%	3.69	8.92	24.3%	
	<= 6-year	36.701	7.80	21.2%	3.69	4.11	11.2%	1.05
Govt. Admin, Education, Health & Community	6-year combined	81.616	24.71	30.3%	9.82	14.89	18.2%	
	<= 6-year	81.616	17.26	21.2%	9.82	7.44	9.1%	0.86
Culture & Recreation, Personal Services	6-year combined	16.694	6.68	40.0%	2.33	4.34	26.0%	
	<= 6-year	16.694	4.72	28.3%	2.33	2.39	14.3%	1.20

3.1 ANZSIC Div F & G – Wholesale Trade / Retail Trade (Sub-Sector B)

3.1.1 Energy Use and Application

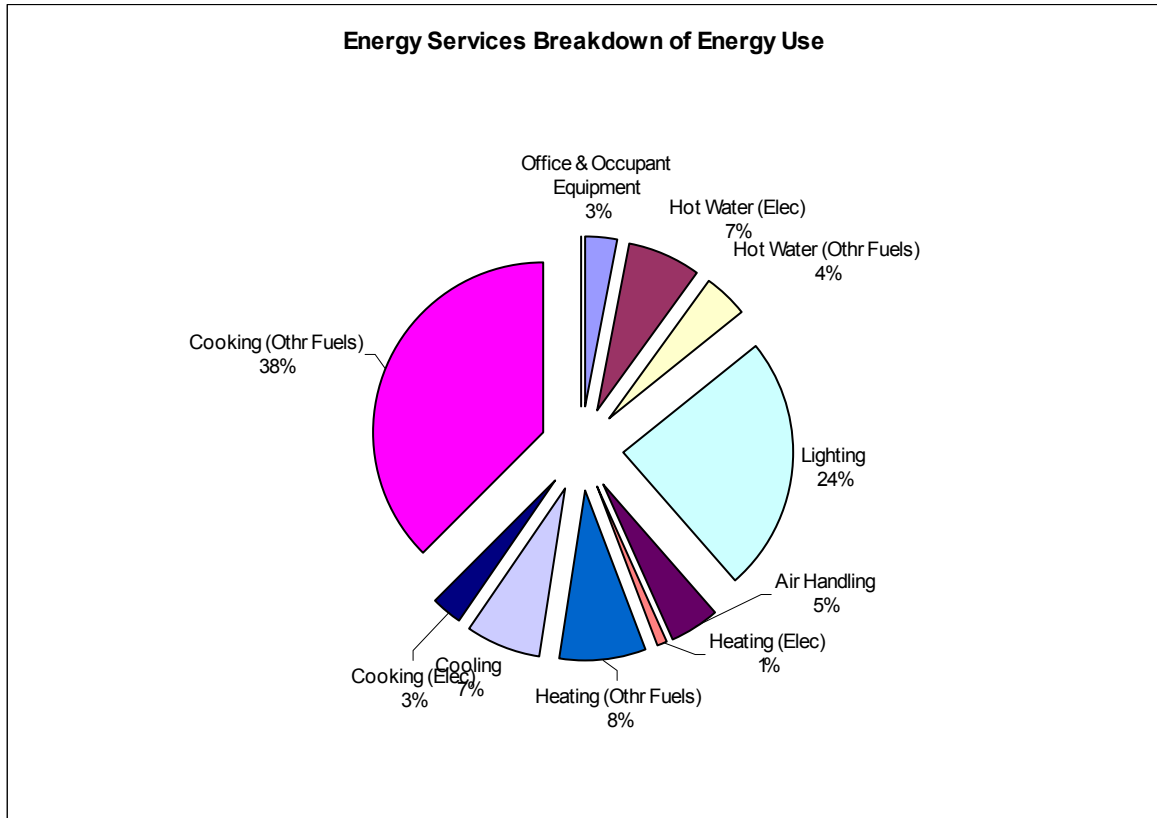


Figure 3.1 – Wholesale/ Retail Sub-Sector – Energy Service Breakdown of Energy Use

3.1.2 Simple Energy Saving Potential

Table 3.2 – Wholesale/Retail Sub-Sector – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	13.2	1.6	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.5	0.2	0.0	2.8	0.0	0.0
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.3	0.0	0.0	0.8	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.8	1.7	0.0	0.0	0.0
Better management and control of Lighting systems	0.0	0.2	1.2	3.8	0.1	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	1.5	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.0	0.0	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.7	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	16.1	2.7	2.9	7.4	0.1	0.0
TOTAL Implementation Cost (\$M)	116.2	163.1	125.2	442.5	12.2	0.0
TOTAL Savings (\$M pa)	590.5	141.0	59.6	129.6	2.4	0.0

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.1.3 Combined Energy Saving Potential

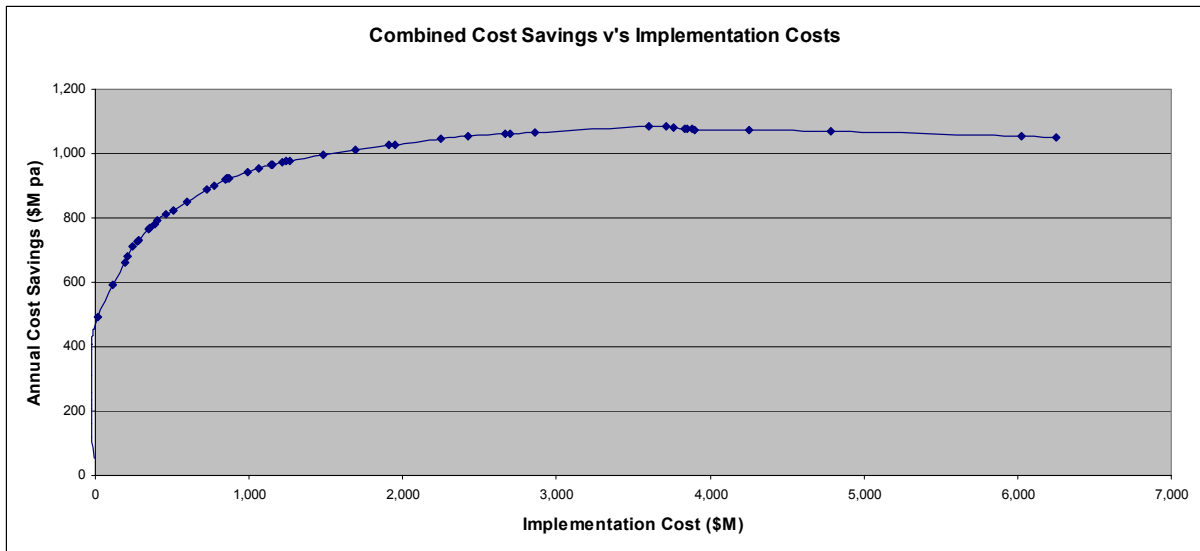


Figure 3.2 – Wholesale/Retail Sub-Sector - Combined Cost Savings v's Implementation Costs

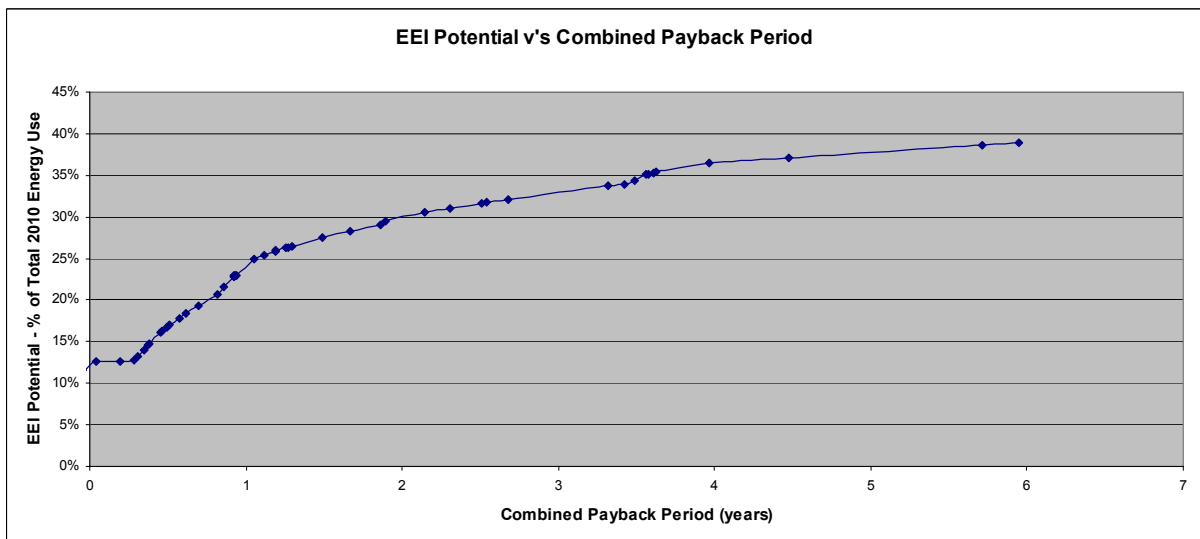
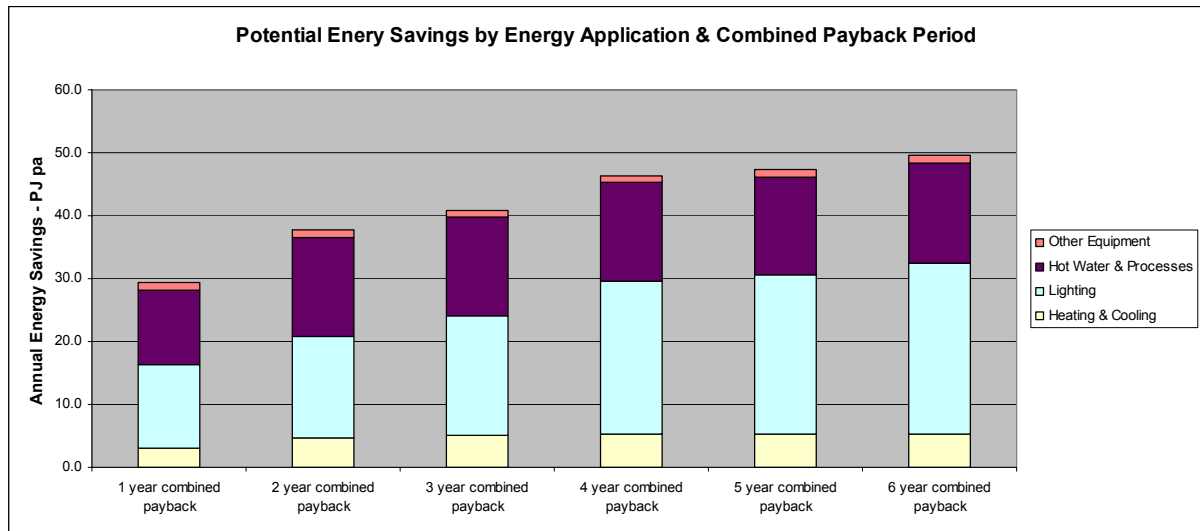


Figure 3.3 – Wholesale/Retail Sub-Sector – Raw EEI Potential (%) v's Combined Payback Period

Table 3.3 – Wholesale/Retail Sub-Sector - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	29.3	23%	868	17.0	3.0	13.3	11.9	1.2
2 year combined payback	37.7	30%	1,948	16.8	4.6	16.2	15.6	1.2
3 year combined payback	40.9	32%	2,856	16.8	5.1	18.9	15.6	1.2
4 year combined payback	46.4	36%	3,765	16.5	5.4	24.2	15.6	1.2
5 year combined payback	47.4	37%	4,673	16.5	5.4	25.2	15.6	1.2
6 year combined payback	49.5	39%	5,581	16.5	5.4	27.1	15.9	1.2

Notes: 1. Average of life is weighted by the impact of potential savings

**Figure 3.4 – Wholesale/Retail Sub-Sector - Potential Energy Savings by Energy Application & Combined Payback Period**

Business as Usual Component -

13.93 PJ pa (6.9 PJ pa for electricity) relating to 10.9% of the

2010 forecast consumption.

