CIM

A GUIDE TO IMPROVING YOUR NABERS RATING

Practical building management tips to drive operational efficiency, direct from CIM's industry leading engineers

PREPARED BY CIM

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Setting the scene

A QUICK NABERS REFRESHER

NABERS ratings assess a building's environmental impact using a simple star rating system, from 1 ('Making a Start') to 6 (Market Leading). Officially, NABERS helps you to "accurately measure, understand, and communicate the environmental performance of your building while identifying areas for cost savings and future improvements." Four factors are considered: energy efficiency, water usage, waste management and indoor environment quality.

Professional assessors, accredited through the NSW Department of Planning, Industry and Environment (DPIE) collect your building's consumption data, along with other information like building size, hours of occupation, climate, and occupation density. Ratings are valid for 12 months after a formal inspection.

The effort to attain a higher rating increases along with your star count. A 6-star rated building has 50% of the greenhouse emissions of a 5 star building, pointing toward a target zero-emissions 7 star rating in the future.

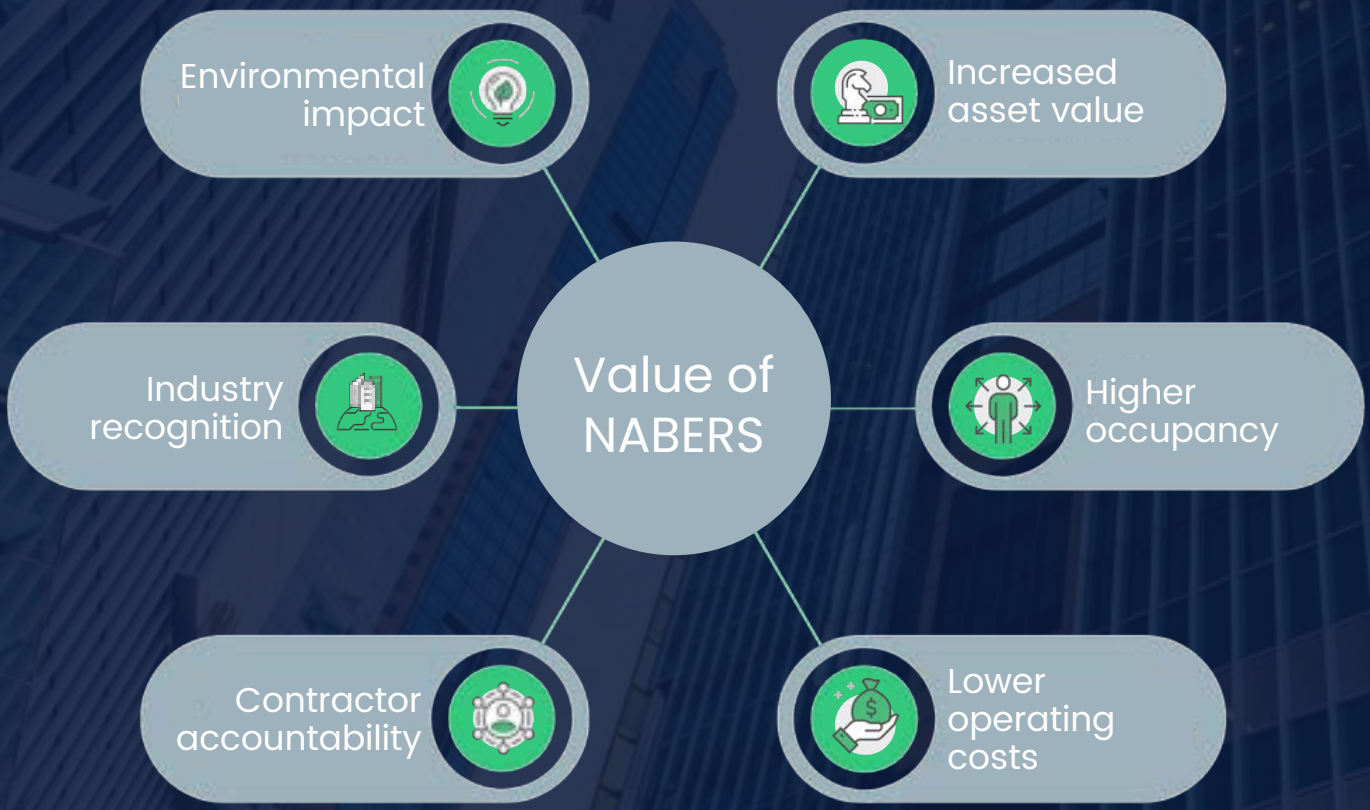
Value of NABERS

WHY DOES YOUR NABERS RATING MATTER?

The benefits of a higher NABERS rating extend beyond environmental impact. They form the basis of a robust sustainability strategy, providing a fair benchmark for a building's operational efficiency. NABERS provides a trustworthy and independent validation of sustainability data, ensuring confidence in communicating it simply.

Buildings with a lower environmental impact, lower running costs, and being able to communicate that with confidence gives building owners a competitive advantage with prospective buyers, tenants and investors.

A higher NABERS rating delivers significant benefits: increased asset value, higher occupancy, lower operating costs, contractor accountability, industry recognition and, of course, lower environmental impact.

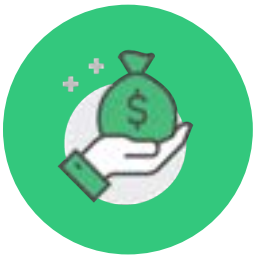


Increased asset value

