



*A Warren Centre project addressing non technical barriers to closing the existing office building energy efficiency gap*

## LOW ENERGY HIGH RISE Suite of Initiatives Report

18 March 2009



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## Table of Contents

Background .....	3
1 Structure of the Suite of Initiatives Report.....	3
2 Project Steps Leading to the Development of the Suite of Initiatives .....	3
3 Next Steps .....	4
Table 1: Key Research Results and Sample of Relevant Initiatives that would support the measure .....	6
Table 2: Initiatives generated by Scenario Working Groups .....	8
Table 3: Brief Description of 5 Scenarios the Scenario Working Groups considered to generate initiatives, Group leaders and participants .....	15
Appendix A: The detailed Brief Scenario Working Groups responded to.....	17
Appendix B: Barriers Identified, Prioritised by Supply & Demand Working Groups .....	21
Appendix C: Initiatives Generated By Working Groups.....	24
1 Table C1: All initiatives generated by Scenario Working Group 1: .....	24
2 Table C2: All initiatives generated by Scenario Working Group 2 & 3:.....	24
3 Table C3: All initiatives generated by Scenario Working Group 4a & 4b:.....	25
4 Table C4: All initiatives generated by Scenario Working Group 5: .....	26
Appendix D: Initiatives Generated by Meetings in Sydney & Brisbane. ....	28
1 Table D: initiatives generated by three meetings in Brisbane & Sydney .....	28
Appendix E: Initiatives Identified by Literature Review.....	30
Appendix F: Full Report of Scenario Working Group 1 .....	32
Appendix G: Full Report of Scenario Working Group 2 & 3 .....	38
1 Executive Summary.....	39
2 Scenario description .....	40
3 Scenario Stakeholders .....	42
4 Project Scoping .....	43
5 Project Funding Approval .....	43
6 Project Design .....	44
7 Design of Energy Efficiency Projects .....	44
8 Project Delivery .....	44
9 Project Commissioning.....	45
10 Project Handover.....	46
11 Project Maintenance.....	48
12 Appendix G1: Example of Building Upgrade Method.....	50
13 Appendix G2: Building Energy Performance Audit .....	51
Appendix H: Full Report of Scenario Working Group 4a & 4b. ....	55
APPENDIX I: Full Report of Scenario Working Group 5 .....	66

## Background

The Warren Centre for Advanced Engineering’s Suite of Initiatives Report, combined with its Final Research Survey Report, are the two central elements of the Low Energy High Rise Project and their release marks the completion of Stage One of the LEHR Project.

From its inception the Low Energy High Rise Project intended to “engage the Australian commercial property industry in developing a suite of initiatives including strategies, tools, incentives and measures (e.g. financial instruments and management strategies) to overcome the barriers or create incentives to significantly improve energy efficiency in existing commercial high rise buildings, defined as buildings with an NLA of 7,500m<sup>2</sup> or greater”. The LEHR Project Plan also noted that it intended to “inform the development of the industry’s suite of initiatives with a ground breaking research project based on the premise that “buildings are significantly human rather than merely technical systems and that the key lies in balancing relatively well trodden technical issues with the far more challenging human and organisational issues that define the ultimate environmental outcomes of buildings in operation”.

### 1 *Structure of the Suite of Initiatives Report*

The Suite of Initiatives Report presents the final suite of initiatives in Table 2. The initiatives are organised according to a building’s life cycle, making them easily accessible and relevant to industry. Consistent with the LEHR Project’s intention to inform the development of the suite of initiatives with the results of the Research Survey, Table 1 summarises the key findings of the Research Survey and some selected initiatives that would support a particular research result. The initiatives were developed to overcome non-technical barriers to improved energy performance in buildings so there are no initiatives that may support the key technical findings.

Table 3 sets out the scenarios that were used to generate the suite of initiatives. Four Working Groups – the Scenario Working Groups were formed to generate initiatives in response to scenarios the industry works with every day. Table 3 also identifies the Scenario Working Group leaders and the participants who were involved in developing the suite of initiatives. The Report’s Appendix includes all the initiatives that were generated by each of the Scenario Working Groups as well as each Scenario Working Group’s final report.

### 2 *Project Steps Leading to the Development of the Suite of Initiatives*

Under the direction of the LEHR Project Director, Sue Salmon and the LEHR Planning Group comprising Robert Mitchell, Martin Poole, David Hood, Keith Bashford, Paul Bannister, Robert Quinn, Mary Casey, Craig Roussac, Bruce Precious, Greg Johnson, Remy Augros and Catherine Hallgath, the LEHR Project has progressed through a number of steps to develop the suite of initiatives. These steps are set out chronologically below:



All the initiatives identified by the Literature Review are set out in Appendix E. A copy of the Literature Review is available at <http://www.warren.usyd.edu.au/LEHR/main.htm>. Three meetings, one in Brisbane and two in Sydney, were held with industry stakeholders to suggest initiatives. The ideas generated from these meetings are set out in Appendix D.

The LEHR Planning Group reviewed the output of these meetings and decided that the LEHR Project needed to devise a new way to generate the suite of initiatives because the main focus of the suggested initiatives was what Government and others could do to improve the energy efficiency of commercial buildings, rather than what industry itself could do. Consequently, the LEHR Planning Group developed a set of scenarios to reflect everyday experience in the operation of office buildings and Working Groups were established to generate initiatives based on these scenarios.

The Scenario Working Groups met over a two month period between August and October 2008 to identify additional members who represented various roles relevant to their scenario and to then work through their scenario and report their findings and suggested initiatives. Appendix C provides a full list of all initiatives generated by each Scenario Working Group. The final reports of each Scenario Working Group are in Appendixes F to I.

Once this work was complete, the LEHR Planning Group reviewed all the initiatives suggested and allocated them across the building life cycle. The result of this review is presented in Table 2. During the latter activities the preliminary results of the Research Report were presented to the Scenario Working Groups and the LEHR Planning Group. That said, at this stage of the LEHR Project, the Research Report and the development of the suite of initiatives have been undertaken in parallel without reference to the other. It was intended that the Research results would be completed earlier so that the research findings would inform the development of the suite of initiatives. However the survey took far longer to complete than expected which delayed the completion of the research report. Table 1 identifies some initiatives that could support a particular research result but no other link has been established between the research results and the initiatives.

### **3    *Next Steps***

The Low Energy High Rise Project has relied on the participation of people who are engaged in running commercial office buildings every day. They have been involved in steering the project, in developing the content of the surveys, in completing the surveys, in developing the initiatives, in literally every aspect of the LEHR Project. The findings of the research and all the measures in the suite of initiatives in concept form are now available to industry to develop and implement in the operation of their buildings. Indeed the Warren Centre will view the LEHR Project as a success when industry is doing this.

That said considerable work remains to develop the ideas in the suite of initiatives from the current concept form to "industry ready" materials and to disseminate them and train people to use them so that they are integrated into everyday industry management practices.

There are two key next steps in Stage 2 of the LEHR Project. The first is to develop the initiatives into industry ready materials and the second is to test them and the research findings in case study buildings. The purpose of the case studies is to test the functionality of the initiatives and to test the causality of the research findings.

We propose to test the research results and the suite of initiatives in at least 5 case study buildings that are representative of the buildings and tenancies identified by the research project. The aim will be to establish the effectiveness and causality of the research results i.e. can we get an effect & can we demonstrate that it is causal. Candidate buildings (including tenancies) will be sought across a range of physical and management archetypes.

The case study buildings will be involved in an evaluation which includes leading practitioners who will evaluate the technical and management opportunities developed in the study and from existing industry expertise.

We would then apply relevant components of the research findings and the measures in the suite of initiatives to each building in negotiation with the building owners and managers. For example, each building would be evaluated for their NABERS rating, base building technology, any relevant arrangements with tenants, and a review of issues identified in the research findings. Throughout this process the building would be monitored to identify the successes, failures and opportunities arising from their application. The LEHR Project Plan provides full details of Stage 2 and is available from the Warren Centre website (see above for link).

Stage 2, as envisaged in the Project Plan, is dependent on a combination of industry and government funding and in the current economic circumstances there is no certainty of funding, although the Warren Centre has applied for some government funding through the Green Building Fund. If this funding is available it will need matching industry dollars. LEHR Project participants have strongly indicated that they want to be involved in the further development of the initiatives so that they are "industry ready". They envisage the support of specialist facilitators to work with industry participants to undertake this work. If funding is not available there is nothing to stop companies and industry associations taking the ideas and making them "industry ready", integrating them into training programs and making them available to the wider industry via the LEHR Project.

**Table 1: Key Research Results and Sample of Relevant Initiatives that would support the measure**

Measure	NABERS Energy Impact	Measure Summary	Sample of Relevant Initiatives to Support Measure
Economy Cycle	0.6 stars	Buildings with Economy cycles outperform those without	
Building technology	1.4 stars	Buildings with current good practice façade and services technology perform better	
Management	1.3 stars	Buildings where management is at least partially in-sourced perform better	
	0.9 stars	Buildings where building, asset and portfolio manager all feel able to effect efficiency perform better	<ul style="list-style-type: none"> <li>▪ Pro- forma Management Routines (SWG1)</li> <li>▪ Efficiency Operation and Maintenance guidelines (SWG 1, 5)</li> </ul>
	Weak	Buildings perform better when there is support for efficiency from building owners	
Disclosure	0.5 stars	Buildings that disclose their NABERS performance to tenants perform better	<ul style="list-style-type: none"> <li>▪ Checklist to assist owner to set targets for energy and greenhouse performance (SWG2,3)</li> <li>▪ Guide to sub-metering buildings for Performance Measurement (SWG1)</li> <li>▪ Checklist for commissioning high performance buildings (SWG 2,3)</li> <li>▪ Real time Energy Display (SWG1)</li> <li>▪ Mandatory disclosure of energy use/energy ratings at sale/lease (Brisbane / Sydney meetings)</li> </ul>
Incentives and Penalties	0.4 stars	Buildings that provide efficiency penalties / incentives to maintenance contractors perform better	<ul style="list-style-type: none"> <li>▪ Energy Performance included in maintenance contract (SWG 1)</li> <li>▪ Contractor Performance KPIs (SWG 1)</li> <li>▪ Efficiency Operation &amp; Maintenance Guidelines (SWG 1 &amp; SWG 5)</li> <li>▪ Establish practices and contracts that allow facility managers and contractors to share and be acknowledged for energy savings captured for building owners and tenants (McCan 2006 from Literature Review)</li> </ul>

Measure	NABERS Energy Impact	Measure Summary	Sample of Relevant Initiatives to Support Measure
Training and skills	0.5 stars	Buildings where there is an efficiency training program perform better	<ul style="list-style-type: none"> <li>▪ Energy training for each trade (SWG 1)</li> <li>▪ Industry Knowledge Forum for facility managers, sustainability managers (SWG 5)</li> <li>▪ Remote and centralised energy trouble shooters (SWG5)</li> <li>▪ On-line Building Operators Accreditation Scheme ((Brisbane / Sydney meetings)</li> <li>▪ Skills building program for energy efficiency (Brisbane / Sydney meetings)</li> <li>▪ Create an on-line energy efficiency information portal (Brisbane / Sydney meetings)</li> </ul>
	1.3 stars	Buildings where the manager reports a higher level of energy efficiency knowledge perform better	<ul style="list-style-type: none"> <li>▪ Establish practices and contracts that allow facility managers &amp; contractors to share and be acknowledged for energy savings captured for building owners, tenants (McCan 2006 from Literature Review)</li> </ul>
	Weak	Buildings where the building manager is conservative with respect to new technologies perform poorer	
Incremental Improvement	0.6 stars	Buildings where incremental investments have been made in efficiency perform better than those where no such investment has occurred	<ul style="list-style-type: none"> <li>▪ Revolving Fund to reinvest energy savings in building (SWG 1)</li> <li>▪ Standard Business Case Template (SWG 5)</li> <li>▪ 5 Year Asset Energy Improvement Plan (SWG 5)</li> </ul>

**Table 2: Initiatives generated by Scenario Working Groups**

Reviewed and allocated across building lifecycle by LEHR Planning Group (see Table 3 for colour coding)

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
Building - Acquisition	Acquisition Feasibility Model	This tool would take the information gathered during due diligence process and enter it into a model to determine the feasibility and investment required to improve a building's energy performance. This would assist the decision making process in determining current and future capital value, IRR and level of risk associated with a building based on its NABERS Energy rating. (SWG 5)	Lack of standard cost-benefit analysis (NEEF 2004)
	Due Diligence Checklist	This is a tool that would assist teams involved in building acquisitions to identify critical energy efficiency issues during the due diligence process and ask the right questions to gather information i.e.: NABERS Energy ratings, electricity consumption history, load profiles, energy savings action plans etc. (SWG 5)	Lack of information (SKM 2006)
	100 Day Plan	This initiative would consist of the creation of a tool and a set of guidelines on how to take a building from acquisition through its first 100 days to achieve quick wins and begin a longer term action plan for energy efficiency. (SWG 5)	Lack of information (SKM 2006)
Building - Baseline	Tool to assess Pre-feasibility Proposals	The key recommendation is the development of a wide range of simple checklists, templates and standards be developed for each stage in the building life-cycle and be disseminated through appropriate training courses and made available through a reliable web site. This is a tool to assess Pre-feasibility proposals. (SWG 2,3)	Scenario Working Group 2, 3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success but did not specify a barrier for each initiative.
	Revolving Fund	How to Guide to reinvesting savings in building. (SWG 1)	Scenario Working Group 1 did not identify barriers
	Guide to Upgrades for High Performance including stakeholder needs, resources	Overview document, which includes stakeholders and their expectations, provides map to other resources. (SWG 2,3)	
	5 Year Asset Energy Improvement Plan	This is the next step from the 100 day action plan. It would set out the necessary actions and planning principles for a longer term action plan for energy efficiency. (SWG5)	Competition for capital (LEHR SWG 2007)
Building - Defining Objectives to obtain budget	Checklist to assist owner to set targets for energy & greenhouse performance	Checklist for internal use that allows owner to determine potential of a building to achieve improved energy performance. Would provide guidance on juggling age of building & plant, current performance (rating), age of building & plant, planned capex on equipment replacement in immediate future years, opportunity to convert opex to capex, and expected tenant demands. (SWG2, 3)	Scenario Working Group 2,3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
	Pre-feasibility Checklist	The following Pre-feasibility Checklist, Scope of Works, Report and Contract are for	

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
		external purposes and allow the owner to engage the best external consultant including advice on how/where to get smart meter data. (SWG2, 3)	
	<b>Pre-feasibility Scope of Works</b>	See above (SWG2, 3)	
	<b>Pro-forma Pre-feasibility Report</b>	See above (SWG2, 3)	
	<b>Pro-forma Pre-feasibility Contract</b>	See above (SWG2, 3)	
<b>Building - Determining Costings</b>	<b>Business Case Pro-forma and Guide for Building Upgrade</b>	See above (SWG2, 3)	
	<b>Standard Business Case Template</b>	This tool would assist in the more robust cost benefit analysis of energy efficiency initiatives and present a sound financial proposition and investment return in both financial and non financial terms. It would also identify key risk areas where government policy or tenant demand for energy efficient buildings can assist decision making. (SWG 5a)	Lack of standard cost-benefit analysis (NEEF 2004)
	<b>Building Upgrade Business Case Checklist</b>	(SWG2, 3)	
	<b>Building Upgrade Business Case Advisory Notes</b>	The Business Case Advisory Notes to flesh out aspects of the business case e.g. how to treat carbon credits generated. (SWG 2,3)	
	<b>Detailed Feasibility Checklist</b>	Details all requirements of Feasibility Checklist. In engaging external specialists (SWG 2,3)	Scenario Working Group 2, 3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
	<b>Sample cost benefit analysis on buildings that use smart metres.</b>	( SWG 4)	
	<b>Guide to Contracting for Energy Upgrades</b>	Advisory document with pros, cons, risk management strategies, time considerations, outcome definitions, sample clauses, sample contractor KPIs. (SWG 2,3)	Scenario Working Group 2,3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
<b>Building - Project Delivery</b>	<b>Guide to Communicating Design Intent</b>	Including case studies (SWG 2,3)	
	<b>Guide to Sub-metering Buildings for</b>	Sub-metering tools - best practice, scope, performance, use. (SWG 1)	