3.2 ANZSIC Div H – Accommodation, Cafes & Restaurants (Sub-Sector D)

3.2.1 Energy Use and Application

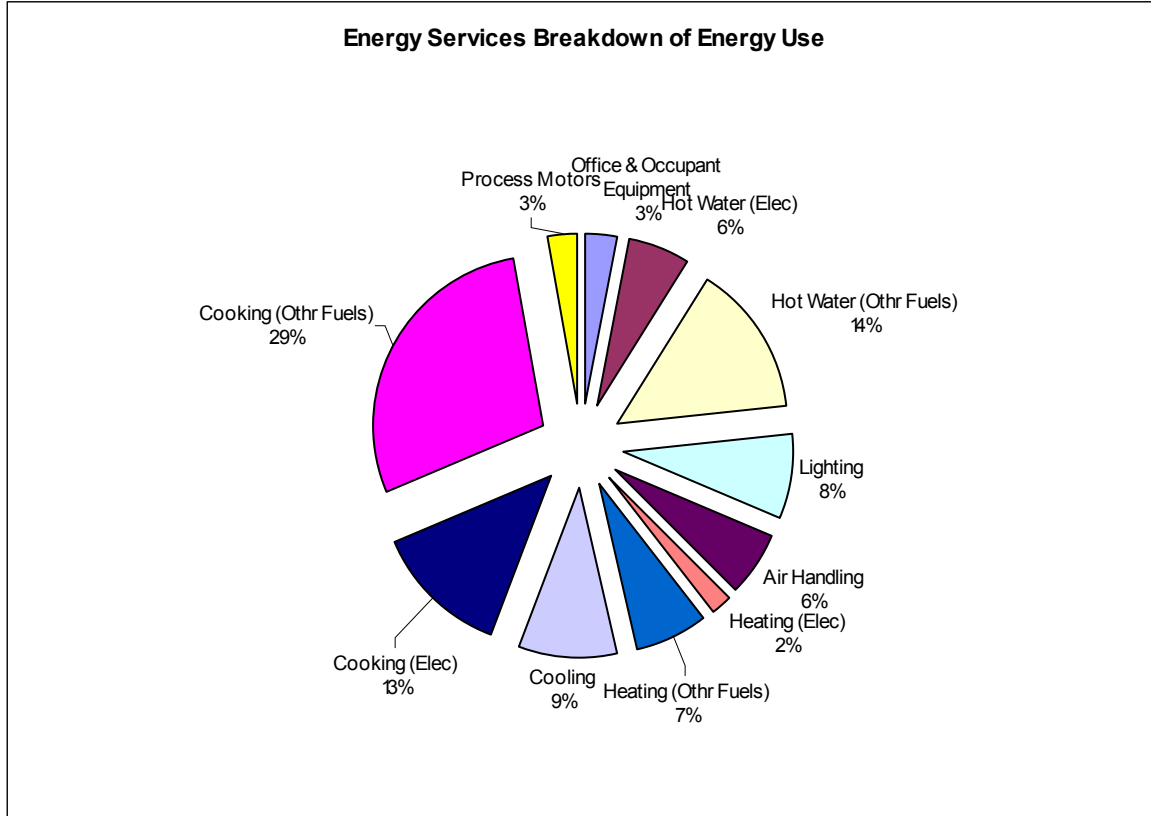


Figure 3.5 – Accommodation, Cafes, Restaurants etc – Energy Service Breakdown of Energy Use

3.2.2 Simple Energy Saving Potential

Table 3.4 – Accommodation, Cafes, Restaurants etc – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	2.1	0.1	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.0	0.0	0.0	0.2	0.0	0.0
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.1	0.0	0.0	0.2	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.2	1.1	0.0	0.0	0.0
Better management and control of Lighting systems	0.0	0.0	0.1	0.2	0.0	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	0.3	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.5	0.0	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.1	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	2.6	0.3	1.3	1.1	0.0	0.0
TOTAL Implementation Cost - \$M	7.7	13.7	61.1	61.6	0.8	0.0
TOTAL Savings (\$M pa)	68.9	10.8	22.6	19.1	0.2	0.0

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.2.3 Combined Energy Saving Potential

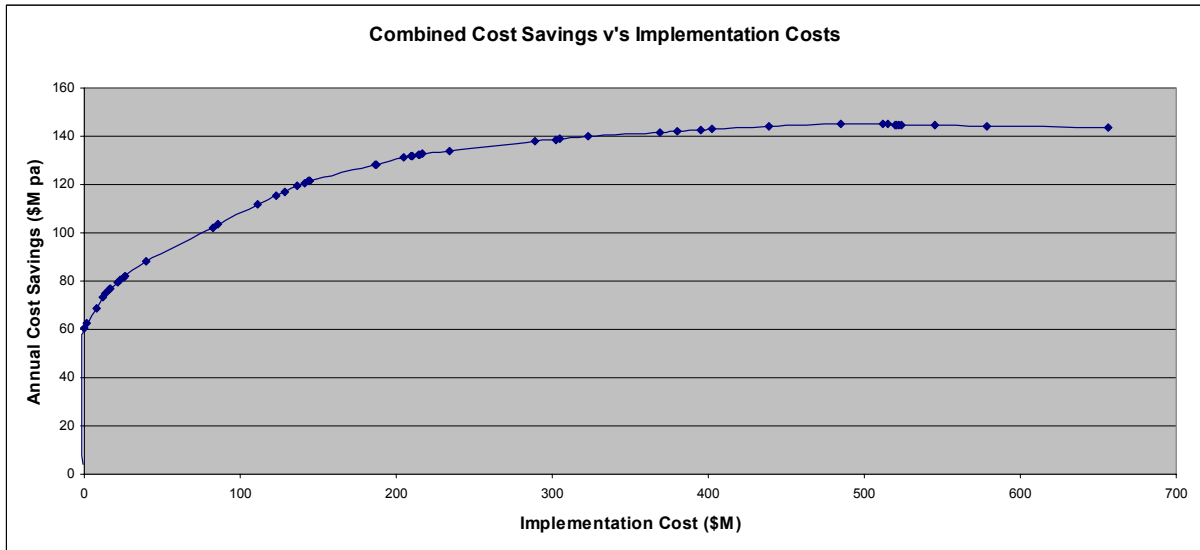


Figure 3.6 – Accommodation, Cafes, Restaurants etc - Combined Cost Savings v's Implementation Costs

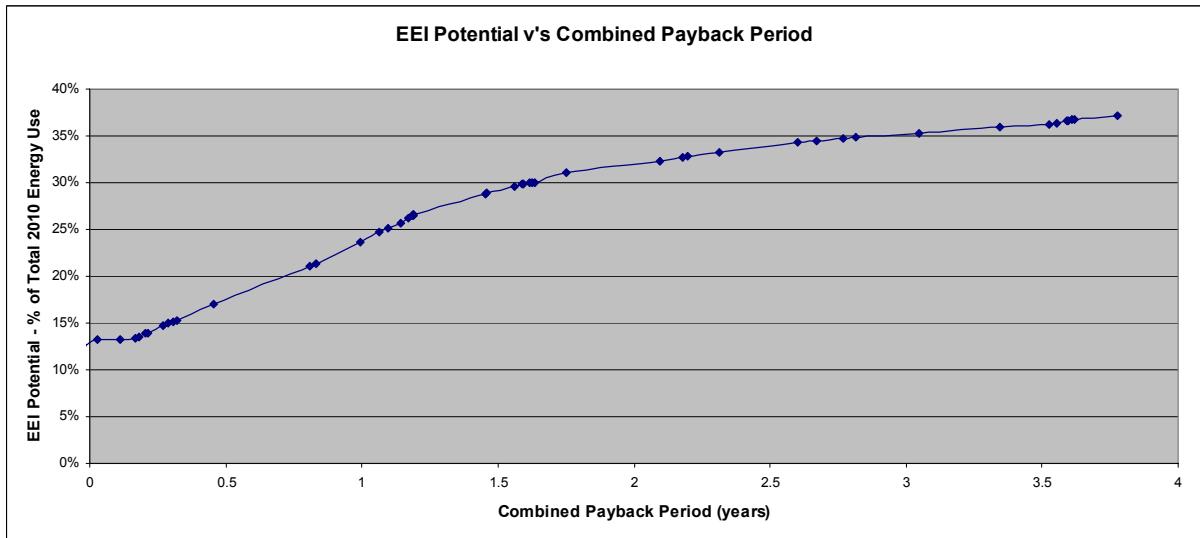
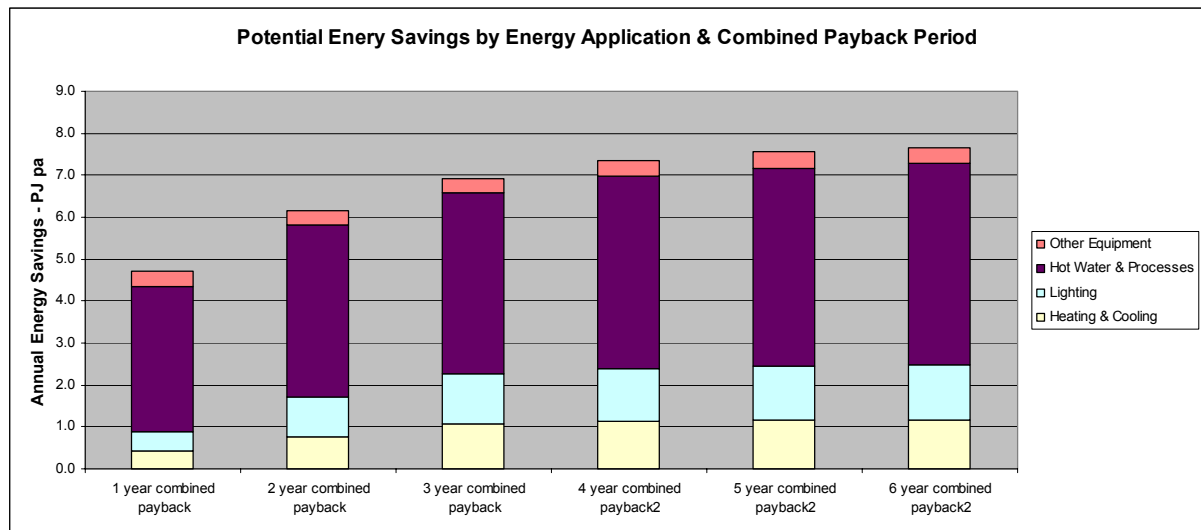


Figure 3.7 – Accommodation, Cafes, Restaurants etc – Raw EEI Potential (%) v's Combined Payback Period

Table 3.5 – Accommodation, Cafes, Restaurants etc - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	4.7	24%	111	19.4	0.4	0.5	3.5	0.4
2 year combined payback	6.2	31%	234	17.8	0.8	0.9	4.1	0.4
3 year combined payback	6.9	35%	402	17.3	1.1	1.2	4.3	0.4
4 year combined payback ²	7.3	37%	570	17.3	1.1	1.3	4.6	0.4
5 year combined payback ²	7.6	38%	738	17.3	1.2	1.3	4.7	0.4
6 year combined payback ²	7.7	39%	906	17.3	1.2	1.3	4.8	0.4

Notes: 1. Average of life is weighted by the impact of potential savings
2. Values for 4, 5 and 6 year combined payback have been extrapolated

**Figure 3.8 – Accommodation, Cafes, Restaurants etc - Potential Energy Savings by Energy Application & Combined Payback Period**

