

Making  
Energy  
Efficiency  
Work For You

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# How to Retrofit your Building From Benchmarking to Commissioning

Presented by

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# Overview

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- Why retrofit?
- Benchmarking
- Identifying energy efficiency opportunities
- Making it happen

## Why Retrofit?

- Reasons for retrofitting buildings vary, but key factors include:
  - Services upgrade
  - NABERS upgrade to attract tenants
  - Reposition asset for improved rent/sale value

## Why Retrofit?

- Services upgrades
  - Replacement of old plant
  - Improvement of service delivery
  - Reduced maintenance costs
  - Improved reliability

## Why Retrofit?

- NABERS & asset repositioning
  - PCA grade matrix references NABERS
  - Government tenants demand 4.5 star rating
    - Some large corporate tenants, too
  - CBD lighting may generate similar drivers
  - Building with 4.5 stars may attract higher rents
  - Building with quality tenants has higher sale value

## Why Not Knock Down and Rebuild?

- Rebuild has many disadvantages
  - High capital costs
  - High environmental impacts
  - Loss of rent during construction period
  - Final result may not be that much better

## When to Retrofit?

- Retrofit timing has to be coordinated carefully:
  - Vacancies (especially for deeper refurbishments)
  - Known replacement horizons for plant
  - Seasonal plant outage coordination
    - Beware central plant lead times

## Benchmarking – How Good is my Building?

- Use available benchmarks to determine the level of efficiency opportunity in your building:
  - Offices: Anything less than NABERS 4 stars is fair game
  - Hotels/shopping centres: Anything less than NABERS 3.5 stars is fair game
- But.....
  - Almost every building has 10-15% savings available
  - Benchmarking tells you how much worse it is than that



## Benchmarking – How BAD is my building?

- With low-hanging fruit measures
  - 2.5 star buildings have savings of 15-20%+ available
  - 0-1 star buildings have savings in excess of 30% available
- With some capital investment
  - 2.5 star buildings have savings of 30%+ available
  - 0-1 star buildings have savings in 50%+ available
- Almost everywhere, gas savings are available
  - Gas is typically wasted more than electricity

# Identifying Energy Savings

- Standard process is an energy audit, which should include as a minimum:
  - List of specific energy savings measures with costs and benefits
  - An energy end-use breakdown
  - A description of the site
- Notional standard is AS3598 Level 2