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
	Performance Measurement		
	Staging Methodology	How to work around existing tenants and vice versa. (SWG 4b)	
	Energy Lease on Replacement Equipment	Pro-forma Proposal, Scope, Evaluation. (SWG 1)	
Building - Commissioning & Recommissioning	Checklist for Commissioning High Efficiency Buildings	Overview document, include stakeholders and expectations, provide map to other resources (SWG 2,3)	Scenario Working Group 2,3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
	Project Commissioning Checklist	Including scoping relative to scope of project, information required, and performance outcomes expected. (SWG 2,3)	
	Commissioning Agent	Scope of Work, Checklist, Contract. Check California Commissioning Collaborative outputs + Berkeley Laboratory outputs & relevance to commissioning & recommissioning. (SWG 2,3)	
	Real time Energy Display	Tool to provide feedback to management of real time energy data and profiling from display (SWG 1)	
Building - Operations	Energy Performance included in Maintenance contracts	Pro-forma for proposal, evaluation & scope. (SWG 1)	
	Guide to Maintaining High efficiency buildings	Advisory documents, including maintenance scope of works, checklists, report pro-formas. (SWG 2,3)	Scenario Working Group 2,3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
	Pro-forma Management Routines	Daily, weekly, monthly, annual checks (SWG 1)	
	Building Operations Manual	Sample best practice (SWG 1)	
	Efficiency Operation & Maintenance Guidelines	Covering all building life cycle issues from acquisition, operation, redevelopment and 'relifing'. (SWG1)	
		This initiative is envisaged to build a set of guidelines for energy efficiency that covers the full spectrum of building life cycle issues from acquisition, operation, redevelopment and 'relifing'. It is quite possibly the signature document that encompasses all other initiatives detailed here. (SWG5)	Energy Efficiency is not integrated into core business (LEHR SWG 2007)

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
	Contractor Performance KPIs	Pro-forma documents. (SWG 1)	
	Off shelf specification for Online Data Management System	Number of metres, what to expect, access to data, reporting capacity. (LEHR Planning Group)	
	Online Data Management System	Providing a data base of electricity, utility consumption history, accounting information to aid analysis of energy usage & reporting for voluntary, mandatory requirements incl. benchmarking for individual portfolio comparison. Supported in existing organisation. (SWG 5)	Lack of information on past total energy consumption limiting assessments (NEEF 2004)
	Building Energy Log Book	(SWG 5)	Lack of awareness of building energy use (where it goes - breakdown) (NEEF 2004)
	Sub-metering tools	Best practice performance and use (SWG 1)	
	Monitoring & Verification of High Performance Buildings for high NABERS Energy rating	Guide, Case Studies (SWG 2,3)	Scenario Working Group 2,3 noted the following barrier themes: communication; decision making; training and capability; risk management; probability of success.
Building - Ongoing Monitoring & Maintenance	New AIRAH Maintenance for efficiency Standards	This initiative takes up the new AIRAH Maintenance for Efficiency Standards and promotes this for specifying and embedding within HVAC maintenance contracts. SWG 5	Poor commissioning and maintenance of service systems (NEEF 2004)
	Trade Specific courses for each trade on building	Introduction to energy performance. (SWG1)	
	Reporting Best Practice Scope, Performance, Use	Define audience, Metrics, against objectives. (SWG 1)	
Building - Behavioural Change / Education for Behavioural Change	Communication Plan for stakeholders	(SWG 5)	Energy Efficiency is not integrated into core business (LEHR SWG 2007)
	Green Lease fit out design requirements	Requires modifications to landlord tenant relationship. (SWG 1) Being done through Investa, Department of Water, Heritage, City Switch, PCA, GBCA, CORE.	
	Fit-out Guide	Model Fit-out Guide. (SWG 4b)	
		A series of identified steps for implementation with proven financial benefits, e.g. showing payback periods. (SWG 4a)	Lack of standard cost-benefit analysis (NEEF 2004)

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
	Contractor Accreditation	High Performance Building Accreditation. (SWG 1)	
	Energy training for each trade	Introduction to Energy Performance. (SWG 1)	
	Remote and Centralised Energy Efficiency Trouble-shooters	An initiative of the 'Industry Knowledge Forum' to consist of a formal education program to train FMs to be 'energy efficiency trouble-shooters' able to readily identify energy wastage from data, usage profiles etc. (SWG 5)	Lack of specialised knowledge such as building controls (LEHR Supply Working Group 2007)
	Industry Knowledge Forum	Establishes ongoing forum for FMs to meet, share knowledge & experience around energy efficiency in operation of office buildings. Format could include each member hosting a meeting and arranging educative content - speaker, product demonstration, case studies. (SWG 5)	Lack of education and vocation programs (NEEF 2004)
Tenancy - Defining Objectives	Strategic Plan for building & tenancy design guidelines	In the form of costing plans for energy efficient design of the tenancy fit-out.. (SWG 4b)	
	Generic Auditing Template	Generic auditing template to be available in the public domain. (SWG 4a)	
Tenancy – Preliminary Costings			
	Preliminary Costing	A series of identified steps for implementation with proven financial benefits, e.g. showing payback periods. (SWG 4a)	
	Commitment by new tenant to a green lease	Both parties committed to maintain NABERS rating - base for landlord, tenancy for tenant. (SWG 4b)	
	Tenancy Brief	Framework for a Tenancy Brief with objectives including Energy Efficiency Checklists, upgrade opportunities. (SWG 4a)	Lack of understanding of physical deficiencies in building to enable appropriate assessments, existing services limitations.
	Tenancy fit-out to be compliant with building strategy for energy efficiency	(SWG 4b)	
Tenancy - Green lease contents			
	Green Lease Guide for medium, large tenancies	Several versions of Green Lease Guide + suitable clauses for each size tenancy covering: energy efficient lighting; lighting controls; selection of tenant equipment; behavioural issues. (SWG 4a)	
	Simplified Green Lease for small tenancies including setting greenhouse and energy efficiency targets.	Simplified versions of Green Lease guide for small tenancies. Guide should cover: 1. Energy Efficient lighting. 2. Lighting control. 3. Selection of tenant equipment. 4. Behavioural issues that relate to how/when equipment is turned down. 5. Sub-metering.	Potential conflict between tenancy and base building existing services. Split incentives - in

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
		(SWG 4a)	many cases the party incurring the capital cost of energy efficiency measures does not receive the saving benefits of the upgrade.
<b>Green Lease from owner perspective</b>	<b>Industry developed Green lease</b>	Aims for Tenant and Landlord collaboration covering widening comfort bands, removing make good provisions as applicable, facilitating upgrades by allowing upgrade financing expenses to be passed on to tenant as outgoings and outgoings (which should go down) become combination of operating expense and amortised upgrade costs. Set maximum occupancy levels and density. Tenant Equipment specifications. Scope, contract. Provides tenant incentives. Fund CAPEX through outgoings. (SWG 1)	Comment from SWG - As opposed to Commonwealth Government's Green Lease .
<b>Tenancy - Project Delivery</b>	<b>Project Delivery Toolkit and Case Studies</b>	A project delivery tool kit and case studies for small tenants available on line to assess how these projects were delivered, so they can relate to their own projects. (SWG 4a)	Obsolete or non-adaptable base building equipment systems or building structure which is not easily integrated with tenant upgrades. Reluctance or negativity on part of building management possibly based on view that this is extra work for them to maintain.
	<b>Project Delivery Toolkit and Case Studies for Medium, Large Tenancies</b>	A project delivery tool kit and case studies for medium, large tenants available on line to assess how these projects were delivered, so they can relate to their own projects. (SWG 4a)	Obsolete or non-adaptable base building equipment systems or building structure which is not easily integrated with tenant upgrades. Reluctance or negativity on part of building management possibly based on view that this is extra work for them to maintain.
<b>Tenancy - Commissioning &amp; Recommissioning</b>		Check if expected performance levels have been met with a 6 month review (SWG 4a)	Consider if there should be a section of the lease covering a performance review at 6 months?
	<b>Commissioning Handover</b>	Provision of tenancy fit-out documentation to building management. (SWG 4b)	
<b>Tenancy – Operations</b>			
	<b>Existing Equipment Checklist</b>	Existing equipment checklist including mechanical, electrical items within the tenancies. (SWG 4a)	
	<b>A set of on-line case studies of small &amp; medium tenancies</b>	Case studies to be directed at behavioural change, to set out initiatives that have implemented, what were the success factors, lessons learnt. Including case studies and particularly testimonials, lessons learnt, what were the drivers for management. (SWG	There is no specific function with the organisation of commercial tenants that focuses on energy

Lifecycle Stage	Initiative Name	Initiative Contents	What main Barrier is it Relevant to?
		4a)	use. Sometimes there is a specific energy manager, but often it is a sustainability, facility or communication manager (Sheehan 2007).
	Simple sets of business initiatives	Tenant Effect on Energy (SWG 1)	
Tenancy - Ongoing Monitoring and Maintenance		Building Management oversight of proposed and actual tenancy works to maintain systems integrity (SWG 4a)	
		Documentation of tenant's system provided to building management (SWG 4a)	
Tenancy - Behavioural Change / Education for Behavioural Change	Create Green Tenant Reps	(SWG 4 a, b)	

**Table 3: Brief Description of 5 Scenarios the Scenario Working Groups considered to generate initiatives, Group leaders and participants**

(See Appendix A for full brief for Scenario Working Groups and Appendix C1-C4 for all initiatives)

Scenario Number	1	2	3	4	5
Scenario Title	Existing Building - Operating Budget Only, No Upgrade Considered	Existing Building Floor by Floor Refurbishment	Whole Building Refurbishment	4a: Single floor Tenancy Upgrade in Scenario 2 Building 4b: Large Tenancy Upgrade	5a: New Sustainability Manager - Large National Property Portfolio 5b: New Facility Manager - Small Portfolio (8-10 A to C grade buildings)
Lead by	Craig Roussac	Bruce Precious	Bruce Precious	Group chose not to have a leader	Greg Johnson
Scenario Description	B grade office building CBD location Built 1985 12 storeys 15,000 NLA office space only 3 floors of car park 85% tenanted Air conditioning is a condenser water loop, packaged units and a wooden slat cooling tower in need of an upgrade. No on-site building manager Building owner pays air conditioning and	A grade office building Built 1975 30 storeys 25,000 NLA Nett leased HVAC system is induction perimeter units and VAV internal units. It is a water cooled building. One chiller is a 12 – 15 year old large centrifugal chiller and the smaller chiller is a low load reciprocating chiller, which is as old as the building. It has a 10 year old direct digital control Building Management System.	The Scenario 2 building 5 years down the track. Upgrades are likely to be focused on plant room upgrades (base building services).	4a: Single floor tenancy in Scenario 2 building in the absence of a base building lead upgrade (example of tenancy churn). Tenant seeking to upgrade their tenancy performance to the maximum level (ideally in the region of 5 stars). They will need to interact with the base building owner in a number of ways.	5a: Portfolio with several listed trusts as owners 40 premium and A grade buildings located in all mainland Australian capital cities. The buildings will reflect the activities in the other scenarios – i.e. buildings with operational budgets only seeking to improve performance, floor by floor refurbishments and whole building refurbishments. There has been a directive to

	<p>electricity</p> <p>Currently has NABERS ENERGY 2.5 stars rating and an audit outlining options to take it to 3.5 stars including:</p> <ul style="list-style-type: none"> <li>• Some plant replacement, mainly on plant that has life expired</li> <li>• Some controls modifications</li> <li>• Current maintenance arrangements are serviced on failure</li> </ul> <p><b>Goal</b> - Make the building more attractive to tenants and to “future proof” the building.</p>	<p>Asset needs repositioning in the market. The context for this landlord driven floor by floor upgrade is that the building needs a fundamental repositioning in the market within the next 5 years.</p> <p><b>Goal</b> - The best outcome in the floor by floor upgrade while keeping options open for the more fundamental upgrade, therefore, minimizing the amount of stranded capital.</p>		<p><b>4b:</b></p> <p>This scenario is as per Scenario 4 (a) but for a large tenancy in the Scenario 2 building, driven by need to refurbish the space to get it back onto the market.</p>	<p>The role is to focus on improving building performance rather than reporting building performance.</p> <p>5b:</p> <p>Under this scenario, the issues examined under Scenario 5 (a) need to be re-examined from the perspective of how things would change when working with a smaller, less well resourced portfolio.</p>
<p><b>Scenario Working Group Members</b></p>	<ul style="list-style-type: none"> <li>▪ Steven Cardwell</li> <li>▪ Ian Bentley</li> <li>▪ Lloyd Coombs</li> <li>▪ Nathan Dale</li> <li>▪ Steele Ellaway</li> <li>▪ Ivan Gorridge</li> <li>▪ Frank Hack</li> <li>▪ Alex McKenna</li> <li>▪ Grant Nichols</li> <li>▪ Nicole Plant</li> <li>▪ Craig Roussac (chair)</li> <li>▪ Gladys So</li> <li>▪ Bradley Wong</li> </ul>		<ul style="list-style-type: none"> <li>▪ Remy Augros</li> <li>▪ Cris Van Haren</li> <li>▪ Victor Goodge</li> <li>▪ Ian Tucker</li> <li>▪ Kasim Ali Khan</li> <li>▪ Lloyd Nazareth</li> <li>▪ Keith Bashford</li> <li>▪ Den Jolly</li> <li>▪ Bruce Precious</li> <li>▪ Daniel Elgawly</li> <li>▪ Lambert Seeto</li> <li>▪ Peter Scott</li> <li>▪ Arthur Vergopoulos</li> <li>▪ Andrew Doherty</li> <li>▪ Lee Tolley</li> <li>▪ Robert Starkey</li> <li>▪ Moses Rubal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Joe Zannino</li> <li>▪ Geoff King</li> <li>▪ Greg Kaplan</li> <li>▪ Desiree Sheehan</li> <li>▪ Andrew Kerr</li> <li>▪ Joe Romero</li> <li>▪ Christina Widjaja</li> <li>▪ Gordon Weiss</li> </ul>	<ul style="list-style-type: none"> <li>▪ Gary Cochrane</li> <li>▪ John Penny</li> <li>▪ Tim Bruce</li> <li>▪ Zoe Duan</li> <li>▪ Greg Johnson</li> <li>▪ David Latimer</li> <li>▪ Jim Tatis</li> <li>▪ Matthew Clark</li> <li>▪ Christina Hughes</li> <li>▪ Peter Dunn</li> <li>▪ Amy Hogan</li> <li>▪ Michael Yiend</li> <li>▪ Sally Aitken</li> <li>▪ James Vesper</li> <li>▪ Angus Gordon</li> <li>▪ Lorenzo Lun</li> <li>▪ Adam Wheatley</li> <li>▪ David Stiddolph,</li> <li>▪ Shaun Condon</li> </ul>

## **Appendix A: The detailed Brief Scenario Working Groups responded to.**

### **LOW ENERGY HIGH RISE PROJECT: DEVELOP THE SUITE OF INITIATIVES BY CONSIDERING FIVE SCENARIOS**

#### **INTRODUCTION**

The Warren Centre's Low Energy High Rise Project has now reached a critical point. So far the LEHR Project has:

- conducted a Literature Review;
- identified and prioritized supply and demand side barriers to energy efficiency;
- developed and implemented a comprehensive survey of building technical performance and management practices to understand the empirical relationships between building practices and building energy performance;
- completed an analysis of the quality of the survey data; and
- is now conducting a detailed, multi-factor analysis of the survey data, with a final report due at the end of August, 2008.

The next step is for Working Groups to consider 5 scenarios to develop:

- an **evidence-based** suite of initiatives to overcome the **non-technical barriers** to energy efficiency upgrades in existing office buildings.

The five scenarios reflect industry experience and are typical experiences in the commercial property sector. In summary, they are:

**Scenario 1 - Existing Building - Operating Budget Only, No Upgrade Considered**

**Scenario 2 – Existing Building - Floor by Floor Refurbishment**

**Scenario 3 – Whole Building Refurbishment**

**Scenario 4(a) – Single Floor Tenancy Upgrade in the Scenario 2 Building**

**Scenario 4 (b) – Large tenancy upgrade**

**Scenario 5 (a) – New Sustainability Manager - Large National Property Portfolio**

**Scenario 5 (b) - New Facility Manager - Small Property Portfolio**

To develop a suite of initiatives that will deliver a transformed market, Working Groups are encouraged to:

- really think “**outside the box**”;
- consider successful industry approaches that while not currently widespread would transform the market if they were;
- focus on what industry can effect and implement rather than policy suggestions that require government action, although some initiatives may require complimentary policy measures and should be noted;
- explore and propose new value systems, and new implementation approaches that are really different from the current way of doing business - i.e. not just marginal improvements to current processes;
- consider if current industry KPIs are barriers and what needs to change; and
- build on earlier work by reviewing the initiatives identified in the Literature Review, as well as initiatives suggested in earlier meetings (see LEHR starter pack).