Business as Usual Component -

2.47 PJ pa (1.2 PJ pa for electricity) relating to 12.4% of the 2010 forecast consumption.

3.3 ANSZIC Div J – Communication services (Sub-Sector F)

3.3.1 Energy Use and Application

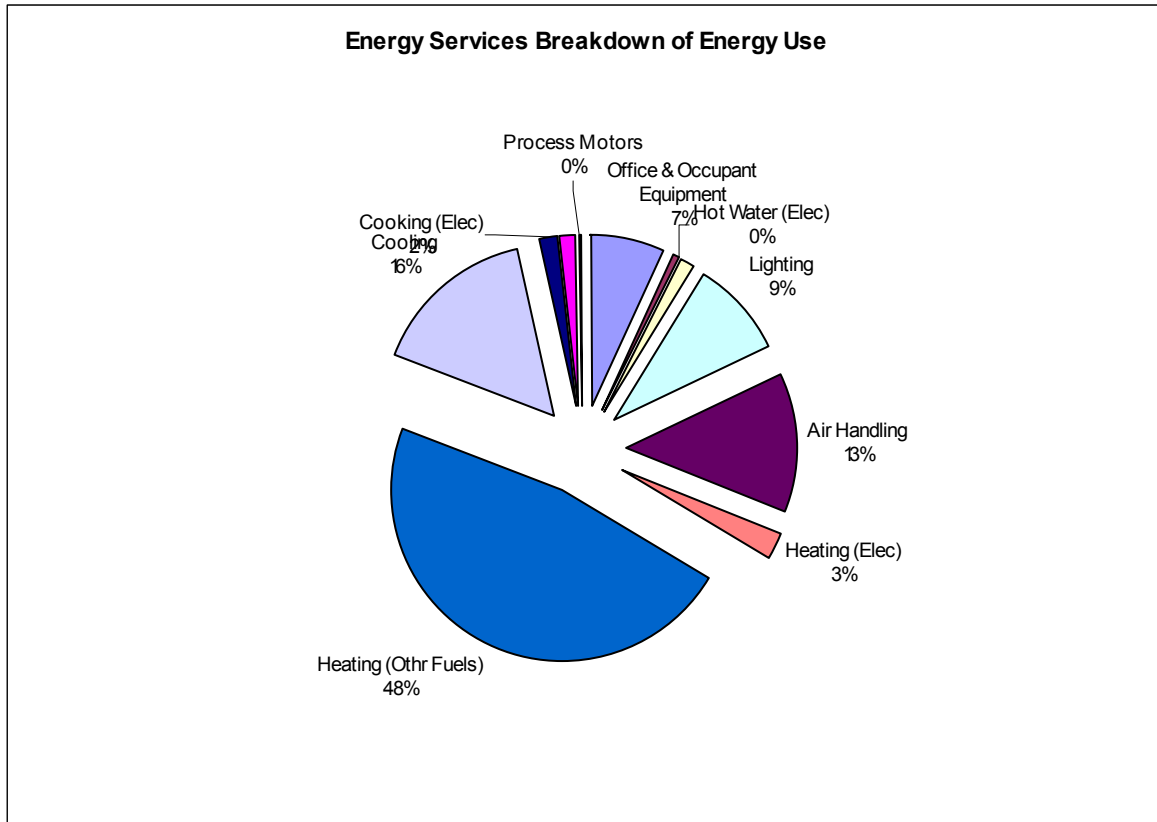


Figure 3.9 – Communication Services – Energy Service Breakdown of Energy Use

3.3.2 Simple Energy Saving Potential

Table 3.6 – Communication Services – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	0.4	0.0	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.0	0.0	0.0	0.1	0.0	0.0
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.0	0.0	0.0	0.1	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.0	0.0	0.0	0.0	0.0
Better management and control of Lighting systems	0.0	0.0	0.1	0.1	0.0	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	0.1	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.0	0.0	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.1	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	0.6	0.1	0.1	0.3	0.0	0.0
TOTAL Implementation Cost - \$M	3.3	3.6	2.6	17.8	0.3	0.0
TOTAL Savings (\$M pa)	16.0	3.3	1.2	5.4	0.1	0.0

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.3.3 Combined Energy Saving Potential

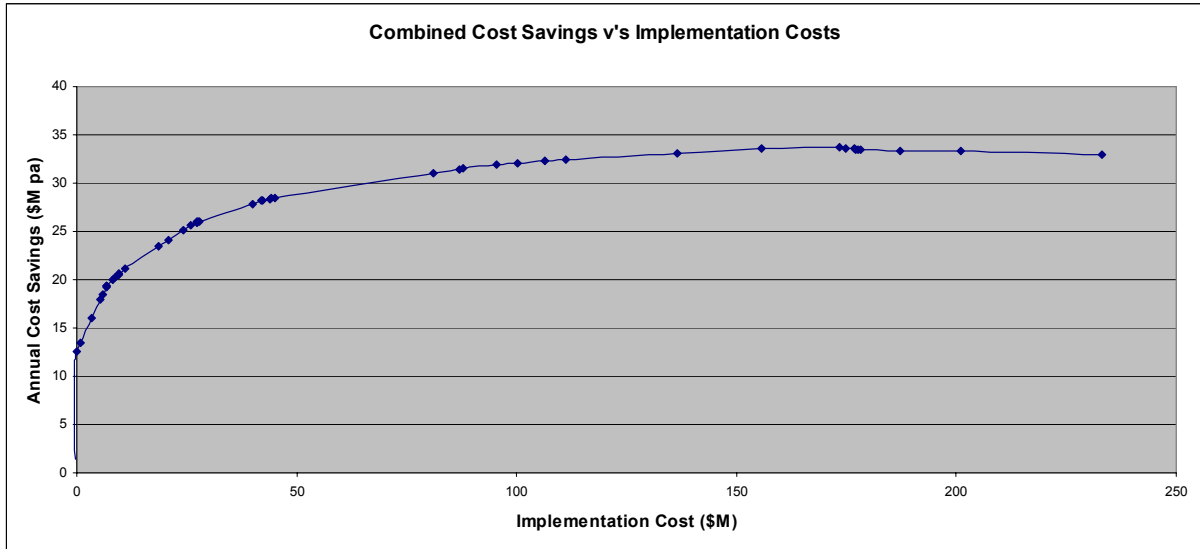


Figure 3.10 – Communication Services - Combined Cost Savings v's Implementation Costs

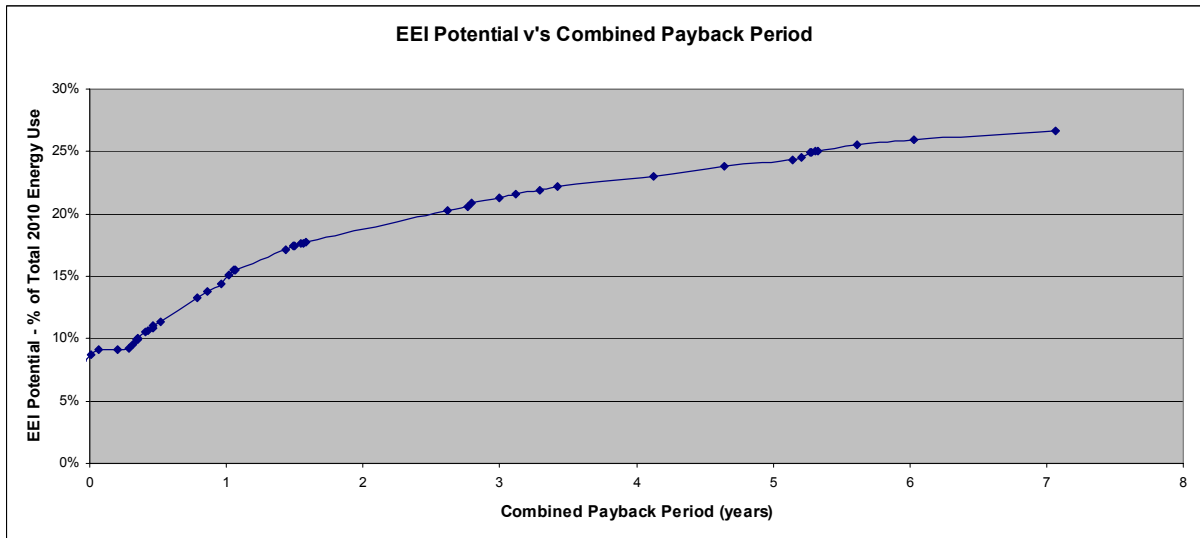


Figure 3.11 – Communication Services – Raw EEI Potential (%) v's Combined Payback Period

Table 3.7 – Communication Services - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	1.0	14%	24	19.2	0.5	0.3	0.1	0.2
2 year combined payback	1.2	18%	45	18.6	0.6	0.4	0.1	0.2
3 year combined payback	1.4	21%	96	19.0	0.7	0.5	0.1	0.2
4 year combined payback	1.5	22%	111	19.0	0.8	0.5	0.1	0.2
5 year combined payback	1.6	24%	127	19.1	0.8	0.5	0.1	0.2
6 year combined payback	1.7	26%	142	18.9	0.8	0.6	0.1	0.2

Notes: 1. Average of life is weighted by the impact of potential savings

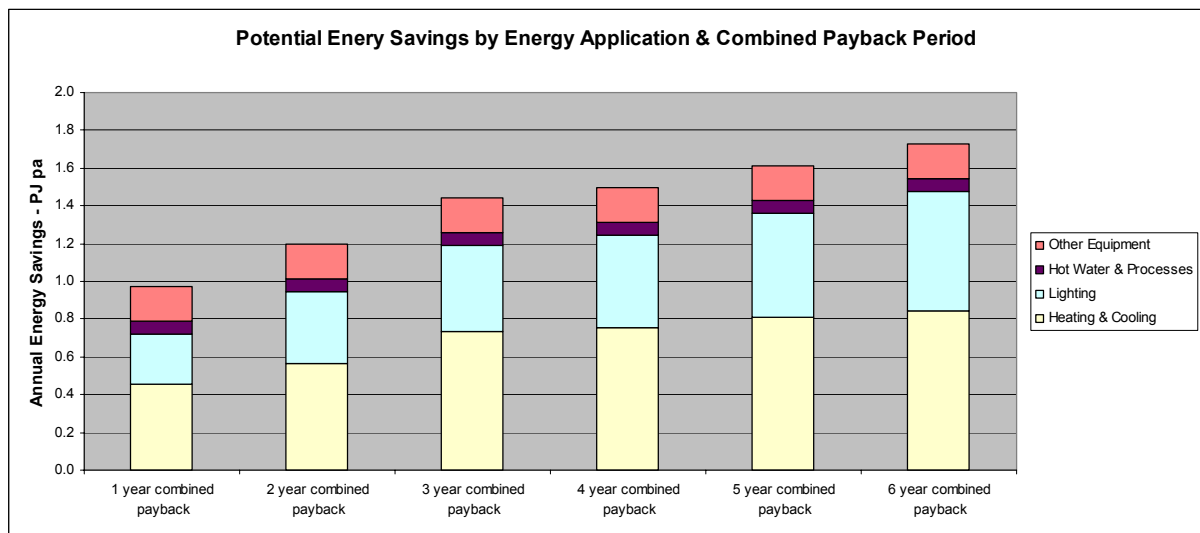


Figure 3.12 – Communication Services - Potential Energy Savings by Energy Application & Combined Payback Period

Business as Usual Component -

0.54 PJ pa (0.32 PJ pa for electricity) relating to 7.9% of the

2010 forecast consumption.