Building owners are penalised with a low asset valuation if their NABERS rating is low, because buyers expect high operating costs and significant capex for future energy efficiency upgrades. Conversely, higher-performing buildings have lower net operating costs, making them more attractive to buyers. A correlation has been identified between cap rates and NABERS ratings, with data from CBRE's NABERhood Watch Report finding a 5% premium for 6 star rated buildings, and a 2% discount for 4.5 star rated buildings.

Higher occupancy

Tenants are increasingly considering NABERS within their evaluation criteria. Research has clearly illustrated higher occupancy for NABERS 5.5 and 6 star rated buildings, with a 4% gap to 4.5 star rated and an 11% gap to 4 star and less rated assets[1].



Lower operating costs

Minimising wasted energy consumption and eliminating inefficiencies lifts a building's overall performance, reducing running costs. Energy expenses typically account for up to 15% of the overall cost of building operation.

[1] NABERhood Watch Report, CBRE

Accountable contractors

By specifying NABERS rating and improvements in your contracts and performance indicators, you can increase accountability for delivery from your service contractors and technical service providers.

Industry recognition

The industry recognition that comes with peak building performance helps your building stand out from the crowd, attracting the attention of buyers, investors, and tenants.

As ESG continues to gain worldwide traction, more governments and organisations will mandate that the buildings they occupy have high environmental ratings. Locking in high operational standards now will put you ahead in the long run.

Environmental impact

Buildings have a significant impact on the environment, being responsible for nearly 40% of the global carbon emissions[2]. By enhancing operational efficiency within the NABERS framework, buildings are reducing their carbon footprint. Since 2010, NABERS rated office assets have decreased energy use by an average of 10%.

[2] NABERS, nabers.gov.au/about

Improving your NABERS

THE TWO PATHS TO ENERGY EFFICIENCY

Improving the energy efficiency of a building or portfolio within the NABERS framework requires optimisation of your activity. The road to optimisation is paved with one of two approaches, capital expenditure or operational improvement. While both have value, you should always prioritise the smarter use of existing equipment over capital outlays on new equipment.