## SCENARIO STEPS

For each scenario, Scenario Working Groups will be formed, and in developing the initiatives will consider the following steps:

- Getting the scope of works right
- Framing the budget
- Obtaining funding (Are there existing or unexplored financial products to better facilitate the project?)
- Managing required resources and time to execute the works successfully
- Securing the required competencies, both internal and external
- Managing relationships with tenants before, during and after the necessary activities in each scenario
- Commissioning the scope of works correctly
- Monitoring, reporting and verifying the impact of these works on energy efficiency
- Tuning the new systems correctly
- Educating appropriate technical staff and occupants
- Maintaining the ongoing level of building energy performance

## ROLES REPRESENTED IN SCENARIO WORKING GROUPS

To be successful each Scenario Working Group needs to have appropriate representatives of key stakeholders able to influence energy efficiency outcomes in existing buildings. In composing Working Groups we hope to draw on the experience of current practitioners and importantly the experience of those currently outside existing management and delivery structures:

- Facilities Manager
- Project Manager
- Finance (accountant)
- Investment brokers
- Insurance industry
- Funds Manager
- Asset Manager
- Real estate agents
- Agent / Tenant Representative
- Engineer / design consultant ( + Architect for Scenario 2)
- Sustainability Manager / ESD Consultant
- Energy & Greenhouse Consultant with knowledge of carbon markets, ratings and regulation
- Project Finance (Scenario 3)
- Enhanced Project Management capability (Scenario 3)
- Design Consultant with understanding of BCA Section J (Scenario 3)
- Computer Simulation Capability (Scenario 3)
- Skilled Tenant Project Director (Scenario 4)
- Tenant Corporate Services Manager (Scenario 4)
- Occupant behavioural scientist
- Psychologist – change management agent

## DETAILED DESCRIPTION OF THE SCENARIOS

### **Scenario 1 Working Group - Existing Building - Operating Budget Only, No Upgrade Considered**

#### **(Scenario Working Group Leader - Craig Roussac)**

This B grade building is located in a CBD precinct, built in 1985, 12 storeys and 15,000 NLA of office space only with 3 floors of car park. It is 85% tenanted. The air conditioning is a condenser water loop, packaged units and a wooden slat cooling tower that is in need of an upgrade. There is no on-site building manager and the building owner pays the air conditioning and electricity. The goal is to make the building more attractive to tenants and to “future proof” the building.

The building currently has a 2.5 star NABERS ENERGY rating and an audit outlining options to take it to 3.5 stars including:

- Some plant replacement, mainly on plant that has life expired
- Some controls modifications
- Current maintenance arrangements are serviced on failure

### **Questions for Scenario 1**

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

1. What (possibly new) internal and external resources are needed?
2. What factors would impede or enable the project? What would stop the project dead in its tracks?
3. How would you address these barriers?
4. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

### **Scenario 2 Working Group– Existing Building Floor by Floor Refurbishment**

**(Scenario Working Group Leader - Bruce Precious)** Note: the Working Group considered both Scenarios 2, 3.

This A grade office building is 30 storeys with 25,000 NLA. It was built in 1975 and is net leased. The HVAC system is induction perimeter units and VAV internal units. It is a water cooled building. One is a 12 – 15 year old large centrifugal chiller and the smaller chiller is a low load reciprocating chiller, which is as old as the building. It has a 10 year old direct digital control Building Management System.

This asset needs repositioning in the market. The context for this landlord driven floor by floor upgrade is that the building needs a fundamental repositioning in the market within the next 5 years. The goal is the best outcome in the floor by floor upgrade while keeping options open for the more fundamental upgrade, therefore minimizing the amount of stranded capital.

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

1. What (possibly new) internal and external resources are needed?
2. What factors would impede or enable the project? What would stop the project dead in its tracks?
3. How would you address these barriers?
4. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

### **Scenario 3 Working Group– Whole Building Refurbishment**

**(Scenario Working Group Leader – Bruce Precious)**

This scenario is the Scenario 2 building 5 years down the track. Upgrades are likely to be focused on plant room upgrades (base building services).

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

1. What (possibly new) internal and external resources are needed?
2. What factors would impede or enable the project? What would stop the project dead in its tracks?
3. How would you address these barriers?

4. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

#### **Scenario 4(a) Working Group – Single floor Tenancy Upgrade in Scenario 2 Building**

##### **(Scenario Working Group Leader – Group chose not to have a leader)**

This scenario is for a single floor tenancy within the Scenario 2 building in the absence of a base building lead upgrade (example of tenancy churn). The tenant is seeking to upgrade their tenancy performance to the maximum level (ideally in the region of 5 stars). In doing, so they will need to interact with the base building owner in a number of ways. The questions to be considered are:

- What (possibly new) internal and external resources are needed?
- What factors would impede or enable the project? What would stop the project dead in its tracks?
- How would you address these barriers?
- Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?
- What would achieve the fastest results, and what would need to be in place to make this happen?
- What synergies exist between the refurbishment of the base building and the refurbishment of the tenancy? How could these synergies most effectively be exploited?
- What conflicts exist between the refurbishment of the base building and the refurbishment of the tenancy? How could these conflicts most effectively be avoided?

#### **Scenario 4 (b) – Large Tenancy Upgrade**

This scenario is as per Scenario 4 (a) but for a large tenancy in the Scenario 2 building, driven by need to refurbish the space to get it back onto the market.

#### **Scenario 5 Working Group (a) – New Sustainability Manager - Large National Property Portfolio (several listed trusts as owners)**

##### **(Scenario Working Group Leader - Greg Johnson)**

This is a portfolio with several listed trusts as owners with 40 premium and A grade buildings located in all mainland Australian capital cities. The buildings will reflect the activities in the other scenarios – buildings with operational budgets only seeking to improve performance, floor by floor refurbishments and whole building refurbishments. There has been a directive to implement corporate social responsibility policies across the portfolio in the previous year which has led to the appointment of the sustainability manager. The role is to focus on improving building performance rather than reporting building performance.

Define and procure the resources required considering the above mentioned steps and responding to the following questions:

1. What (possibly new) internal and external resources are needed?
2. What factors would impede or enable the project? What would stop the project dead in its tracks?
3. How would you address these barriers?
4. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

#### **Scenario 5 (b) - New Facility Manager - Small Portfolio (8-10 A to C grade buildings)**

##### **(Scenario Working Group Leader - Greg Johnson)**

Under this scenario, the issues examined under Scenario 5 (a) need to be re-examined from the perspective of how things would change when working with a smaller, less well resourced portfolio.

## Appendix B: Barriers Identified, Prioritised by Supply & Demand Working Groups

Ref #	Barrier Description	
<b>DEMAND WORKING GROUP BARRIERS</b>		
1	Lack of information (SKM 2006)	Extr
	Expected payback time for commercial tenants is around 3 years (SKM 2006)	Ext.
2	Building occupants do not fully recognise the health and productivity benefits from having better indoor environment quality (SBLP, 2006).	H
	Lack of visibility of both energy efficiency measures and their benefits (Pears 2007).	H
3	Lack of information on the positive effects of green designs on the productivity of organisations working in office buildings (Kosholeva 2007)	H
4	The split money flows between payers and users (AEC 2005)	H
5	High investment hurdles (AEC, 2005)	H
6	Perceived risk with reliability, operation, maintainability, suitability of new technologies (SKM 2006)	H
7	The budgeting issues (Jopson 2006) (Energy is a low order item of low value)	H
8	Low management priority (SKM 2006)	H
9	There is no specific function with the organisation of commercial tenants that focuses on energy use. Sometimes there is a specific energy manager, but often it is a sustainability, facility or communication manager (Sheehan 2007).	H
	Tenants are left out in the design process (Kosholeva 2007)	H
10	Corporation culture that is not committed to green issues, out of sync with staff issues.	H
11	Market does not have clear understanding of what each Australian rating tool measures (SBLP 2006).	M
12	Transaction costs for project management, securing capital budgets, and investigating alternatives (SKM 2006)	M
14	It often takes 18 months to 2 years of occupation before you have a reasonable set of energy bills to base your occupancy ratings on (Field 2007).	M
	Lack of interest by staff in a tenant organisation in energy efficiency	M
15	The people that make decision on tenancy accommodation are affected by the function of their firm, their institutional context, opportunistic behaviour and personal preferences (Ross, 2003).	L
16	Lack of prestige for energy managers (AEC 2005)	L
	Major refurbishments take a long period of time (> 1 year) and require tenants to operate the building at least for a year before the ABGR can be re-checked (Hennessy 2004)	L
17	The CBD office market is not rational neither perfectly competitive, because of a lack of a coherent centralised market place and incomplete and poorly disseminated information processes (Ross 2003).	L
19	Higher rent premium (APEC 2005)	?
<b>23 SUPPLY WORKING GROUP BARRIERS BELOW</b>		
24	Competition for capital (LEHR SWG 2007)	H

Ref #	Barrier Description	
25	Whole building refurbishment is v. difficult due to varying timing of tenant lease expiry for a given building (LEHR SWG 2007)	H
26	Unwillingness to upgrade existing equipment to higher EE before end of serviceable life (LEHR SWG 2007)	H
27	Lack of awareness of building energy use (where it goes - breakdown) (NEEF 2004)	H
28	Limited understanding of potential cost effective energy actions (NEEF 2004)	H
29	Poor commissioning and maintenance of service systems (NEEF 2004)	H
30	Lack of knowledge transfer/feedback between designers and operators (LEHR SWG 2007)	H
31	Split incentives and split responsibilities between developer, owner and tenant (NEEF 2004, LEHR SWG 2007)	H
32	Short-term costs versus life-cycle costing (LEHR SWG 2007)	H
33	Absence of reward for outstanding design (LEHR SWG 2007)	H
34	Existing low cost of energy (NEEF 2004)	H
35	Inertia to change (NEEF 2004)	H
36	Risk Aversion (PC 2005)	H
37	Energy Efficiency is not integrated into core business (LEHR SWG 2007)	H
38	Short time horizons (PC 2005)	H
39	Client design briefs to consultants and builders do not take energy efficiency into consideration (NEEF 2004) (LEHR SWG 2007)	H
40	Accounting practices favour revenue streams over cost reduction strategies (NEEF 2004)	H
41	Limitations with network providers constraining opportunities for building energy efficiency e.g. wind, solar feed-in (LEHR SWG 2007)	H
42	The use of 'rules of thumbs' and routines affecting the ideal choice (PC 2005)	H
43	Insufficient time in design and retrofit planning stages to explore alternative design options (LEHR SWG 2007)	H
44	No mandatory disclosure of energy performance (LEHR SWG 2007)	H
	Lack of information on past total energy consumption limiting assessments (NEEF 2004)	M
45	Jurisdiction specific standards increasing complexity of design and construction (NEEF 2004)	M
46	Implementation cost of EE technologies & processes which entail additional costs.(PC 2005)	M
47	Lack of education and vocation programs (NEEF 2004)	M
48	Lack of specialised knowledge such as building controls (LEHR SWG 2007)	M
49	Lack of knowledge of benchmarking data (such as past energy data) and rating tools. (LEHR SWG 2007)	M
50	Reduced incentives for private providers to supply information (PC 2005) (LEHR SWG 2007 added control of IP)	M
51	Lack of effective incentive schemes (LEHR SWG 2007)	M

Ref #	Barrier Description	
52	No repeat purchasing of building services equipment (PC 2005)	M
53	Risk and uncertainty reducing the level of investment or restricting access to finance (PC 2005)	M
54	Uncertainty within an organisation on outcome of energy efficiency projects (NEEF 2004)	M
55	Loose fit (flexible) design in base building overtaken by value management (LEHR SWG 2007)	M
56	Services designers often ignored (NEEF 2004)	M
57	Adverse selection, whereby supplier can promote products as energy efficient, even if they are not (PC 2005)	M
58	Lack of understanding of the consequences of rapidly changing expectations re environmental impact of buildings (LEHR SWG 2007)	M
59	Lack of standard cost-benefit analysis (NEEF 2004)	M
60	Services can encourage energy waste as part of the service. Energy waste is a prerequisite for quality - combine - <i>"Perception that high quality includes high energy service and high level of waste"</i> (LEHR SWG 2007)	M
61	Decision makers not resourced to implement energy efficiency projects despite short paybacks (6 - 12 months)(LEHR SWG 2007)	M
62	Historical budget allocations EEF 2004)	M
63	Procurement policies do not encourages innovative technologies (LEHR SWG 2007)	M
64	Industry cynicism about potential performance of new energy efficiency technologies(LEHR SWG 2007)	M
65	Management not responsive to significant energy efficiency opportunities identified in due diligence reports (LEHR SWG 2007)	M
66	Cost of obtaining information on energy efficiency (PC2005)	L
67	No means of capturing the benefits of being the first mover (PC 2005)	L
68	Moral hazards for energy efficiency auditors after contracts are signed (PC 2005)	L
69	BCA strategies seen as a monetary waste hence endeavour to avoid BCA upgrades (LEHR SWG 2007)	L
70	Satisfying rather than exceeding the brief (LEHR SWG 2007)	
71	Decision making that satisfies minimum requirements rather than aiming for best practice (LEHR SWG 2007)	
72	No legislation driving compliance with "energy efficient" parameters (LEHR SWG 2007)	
73	Middle management inertia irrespective of senior management commitment to energy efficiency (LEHR SWG 2007)	
74	Conservative approach during design phase (high inbuilt safety factors i.e. over-engineering) leading to energy inefficiencies (LEHR SWG 2007)	

## Appendix C: Initiatives Generated By Working Groups.

**1    Table C1: All initiatives generated by Scenario Working Group 1:**

Initiative Name	Initiative Contents
<b>Green Lease</b>	Increase comfort bands, remove make good requirements where applicable, trade-off outgoings against capex
<b>Green Lease</b>	Encourage landlord, tenant collaboration
<b>Green Lease</b>	Fit-out design requirements
<b>Green Lease</b>	Tenant Energy Audits
<b>Green Lease</b>	Maximum occupancy levels / density
<b>Green Lease</b>	HVAC Charges made explicit in monthly lease
<b>Green Lease</b>	Tenant equipment specifications
<b>Green Lease</b>	Tenant incentives
<b>Tenant Guides</b>	Tenant Effects on Energy
<b>Energy Lease on Replacement Equipment</b>	Pro-forma for proposal, evaluation & scope
<b>Real Time Energy Display</b>	
<b>Energy Performance included in maintenance contracts</b>	Pro-forma for proposal, evaluation & scope
<b>Management Routines</b>	Pro-forma daily/weekly/monthly annual checks
<b>Sub-metering tools</b>	Best practice scope, performance & use
<b>Reporting</b>	Best practice scope, performance & use
<b>Revolving Fund</b>	How to Guide for reinvesting savings in building
<b>Trade Specific courses for each trade on building</b>	Introduction to energy performance
<b>Contractors performance KPIs</b>	Pro-forma documents
<b>Contractors Accreditation</b>	High Performance building accreditation
<b>Building Operations Manual</b>	Samples, best practice

**2    Table C2: All initiatives generated by Scenario Working Group 2 & 3:**

Initiative Name	Initiative Contents
<b>Setting targets for energy &amp; greenhouse performance checklist</b>	Checklist to include perspective on age of property, current rating, age of systems, planned capex. opportunity to convert opex. to capex, expected tenant demands
<b>Upgrading Buildings for Hi Performance</b>	Overview document, include stakeholders and expectations, provide map to other resources

<b>Pre Feasibility Scope of Work</b>	
<b>Pre Feasibility Checklist</b>	Information that should be provided to a consultant conducting a Pre Feasibility, incl. advice on how/where to get smart meter data
<b>Assessing Pre Feasibility Proposals</b>	
<b>Pro-forma Pre Feasibility Contract</b>	
<b>Pro-forma Pre Feasibility Report</b>	
<b>Using the Pre Feasibility Guide</b>	
<b>Building Upgrade Business Case Checklist</b>	
<b>Building Upgrade Business Case Pro-forma</b>	
<b>Building Upgrade Business Case Advisory Notes</b>	
<b>Building the Business Case</b>	
<b>Contracting for building upgrades</b>	Advisory document with pros, cons, risk management strategies, time considerations, outcome definitions
<b>Detailed Feasibility Checklist</b>	Details all requirements of
<b>Communicating Design Intent</b>	
<b>Communicating Design Intent Case Studies</b>	
<b>Managing Energy Efficiency Upgrades</b>	
<b>Managing Energy Efficiency Upgrades</b>	Ensuring success for all stakeholders
<b>Maintaining Energy Efficient Buildings</b>	Advisory documents, including maintenance scope of works, checklists, report proformas
<b>Project Commissioning Checklist</b>	Including scoping relative to scope of project, information required, performance outcomes expected
<b>Commissioning Agent Scope of Work</b>	
<b>Managing Commissioning</b>	
<b>Monitoring and Verification for NABERS Energy</b>	

**3 Table C3: All initiatives generated by Scenario Working Group 4a & 4b:**

<b>Initiative Name</b>	<b>Initiative Contents</b>
<b>Tenancy Brief</b>	Framework for a Tenancy Brief with objectives including Energy Efficiency Checklists, upgrade opportunities
<b>Auditing Template</b>	Generic auditing template to be available in the public domain
<b>Existing Equipment Checklist</b>	Existing equipment checklist including mechanical, electrical items within the tenancy
	A series of identified steps for implementation with proven financial benefits, e.g. showing payback periods

<b>Simplified Green Lease</b>	Simplified versions of Green Lease guide for small tenancies. Guide should cover: 1. Energy Efficient lighting. 2. Lighting control. 3. Selection of tenant equipment. 4. Behavioural issues that relates to how/when equipment is turn down. 5. Sub-metering
<b>Simple case studies</b>	Simple sets of business initiatives: case studies / testimonials
	Sample of simple Green Leases for Tenants review. Access to Green Lease clauses (within the Green Lease guide).
<b>Project Delivery Toolkit</b>	A project delivery tool kit and case studies for small tenants available on line to assess how these projects were delivered, so they can relate to their own projects.
<b>Regular Performance Reviews</b>	Check if expected performance levels has been met with a 6 months review
<b>On-line case studies</b>	Develop a set of online case studies of organisation that have successfully implemented behavioural change including what initiatives they used or what were they success factors, or learning's.
	Formal, regular communication between lessors and tenants on building performance.
	Building management oversight of proposed and actual tenancy works to maintain systems integrity.
	Sharing energy performance data between tenants and building management.
	Documentation of tenants system provided to building management.
<b>Strategic Plan for building &amp; Tenancy Design Guidelines</b>	A strategic plan for building and tenancy design guidelines.
	Preliminary but realistic costing and design

**4 Table C4: All initiatives generated by Scenario Working Group 5:**

<b>Initiative Name</b>	<b>Initiative Contents</b>
100 Day Plan to initiate data collection and identify quick wins	This initiative would consist of the creation of a tool and a set of guidelines on how to take a building from acquisition through its first 100 days to achieve quick wins and begin a longer term action plan for energy efficiency.
<b>New AIRAH Maintenance for Efficiency Standards</b>	This initiative takes up the new AIRAH Maintenance for Efficiency Standards and promotes this for specifying and embedding within HVAC maintenance contracts.
<b>Building Energy Log Book</b>	Needs input from working group
<b>Communication Plan</b>	Needs input from working group
<b>Efficiency Operation and Maintenance Guidelines</b>	This initiative is envisaged to build a set of guidelines for energy efficiency that covers the full spectrum of building life cycle issues from acquisition, operation, redevelopment and 'relifing'. It is quite possibly the signature document that encompasses all other initiatives detailed here.
<b>Due Diligence Checklist</b>	This is a tool that would assist teams involved in building acquisitions to identify critical energy efficiency issues during the due diligence process and ask the right questions to gather information ie: NABERS Energy ratings, electricity consumption history, load profiles, energy savings action plans etc .