3.4 ANZSIC Div K & L – Finance & Insurance / Property & Business Services (Sub-Sector A)

3.4.1 Energy Use and Application

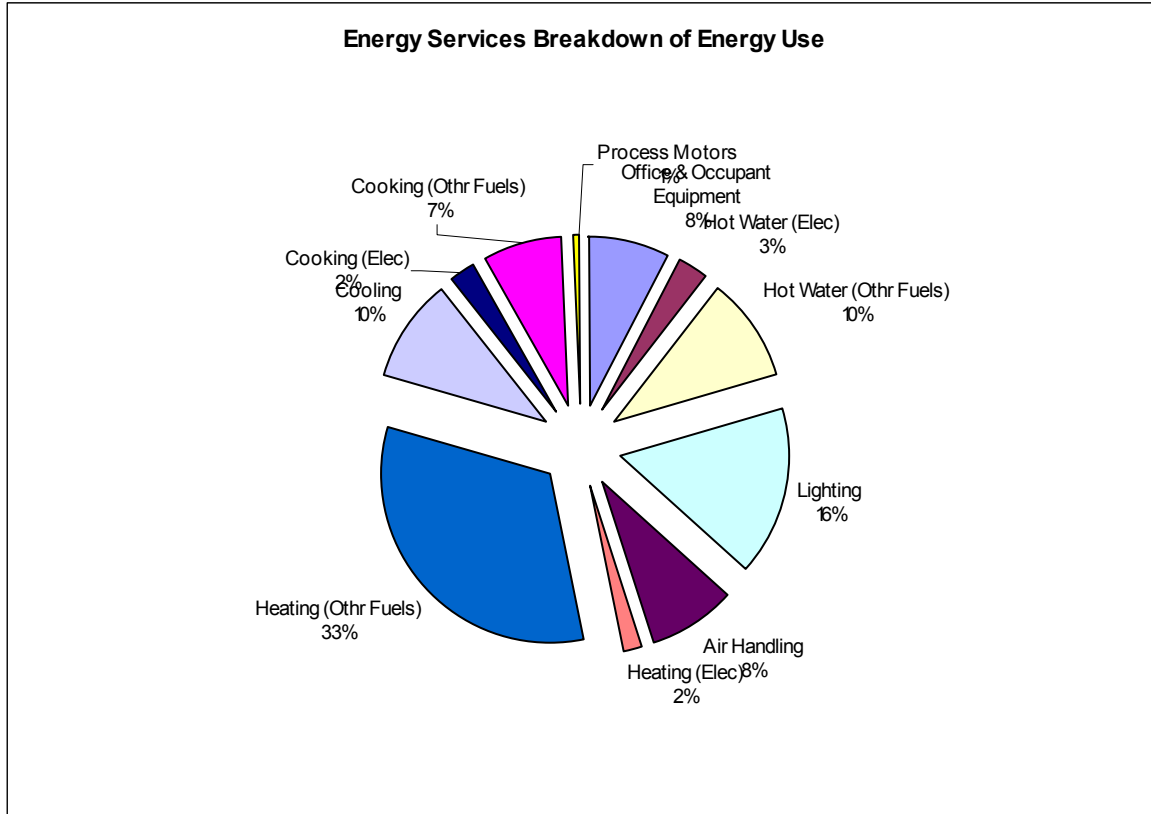


Figure 3.13 – Finance/ Insurance etc. Sub-Sector – Energy Service Breakdown of Energy Use

3.4.2 Simple Energy Saving Potential

Table 3.8 – Finance/ Insurance etc. Sub-Sector – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	2.9	0.4	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.1	0.1	0.0	0.6	0.0	0.0
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.1	0.0	0.0	0.5	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.0	0.5	0.0	0.0	0.0
Better management and control of Lighting systems	0.0	0.1	0.3	0.9	0.0	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	0.6	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.1	0.0	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.6	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	4.3	0.5	0.9	2.1	0.0	0.0
TOTAL Implementation Cost - \$M	27.6	31.6	24.9	119.4	2.8	0.0
TOTAL Savings (\$M pa)	120.3	29.7	10.8	35.2	0.6	0.0

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.4.3 Combined Energy Saving Potential

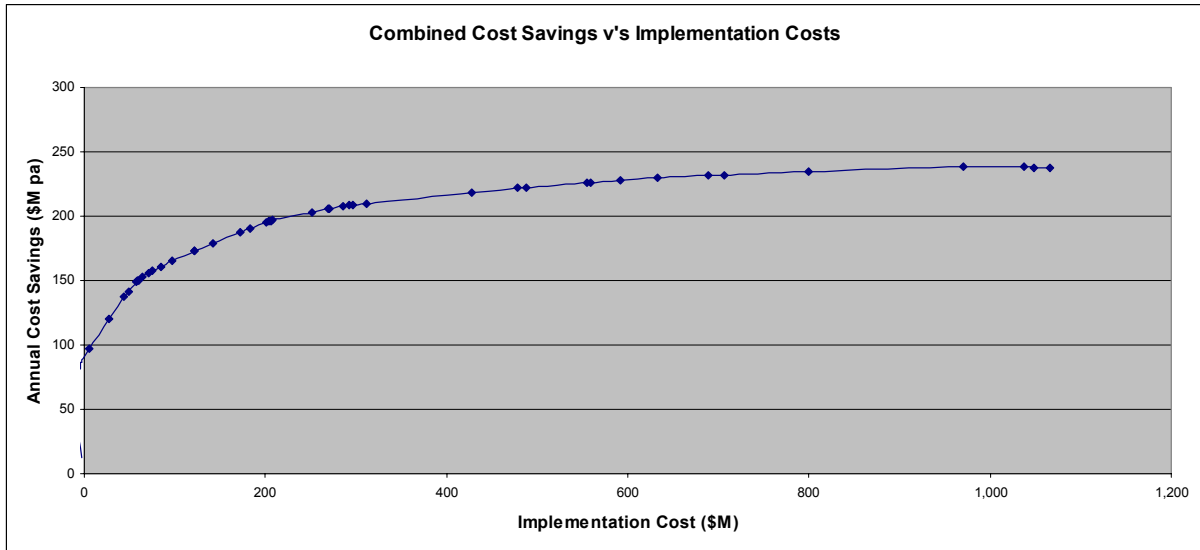


Figure 3.14 – Finance/ Insurance etc. Sub-Sector - Combined Cost Savings v's Implementation Costs

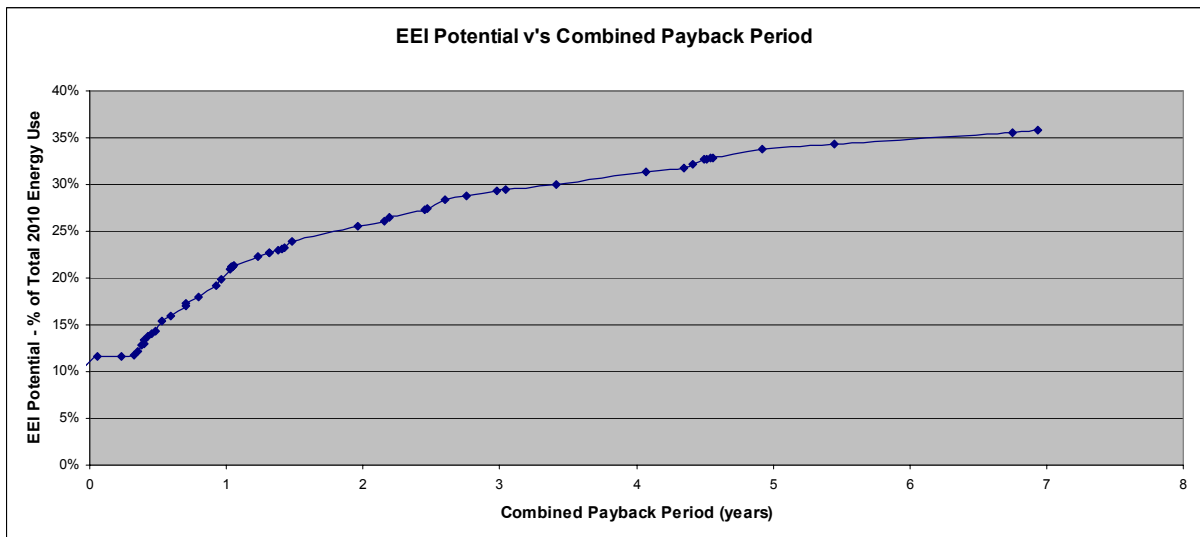
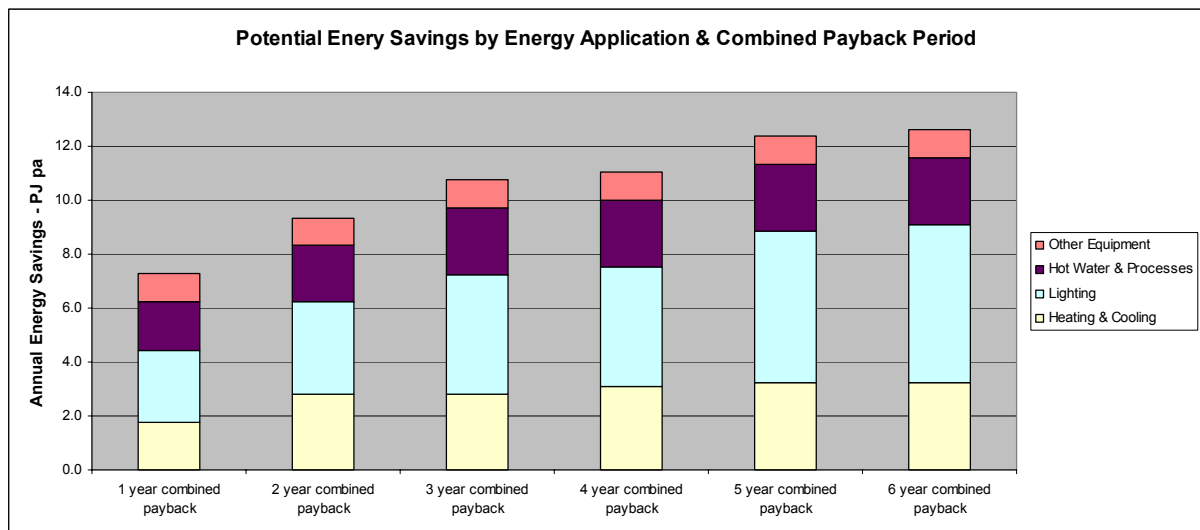


Figure 3.15 – Finance/ Insurance etc. Sub-Sector – Raw EEI Potential (%) v's Combined Payback Period

Table 3.9 – Finance/ Insurance etc. Sub-Sector - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	7.3	20%	184	17.9	1.8	2.7	1.8	1.0
2 year combined payback	9.4	25%	428	17.6	2.8	3.4	2.1	1.0
3 year combined payback	10.7	29%	688	17.5	2.8	4.4	2.5	1.0
4 year combined payback	11.0	30%	800	17.7	3.1	4.4	2.5	1.0
5 year combined payback	12.4	34%	911	17.4	3.2	5.6	2.5	1.0
6 year combined payback	12.6	34%	1,023	17.4	3.2	5.8	2.5	1.0

Notes: 1. Average of life is weighted by the impact of potential savings

**Figure 3.16 – Finance/ Insurance etc. Sub-Sector - Potential Energy Savings by Energy Application & Combined Payback Period**

Business as Usual Component -

3.69 PJ pa (2.8 PJ pa for electricity) relating to 10.0% of the

2010 forecast consumption.