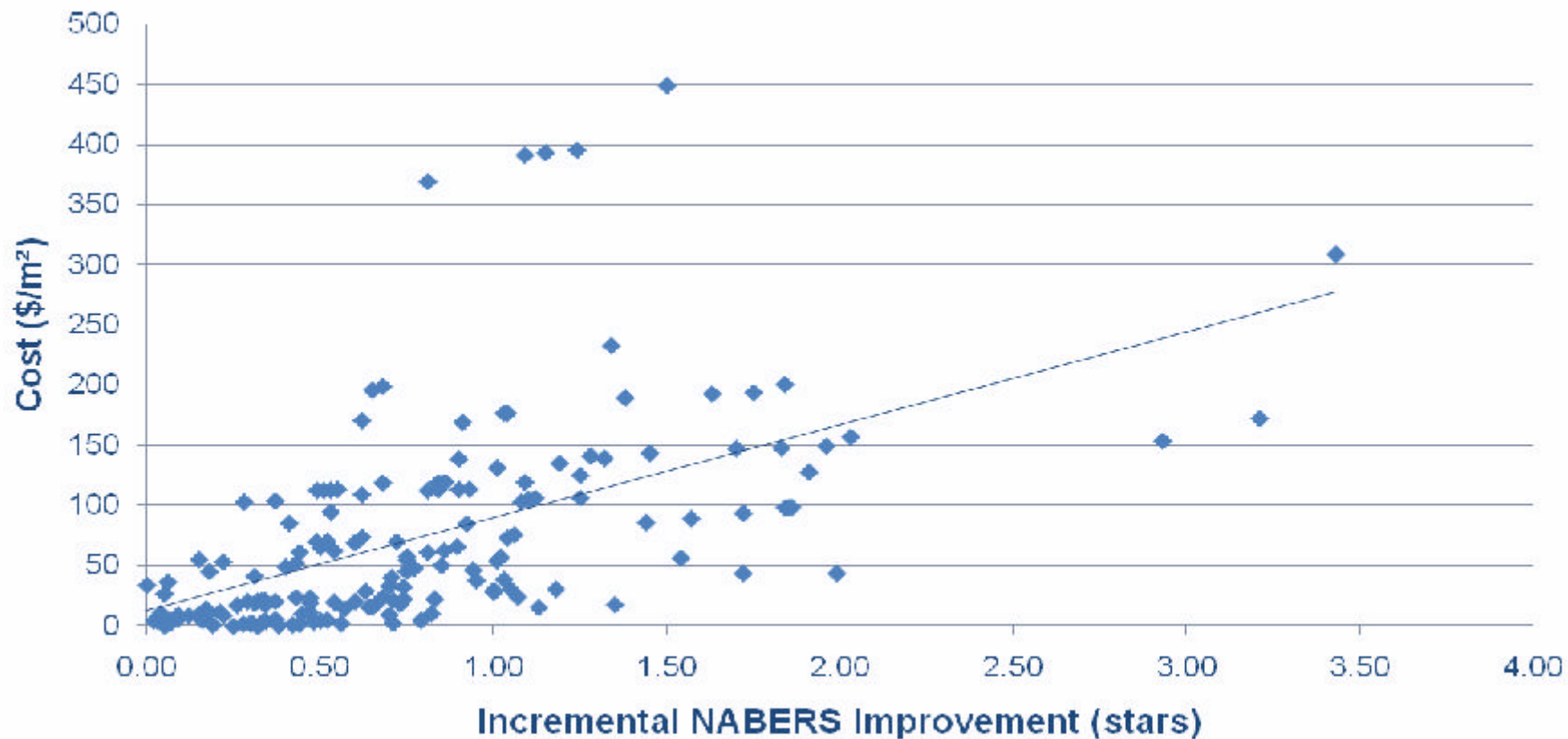
## Good and Bad Audits

- Audits cost anywhere between 3% and 20% of annual energy cost depending on site size and complexity
  - You get what you pay for.
- Bad audit call-signs:
  - No end use breakdown
    - How did the auditor estimate energy use?
  - Non-specific measures
    - “Do something with your HVAC controls”
    - “Replace all the T8 lamps with T5 replacements”