<p><b>Acquisition Feasibility Model</b></p>	<p>This tool would take the information gathered during due diligence process and enter into a model to determine the feasibility and investment required to improve a building's energy performance. This would assist the decision making process in determining current and future capital value, IRR and level of risk associated with a building based on its NABERS Energy rating.</p>
<p><b>5 Year Asset Energy Improvement Plan</b></p>	<p>This is the next step from the 100 day action plan. It would set out the necessary actions and planning principles for a longer term action plan for energy efficiency.</p>
<p><b>Standard Business Case Template</b></p>	<p>This tool would assist in the more robust cost benefit analysis of energy efficiency initiatives and present a sound financial proposition and investment return in both financial and non financial terms. It would also identify key risk areas where government policy or tenant demand for energy efficient buildings can assist decision making.</p>
<p><b>On Line Data Management System</b></p>	<p>Another tool that would provide a database of electricity and utility consumption history and account information to aid analysis of energy usage and reporting for both voluntary and mandatory requirements. Would include benchmarking capability for individual building and portfolio comparison. Would probably need to be supported by an existing industry association such as FMA, PCA or similar.</p>
<p><b>Industry Knowledge Forum (Facility Manager/Sustainability Manager)</b></p>	<p>This is an initiative that would seek to establish an ongoing forum for facility managers to meet and share knowledge and experience around energy efficiency in the operation of office buildings. The format could include each member hosting a meeting and arranging for some form of educative content such as guest speakers, product demonstrations, case studies presentation etc.</p>
<p><b>Remote and Centralised Energy Efficiency Trouble-shooters</b></p>	<p>As an initiative of the 'Industry Knowledge Forum', this would consist of a formal education program that would train facility managers to be 'energy trouble shooters' able to readily identify energy wastage from examining data, usage profiles and inefficient plant operation and devising and implementing remedial measures.</p>

## Appendix D: Initiatives Generated by Meetings in Sydney & Brisbane.

**1 Table D: initiatives generated by three meetings in Brisbane & Sydney**

Initiatives	Meeting Attendees
Landlord guarantee to tenants on maximum energy use	Rod Hraiki George Deragopian Adam Wheatley Stephen Bulter Tony Ceapa PC Thomas Lena Thomas Craig Roussac Greg Johnson Tony Marker Roger Blackwell Jamie Wan Paul Riordan David Latimer Ray Thompson John Dunlop Alex Hartman Steve Hennessy Greg Wallace
Whole precinct project for commercial CBD buildings to investigate the integration of all the systems.	
Simple green guide for tenants. Tenants information pack.	
Prototype case studies to illustrate energy efficiency refurbishment. Case studies for new technologies, products.	
Government lead by example	
Promote national green lease	
Standardised tenancy agreement (legal) clauses.	
Education program for owners, tenants, service providers. Train more energy auditors. Skills building program for energy efficiency. Tenant Education Initiatives. Education and communication strategy to promote CBA.	
Replicate programs run by major property owners to owners of B, C, D grade buildings.	
Empower tenants including standard lighting controls & AC set points.	
Reduction of Capital Gains Tax for investors and developers	
Tax break for published audit on energy efficiency.	
Inefficient building network levy (tax)	
Accelerated depreciation on energy saving equipment	
Incorporate energy efficiency into due diligence	
Optimise effectiveness of \$90 million incentive and public knowledge to ensure triple bottom line	
Tradeable carbon credit for energy reductions for the organisation who funds the reduction. Investigate carbon trading opportunities.	
Mandatory disclosure of energy use / energy ratings at sale / lease	
Mandatory green power purchase above set limits.	
Mandatory NABERS Energy Rating for all office buildings & tenancies	
Establish national energy efficiency targets	
Create a National Standard of Energy Efficiency Measurement.	
Sustainability trigger to invoke BCA type upgrades.	

Capped energy consumption allowance for new buildings.
Resolve conflicting regulatory requirements.
Regulation of technology to cut out lower, ineffective products.
Legislation to reduce emission cut-offs for EEO.
Recommissioning Program
Preparation of plan for Green Business Program
Installing sub-metering/energy/water monitoring.
Develop a valuation protocol to recognise energy efficiency
Create an energy efficiency information portal
Establish energy benchmark for existing buildings
Create opportunities for user to use visualisation techniques. RE impediments to efficiency and replicate.
Visual rating & metering of tenant energy usage
Develop an Australian Standard for commissioning. Implementation and measurement.
Develop a maintenance protocol for energy efficiency.
Online Building Operators Accreditation Scheme
Develop CBA focussed on B,C and D grade buildings, types and technologies

## Appendix E: Initiatives Identified by Literature Review.

Table E: Initiatives identified by Literature Review:

Coupling incentives for whole building energy assessments with equipment incentives (e.g. cover 50% of assessment up front) (AEC 2005)
Instead of focussing on high standards, focus on high incentives for emerging technologies (AEC 2005)
Upstream interventions & manufacturers partnerships by financing R&D and incentives to reduce the cost of goods (CEO 2005)
Standardisation within the development and design process (Lutzenhiser 2000).
Training of real estate agents & appraisers (Lockwood 2006)
Engage insurance industry to explore risk reduction (Lockwood 2006)
Develop case studies using risk management as a context for retro-commissioning including the development of a retro-commissioning services infrastructure (CEO 2005; Lockwood 2006)
Extensive energy audits often not implemented, so tailor the requirements to meet the need of the customer (AEC 2005)
Energy analysis reports approved by program sponsors, to bolster confidence of customers (AEC 2005)
Support "trade allies" (AEC 2005)
Focus on specific market segment, e.g. comprehensive chiller retrofits (AEC 2005)
Information gate-way with information on efficiency programs and services offered by different local, state and federal institutions (CEO 2005)
Educate customers by "shadow bills" and info on peak and off-peak prices to trigger demand response (CEO 2005)
Branding energy efficiency programs (CEO 2005)
Leasing contracts should encourage tenants to reduce operating costs (RICS 2005)
Communication of green value to occupier should improve (RICS 2005)
Facilitate information access to building and construction industry (PWC 2002)
Establish collaborative projects with building owners, utilities and the Climate Control Industry to retrofit HVAC systems with sub metering systems and demonstrate use of the resulting data to building managers (McCan 2006)
Demonstrate system retrofits with low cost wireless data logging systems monitoring HVAC performance, comfort conditions and air quality and demonstrate results to building managers (McCan 2006)
Design and demonstrate contractual arrangements allowing stakeholders to share the costs and risks of investment in new equipment (McCan 2006)
Establish practices and contracts that allow facilities managers and contractors to share and be acknowledged for energy savings captured for building owners and tenants (McCan 2006)
Develop material on HVAC systems into Continuing Professional Development (CPD) programmes (McCan 2006)
Develop quality marks and certification standards for different classes of Climate Control practitioners (McCan 2006)
Negotiate commitments from building owners to create engineer cadet positions on building mechanical services (McCan 2006)
Develop training material and sponsor specialist conferences on Climate Control (McCan 2006)
Make energy relevant to the market (Lutzenhiser 2000)
Accounting standards should improve (RICS 2005)
Support innovative programs in building sector (PWC, 2002)
Encourage collaboration in the building & construction sector (PWC 2002)

Level-playing field required to make the building market appreciate green buildings (Freehills 2004)
Special tax deductions for green building practices (GBCA 2006)
Green building tax credits for developers (GBCA 2006)
Introducing credits that increase net dividend returns for Socially Responsible Investments (GBCA 2006)
Amendment of Income Tax Assessment Act to offer a green building incentive (GBCA 2006)
Increase Research & Development tax concessions to promote innovation (GBCA 2006)
Policies and procedures allowing utilities to claim the energy savings in commercial buildings (Lockwood 2006)
Historical energy consumption and energy ratings for all commercial buildings (Lockwood 2006)
Require utilities to update the energy benchmarks with each billing cycle including referrals to retro-commissioning & retrofit programs (Lockwood 2006; CEO 2005)
Develop mandatory energy efficient procurement policies and establish strong central product assessment office to evaluate the efficiency, suitability and functionality of products purchased (CEO 2005)
Support introduction of MEPS and energy labelling programs for all components of HVAC systems (McCan 2006)
Develop economic incentives for best practice commissioning through regulatory and compliance requirements for commissioning (McCan 2006)
Encouraging demand institutionalisation in the market place (Lutzenhiser 2000)
Certification which monitors both the calculated energy efficiency in design as well as the actual energy consumption in buildings (Bordass 2006)
New valuation methodologies to quantify important green building factors like productivity and long-term life cycle costs when determining real estate values (Lockwood 2006)
Reliable building-rating and performance measurement for both construction and renovation (Lockwood 2006)
Deliver energy audits for buildings online (Lockwood 2006)
Develop methods to value non-energy benefits of energy savings in cost-effectiveness calculations (Lockwood 2006; AEC 2005)
Integrated whole building diagnostic testing & repair including non-energy benefits in cost-effectiveness calculations (CEO 2005; Lockwood 2006)
Energy efficiency clauses incorporated into commercial leasing (CEO 2005)
Develop risk assessment functions that examine the technology mix offered by energy efficiency programs (CEO 2005)
Interagency program coordinator for all energy efficiency programs (CEO 2005)
Work is needed by the real estate, financial, appraisal and green building sectors to improve how green building value is appraised (RICS 2005)
Integrated design process on basis of extended values is required (RICS 2005)
Development of Construction Performance Management contracting, whereby the performance of developers and contractors is linked to agreed KPIs and contractors have accountability and an incentive to meet the objectives of the owners (Mulholland et al. 2005)
Develop a scheme of Best Practice for Installation and Commissioning of HVAC systems (McCan 2006)
Develop a scheme of Best Practice for Maintenance of HVAC systems (McCan 2006)
Develop a Building Log book for Australian conditions that allows for the actual and/or virtual storage and capture of all system performance, operation and maintenance data (McCan 2006)
Develop a template for a Chain of Custody Documentation Standard for HVAC systems (McCan 2006)

## Appendix F: Full Report of Scenario Working Group 1

### DEFINITION OF THE SCENARIO:

Scenario 1 Working Group - Existing Building - Operating Budget Only, No Upgrade Considered  
(Scenario Working Group Leader - Craig Roussac)

This B grade building is located in a CBD precinct, built in 1985, 12 storeys and 15,000 NLA of office space only with 3 floors of car park. It is 85% tenanted. The air conditioning is a condenser water loop, packaged units and a wooden slat cooling tower that is in need of an upgrade. There is no on-site building manager and the building owner pays the air conditioning and electricity. The goal is to make the building more attractive to tenants and to “future proof” the building.

The building currently has a 2.5 star NABERS ENERGY rating and an audit outlining options to take it to 3.5 stars including:

- Some plant replacement, mainly on plant that has life expired
- Some controls modifications
- Current maintenance arrangements are serviced on failure

### Questions for Scenario 1

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

5. What (possibly new) internal and external resources are needed?
6. What factors would impede or enable the project? What would stop the project dead in its tracks?
7. How would you address these barriers?
8. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

<b>Members:</b>	Steven Cardwell	Commonwealth Bank (Facilities Manager)
	Ian Bentley	CBRE (Building Operations)
	Lloyd Coombs	EnviroLite (National Sales Manager)
	Nathan Dale	Intact Group (Property Services Contractor)
	Steele Ellaway	GE (Asset Manager)
	Ivan Gorridge	Investa (Chief Financial Officer)
	Frank Hack	Crown Project Services (Corporate Property Specialist)
	Alex McKenna	Dexus (Sustainability)
	Grant Nichols	Investa (Fund Manager)
	Nicole Plant	Stockland (Fund Manager)
	Craig Roussac (chair)	Investa (Sustainability, Safety, Environment)
	Gladys So	Steensen Varming (Services Engineer)
	Bradley Wong	Stockland (Project Manager)

### HEADLINE Solutions;

“A green improvement program”

- Setting improvement schedule to 2012 for both tenants and contractors
- Steps to be recognised in leases and the leasing process

“Align tenant and landlord interests”

- Co-sharing of benefits through leasing arrangements

“Establish a comprehensive building services upgrade and maintenance agreement”

- Scope to cover building services design, finance, upgrade and maintenance.

### Background

The objective of this scenario is to maximise the energy efficiency of an existing Grade B building in the “business as usual” approach, with operating budget only. A conventional major building services upgrade is not possible. The goal is to make the building more attractive to tenants and to “future proof” the building.

### Principal objectives

Produce 3-5 initiatives to overcome the barriers of this scenario by:

1. Understanding the constraints of the Scenario.
2. Defining and describing the success/ outcome in 2012.

### SWOT ANALYSIS

#### Strengths

- 85% occupied
- 3 levels of carpark (potentially may also be converted to retail, car washing or higher value use to generation more income, esp if car pooling is successful).
- Located in a CBD.

#### Weaknesses

- Existing equipment: condenser water loop, floor packaged units and cooling tower. (Alternative equipment configuration should be considered.)
- Operating budget only
- Existing Building
- No building manager on site
- Service on failure

#### Opportunities

- The lease expiry of existing tenant (85% occupancy). The consequence of such should be addressed. If possible, upgrade work can be performed over the 4 years period to 2012.
- Implementation of innovative operation lease.
- Develop a 5 years strategic plan for the building
- Appoint Site manager
- Appoint recognised maintenance contractor
- Produce maintenance specification
- Monitor the performance of building and identify KPIs, this will help to assess the contractors' performance.
- Investigation on alternative financial agreement (e.g. leasing agreement)
- Change of existing maintenance regime (from serviced on failure to regular maintenance)
- Increase level of expertise
- Building owners to take the responsibility of staff training; ensure the core competency level of maintenance provider
- Consultants to educate the technicians
- Ensure the transfer of knowledge through building management
- Identify the accountability of the stakeholders

#### Threats

- At present, the energy performances of commercial buildings are not connected to the Grading of building. (i.e. Premium, A, B, C or D)
- Cost of occupancy, rent, outgoing are major considerations for tenants.