3.5 ANZSIC Div M, N, O – Govt Admin / Education / Health & Community (Sub-Sector C)

3.5.1 Energy Use and Application

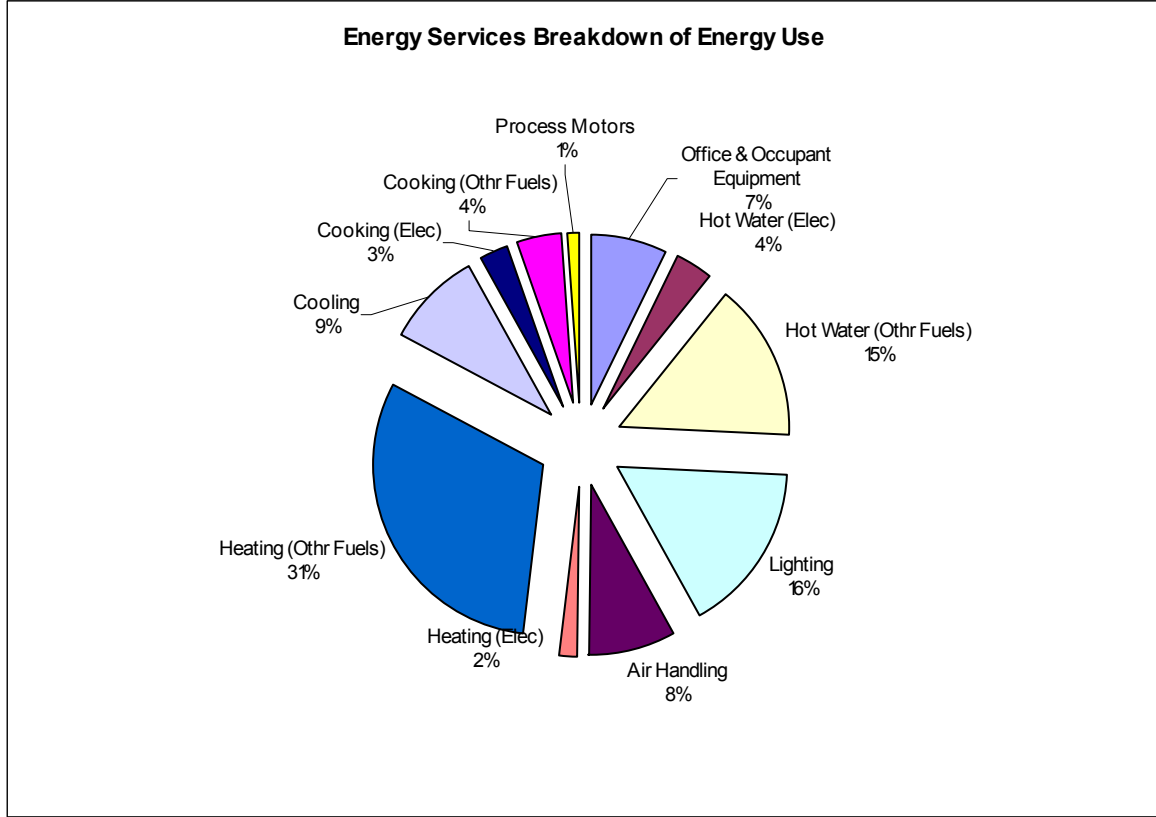


Figure 3.17 – Government Services – Energy Service Breakdown of Energy Use

3.5.2 Simple Energy Saving Potential

Table 3.10 – Government Services – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	8.8	0.4	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.2	0.1	0.5	0.6	0.0	0.6
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.3	0.0	0.8	0.0	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.0	0.0	0.0	0.5	0.0
Better management and control of Lighting systems	0.0	1.2	0.8	0.0	0.2	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	1.2	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.0	0.2	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.9	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	11.3	1.7	2.1	0.6	0.9	0.6
TOTAL Implementation Cost - \$M	56.1	85.5	107.1	28.0	53.5	60.8
TOTAL Savings (\$M pa)	314.1	68.0	40.2	7.7	11.3	11.9

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.5.3 Combined Energy Saving Potential

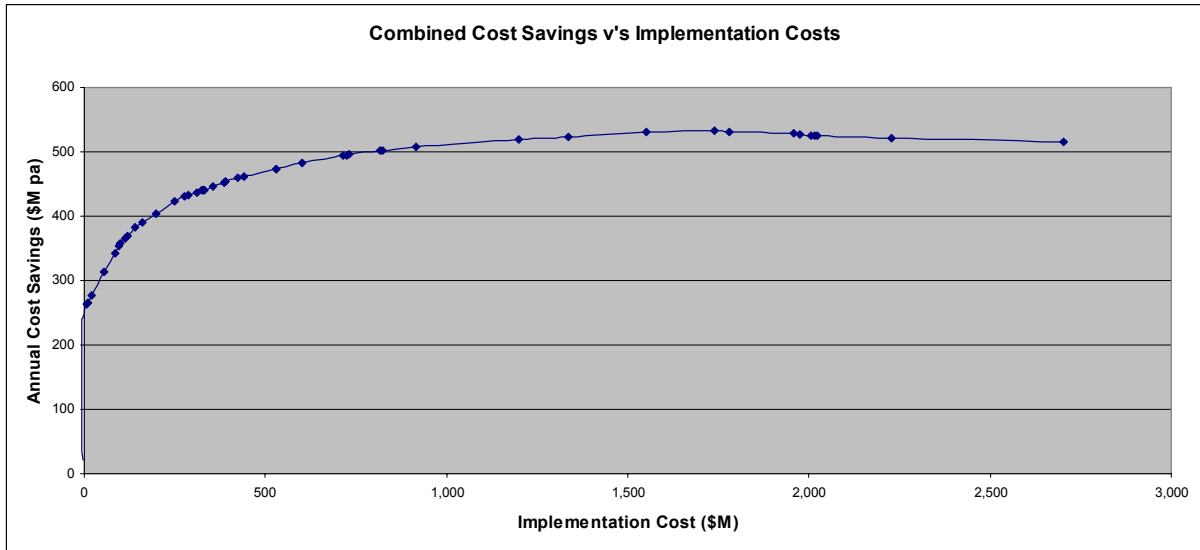


Figure 3.18 – Government Services - Combined Cost Savings v's Implementation Costs

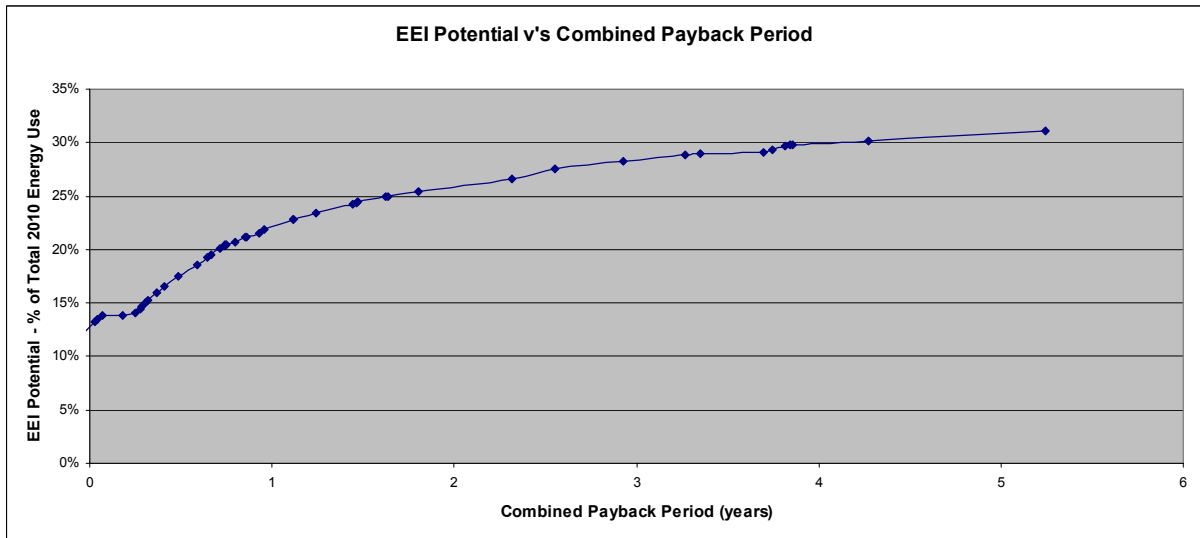
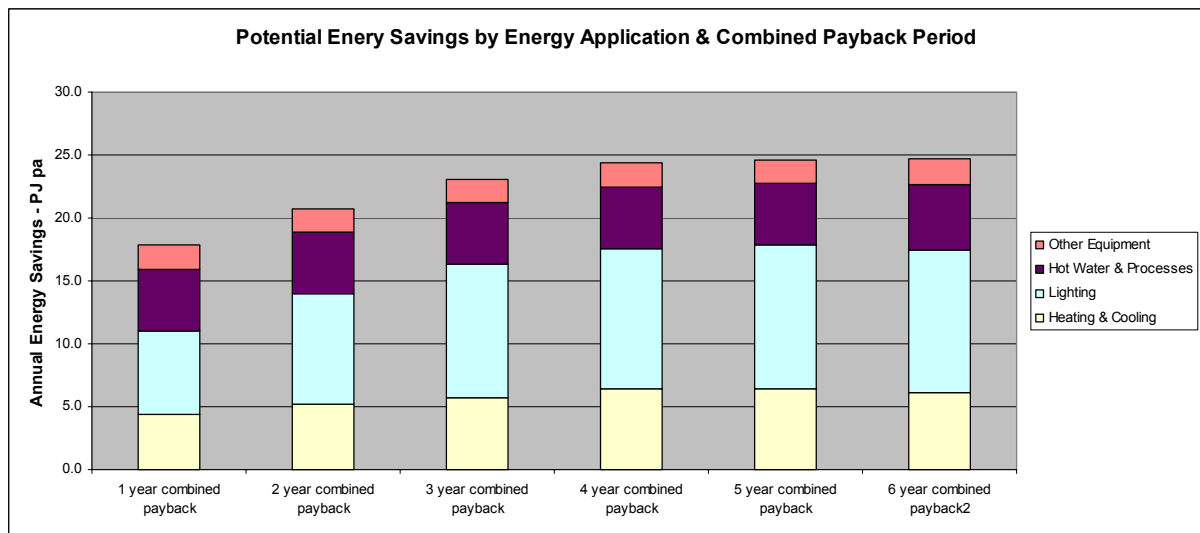


Figure 3.19 – Government Services – Raw EEI Potential (%) v's Combined Payback Period

Table 3.11 – Government Services - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	17.8	22%	440	17.9	4.4	6.7	4.8	1.9
2 year combined payback	20.8	25%	915	17.8	5.2	8.8	4.8	1.9
3 year combined payback	23.1	28%	1,553	17.8	5.7	10.6	4.8	1.9
4 year combined payback	24.3	30%	2,021	17.9	6.4	11.2	4.8	1.9
5 year combined payback	24.6	30%	2,490	17.8	6.4	11.5	4.8	1.9
6 year combined payback ²	24.7	30%	2,959	17.8	6.1	11.3	5.2	2.0

Notes: 1. Average of life is weighted by the impact of potential savings
2. Values for the 6 year combined payback has been extrapolated

**Figure 3.20 – Government Services - Potential Energy Savings by Energy Application & Combined Payback Period**

Business as Usual Component -

9.82 PJ pa (4.55 PJ pa for electricity) relating to 12.0% of the 2010 forecast consumption.

3.6 ANZSIC Div P & Q – Culture & recreation / Personal & other services (Sub-Sector E)

3.6.1 Energy Use and Application

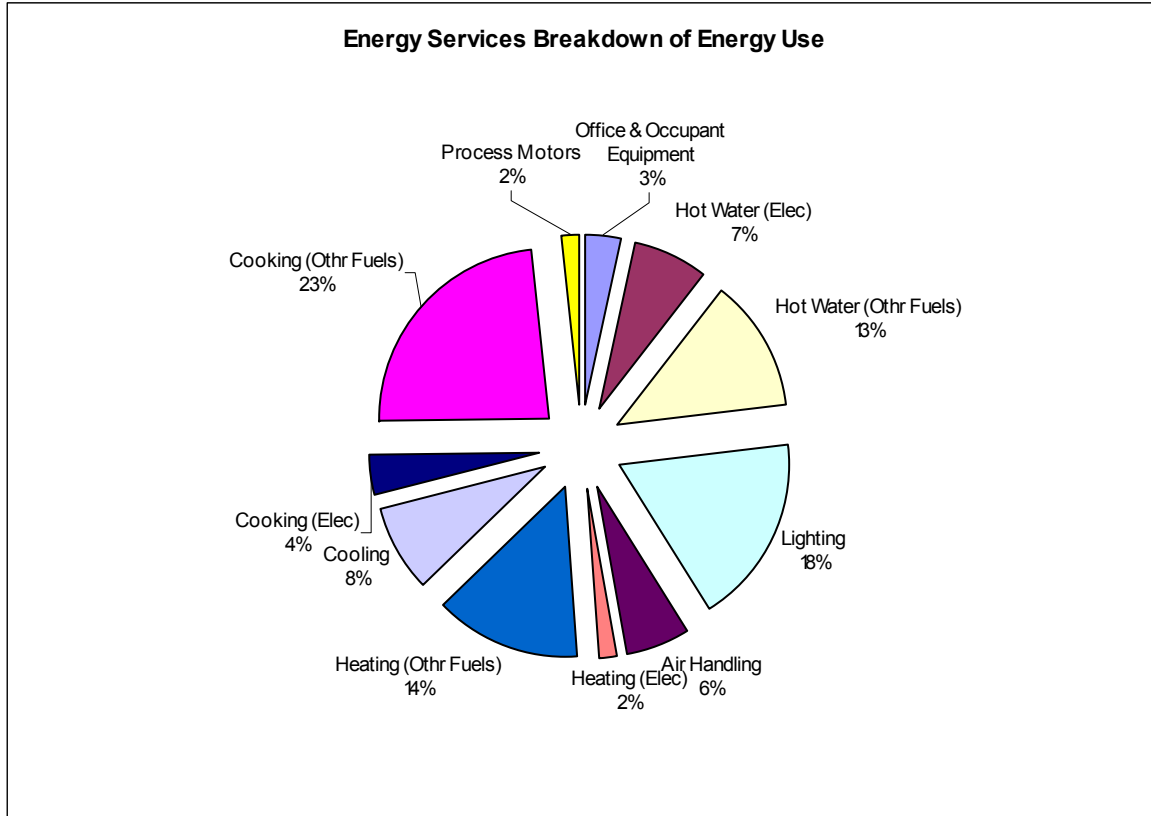


Figure 3.21 – Culture/ Recreation etc Sub-Sector – Energy Service Breakdown of Energy Use