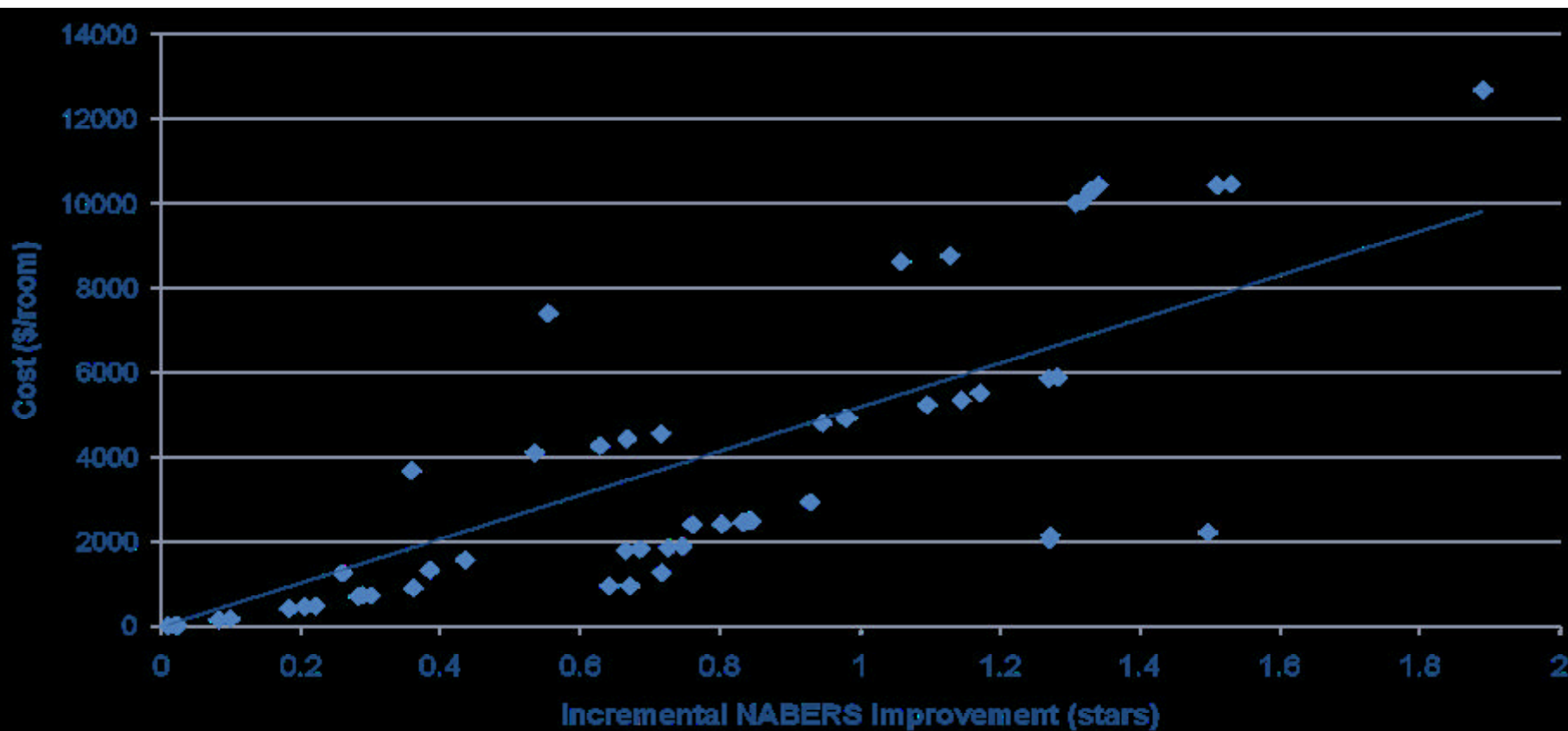
## Alternatives to Audits

- Work internally to identify waste
  - Results dependent upon skills and motivation of building staff
- Limited domain audits can deliver results
  - e.g. lighting only, HVAC only
- HVAC controls reviews can be very cost-effective
- Be wary of supplier driven equipment upgrades
  - Solutions offered will be equipment driven
  - Plenty of bad examples and far fewer good examples

# Retrofit Costs - Office Buildings



# Retrofit Costs - Hotels



## Areas of Opportunity

### → Lighting

- Turn off when not needed
- Reduce lighting power density/install more complex controls

### → HVAC

- Improve controls
- Upgrade plant

### → Other equipment

- Turn off when not in use
- Rationalise

# Don't Forget Building Management

- ➔ LEHR demonstrated that performance improvement is not just about technology. Key factors include:
  - ➔ Management responsibility and authority
  - ➔ Having a reason to care:
    - ➔ Staff vs contractors
    - ➔ Incentives and disincentives
    - ➔ NABERS declaration
  - ➔ Training
  - ➔ Culture of continuous improvement



# Key Issues in the Implementation Process

- Implementation process must manage:
  - Preservation of design intent
  - Translation of design intent into design
  - Translation of design into a working outcome
  - Minimisation of tenant disruption
  - Demonstration of outcome
  - Time and costs

# Key Players in the Implementation Process

- Key players
  - Energy auditor
  - Services engineer
  - Contractor(s)
  - Building owner
  - Building management
  - Project manager
  - Tenants
- One party may take several roles

# Procurement and Contracting Options

- Design and construct
  - Hand audit to contractor
  - Contractor designs and implements solutions
- Detailed design, build to plan
  - Hand audit to design consultant
  - Design works and tender
  - Contractor implements, consultant checks
- Energy Performance Contract
  - EPC contractor identifies and implements solutions
  - EPC contractor guarantees outcome

# Common Failures

- Not all efficiency upgrades are successful
  - Specification issues
  - Control/commissioning issues
  - Lack of monitoring and verification
  - Project management

## Specification Issues

- Audits don't always give much detail
  - A good audit should, though
  - Energy efficiency is often about detail
- Normal practice delivers the designs that fail and need upgrade
  - Delivery of successful retrofits requires specific attention to energy efficiency
- Preservation of design intent is important

## Controls/Commissioning Issues

- Simple questions (not always easy answers)
  - Does it work the way it was intended?
  - Has it been optimised for efficiency?
  - What commissioning tests has it been subject to?
  - Has it been correctly documented (or at all)?
- Consider the use of an Independent Commissioning Agent

# Monitoring and Verification

- Establish a pre-works baseline
  - NABERS easiest where available
- Develop monitoring for each measure, preferably
  - Simple before/after measures for simple systems
  - Climate corrected correlation based benchmarks for HVAC
- Build metering into the works to enhance understanding
- Confirm performance as part of the defects process

# Project Management

- All procurement methods need a good project manager to
  - Integrate proposed design with design intent
  - Manage implementation issues in line with design intent
  - Manage multiple conflicting priorities
  - Manage monitoring and verification process



# Conclusions

- ➔ Retrofitting is an attractive option for the repositioning of an asset
- ➔ The basic process is:
  - ➔ Measure
  - ➔ Identify savings
  - ➔ Implement savings
  - ➔ Measure
- ➔ Procurement and execution of retrofits require care

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# Questions?

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