CAPITAL EXPENDITURE

Big money for small gain

OPERATIONAL IMPROVEMENTS

Low-cost alternative with a big impact

Big money for small gain

CAPITAL EXPENDITURE

Capital expenditures that directly impact NABERS ratings generally involve replacing or upgrading building equipment and systems. Common examples include:

- Equipment replacement (especially HVAC)
- Lighting upgrades
- New BMS installation
- Adding solar power

In some cases, capital expenditures can be quick wins. For instance, if you are confident that your chiller has reached the end of its lifecycle, replacing it with a newer and more efficient model may be an easy and cost-effective improvement.

But while new and improved equipment can help reduce overall energy consumption, there are significant drawbacks. First, the cost can be prohibitive. Second, unless the performance of new equipment is optimised, it will still fault and degrade in much the same way as the old equipment.

All of this means that efficiency gains from capital expenditures are spread out over a long period, due to significant upfront investment. If you're considering replacing equipment that still has years of life left, you won't see ROI on those purchases until many years down the road.

Our recommendation is to only invest in capital upgrades when you are confident they will offer quantifiable improvements in efficiency.

Low-cost alternative with a big impact

OPERATIONAL IMPROVEMENTS

That leads us to the second option: improving the operation of your existing systems to maximise its performance potential.

Unlike more costly capex strategies, improving the performance of equipment via control systems (i.e. optimisation or tuning) can provide immediate reductions in energy use. The ROI can often be measured in months, not years. Most improvements that impact NABERS have to do with HVAC systems, which consume most of a building's energy. In fact, optimising HVAC systems alone can yield a 10-15% energy reduction.

Ultimately, the results you'll get from using your current equipment more intelligently are much better than simply throwing money at the problem.

So, where do you start?

We recommend running BMS control strategy reviews to identify and resolve operational inefficiencies. The following 7 strategies are recommended year-round. These optimisation initiatives have the potential to yield distinct efficiency gains when supported by robust building analytics data.

- Outside air temperature lockouts
- Cooling tower temperature control
- Chiller cooling & boiler heating calls
- Zone temperature setpoints
- Economy mode operation
- Night purge operation
- CHW temperature setpoint

Operational Improvement 1

1 OUTSIDE AIR TEMPERATURE LOCKOUTS

Outside air temperature (OA-T) lockouts are designed to prevent chillers and boilers from operating unnecessarily when the outside air temperature sits within certain thresholds. With the proper controls, chillers won't cool and boilers won't heat the building unnecessarily on days when temperatures can fluctuate between ~14℃ and 20℃.

Investigative questions to ask

- Is the OA sensor located in a suitable location?
- Is there an alignment between the readings from your building's OA Temperature/Humidity sensor readings and your building analytics software? If not within 2℃ of each other, consider recalibrating or relocating the sensors.
- Are the OA-T lockout setpoints appropriate for the site?
- Do the lockout setpoints need to be reviewed to take into account variable occupancy?

Optimisation tips

Chilled Water System (CWS)

- If the OA-T is less than 17℃ for 30 minutes, lock out the CWS
- If the OA-T is greater than 17℃ for 10 minutes, make CWS available for operation

Hot Water System (HWS)

- If the OA-T is greater than 16℃ for 30 minutes, lock out the HWS
- If the OA-T is less than 15℃ for 10 minutes, make HWS available for operation

Optimisation 2

2 COOLING TOWERS WET-BULB TEMPERATURE

Cooling Towers are used to cool down condenser water for the chillers, by extracting heat from the chillers' condenser. Typically, chiller manufacturers specify the maximum water temperature the chillers can operate with to deliver the cooling requirements. However, there are benefits to reducing the condenser water temperature on the operation of the chillers.

This is usually governed by the amount of moisture available in the air. The psychrometric measurement of this is called wet-bulb temperature. Ideally, you want all cooling towers to track the outside air wet-bulb temperature and control to it with an offset of between 4 and 5℃.

Investigative questions to ask

- Is the setpoint fixed for the condenser water temperature?
- Is the minimum setpoint too high?
- Is the minimum setpoint causing the chillers to fault or trip?