3.6.2 Simple Energy Saving Potential

Table 3.12 – Culture/ Recreation etc Sub-Sector – Energy Saving Potential by Type of Initiative and Simple Payback Period

Description of Initiative	Potential Energy Saving* by Simple Payback Period (PJ pa)					
	1 year or less	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 6 years
Improvement in operation and management of existing systems, including such activities as Staff Awareness, Training, Maintenance, Operating schedules, controls etc	2.1	0.1	0.0	0.0	0.0	0.0
Using more efficient lighting systems (lamps and fittings)	0.0	0.0	0.0	0.2	0.0	0.0
Improvements to the efficiency of operation and control of Heating and Air Conditioning systems	0.1	0.0	0.0	0.2	0.0	0.0
Water heating systems – reduction in losses, improvement in efficiency of operation and the adoption of alternative, more efficient systems.	0.0	0.0	0.2	0.2	0.5	0.0
Better management and control of Lighting systems	0.0	0.0	0.2	0.3	0.0	0.0
Natural improvements in new building designs (no effort required as this takes into effect improved efficiencies of systems and services compared average existing buildings).	0.3	0.0	0.0	0.0	0.0	0.0
Improvements in the efficiency and operation of commercial cooking and related equipment (includes refrigeration etc)	0.0	0.0	0.0	0.0	0.2	0.0
Improvements in the selection and use of Office Equipment (no cost is included as new generation equipment with energy saver modes etc is no more expensive and progressive replacement is assumed)	0.1	0.0	0.0	0.0	0.0	0.0
TOTAL Energy Savings Potential – PJ pa	2.6	0.2	0.3	0.9	0.7	0.0
TOTAL Implementation Cost - \$M	9.8	10.8	6.9	46.5	19.9	0.0
TOTAL Savings (\$M pa)	46.4	10.1	3.1	13.9	4.4	0.0

* Data shows the 'raw' EEI potential, prior to the BAU uptake being taken into account

3.6.3 Combined Energy Saving Potential

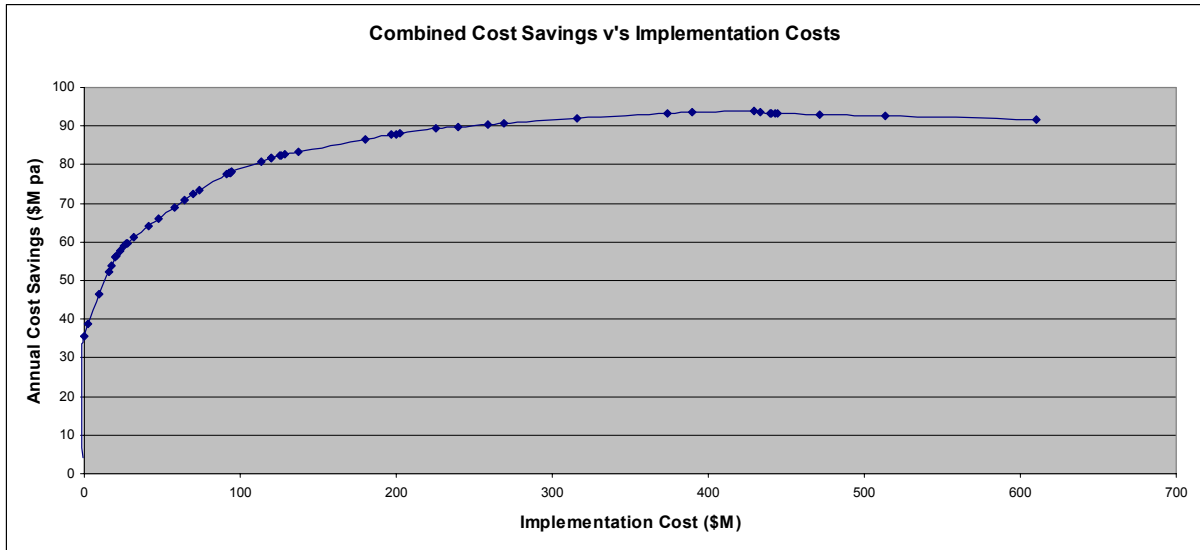


Figure 3.22 – Culture/ Recreation etc Sub-Sector - Combined Cost Savings v's Implementation Costs

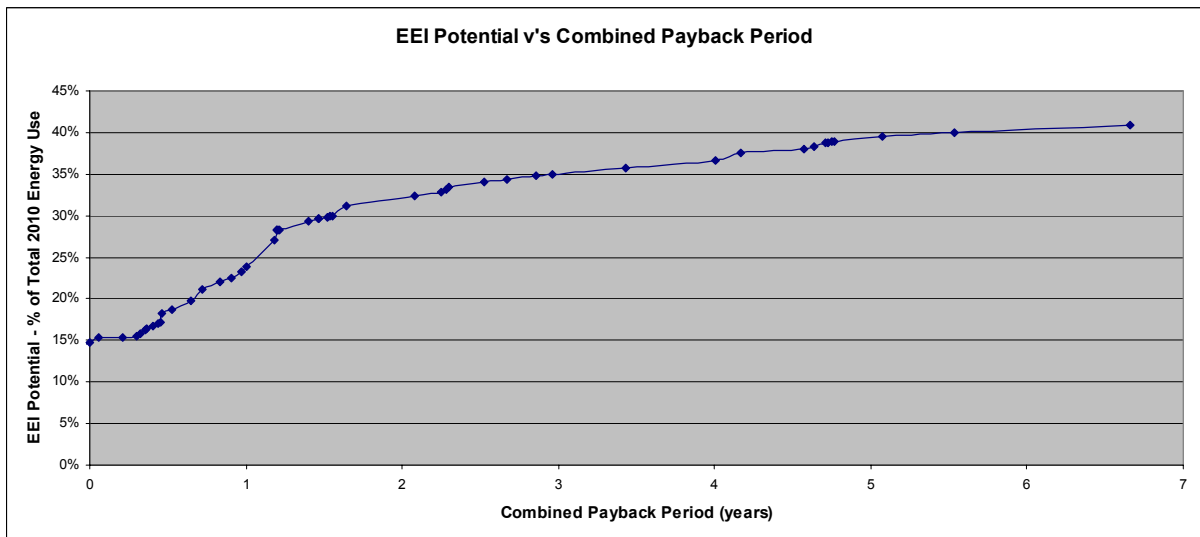
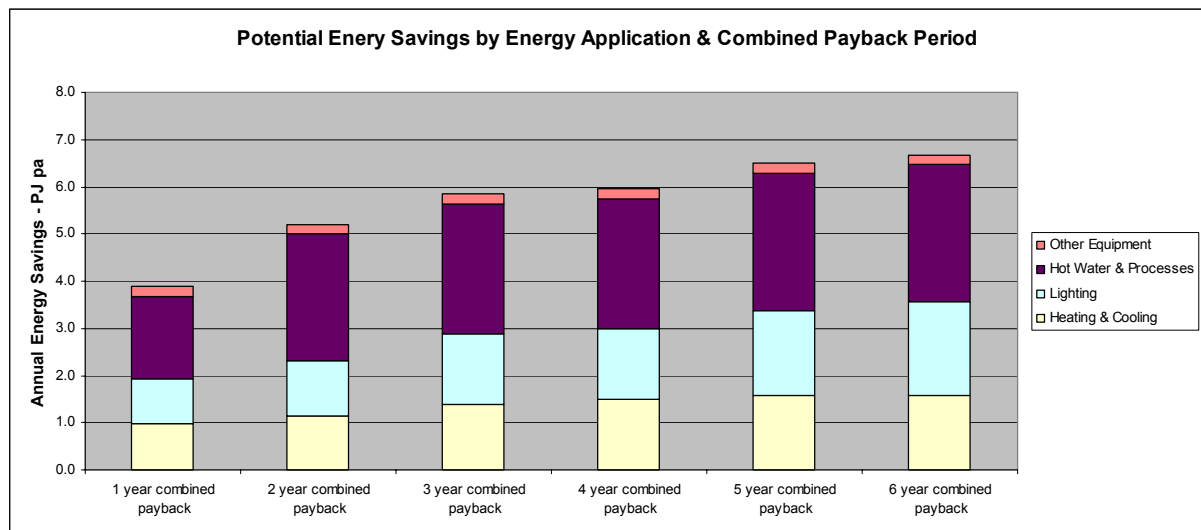


Figure 3.23 – Culture/ Recreation etc Sub-Sector – Raw EEI Potential (%) v's Combined Payback Period

Table 3.13 – Culture/ Recreation etc Sub-Sector - Combined Energy Saving Potential Characteristics

Period	Raw EEI Potential (PJ pa)	Raw EEI Potential (% of Total)	Implementation Cost (\$M)	Average life of Initiatives (Years) ¹	Heating & Cooling	Lighting	Hot Water & Processes	Other Equipment
1 year combined payback	3.9	23%	70	20.2	1.0	0.9	1.8	0.2
2 year combined payback	5.2	31%	137	20.8	1.1	1.2	2.7	0.2
3 year combined payback	5.8	35%	269	20.5	1.4	1.5	2.8	0.2
4 year combined payback	6.0	36%	316	20.6	1.5	1.5	2.8	0.2
5 year combined payback	6.5	39%	444	20.1	1.6	1.8	2.9	0.2
6 year combined payback	6.7	40%	513	19.9	1.6	2.0	2.9	0.2

Notes: 1. Average of life is weighted by the impact of potential savings

**Figure 3.24 – Culture/ Recreation etc Sub-Sector - Potential Energy Savings by Energy Application & Combined Payback Period**

Business as Usual Component -

2.33 PJ pa (0.95 PJ pa for electricity) relating to 14.0% of the 2010 forecast consumption.

Sustainable Energy Authority of Victoria**ENERGY EFFICIENCY IMPROVEMENT
in the COMMERCIAL SUB-SECTORS****4 References**

1. EMET, December 2002 – Paper presented to the ABARE Workshop 2002 – Energy Efficiency Improvement Potential & Policies in the Commercial Sector
2. EMET & ABARE, February 2002 – MARKAL MODEL – Commercial Sector Factor Update
3. EMET & Solarch, May 1999 – “Baseline Study of Greenhouse Gas Emissions from the Commercial Sector with projections to year 2010”
4. ABARE, 2003 – Australian Supply and Disposal Figures
5. Armstrong, G., SEAV, *Preliminary Assessment of Demand-Side Energy Efficiency Improvement Potential and Costs*, SEAV, November 2003.

Sustainable Energy Authority of Victoria

ENERGY EFFICIENCY IMPROVEMENT
in the COMMERCIAL SUB-SECTORS

5 Appendixes

Appendix 1 – The analysis tool

Sustainable Energy Authority of Victoria

ENERGY EFFICIENCY IMPROVEMENT
in the COMMERCIAL SUB-SECTORS

Appendix 1 – The Analysis Tool

The analytical tool uses the basic database described above, and incorporates 80 energy management initiatives available to different components of the buildings sector. It provides data on saving potential and costs and incorporates market penetration factors which allow it to provide an assessment of total impact and cost-effectiveness of selected action from the perspective of the beneficiary, other stakeholders and society.

The main features of the model, and the assumptions used in evaluating the Business as Usual case, the Current Measures and Policies case; and the financial evaluations related to the reduction in the Gap, are presented in the following sections.

5.1.1 Energy Saving Measures

The tool features over 80 energy management measures available to components of the commercial building sector. These apply to each of the following areas:

- Thermal performance of building fabric.
- Heating, ventilation and Air Conditioning (HVAC) – technical and control improvements.
- HVAC – management, maintenance and operational improvements
- Lighting – technical and control improvements.
- Lighting – management, maintenance and control improvements.
- Hot Water Services.
- Lifts.
- Other Services and Plant.