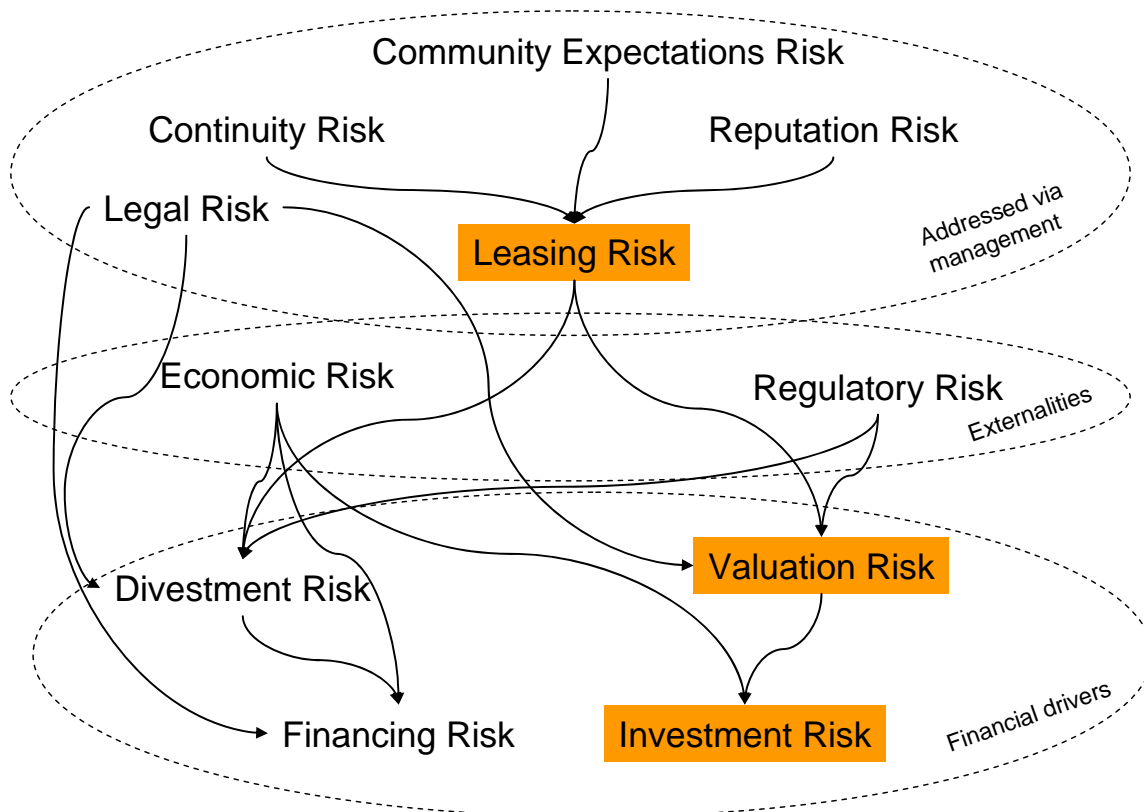
Key external factors influencing the scenario (i.e. Unable to influence/adjust)

- Investors
- Regulators
- Government
- Owners/ Financiers

Important 'scope limiting' questions

- Q: Is the building under gross lease or net lease?
- A: The lease agreement can greatly affect the potential of equipment upgrade/replacement (i.e. cooling tower/ control modification). Therefore it is important to consider implications of both structures.
- Q: Is energy use the only focus of this exercise? Will water conservation be considered as part of scheme?
- A: The major focus of this project is on energy use of high rise (>6 stories) commercial buildings. Other issues identify during the progress will be complimentary.
- Q: Is achieving 3.5 Stars NABERS ENERGY part of the goal of this scenario?
- A: The group agreed that the achievement of 3.5 Stars NABERS ENERGY will not be part of the goal, but as an inspirational target. The major focus is to make the building more attractive to tenants and to "future proof" it.
- Q: What operating budget is available?
- A: Reference value will be obtained from PCA
- Q: Should we consider the implications of emissions trading scheme?
- A: Yes.

The major risks identified for this scenario



General Observation

- "Valuation" is the key driver of all business cases, which should also provide the incentive to improve energy efficiency of the building over time. (I.e. shifts tenant expense from outgoings to rent).

Our Dream/ Definition of Future Proof

1. Compliant
2. Attractive to Investors (close out risk)
3. Attractive to Tenants (Rent, Reliable, Staff Appeal)
4. Cheap/ efficient to run
5. Easy to run (tenant support)
6. Fully leased & Strong covenants

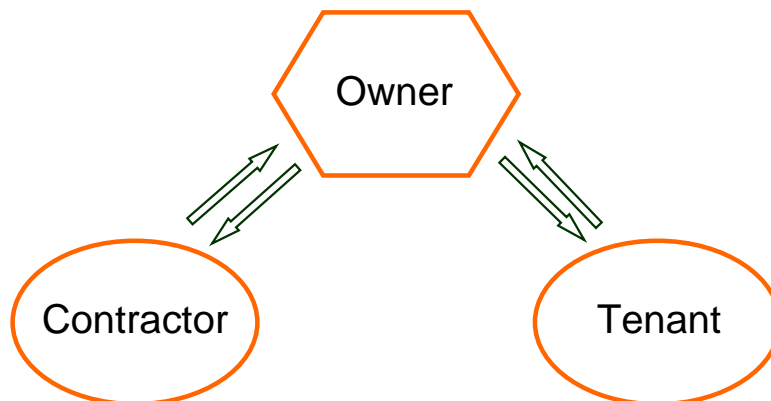
MAJOR INITIATIVES

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Focus areas, in order of Importance:

- Tenants (1)
- Equipment/ Plant (2)
- Building Manager/ Management (2)
- Maintenance/ Contractors (2)

The objective of initiatives should focus on the co-sharing/gaining of benefits between tenant, landlord and contractor, within the given constraints.



1. Tenant related initiatives:

- Green Lease
  - Address negative clauses, by:
    - widening comfort band
    - removing "make good" requirement for items that can be retained
    - facilitating upgrades by allowing upgrade financing expenses to be passed to tenant as outgoings – outgoings become a combination of operating expense (which should go down) and amortisation of upgrade costs.
  - Condition report which provides a list of items that may not need to be 'made good' at end of lease.
  - Encourage landlord & tenant collaboration.
  - Introduce leasing arrangement that includes the following items:
    - performance target for each year
    - efficient Lighting
    - lower performance (e.g. lift)

- flow restrictors (i.e. improve energy efficient through reduction of hot water consumption)
- occupancy detectors
- real time monitoring of equipment
- minimum tenant equipment performance
- Fitout Design Requirements:
  - include energy performance initiatives (i.e. Maximum/standardise \$/m2 tenant lighting energy cost) and
  - occupant comfort and productivity enhancements, eg access to natural light.
- Independent Energy Audit to be performed for each tenant.
- Establish maximum occupancy level/ density
- Incentives (Cheaper rent, Landlord to provide where tenant actions enhance building performance)
- Education
  - For Tenant Representatives (Implementation of Tenancy Guide)
  - Design Team/ Project Manager
- Discourage car parking
  - Introduce web-based car pooling initiative
  - Use space for other purpose

The purpose of the Green Lease is to generate a behavioural change. This should be driven from a commercial perspective and involve active contribution from landlord and tenant.

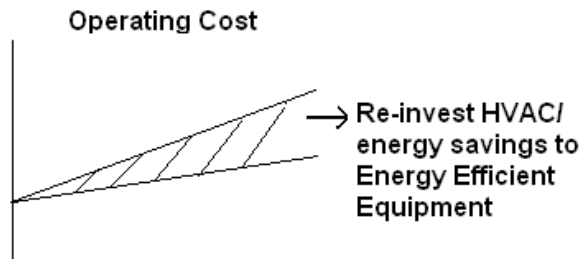
2. Plant/ equipment related initiatives:

- Replacing existing packaged air conditioning (PAC) units with more efficient units
  - Lock into contract with payback contributing to capital cost of new plant.
- Directly recover A/C costs from tenants
- REAL TIME metering/ Display – monitoring consumption profile
- Maintenance
  - Landlord/ manager to take responsibility (include in lease agreement)
  - Upgrade/maintenance package including mechanical upgrade works
  - Agreement with contractors and recharge to tenants
  - Energy performance contracts – PPP arrangement/BOO schemes (building, owned, operated)
    - If contractor runs into financial difficulty then bank takes control – clause in specification to resolve this
  - Compliance based specification
    - contractors penalised for poor performance
- Carpark lighting and ventilation (Carbon monoxide sensors)
  - To be included in BOO as these initiatives yield significant results.
- Specifications for Tenant Equipment

3. Building Manager/management related initiatives:

- Education
  - Green Lease
    - Noted that a green lease is not directly related to building performance.
  - Maintenance
- Daily presence in building:
  - sign on/checking tool
  - introduce site supervisor to check all work carried out by contractors
  - introduce KPI's to ensure all checks are carried out as claimed.
- Tools
  - Sub-metering
    - worthwhile initiative to pursue
    - payment for sub-meters – leased from contractors
    - operating lease with large residual (efficient plant, submetering, replacement of PAC units)
  - Reporting regime

- specific trade to explain associated building performance problems
  - contractors require reporting tool to ensure any breach in contract can be easily proven
  - performance based contracts
  - building managers to be given the power to veto sub standard contractors
- Consultant reviews
- Revolving fund
  - Savings reinvested into the building



4. Maintenance /Contractor related initiatives:

- Education
  - Trade specific training course to be provided that had educational merit.
- Develop specification to include efficiency
  - Performance
  - KPIs
  - Incentives:
    - contractors could be penalised for non-performance – specification clause
    - generic industry-recognised specification to provide a framework for building-specific specification.
- 'Competency Card'
  - independent regulatory body should be established.
  - each trade would compile a competency scale based on this training. Building managers would then specify contractors with a specific, industry recognised competency standard
  - certifies that contractors are qualified to carry out work to an industry recognised standard.
- Future 5 years strategy/plan for maintenance (transition of plant)
  - Introduction of building manual of operation that is built on an industry recognised framework which can then be manipulated to make building-specific.
  - Introduction of trade specific training for contractors that is recognised by way of a scale of competency standards for which a card is held as proof of designated level.

## **Appendix G: Full Report of Scenario Working Group 2 & 3**

**29<sup>th</sup> October 2008**

The following Scenario Working Group members volunteered their time and contributions to this paper:

Remy	Augros	Bassett Applied Research
Cris	Van Haren	Eastview Commercial
Victor	Goodge	Rider Levett Bucknall
Ian	Tucker	Crown Projects
Kasim	Ali Khan	TCW
Lloyd	Nazareth	Investa
Keith	Bashford	Warren Centre
Den	Jolly	Knight Frank
Bruce	Precious	GPT
Daniel	Elgawly	Davenport Campbell
Lambert	Seeto	Jones Lang Lasalle
Peter	Scott	Caltex
Arthur	Vergopoulos	Triple M
Andrew	Doherty	Davis Langdon
Lee	Tolley	Commtech Asia
Robert	Starkey	Dalkia
Moses	Rubal	Eastview

## 1 **Executive Summary**

The task of upgrading existing buildings to improve NABERS Energy performance is a relatively new pursuit in the office property sector. As a result of the limited experience, compounded by the cycle time from conducting upgrade projects to measuring full years performance, there is no well established routine way to conduct an upgrade.

Scenario Working Group 2+3 explored:

- the complex network of participants required to be involved in a building upgrade
- the motivations of these participants and how they may be aligned to ensure optimum outcomes
- the many decisions required during a building upgrade, who should make them and if the participant is likely to be equipped to make them
- the various contract types and how risk/incentive can be managed through them to ensure the required outcome
- the means to ensuring the highest probability of a successful outcome

Throughout the life of a building upgrade project every decision required becomes a potential stop point for the project if the participant is not suitably equipped to make the decision. Every handover point between participants provides the potential for communication to break down and project intent to be lost or diluted.

A number of themes emerged through the working groups deliberations:

- **Communication:** the requirements of the project, the strategies to implement and the outcomes to be achieved must be documented/communicated in a way that all participants understand.
  - Communicating the tenant's requirements
  - Communicating the business case
  - Communicating the design intent through implementation, commissioning and operation
- **Decision making:** whenever a decision is required to be made whoever should make it is capable and well informed
  - Example: when selecting a consultant to conduct a pre-feasibility the Facilities Manager is presented with a wide range of options, yet they may be unsure of how the scope of work should be described, what the study should cost, or what a complete report should look like. This presents as an impediment to making progress.
  - Strategies to overcome this barrier include the provision of checklists, registered consultants with demonstrable experience, standard form scope of works, sample reports and the provision of training around these documents.
- **Training and capability:** whenever a task is required to be completed whoever needs to carry it out is trained and capable
  - Example: Continuing on from above, the consultant carrying out the pre-feasibility study should be experienced in analysing the current performance of buildings, surveying the condition and likely life of plant and equipment and of modelling the effect on energy efficiency of a wide range of energy saving strategies and technologies.
- **Risk Management:** effective management of the risks involved in upgrading of buildings
  - The management of risk should be assigned to the group best placed to carry it, technical risk by those who are most familiar with the technology, construction risk by those in charge of construction. Traditional building enhancement works are conducted in a way that the owner is left carrying the majority of project risk.
- **Probability of Success:** factors affecting the probability of success are understood and managed

- There are a range of steps that can be taken to increase the chance of success, from carefully selecting experienced practitioners with demonstrated track record to carefully considering how new technology could work in a building.

The major recommendations of the Working Group are that a wide range of simple checklists, templates and standards be developed and disseminated through appropriate training courses and made available through a reliable web site.

Also, case studies of the various contract types be developed to inform the market as the most successful methods for enhancing the NABERS ratings of existing building.

## **2    Scenario description**

### Scenario 2 Working group – Floor by Floor Refurbishment

This A grade office building is 30 storeys with 25,000 NLA. It was built in 1975 and is nett leased. The HVAC system is induction perimeter units and VAV internal units. It is a water cooled building. One is a 12 – 15 year old large centrifugal chiller and the smaller chiller is a low load reciprocating chiller, which is as old as the building. It has a 10 year old direct digital control Building Management System.

This asset needs repositioning in the market. The context for this landlord driven floor by floor upgrade is that the building needs a fundamental repositioning in the market within the next 5 years. The goal is the best outcome in the floor by floor upgrade while keeping options open for the more fundamental upgrade, therefore minimizing the amount of stranded capital.

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

5. What (possibly new) internal and external resources are needed?
6. What factors would impede or enable the project? What would stop the project dead in its tracks?
7. How would you address these barriers?
8. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

### Scenario 3 Working Group– Whole Building Refurbishment

This scenario is the Scenario 2 building 5 years down the track. Upgrades are likely to be focused on plant room upgrades (base building services).

Establish the viable forward path considering the above mentioned steps and responding to the following questions:

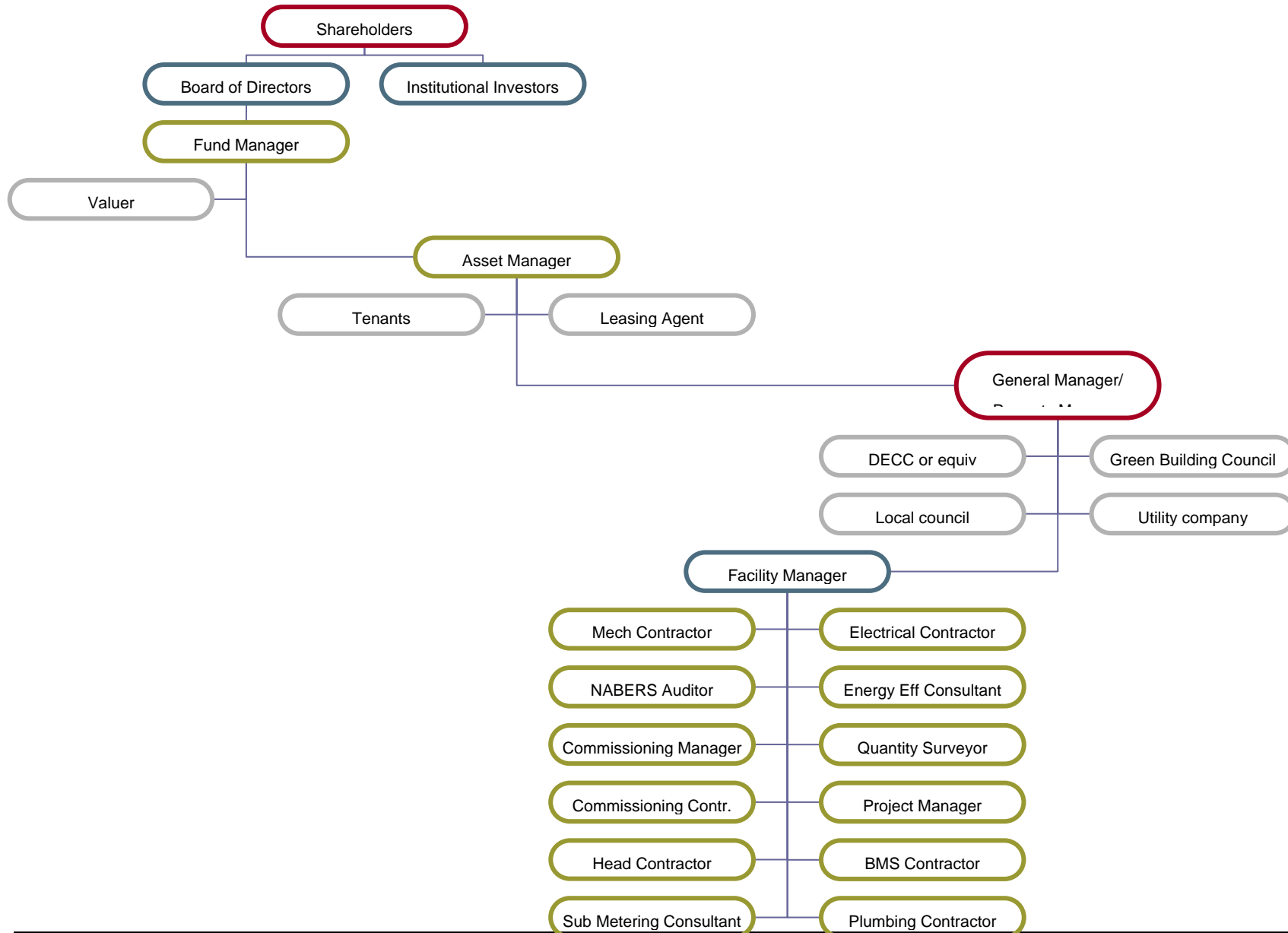
5. What (possibly new) internal and external resources are needed?
6. What factors would impede or enable the project? What would stop the project dead in its tracks?
7. How would you address these barriers?
8. Who are the decision makers with regard to implementing these measures and how do you make the proposed changes a priority for them? What would be the benefits?