Each measure forms part of a database which incorporates target component, indexed costs and savings for that target, scope, capture rate, and other specific characteristics related to the initiative

This database is processed against the consumption database to produce the total financial and CO₂ impact achieved by the application of each initiative.

The individual initiatives are then combined into a package, based on specified selection criteria, which then allows interactive components to be assessed and evaluated, to form a total impact across the sector.

5.1 Analysis Issues

5.1.1 Opportunities

Three areas of opportunity are incorporated in the analysis. Each component has a specific level of application, and costs and saving indexes vary with each case. The three levels of opportunity are as follows:

- New Buildings – the cost of implementing energy management features in new buildings is lower than existing. Some initiatives are only available to new buildings, as they are prohibitive in existing situations.
- Refurbishments – buildings undergoing refurbishment provide better opportunities for energy management compared to those which are not planned to be upgraded in any way.
- Retrofits – These are buildings and services for which no specific plans for upgrade are in place. The cost of implementing initiatives in these cases is higher, and the savings usually apply over a smaller scope.

5.1.2 Scope of Application

The scope of each measure is defined as the amount of energy over which it applies. This will vary with each initiative, and for any one initiative, a number of component scopes may be use, where the performance or cost/savings indexes vary.

5.1.3 Capture Rate

Capture rate for any application is used to discount the scope of an initiative from the total applicable level, to the expected level, based on the status of the initiative (eg: mandatory or voluntary) or its acceptance in the marketplace etc.

5.1.4 Energy Prices

Energy prices are based on average prices paid by Commercial Sector enterprises, weighted by their proportion in location and size of consumer (ie. larger users generally pay a lower rate or are able to negotiate more favourable contracts). Table A1.1 shows the average rates of energy used in the analysis.

Table A1.1: Energy Prices used in the Analysis Tool

ENERGY SOURCE	Cost of Energy - \$/GJ
Electricity	25.45
Gas	8.45
Petroleum Products	10.42
Coal	4.94
Wood	17.19

5.2 Energy Efficiency Initiatives

5.2.1 Selected Options

A number of key energy efficiency initiatives currently available in the marketplace were chosen to enable the saving potential and retrofit costs to be calculated. These are summarised in Table A1.2. Some of the options have sub-categories for more specific initiatives, and these have been designated as a decimal form of the basic option. An additional designator in the form of a letter is also used to determine the type of building to which the specific option refers. The letter "a" is used for existing buildings which have not undergone refurbishment by the year 2010 the letter "b" is used for existing buildings which will undergo refurbishment by the year 2010 and the letter "c" is used for new buildings.

A separate computer spreadsheet has been compiled for each initiative and a summary printout of the analysis is included in Attachment 2.

For each of the initiatives a *scope* was calculated, representing the percentage of the total energy use which was applicable to the option. For example, for new buildings, where the total scope is 23.7 PJ per annum, the application of Metal Halides to external lighting is discounted to 28% to represent the proportion of energy used in outdoor lighting, and then further discounted to 30% to represent the proportion of outdoor lighting which can be converted in that way. Therefore, the total scope becomes - $23.7 \times .28 \times .3 = 1.99$ PJ/annum.

Table A1.2: Categories of Greenhouse Gas Abatement Initiatives included in the Analysis Tool

System	Designator	Type of Initiative
Lighting	1	Lighting Control Systems for Internal Lighting
Lighting	1.1	Zone Control of Lighting
Lighting	1.2	Daylight Control
Lighting	1.3	Individual Lighting Controls for Offices, Stores etc.
Lighting	2	Conducting Lighting Surveys
Lighting	3	Lighting Control Systems for External and Common Area Lighting
Lighting	4	Regular Maintenance of Lighting Systems
Lighting	5	Replacement of Incandescents with Fluorescents
Lighting	5.1	Replacement of Incandescents with standard Fluorescent Fittings
Lighting	5.2	Replacement of Incandescents with Compact Fluorescent Lamps
Lighting	5.3	Replacement of Dimmed Incandescent Installations
Lighting	6	Replace Ballasts, and Luminaires for Fluorescent Lamps
Lighting	6.1	Installation of Super Low Loss Ballasts
Lighting	6.2	Installation of High Frequency Ballasts
Lighting	6.3	Installation of High Efficiency Luminaires.
Lighting	7	Replace Exterior MV and Fluor'nt Lamps with Metal Halide and High Press. Sodium
Lighting	7.1	High Pressure Sodium Installation
Lighting	7.2	Metal halide Lamp Installation
Lighting	8	Natural Efficiency Improvement in New Buildings
HVAC	1	Application of Outside Air Cycles
HVAC	1.1	Low Cost - Existing Buildings
HVAC	1.2	Medium Cost - Existing Buildings
HVAC	1.3	Difficult applications
HVAC	1.4	New Buildings
HVAC	2	Consolidation of Central Heating

HVAC	2.1	Institutional Buildings
HVAC	2.2	Commercial Buildings
HVAC	2.3	Elimination of Poor Efficiency in Design
HVAC	3	Calibration of Controls and their Regular Maintenance
HVAC	4	Improving Thermal Performance of Buildings
HVAC	4.1	Insulation in Community Services Buildings
HVAC	4.2	Major Improvements
HVAC	5	Efficient New Building Developments
HVAC	5.1	Basic Improvement in the Efficiency of New Buildings
HVAC	5.2	Optimising Designs for Maximum Efficiency
HVAC	5.3	Retrofit features applied to new buildings to recover opportunities not covered under the original design.
HVAC	6	Optimisation of Fans, Pumps, and Motors
HVAC	7	Optimisation of Equipment Stop/Start Control
Processes & Other	1	Alternative Means of Water Heating
Processes & Other	2	Hot Water System Management
Processes & Other	3	Cooking Equipment Management
Processes & Other	4	Refurbishment of Lift Controls
Processes & Other	5	Improved Control of Office Equipment

Sustainable Energy Authority of Victoria**ENERGY EFFICIENCY IMPROVEMENT
CASE STUDIES in the COMMERCIAL SECTOR****Appendix 2 – List of Cost-Effective Measures by Sub-Sector**

The following tables list the Energy Efficiency Initiatives for each building type in order of simple payback period to a limit of 4 years simple payback. The energy saving potential data presented is the 'raw' EEI potential, prior to the BAU uptake being taken into account.

Refer to Table 2 in Appendix 1 for a legend of codes used to describe the initiatives in the following tables. For example, the initiative code LGHTS-7.2c refers to the use of metal halide lamps in external areas of new buildings, in place of the less efficient fluorescent and/or mercury vapour lamps.

Table A2.1: ANZSIC Div F & G – Wholesale Trade / Retail Trade (Sub-Sector B)

Initiative	Energy saving Potential (PJ pa) Discounted	Electricity Saving included (PJ pa) Discounted	Operating Cost Saving (\$M pa) Discounted	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2c	0.07	0.07	54.1	9.4	-0.2
LGHTS-7.2b	0.09	0.09	66.4	11.6	-0.2
LGHTS-7.1c	0.15	0.15	39.6	0.3	0.0
LGHTS-7.1b	0.19	0.19	48.7	0.4	0.0
HVAC-Option 5.1	0.42	0.20	9.1	0.0	0.0
HVAC-Option 3.1	1.38	0.27	15.2	0.0	0.0
LGHTS-8	1.03	1.03	26.2	0.0	0.0
PROC-Option 3.3	5.66	2.72	51.8	0.0	0.0
PROC-Option 2.3	3.78	0.99	80.9	0.0	0.0
OTHR-Option 5.2	0.66	0.66	16.9	0.0	0.0
OTHR-Option 4.1	0.00	0.00	0.1	0.0	0.0
OTHR-Option 5.1	0.50	0.50	12.7	0.0	0.0
LGHTS-2a	0.37	0.37	13.9	-3.9	0.3
LGHTS-2b	0.25	0.25	9.2	-2.6	0.3
LGHTS-2c	0.17	0.17	6.7	-2.1	0.3
HVAC-Option 1.4	0.09	0.04	1.8	-0.9	0.5
HVAC-Option 1.1	0.11	0.04	2.3	-1.8	0.8
LGHTS-4c	1.13	1.13	37.0	-30.4	0.8
LGHTS-7.2a	0.07	0.07	98.1	-96.1	1.0
LGHTS-7.1a	0.15	0.15	69.7	-73.2	1.0
LGHTS-4b	0.65	0.65	20.5	-22.1	1.1
LGHTS-4a	0.97	0.97	30.7	-33.2	1.1
PROC-Option 1.3	0.76	0.20	14.9	-25.3	1.7
LGHTS-3c	0.22	0.22	5.2	-9.2	1.8
PROC-Option 1.4	1.72	1.31	33.5	-68.0	2.0
HVAC-Option 1.2	0.23	0.09	4.1	-8.8	2.2
LGHTS-3a	0.58	0.58	13.2	-29.0	2.2
LGHTS-3b	0.38	0.38	8.8	-19.4	2.2
LGHTS-1.1c	0.87	0.87	19.3	-58.0	3.0
HVAC-Option 5.3	0.76	0.76	13.7	-43.3	3.2
LGHTS-1.1b	1.17	1.17	25.3	-88.1	3.5
LGHTS-1.1a	1.75	1.75	37.9	-132.1	3.5
LGHTS-5.2b	1.12	1.12	13.4	-48.4	3.6
LGHTS-5.2a	1.68	1.68	20.1	-72.6	3.6
TOTALS	29.14	20.85	920.8	-846.9	0.9

Table A2.2: ANZSIC Div H – Accommodation, Cafes & Restaurants (Sub-Sector D)

Initiative	Energy saving Potential (PJ pa)	Electricity Saving included (PJ pa)	Operating Cost Saving (\$M pa)	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2b	0.01	0.01	4.2	0.7	-0.2
LGHTS-7.2c	0.00	0.00	3.4	0.6	-0.2
LGHTS-7.1b	0.01	0.01	3.0	0.0	0.0
LGHTS-7.1c	0.01	0.01	2.5	0.0	0.0
HVAC-Option 5.1	0.09	0.04	2.1	0.0	0.0
HVAC-Option 3.1	0.23	0.05	3.2	0.0	0.0
LGHTS-8	0.06	0.06	1.6	0.0	0.0
PROC-Option 3.3	0.94	0.45	13.8	0.0	0.0
PROC-Option 2.3	0.76	0.20	14.8	0.0	0.0
OTHR-Option 5.2	0.12	0.12	3.0	0.0	0.0
OTHR-Option 4.1	0.14	0.14	3.6	0.0	0.0
OTHR-Option 5.1	0.09	0.09	2.3	0.0	0.0
LGHTS-2a	0.02	0.02	0.9	-0.2	0.3
LGHTS-2b	0.02	0.02	0.6	-0.2	0.3
LGHTS-2c	0.01	0.01	0.4	-0.1	0.3
HVAC-Option 1.4	0.02	0.01	0.4	-0.2	0.5
HVAC-Option 1.1	0.02	0.01	0.5	-0.4	0.7
LGHTS-4c	0.07	0.07	2.3	-1.9	0.8
LGHTS-7.2a	0.01	0.01	6.2	-6.0	1.0
LGHTS-7.1a	0.02	0.02	4.6	-4.6	1.0
LGHTS-4b	0.04	0.04	1.3	-1.4	1.1
LGHTS-4a	0.06	0.06	1.9	-2.1	1.1
LGHTS-3c	0.01	0.01	0.3	-0.6	1.8
PROC-Option 1.3	0.15	0.04	2.7	-5.1	1.9
HVAC-Option 1.2	0.05	0.02	1.0	-1.9	2.0
LGHTS-3a	0.04	0.04	0.8	-1.8	2.2
LGHTS-3b	0.02	0.02	0.6	-1.2	2.2
PROC-Option 1.4	0.35	0.26	6.1	-13.6	2.2
PROC-Option 1.2	0.80	0.56	14.2	-42.5	3.0
LGHTS-1.1c	0.05	0.05	1.2	-3.6	3.0
PROC-Option 3.1	0.48	0.23	8.2	-24.9	3.1
HVAC-Option 5.3	0.21	0.21	3.7	-11.7	3.2
LGHTS-1.1b	0.07	0.07	1.6	-5.5	3.5
LGHTS-1.1a	0.11	0.11	2.4	-8.3	3.5
LGHTS-5.2a	0.11	0.11	1.3	-4.5	3.6
LGHTS-5.2b	0.07	0.07	0.8	-3.0	3.6
TOTALS	5.27	3.25	121.39	-144.03	1.2