### Scenario Steps

For each scenario, Scenario Working Groups will be formed, and in developing the initiatives will consider the following steps:

- Getting the scope of works right
- Framing the budget
- Obtaining funding (Are there existing or unexplored financial products to better facilitate the project?)
- Managing required resources and time to execute the works successfully
- Securing the required competencies, both internal and external
- Managing relationships with tenants before, during and after the necessary activities in each scenario
- Commissioning the scope of works correctly
- Monitoring, reporting and verifying the impact of these works on energy efficiency
- Tuning the new systems correctly
- Educating appropriate technical staff and occupants
- Maintaining the ongoing level of building energy performance

3 Scenario Stakeholders



#### **4    Project Scoping**

The Scenario Working Group concluded that there is a great deal of uncertainty in the development of such a project. The building owner is often uncertain about the potential of their building to achieve improved energy performance and is therefore held back from kicking a project off. This uncertainty is compounded by a lack of knowledge around suitable budgets.

Recommendation: building owners need advisory tools to assist them in the establishment of rational efficiency targets for their property. This could be in the form of a simple checklist that would provide guidance around juggling age of building and plant, current performance (if known), planned expenditure on equipment replacement in immediate future years and the competitive nature of the office building market.

At worst the checklist may propose that the scope to achieve 4, 4.5 or 5 stars NABERS Energy be explored. (Similar to AEP/CA "Is EPC right for you checklist?")

Once the target or target range has been identified a preliminary assessment needs to be made in order to scope both the potential scope of work and likely budgets around these works. This information will allow the Asset Manager or Fund Manager to build a business case in order to gain budget approval for upgrade works. It would commonly fall to the Facility Manager to identify, engage and manage an appropriate resource (consultant or company) to conduct these works. Experience has demonstrated that there is a low level of availability of suitably qualified and skilled personnel offering to conduct this type of building assessment. Again, the Facility Manager will find it difficult to establish both the scope of work and budget appropriate to this work.

Recommendation: Facility Managers need advisory tools to assist them identify, assess suitability to their building, define scope of work and assess pricing.

The pre feasibility should clearly identify:

- Current, past building performance
- Factors affecting changes in the performance
- Strategies to improve the performance
- Forecasts/estimates of the improvement in performance
- Assumptions/qualifications around the forecasts
- Budgets for identified projects including Project Management and applicable fees
- A clear strategy for upgrade including advice on delivery method types and next steps

Recommendation: A checklist of prefeasibility report contents will help the Facility Manager assess the quality of the feasibility study/report

#### **5    Project Funding Approval**

The development of the business case requires the cooperative effort of a number of the stakeholders, in particular the FM, Asset Manager. The website [www.yourbuilding.org](http://www.yourbuilding.org) provides further information.

Recommendation: sample business case documents could be provided demonstrating various project benefits and how they can improve the business case

## 6 **Project Design**

Now that a target, a likely scope and budget has been established the form of delivery needs to be established. Again the responsibility for this task is probably with the Facility Manager. There is little information available about the delivery models that might be employed, especially information that doesn't come from a vested interest such as a contractor who prefers a certain method of delivery.

Discussion arose through the scenario around the probability of the delivery process achieving the required NABERS Energy rating and the risks associated with this delivery. Considering that the Asset or Fund Manager is now not necessarily so much interested in what hardware is being delivered (new equipment comes with a warranty) but in the outcome of the NABERS Energy rating the question arises as to whether the rating itself can be warranted. Under the Performance Contract model of delivery this is a potential outcome.

The various contract types are described:

### **LEHR CONTRACT TYPE PROS & CONS**

Lump Sum Contract	
Pros	Cons
Plan and Spec competitive tender will provide competitive pricing	No technical risk is accepted by the contractor or consultant
Tendering is based on a common platform enabling price based assessment	Separate entities for design, construction and maintenance impedes risk management
Fund Manager has the option of deploying specialist, independent consultants	Contractor liability ceases at the end of DLP
Would be simpler to roll out for smaller projects where other delivery models have higher thresholds of economic viability	

Alternately, an Energy Performance Contract could be used

## 7 **Design of Energy Efficiency Projects**

An example of a process is described in Appendix G1.

## 8 **Project Delivery**

Delivery methods are described above, in "Project Design"

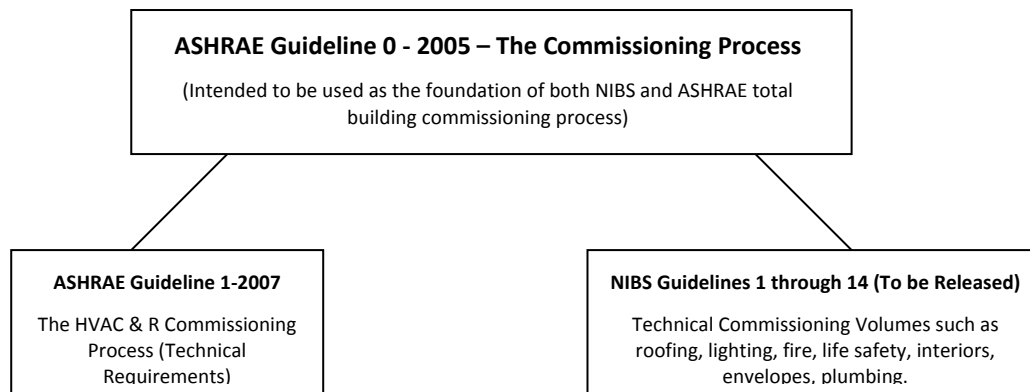
## 9 Project Commissioning

Commissioning is a vital process in achieving the targeted energy goals of any Low Energy High Rise project. To ensure the process is suitably structured and monitored we advocate a contractual requirement for a multi-discipline commissioning management team to be appointed by the client and suitably qualified hands on commissioning technicians are contracted to the project.

Codes and Guidelines

ASHRAE Guidelines

A suite of literature has been published by the American society of Heating, Refrigerating and Air Conditioning Engineers to outline a suggested structure for the commissioning process as detailed in figure 1



**Figure 1**

For optimum effectiveness the ASHRAE total building commissioning process should be a contractual requirement that details the structure of the commissioning and management and listing of deliverables over the following phases :

- Pre-Design Phase
- Design Phase
- Construction Phase
- Occupancy and Operations Phase (Including Seasonal building Tuning)

Chartered Institute of Building Service Engineers Commissioning Codes

CIBSE codes detail the technical procedures and an agreed process of commissioning for the following disciplines and should be a contractual requirement for the contractor to follow these codes.

CIBSE Commissioning Code A : Air Distribution Systems

CIBSE Commissioning Code B : Boilers

CIBSE Commissioning Code C : Automatic Controls  
CIBSE Commissioning Code L : Lighting  
CIBSE Commissioning Code M : Commissioning Management  
CIBSE Commissioning Code R : Refrigeration Systems  
CIBSE Commissioning Code W : Water Distribution Systems

#### Commissioning Technician Qualifications

To ensure suitably qualified air and water services commissioning technicians are present on LEHR projects we recommend implementing a contractual requirement for personnel to have successfully completed one of two international industry recognised commissioning qualifications.

National Environmental Balancing Bureau (NEBB)

Linked to ASHRAE Guidelines

Can be completed by distance learning correspondence course.

Further information can be found at

[www.nebb.org](http://www.nebb.org)

Commissioning Specialist Association (CSA)

Linked to CIBSE Commissioning Codes

Papers graded 1-6. Grade 5 qualification deemed suitable level for commissioning team leader.

Can be completed by distance learning correspondence course.

Further information can be found at,

<http://www.csa.org.uk>

#### Further recommendations

Request for Standards Australia to compile and release an AS/NZ Commissioning Standard

Current Green Star Management credit criteria to be adopted for all LEHR projects.

## **10 Project Handover**

### Project Measurement and Verification

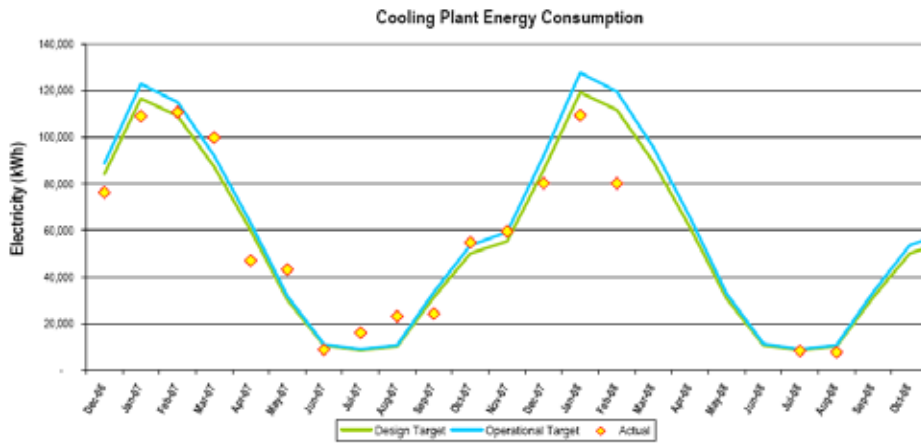
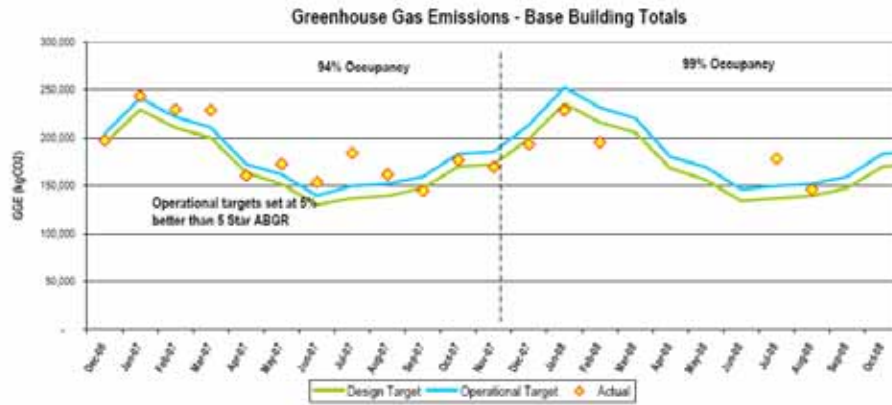
It was acknowledged that there is limited experience in the full cycle from upgrade feasibility through to the measurement and verification of results. An example of a new build design intent (from an energy performance perspective) was provided. Darling Park 3 is an office building designed to achieve 5 stars NABERS Energy, delivered accurately to the design intent, commissioned to the design intent and operated to the design intent, resulting in 5 star NABERS Energy performance.

A key communication tool of the design intent from the energy performance perspective were seasonal building and system energy forecasts examples are shown:

Darling Park Tower 3

Base Building  
ABGR Monitoring

Lend Lease design



Recommendations: Case studies, training and guides are required for all stakeholders to understand the components of a successful monitoring and verification process.

## 11 Project Maintenance

# LEHR Asset Repositioning Stakeholder Accountability Operations Phase

### Contractor Site Personnel

Ensure Building Manager is engaged at each maintenance visit ensuring an initial debriefing upon entry and sign off and acceptance of reports upon completion

Ensure that issues relating to energy performance are explained to the Building Manager with a view to immediate action.  
All issues not resolved at this point are to be escalated to Maintenance Contractor Management

### Maintenance Contractor Management

Shall ensure all site personnel education to ensure an understanding of how the asset is benchmarked and how maintenance duties impact on its rating

Shall create custom maintenance regimes designed to ensure each item of equipment is operating within the specified energy objective

Shall ensure maintenance regimes are scripted in template form for the site technician to complete and submit

Maintenance regime include specific routines designed to test each energy conservation with use of submetering and BMS systems

Maintenance regimes shall include the monitoring and reporting of energy consumption levels and shall include a comparison to specific energy targets

Building Supervisor to attend site at least once per month or on an as need basis to ensure reactive works and recommissioned in accordance with the design intent and that any unresolved or outstanding issues are attended to.

Internal quarterly audits shall be carried out to ensure technicians are fulfilling their duties and to provide a progress report specific to energy targets to the Building Manager

Provide scripted templates for recording storing of building energy performance data at the end of each maintenance visit

Ensure internal alarms are raised when specific benchmarks are not being met

Ensure all required or suggested upgrade works are communicated not only on cost but on the potential energy impact of action or inaction.

### Building Manager

Shall ensure site personnel attend the site office prior to and subsequent to the maintenance visit

Shall sign off on maintenance reports and action any items for resolution either by immediate order, requesting quotations or escalating to the Facilities Manager

Will carry out a monthly audit of maintenance activities, the result of which will be communicated to the contractor or escalated to the facilities manager as performance dictates

Shall prepare a monthly report to the Facilities Manager outlining energy performance

### Facilities Manager

Ensures Building manager is correctly trained in the NABERS benchmarking system

Ensure Building manager receives technical training specific to the system within the building and understands how the energy measures are intended to perform

Ensures that any changes to the intended operation of the building are immediately communicated

Ensure Building Manager is trained to compile a monthly report which stipulates energy performance and compares it to the previous years performance and the intended design objective

Provided a scripted template for reporting to the Building Manager and ensure the reports is received at specific times within each month

Shall escalate the report to the Asset Manager when performance is not within the required parameters

Shall immediately engage the Building Manager and Maintenance Contractor to provide recommended action

Shall undertake detailed quarterly audits to ensure the Building Manager is undertaking his duties and report to the Asset manager accordingly

Shall prepare a quarterly report outlining performance to date, outstanding issues and recommended courses of action along with costs and expected time frames

### Asset Manager

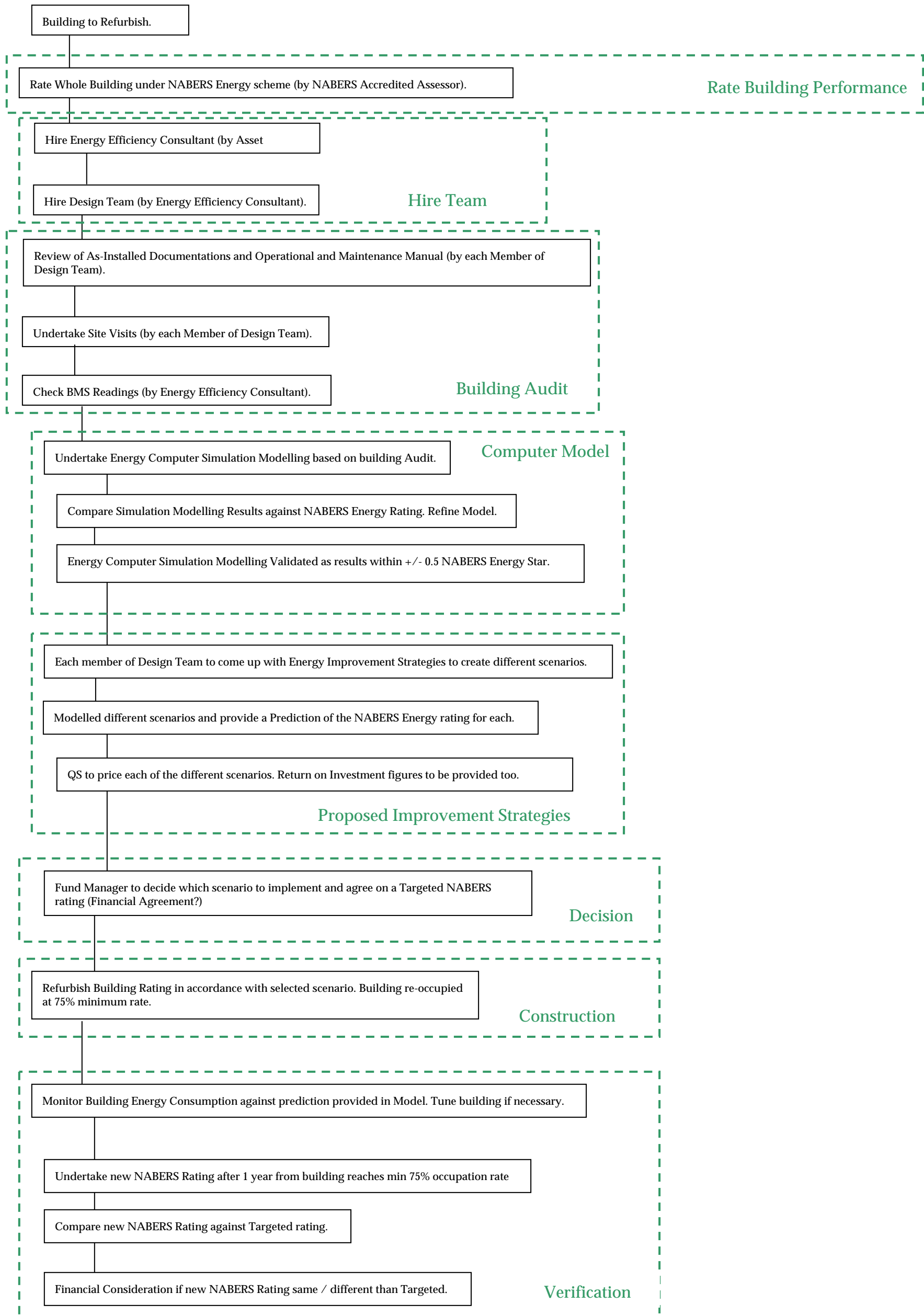
### Fund Manager

Managing Risk

<b>LEHR Contract Type Risk Allocation</b>					
<b>Contract Type/ Risk Type</b>	<b>Lump Sum</b>	<b>Construction Management (CM)</b>	<b>Design and Construct</b>	<b>Guaranteed Maximum Price</b>	<b>Energy Performance Contract</b>
<b>Design</b>	Consultant	Consultant	Contractor	Consultant	Contractor
<b>Construction</b>	Contractor	Contractor	Contractor	Contractor	Contractor
<b>Technical</b>	Fund Manager	Fund Manager	Fund Manager	Fund Manager	Contractor
<b>Site access</b>	Facilities Manager	Facilities Manager	Facilities Manager	Facilities Manager	Facilities Manager
<b>Services During Construction</b>	Facilities Manager	Facilities Manager	Facilities Manager	Facilities Manager	Facilities Manager
<b>Site Conditions &amp; Latent Defects</b>	Fund Manager	Fund Manager	Fund Manager	Fund Manager	Fund Manager
<b>Planning and Other Approvals</b>	Consultant	Consultant	Contractor	Consultant	Contractor
<b>Maintenance</b>	Maintenance Contractor	Maintenance Contractor	Maintenance Contractor	Maintenance Contractor	Manager/Contractor
<b>Industrial Relations</b>	Contractor	Contractor	Contractor	Contractor	Contractor
<b>Force Majeure</b>	Fund Manager	Fund Manager	Fund Manager	Fund Manager	Contractor
<b>ie Increases, sales tax &amp;</b>	Contractor	Contractor	Contractor	Contractor	Contractor
<b>Changes in Law</b>	Fund Manager	Fund Manager	Fund Manager	Fund Manager	Fund Manager
<b>Inflation</b>	Contractor	Contractor	Contractor	Contractor	Contractor
<b>Insurance</b>	Contractor	Contractor	Contractor	Contractor	Contractor
<b>Financing</b>	Fund Manager	Fund Manager	Fund Manager	Fund Manager	Fund Manager

12 Appendix G1: Example of Building Upgrade Method.

Refurbishment Procedure Map



### **13 Appendix G2: Building Energy Performance Audit**

The first work to be undertaken is to assess the building state in terms of energy efficiency as a Whole Building system. An Audit including the followings is to be undertaken by the Design Team:

#### **1. Original Design Specifications**

Review of Operational and Maintenance Manual and As-Installed Documentations for the followings:

- Electrical
- Mechanical
- Hydraulic
- Lifts
- Architectural

#### **2. Site Visit**

Evaluate the followings:

- Electrical Systems:
  - o Lighting Density
- Mechanical Systems:
  - o ...

#### **3. BMS Readings**

If BMS linked to high level interface readings, obtain the followings:

- base building electrical consumption
- chilled water consumption
- heating water consumption
- tenancy electrical consumption
- ...

#### **4. Energy Bills**

A year worth of energy bills from the Utility is a great way to evaluate the building energy performance. It is important to make sure that the energy bills are based on actual metered energy and not estimation assumed from the Utility.

#### **5. NABERS Energy Rating Required Procedure**

Perform a NABERS Energy rating (Base Building or Whole Building) is the best way to evaluate the building energy performance. The rating is based on metered energy consumptions and carried out through stringent audit procedure developed by the Department of Climate Change (DECC).

## 6. Building Evaluation

### NABERS Energy Rating

A NABERS Energy rating is the best tool to assess the performance of the Building Energy Efficiency.

## 7. Energy Computer Simulation Modelling – Model Validation

If a NABERS Energy assessment is not possible, then evaluate the performance of the Building Energy Efficiency can be undertaken through Energy Computer Simulation Modelling.

The Simulation Modelling will be based on the Building audit undertaken.

Results from the Modelling must be compared against available tools in order to validate the model. Modify modelling inputs until modelling energy result within +/- 0.5 NABERS Energy Star

Difference between Energy modelling and Audit may be from:

- operational inefficiencies
- poorly commissioned systems
- out of hours plant operation

Review of BMS Trends and Time logs to point out where inefficiencies are from:

- check submeters Vs Model prediction

## 8. Energy Improvement Strategies

Examples of strategy to improve the building energy efficiency are proposed below. It is the Design Team to come up with such strategies:

### Code Strategies

- Meet the Fire BCA requirements
- Meet the BCA Section J (level of Insulation, etc...)

### Mechanical Strategies

(See below)

### Electrical Strategies

(See below)

### Architectural Strategies

(See below)

## 9. Modelling of Energy Improvement Strategies

The strategies described above will be discussed with the client, and 5 different scenarios integrating some of these strategies will be modelled.

For each of these scenarios, the overall energy consumption of the whole building system (base building + tenancies) will be predicted. The resultant NABERS energy Rating predicted for each scenario will also be provided.

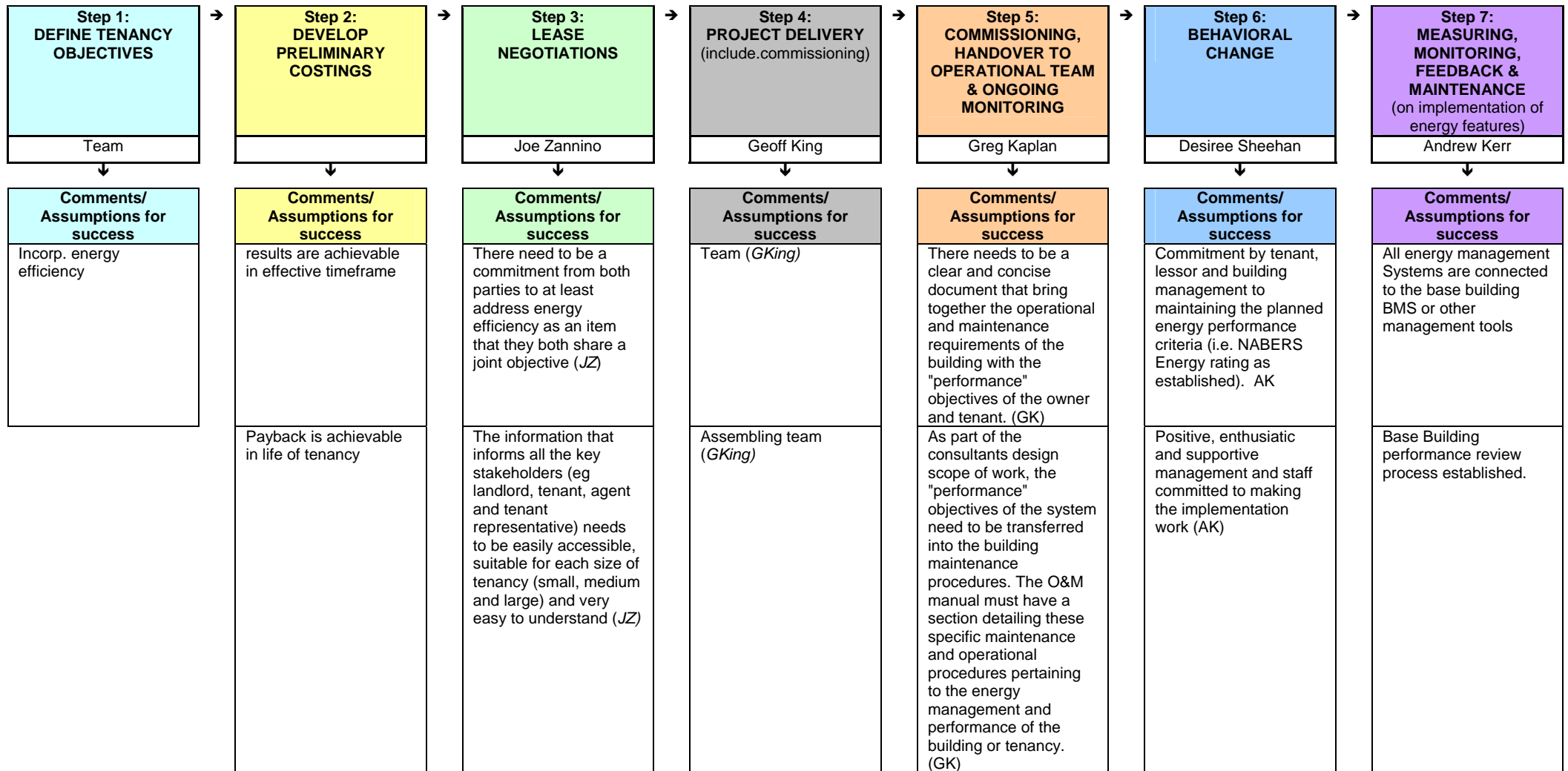
Below are listed examples of scenarios:

- Scenario 1 (Refurbish Base Building System to meet minimum Building Code of Australia requirements):
  - o Bring building up to updated Fire Standards (new sprinklers, ventilation exhausts, etc)
  - o Bring building up to updated Mech Standards (medium efficiency chillers (COP of 5) and boilers, etc)
  - o Comply with updated Elec Standards (maximum lighting power density of 10W/m<sup>2</sup> for offices)
  - o Comply with updated Hydraulic Standards
  
- Scenario 2 (Base Building Higher Improvement and meet BCA requirements):
  - o Same strategies than in Scenario 1 will be implemented
  - o Buy new and efficient chillers (COP of 9)
  - o Buy new and efficient boilers
  - o Buy new and efficient fans
  - o Add Outside Air Economy Cycle
  - o Change VAV boxes if necessary
  - o Re-commissioning VAV boxes, Temperature control set-points
  - o Change light fitting for common spaces
  - o Change lifts Control System
  - o Change lift motors efficiencies
  - o Change Pumps
  - o Change VSD
  - o Change control and strategies of VAV and Pumping
  - o Light control strategy of Common Areas will be changed for different zonings based on occupancy sensors, daylighting sensors, etc.
  
- Scenario 3 (Base Building Improvement with Trigen System)
  - o Same strategies than in Scenario 2 will be implemented
  - o Addition of Cogen / Trigeneration system
  
- Scenario 4 (Whole Building Improvement)
  - o Same strategies than in Scenario 2 will be implemented
  - o Light fittings will be changed for more efficient fittings
  - o Light control strategy will be changed for different zonings based on occupancy sensors, daylighting sensors, etc.
  
- Scenario 5 (Whole Building Improvement + Façade Improvement)
  - o Same strategies than in Scenario 4 will be implemented

- Plus, External Façade Glazing will be changed for better glazing.
- Increase level of insulation for the Roof, External Walls, and Floor Slabs.

For the implementation of each of these scenarios, it is intended that the Quantity Surveyor (QS) costs them and provide Return on Investments figures thanks to the different scenarios' energy consumption provided my Computer Modelling.

**Appendix H: Full Report of Scenario Working Group 4a & 4b.**



<p>understanding current position and NABERS, then set out goals/aims to create a number of targets: short terms to long terms, stretch targets</p>	<p>Tenant understands what is required within the office to achieve a 5 star tenancy rating that: (a) requires negotiation with the building owner/landlord eg. modifications to existing lighting; electrics; kitchen equipment etc (b) can be undertaken without negotiation with the building owner/landlord (DS)</p>	<p>Prepare several versions of the Green Lease Guide and suitable clauses for each size of tenancy. The base document "Green Lease Guide" is an excellent starting point but is too detailed for smaller tenancies. For the smaller tenancies and from an energy efficiency point of view, the critical initiatives will revolve around:          1. Energy efficient lighting          2. Lighting control          3. Selection of tenant equipment          4. Behavioural issues that relate to how and when equipment is turned down          5. Sub-metering (JZ)</p>	<p>Statutory approvals (GKing)</p>	<p>Once the "performance" objectives are clearly established by the owner and tenant team, this then need to be transferred into the building maintenance team for each maintenance trade. Maintenance contracts need to be updated to include these performance requirements as KPI's. (GK)</p>	<p><b>Building owner</b> is prepared to assist tenant meet their energy efficiency target by:          (a) making adjustments to the building eg adjusting aircon setpoint          (b) not hindering modifications to the tenancy (retrofit) (DS)</p>	<p>Management and tenancy communication process established</p>
<p>unity of commitment between landlord and tenant to improve energy efficiency</p>	<p>The tenant has funds allocated to undertake the work (DS)</p>	<p>A simple set of business initiatives (case studies and testimonials) that other tenants have used to drive changes in behavioural barrier (JZ)</p>	<p>Construction - Informed that commissioning will be very detailed and any shortcuts will be discovered (GKing)</p>		<p><b>Senior management/ staff</b> understand what the business is trying to achieve and why; and are committed to the same objectives (DS)</p>	<p>Tenant systems documentation available to building management.</p>
<p>Achieve 5 star NABERS Energy tenancy rating (DS)</p>	<p>Consultants/tools to facilitate cost-benefit analysis at a cost that can be met by the tenant (AK)</p>	<p>Prepare sample simple green leases that are available for tenants to review (JZ)</p>	<p>Funding (GKing)</p>		<p>The business has adequate/ dedicated staff resources to prepare and deliver an internal and external educational and promotional strategy</p>	
			<p>Designers - PI to cover NABERS aspects, Commissioning very important (GKing)</p>		<p>Regular quarterly or 6 monthly reviews to be set up to honestly appraise performance and what strategies have worked and what are some new strategies to ensure behavioural change. Senior management should be represented</p>	

					on these reviews. JZ	
			Statutory approvals (GKing)			
			Funding (GKing)			
		Assumption that building owner inertia does not exist re benefits of improving base building energy efficiency.	Project Manager: (GKing) 1. Delivers on time for agreed cost to required quality 2. Manages the associated risks with contractors in the contracts with special emphasis on the NABERS performance criteria. Professional indemnity insurance should back the design. Minimise the dilution of risk 3. Hand over the performance outcomes of the project to the tenant and the Landlord in the presence of the design and construct stakeholders. Provide them framework to manage the ongoing performance (probably on the NABERS platform)			
↓	↓	↓	↓	↓	↓	↓
<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>
Cost to complete brief	Cost	issues with what the tenant wants to do but is not possible in the context of the base building, potential conflict with tenancy and base building existing services which will require further investigation	Obsolete or non-adaptable base building equipment, systems or structure which is not easily integrated with tenant upgrades. Ideally, these issues should be identified in Steps 1 and 2. (AK)	There should be no technical barriers to maintaining the building and improving performance provided that the necessary infrastructure was built in at the time of design/delivery. (GK)	Not applicable in this section (DS)	Lack of integration between base building and tenant energy management systems