Table A2.3: ANSZIC Div J – Communication services (Sub-Sector F)

Initiative	Energy saving Potential (PJ pa)	Electricity Saving included (PJ pa)	Operating Cost Saving (\$M pa)	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2c	0.00	0.00	1.4	0.2	-0.2
LGHTS-7.2b	0.00	0.00	1.7	0.3	-0.2
LGHTS-7.1c	0.00	0.00	1.0	0.0	0.0
LGHTS-7.1b	0.00	0.00	1.3	0.0	0.0
HVAC-Option 5.1	0.07	0.03	1.5	0.0	0.0
HVAC-Option 3.1	0.19	0.04	2.2	0.0	0.0
LGHTS-8	0.03	0.03	0.7	0.0	0.0
PROC-Option 3.3	0.03	0.02	0.1	0.0	0.0
PROC-Option 2.3	0.02	0.00	0.1	0.0	0.0
OTHR-Option 5.2	0.10	0.10	0.6	0.0	0.0
OTHR-Option 4.1	0.01	0.01	0.1	0.0	0.0
OTHR-Option 5.1	0.08	0.08	0.5	0.0	0.0
LGHTS-2a	0.01	0.01	0.4	-0.1	0.3
LGHTS-2b	0.01	0.01	0.2	-0.1	0.3
LGHTS-2c	0.00	0.00	0.2	-0.1	0.3
HVAC-Option 1.4	0.01	0.01	0.3	-0.1	0.5
HVAC-Option 1.1	0.02	0.01	0.3	-0.3	0.8
LGHTS-4c	0.03	0.03	1.0	-0.8	0.8
LGHTS-7.2a	0.00	0.00	2.6	-2.5	1.0
LGHTS-7.1a	0.01	0.01	1.9	-1.9	1.0
LGHTS-4b	0.02	0.02	0.5	-0.6	1.1
LGHTS-4a	0.03	0.03	0.8	-0.9	1.1
LGHTS-3c	0.01	0.01	0.1	-0.2	1.8
PROC-Option 1.3	0.00	0.00	0.0	0.0	1.9
HVAC-Option 1.2	0.03	0.01	0.6	-1.3	2.1
LGHTS-3b	0.01	0.01	0.2	-0.5	2.2
LGHTS-3a	0.01	0.01	0.3	-0.7	2.2
PROC-Option 3.1	0.01	0.00	0.0	-0.1	2.5
LGHTS-1.1c	0.02	0.02	0.5	-1.5	3.0
HVAC-Option 5.3	0.13	0.13	2.4	-7.5	3.2
LGHTS-1.1b	0.03	0.03	0.7	-2.3	3.5
LGHTS-1.1a	0.05	0.05	1.0	-3.4	3.5
LGHTS-5.2a	0.04	0.04	0.5	-1.9	3.6
LGHTS-5.2b	0.03	0.03	0.3	-1.2	3.6
TOTALS	1.05	0.78	25.95	-27.29	1.1

Table A2.4: ANZSIC Div K & L – Finance & Insurance / Property & Business Services (Sub-Sector A)

Initiative	Energy saving Potential (PJ pa)	Electricity Saving included (PJ pa)	Operating Cost Saving (\$M pa)	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2c	0.02	0.02	12.4	2.2	-0.2
LGHTS-7.2b	0.02	0.02	15.3	2.7	-0.2
LGHTS-7.1c	0.03	0.03	9.1	0.1	0.0
LGHTS-7.1b	0.04	0.04	11.2	0.1	0.0
HVAC-Option 5.1	0.25	0.24	5.3	0.0	0.0
HVAC-Option 2.3	0.03	0.00	0.3	0.0	0.0
HVAC-Option 3.1	0.84	0.35	9.3	0.0	0.0
LGHTS-8	0.24	0.24	6.0	0.0	0.0
PROC-Option 3.3	0.38	0.38	0.8	0.0	0.0
PROC-Option 2.3	0.80	0.44	3.5	0.0	0.0
OTHR-Option 5.2	0.56	0.56	3.5	0.0	0.0
OTHR-Option 4.1	0.06	0.06	0.5	0.0	0.0
OTHR-Option 5.1	0.42	0.42	2.7	0.0	0.0
LGHTS-2b	0.06	0.06	2.1	-0.6	0.3
LGHTS-2a	0.08	0.08	3.2	-0.9	0.3
LGHTS-2c	0.04	0.04	1.5	-0.5	0.3
HVAC-Option 1.4	0.05	0.04	1.0	-0.5	0.5
HVAC-Option 1.1	0.07	0.05	1.3	-1.0	0.8
LGHTS-4c	0.26	0.26	8.5	-7.0	0.8
LGHTS-7.2a	0.03	0.03	22.9	-22.1	1.0
LGHTS-7.1a	0.06	0.06	16.8	-16.8	1.0
LGHTS-4b	0.15	0.15	4.7	-5.1	1.1
LGHTS-4a	0.22	0.22	7.1	-7.6	1.1
LGHTS-3c	0.05	0.05	1.2	-2.1	1.8
PROC-Option 1.3	0.16	0.09	0.1	-0.3	2.1
HVAC-Option 1.2	0.13	0.10	2.3	-4.9	2.2
LGHTS-3a	0.13	0.13	3.0	-6.7	2.2
LGHTS-3b	0.09	0.09	2.0	-4.4	2.2
PROC-Option 1.4	0.36	0.36	3.4	-8.6	2.6
LGHTS-1.1c	0.20	0.20	4.4	-13.3	3.0
HVAC-Option 5.3	0.42	0.42	7.6	-23.9	3.2
PROC-Option 3.1	0.10	0.10	0.2	-0.8	3.4
LGHTS-1.1b	0.27	0.27	5.8	-20.2	3.5
LGHTS-1.1a	0.40	0.40	8.7	-30.3	3.5
LGHTS-5.2b	0.26	0.26	3.1	-11.1	3.6
LGHTS-5.2a	0.39	0.39	4.6	-16.7	3.6
HVAC-Option 2.2	0.10	0.05	0.8	-3.1	3.9
TOTALS	7.77	6.70	196.07	-203.56	1.0

Table A2.5: ANZSIC Div M, N, O – Govt Admin / Education / Health & Community (Sub-Sector C)

Initiative	Energy saving Potential (PJ pa)	Electricity Saving included (PJ pa)	Operating Cost Saving (\$M pa)	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2c	0.03	0.03	20.8	3.6	-0.2
LGHTS-7.2b	0.03	0.03	25.6	4.5	-0.2
LGHTS-7.1b	0.07	0.07	18.8	0.1	0.0
LGHTS-7.1c	0.06	0.06	15.2	0.1	0.0
HVAC-Option 5.1	0.57	0.27	12.2	0.0	0.0
HVAC-Option 3.1	2.57	0.51	27.3	0.0	0.0
LGHTS-8	0.40	0.40	10.1	0.0	0.0
PROC-Option 3.3	0.80	0.39	9.7	0.0	0.0
PROC-Option 2.3	3.38	0.89	43.6	0.0	0.0
OTHR-Option 5.2	0.86	0.86	22.0	0.0	0.0
OTHR-Option 4.1	0.19	0.19	4.7	0.0	0.0
OTHR-Option 5.1	0.86	0.86	22.0	0.0	0.0
LGHTS-2c	0.08	0.08	2.9	-0.8	0.3
LGHTS-2b	0.10	0.10	3.6	-1.0	0.3
LGHTS-2a	0.11	0.11	4.4	-1.5	0.3
HVAC-Option 1.4	0.11	0.04	2.0	-1.3	0.6
LGHTS-4c	0.58	0.58	17.9	-11.7	0.7
HVAC-Option 1.1	0.17	0.06	3.3	-2.6	0.8
LGHTS-4b	0.33	0.33	10.0	-8.5	0.9
LGHTS-7.2a	0.04	0.04	38.1	-37.0	1.0
LGHTS-7.1a	0.11	0.11	28.1	-28.2	1.0
LGHTS-4a	0.37	0.37	11.8	-12.8	1.1
LGHTS-3c	0.12	0.12	2.8	-3.5	1.2
LGHTS-3a	0.33	0.33	7.8	-11.2	1.4
LGHTS-3b	0.22	0.22	5.2	-7.5	1.4
LGHTS-1.1c	0.52	0.52	12.2	-22.3	1.8
LGHTS-5.2b	0.54	0.54	8.0	-18.7	2.3
HVAC-Option 5.3	0.78	0.78	14.4	-37.5	2.6
LGHTS-1.1a	0.80	0.80	17.8	-50.9	2.9
LGHTS-5.2a	0.65	0.65	7.7	-28.0	3.6
TOTALS	15.78	10.33	430.02	-276.63	0.6

Table A2.6: ANZSIC Div P & Q – Culture & recreation / Personal & other services (Sub-Sector E)

Initiative	Energy saving Potential (PJ pa)	Electricity Saving included (PJ pa)	Operating Cost Saving (\$M pa)	Implementation Cost (\$)	Simple Payback Period (yrs)
LGHTS-7.2c	0.01	0.01	4.2	0.7	-0.2
LGHTS-7.2b	0.01	0.01	5.2	0.9	-0.2
LGHTS-7.1c	0.01	0.01	3.1	0.0	0.0
LGHTS-7.1b	0.01	0.01	3.8	0.0	0.0
HVAC-Option 5.1	0.12	0.06	2.6	0.0	0.0
HVAC-Option 3.1	0.54	0.11	5.8	0.0	0.0
LGHTS-8	0.08	0.08	2.0	0.0	0.0
PROC-Option 3.3	0.47	0.23	0.7	0.0	0.0
PROC-Option 2.3	0.88	0.23	3.1	0.0	0.0
OTHR-Option 5.2	0.09	0.09	0.6	0.0	0.0
OTHR-Option 4.1	0.05	0.05	0.4	0.0	0.0
OTHR-Option 5.1	0.07	0.07	0.4	0.0	0.0
LGHTS-2a	0.03	0.03	1.1	-0.3	0.3
LGHTS-2b	0.02	0.02	0.7	-0.2	0.3
LGHTS-2c	0.01	0.01	0.5	-0.2	0.3
HVAC-Option 1.4	0.03	0.01	0.6	-0.3	0.5
HVAC-Option 1.1	0.04	0.01	0.8	-0.6	0.8
LGHTS-4c	0.09	0.09	2.9	-2.4	0.8
LGHTS-7.2a	0.01	0.01	7.8	-7.5	1.0
LGHTS-7.1a	0.02	0.02	5.7	-5.7	1.0
LGHTS-4b	0.05	0.05	1.6	-1.7	1.1
LGHTS-4a	0.08	0.08	2.4	-2.6	1.1
LGHTS-3c	0.02	0.02	0.4	-0.7	1.8
HVAC-Option 1.2	0.07	0.03	1.3	-2.8	2.2
LGHTS-3a	0.05	0.05	1.0	-2.3	2.2
LGHTS-3b	0.03	0.03	0.7	-1.5	2.2
PROC-Option 1.3	0.18	0.05	0.1	-0.3	2.7
LGHTS-1.1c	0.07	0.07	1.5	-4.5	3.0
HVAC-Option 5.3	0.17	0.17	3.0	-9.5	3.2
PROC-Option 1.4	0.24	0.19	1.8	-5.8	3.2
LGHTS-1.1a	0.14	0.14	3.0	-10.3	3.5
LGHTS-1.1b	0.09	0.09	2.0	-6.9	3.5
LGHTS-5.2a	0.13	0.13	1.6	-5.7	3.6
LGHTS-5.2b	0.09	0.09	1.0	-3.8	3.6
TOTALS	3.98	2.32	73.55	-74.00	1.0