<p>lack of understanding, physical deficiencies in building to enable appropriate assesments, existing services limitations,</p>	<p>Expertise to undertake a robust life cycle and payback assessment. JZ</p>	<p>Split incentives – in many cases the party incurring the capital cost of energy efficiency measures does not receive the saving benefits of the upgrade, e.g. between landlords and tenants of a building (DS - Szencorp Garnaut review 2008)</p>				<p>Lack of coordination of tenancy works leading to a deterioration in management systems as new fitouts installed or refurbished.</p>
<p>Energy audit companies do not normally touch smaller tenancies</p>	<p>breakdown technical barriers to 3 stages, 1st stage: easy to understand and do, 2nd stage: medium level changes, 3rd stage: high level changes e.g. motion detector in place</p>					<p>Lack of understanding of the way in which the lessor and their management practices can impact on the tenant's success in achieving its energy efficiency goals.JZ</p>
↓	↓	↓	↓	↓	↓	↓
<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>	<p><b>Behavioural barriers</b></p>
<p>depth of commitments within the tenancy (e.g. management, technical expertise), lack of commitments from the lessor</p>	<p>Education, lack of expertise in the area of energy efficiency</p>	<p>Lack of skills for smaller tenants or their advisors to negotiate on the issues of energy efficiency.JZ</p>	<p>Reluctance or negativity on part of building management, possibly based on view that this is extra work for them to maintain (AK)</p>	<p>There are many behavioural barriers to achieving these objectives. Previous building performance objectives centred around maintaining the lowest cost maintenance whilst satisfying the tenants occupancy parameters. Only recently has utility consumption and sustainability started to become equally important and many building manager have not shifted their paradigm. (GK)</p>	<p>The tenant may not have enough internal resources to drive behavioural change (JZ)</p>	<p>Uncooperative building managers unwilling to share or provide information on building performance (AK)</p>
<p>who is going to own this project; senior management, energy champion, staff, internal resources, sustainability manager</p>	<p>Information</p>			<p>Electronic "smart meters" are used to measure and track the performance of each utility, building service and reports are then produced that can provide feedback to owners and tenants as</p>	<p>staff inertia</p>	

				to their level of performance as well as areas for improvement. These feedback mechanisms help to change/improve behaviour and hence achieve the performance objectives.(GK)		
require genuine organisational commitment	Transaction costs (especially measurement and/or verification) - the recognition of savings often requires the aggregation of a large number of small energy saving actions, making transaction costs of realising the incentives prohibitive in some cases (DS - Szencorp Garnaut review 2008)			Typical maintenance procedures do not highly value utility minimisation as part of their maintenance procedures. These objectives will need to be changed under direction of the Building Manager who has overall objectives to reduce utility consumption whilst maintaining satisfactory internal conditions. Some maintenance service providers will not be capable of changing their behavioural attitudes and practices. This will take some time to change. (GK)	Behavioural issues - include lack of priority, short-termism, cultural inertia, non-core business activity - electricity typically makes up a small percentage of business costs (estimated by the National Institute of Economic and Industry Research) at under 3% of total expenditure for most economic sectors. Further, there is a lack of understanding of potential cost-effective savings options and available expertise or mechanisms for financing and delivering them. (DS - Szencorp Garnaut review 2008)	
↓	↓	↓	↓	↓	↓	↓
<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>
engage an energy auditing company (e.g. ECS)	Engaging independent consultants, getting recommendations on what's possible, costing these possibilities from a panel of suitable contractors. JZ	green lease guide (JZ)		Electronic "smart meters" are used to accurately measure and track the performance of each utility, building service or separate system. (GK)	<b>CitySwitch Green Office</b> - is a national tenant energy management program run in partnership between the cities of Sydney, North Sydney, Parramatta, Willoughby, Melbourne, Perth, Adelaide and Brisbane and state government agencies (DECC and Sustainability Victoria). The program works with tenants to improve	Electronic "smart meters" are used to measure and track the performance of each utility, building service or separate system. Reports are then produced that can provide feedback to owners and tenants as to their level of performance as well as areas for improvement.(GK)

					<p>office energy efficiency. Signatories commit to achieve and maintain an accredited 4 stars or higher NABERS Energy tenancy rating.</p>	
<p>Develop a robust small assesment tool to self-asses tenancy's energy performance. This tool needs to be used and done by consultants or experts to translate figures to meaning.</p>	<p>Availability of limited on call resources by walkthrough consultant</p>	<p>tenant case studies (JZ)</p>			<p><b>DECC Tenant Energy Management Handbook</b> - CitySwitch is working with DECC to update the TEMH, which contains valuable information re how to address behavioural change in the workplace</p>	
<p>There are companies that do a walk-through energy ratings</p>	<p>NABERS accreditation testimonial with fitout costs and guide</p>				<p><b>DECC Sustainability Advantage Program</b> - brings groups of businesses together in clusters that share regional, industry or supply chain interests. Cluster meetings held 3-4 times a year provide an opportunity to draw on the ideas and experiences of like minded companies. An initial management diagnostic evaluates your current environmental performance and ranks possible initiatives. Over 18 months, businesses work on tailored, flexible projects selected from Sustainability Advantage modules. Participating companies commit to an 18 month involvement and a modest financial contribution. While results will depend on a company's own efforts, Sustainability</p>	

					Advantage provides expertise, training, tools and a network of companies working towards sustainability.	
need a cost effective tool/ consultant to provide a walk thorough evaluation of current state and opportunities of tenancies	Make DECC Tenant Energy Management Handbook more understandable/ affordable to small tenants, tenant reps & agents (similar to BASIX website assesement tool)					
↓	↓	↓	↓	↓	↓	↓
<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>
government needs to find an energy auditing company to develop a generic auditing template for smaller tenancies, become public domain tool for all	Outcome of cost benefit analysis. Achieving financial hurdle internally for investment.	Simpler green lease guide for smaller tenancies (JZ)			<b>CitySwitch Green Office</b> - provides a communications toolkit to Signatories which assists with the promotion of energy efficiency internally and externally.	Reduced operating costs of the building and the tenancies benefit all parties AK
Whether the government provides a rebate when the tenancy undertake this assesments		Tenant case studies (JZ)				Electronic "smart meters" are used to measure and track the performance of each utility and reports are then produced that can provide feedback to owners and tenants. Cost benefit can be included in these reports so that owners and tenants can see exactly how much \$\$ each improvement or change can save.(GK)
has to be cost effective for smaller tenants		agreement with the less or for joint funding				

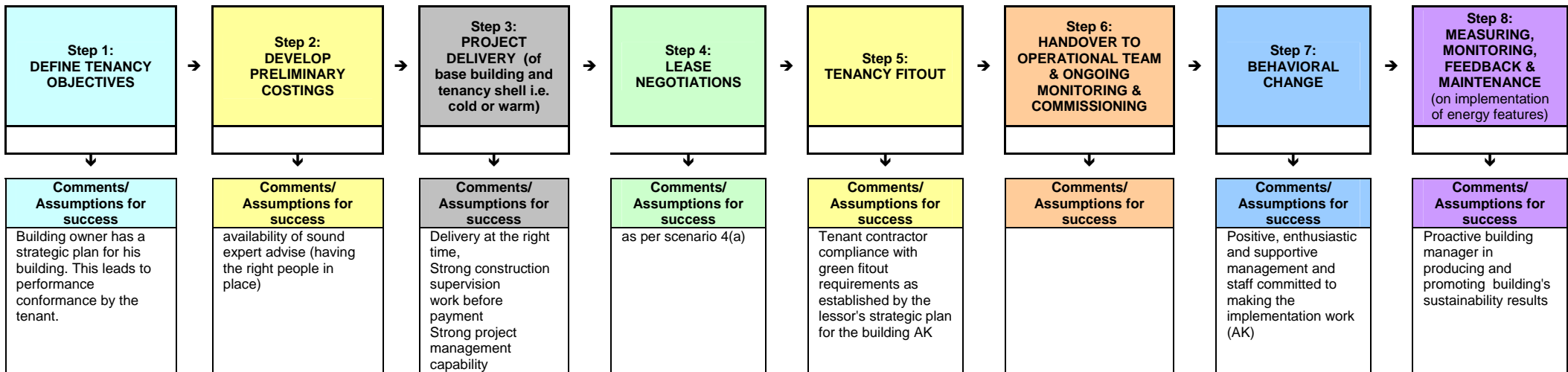
RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES	RECOMMENDATIONS/ OUTCOMES/ INITIATIVES
Develop framework for a tenancy brief with objectives	A series of identified steps for implementation with proven financial benefits	access to green lease clauses within the green lease guide agreement with the lessor for joint funding with tenants (share the cost)	Specified performance level	enhancements are delivered as specified, making sure that results are delivered based on what was agreed on and paid for	Ongoing joint commitment of all tenants and building managements and owners to maintaining the required performance level	Formal/regular communication between lessors and tenants on building performance.
framework can take a form of the following: key parts of brief , energy efficiency checklist, identify possibilities etc...	Quote, payback time and other costing informations are now available to proceed to next step	Buiding owner understands that any improvement to the tenancy will result in improved base building performance - strengthens tenants ability to cost savings when renegotiating lease (DS - TEMH)	Define expected performance level	Performance criteria and a mean of measuring the performance criteria	To maintain the engagement, reinforce and enthusiasm through the implementation phase and operational phase of all the engaged parties	Building management oversight of proposed and actual tenancy works to maintain systems integrity
basic viability outcome is logical so that we'd proceed to step 2	Identify also those initiative which may be achievable with the lesser contribution which are a good precursor to go to step 3		Project works delivered on time and on budget (AK)	Check if expected performance level has been met with a 6 months review to re-check this performance level	Increased industry support for CitySwitch Green Office eg increased collaboration between program/ businesses; promotion of program (DS)	Sharing of energy performance data between tenants and building management
Consultant walkthrough detailing what changes can be done to improve energy efficiency performance and recommending companies or suppliers to go through, at price appropriate for a small tenancy (AK)	Documentation kit that leads tenants through the process (AK)		Develop a project delivery toolkit and case studies for smaller tenants to access to see how these projects can be delivered so they can relate to their own project. This toolkit is to be available online to all tenants (JZ)		Promotion of DECC Sustainability Advantage program	Documentation of tenant systems provided to building management
Consultant walkthrough could include 3 hours of on call support for tenants, 6 monthly energy performance (e.g. thong circuits ?????) JZ					Develop up a set of case studies of organisation that have successfully implemented behavioural change and what initiatives they used and what was their success factors or learnings. This	

						information is to be available online for all tenants. JZ	
Develop existing equipment checklist including: typical electrical and mechanical items within tenancies JZ							

**SCENARIO 4 (b)  
Large tenancy upgrade**

**SCENARIO 4 (b)  
Large tenancy upgrade**

**Objective:** Develop a suite of Initiatives that will deliver a transformed market (by 2012)



	good business case	Commissioning is important. There needs to be a strong regime to test the design as well as proper and extensive documentation coverage					
	ability to operate old and new services in parallel						
<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>	<b>Key technical barriers</b>
basic limitation and constraint from exiting building	existing building limitation	as per scenario 4(a)		Contractor inexperience in installing fitouts to satisfy energy efficiency requirements AK			Lack of competence from the building manager's side
current life cycle of the building and plant	good understanding of the services						
	lack of knowledge and lost of documentations						
	staging of the refurbishment						
<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>	<b>Behavioural barriers</b>
			adhering to Green lease agreement	Lack of commitment by tenant and their contractors to satisfying green lease requirements. AK			Uncooperative tenant or building management (AK)
<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>	<b>Current tools/ initiatives</b>
use third party consultant specialist	As for Step 1 - use third party consultant specialist AK	as per scenario 4(a)	Landlord has their own meter to monitor the base building and advice tenants.	Existing case study material and contractor experience in green fitout delivery AK			Building Management Systems capable of monitoring and reporting on operating performance, energy efficiency, etc AK
Availability of good case studies	Availability of good case studies AK						

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<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>	<b>Financial incentives/ products</b>
Define financial and leasing boundaries and inducements AK	financial feasibility	as per scenario 4(a)		Green products operating cost-effective performance over life of the product versus initial cost factors AK				Reduced operating costs of the building and the tenancies benefit all parties AK
	commercially realistic							
↓	↓	↓	↓	↓	↓	↓	↓	↓
<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>	<b>RECOMMENDATIONS/ OUTCOMES/ INITIATIVES</b>
A strategic plan for building and tenancy design guidelines	Preliminary but realistic costing and design	Project works delivered on time and on budget (AK)	Commitment by the new tenant to a green lease, both parties committed to maintaining building NABERS rating. (AK)	Tenancy fitout compliance with building strategy for energy efficiency. AK	Provision of tenant fitout documentation to building management AK	Ongoing joint commitment of all tenants and building managements and owners to maintaining the required performance level.	To maintain the engagement, reinforce and enthusiasm through the implementation phase and operational phase of all the engaged parties	As per 4 (a) Formal/regular communication between lessors and tenants on building performance. AK
	staging methodology							Building management oversight of proposed and actual tenancy works to maintain systems integrity
								Sharing of energy performance data between tenants and building management
								Documentation of tenant systems provided to building management

**APPENDIX I: Full Report of Scenario Working Group 5**

Initiative Title	Initiative Steps	Initiative Contents	Building Life-Cycle	Project Life-Cycle	Skills	Who Relevant To?	Already Exist?	Who Pays?	Scenario Reference	What Main Barrier is it Relevant to?	Re-search Report	Lit. Review	Feedback from Three Additional Meetings
<b>Guidelines for Energy Efficiency</b>	100 Day Plan to initiate data collection and identify quick wins	This initiative would consist of the creation of a tool and a set of guidelines on how to take a building from acquisition through its first 100 days to achieve quick wins and begin a longer term action plan for energy efficiency.	Operate	Operate	Tools	Facility Manager	No	Owner	Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of information (SKM 2006)			
	New AIRAH Maintenance for Efficiency Standards	This initiative takes up the new AIRAH Maintenance for Efficiency Standards and promotes this for specifying and embedding within HVAC maintenance contracts.	Operate	Operate	Tools	Facility Manager	Yes	Owner	Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Poor commissioning and maintenance of service systems (NEEF 2004)			
	Building Energy Log Book	Needs input from working group	Operate	Operate	Tools	Facility Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of awareness of building energy use (where it goes - breakdown) (NEEF 2004)			
	Communication Plan	Needs input from working group	Operate	Operate	Tools	Facility Manager			Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Energy Efficiency is not integrated into core business (LEHR SWG 2007)			
	Efficiency Operation and Maintenance Guidelines	This initiative is envisaged to build a set of guidelines for energy efficiency that covers the full spectrum of building life cycle issues from acquisition, operation, redevelopment and 'reliving'. It is quite possibly the signature document that encompasses all other initiatives detailed here.	Operate	Operate	Tools	Facility Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Energy Efficiency is not integrated into core business (LEHR SWG 2007)			

Initiative Title	Initiative Steps	Initiative Contents	Building Life-Cycle	Project Life-Cycle	Skills	Who Relevant To?	Already Exist?	Who Pays?	Scenario Reference	What Main Barrier is it Relevant to?	Re-search Report	Lit. Review	Feedback from Three Additional Meetings
	Due Diligence Checklist	This is a tool that would assist teams involved in building acquisitions to identify critical energy efficiency issues during the due diligence process and ask the right questions to gather information i.e.: NABERS Energy ratings, electricity consumption history, load profiles, energy savings action plans etc .	Operate	Operate	Tools	Asset Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of information (SKM 2006)			
	Acquisition Feasibility Model	This tool would take the information gathered during due diligence process and enter into a model to determine the feasibility and investment required to improve a building's energy performance. This would assist the decision making process in determining current and future capital value, IRR and level of risk associated with a building based on its NABERS Energy rating.	Operate	Operate	Tools	Asset Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of standard cost-benefit analysis (NEEF 2004)			
<b>Planning for Energy Efficiency</b>	5 Year Asset Energy Improvement Plan	This is the next step from the 100 day action plan. It would set out the necessary actions and planning principles for a longer term action plan for energy efficiency.	Operate	Operate	Tools	Asset Manager	Yes - recommending modifications		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Competition for capital (LEHR SWG 2007)			
	Standard Business Case Template	This tool would assist in the more robust cost benefit analysis of energy efficiency initiatives and present a sound financial proposition and investment return in both financial and non financial terms. It would also identify key risk areas where government policy or tenant demand for energy efficient buildings can assist decision making.	Operate	Operate	Tools	Asset Manager	Yes - recommending modifications		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of standard cost-benefit analysis (NEEF 2004)			
	On Line Data Management System	Another tool that would provide a database of electricity and utility consumption history and account information to aid analysis of energy usage and reporting for both voluntary and mandatory requirements. Would include benchmarking capability for individual building and portfolio comparison. Would probably need to be supported by an existing industry association such as FMA, PCA or similar.	Operate	Operate	Tools	Facility Manager	Yes		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of information on past total energy consumption limiting assessments (NEEF 2004)			

Initiative Title	Initiative Steps	Initiative Contents	Building Life-Cycle	Project Life-Cycle	Skills	Who Relevant To?	Already Exist?	Who Pays?	Scenario Reference	What Main Barrier is it Relevant to?	Re-search Report	Lit. Review	Feedback from Three Additional Meetings
<b>Education for Energy Efficiency</b>	Industry Knowledge Forum (Facility Manager/Sustainability Manager)	This is an initiative that would seek to establish an ongoing forum for facility managers to meet and share knowledge and experience around energy efficiency in the operation of office buildings. The format could include each member hosting a meeting and arranging for some form of educative content such as guest speakers, product demonstrations, case studies presentation etc.	Operate	Operate	Skills	Facility Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of education and vocation programs (NEEF 2004)			
	Remote and Centralised Energy Efficiency Troubleshooters	As an initiative of the 'Industry Knowledge Forum', this would consist of a formal education program that would train facility managers to be 'energy trouble shooters' able to readily identify energy wastage from examining data, usage profiles and inefficient plant operation and devising and implementing remedial measures.	Operate	Operate	Skills	Facility Manager	No		Scenario 5(a) - New Sustainability Manager - Large National Property Portfolio	Lack of specialised knowledge such as building controls (LEHR SWG 2007)			