Optimisation tips

The condenser water temperature should be reset based on the buildings' outside air temperature wet-bulb + 5℃ (adjustable) with a minimum temperature of 20℃ (adjustable) and maximum temperature of 29.5℃ (adjustable).

Optimisation 3

CHILLER COOLING & BOILER HEATING CALLS

For central cooling systems, you want to ensure the chillers kick on at the right time to address the cooling requirements of the building. Engaging the chillers early increases the risk of energy over-consumption and may reduce the life of your equipment over time.

Similarly, boilers should be enabled when needed, not before. Operating boilers earlier than required increases consumption without achieving the desired outcomes and may lead to equipment malfunctions caused by short cycling (frequently turning on and off). Therefore, it's important to set the correct setpoint and time interval for both the chilled and hot water valves.

Investigative questions to ask

- Is the time interval too short or too long?
- Is the chilled water valve responsible for the cooling/heating call reliable?

Optimisation tips

Chiller

- If the maximum chilled water valve position is 90% for 10 minutes, the cooling call is to be generated
- If the maximum chilled water valve position drops below 20% for 10 minutes, the cooling call is to be disabled

Boiler

- If the maximum hot water valve position is 90% for 10 minutes, the heating call is to be generated
- If the maximum hot water valve position drops below 20% for 10 minutes, the heating call is to be disabled

Optimisation 4

4 ZONE TEMPERATURE SETPOINTS

Zone temperature setpoints are constantly adjusted by Facilities Managers and contractors to address tenant complaints. But it's important to keep the big picture in mind, aligning all setpoints so nearby systems aren't fighting each other.

Sometimes these setpoint adjustments can mask an underlying mechanical issue that needs to be addressed, so it's essential to identify and rectify any underlying issues before adjusting setpoints.

If tenant complaints about temperature control persist, the underlying issue may be resolved by taking some initial investigative steps:

- Install more efficient light fixtures - cool light is best to reduce the chance that lighting is warming the thermostat controls and throwing off the temperature
- Clean out the ducts, vents and filters - which can become clogged with grime, dust and debris
- Update outdated components or systems within your HVAC
- Modify ductwork - new office and cubicle layouts can sometimes require changes to the positioning of your ductwork
- Install new window shades - energy-efficient window coverings can help reduce energy costs and improve comfort levels
- Add window film - these can improve thermal properties by providing sun control and UV protection, while reducing hot spots

Optimisation 5

5 ECONOMY MODE

Economy mode, or free cooling, is when outside air is more efficient to cool the building than return air. Economy mode is the first stage of cooling and is complemented by the modulation of the chilled water valve when the supply air temperature is not meeting its setpoint. The potential energy savings from the economy cycle are significant—but only if the proper strategies are in place.

The most common methods for calculating the suitability of outside air to be utilised are:

1. Outside air temperature versus return air temperature
2. Outside air enthalpy versus return air enthalpy
3. Outside air temperature versus return air enthalpy
4. Outside air enthalpy versus return air temperature

Potential impact

Buildings realise the greatest benefits of economy mode operation during the cooler periods. That is, the shoulder seasons for NSW, WA and SA, winter period for QLD and all year except winter for VIC & ACT.

Energy savings from the economy cycle primarily derive from reduced chiller operation, with AIRAH estimating savings of up to 20%. The table below estimates the potential annual savings on base building electricity if there are no economy cycle strategies in place.

State	Greatest Benefit	Potential annual saving
NSW, WA, SA	Mar - May & Sep - Nov	5% of base building
VIC & ACT	All year except winter	7% of base building
QLD	May - Sep	4% of base building

Optimisation 5

ECONOMY MODE CONT.

Optimisation tips

Often, economy mode is included in the BMS control logic and may have the required points adjustable, making it easy to tune. The strategies recommended below, in order of priority, are to be utilised to tune or implement economy cycle control for your building.

Strategy 1

Enable economy cycle when the outside air enthalpy is less than the return air enthalpy by 5 KJ/Kg˚C and the outside air temperature is less than 22˚ C. A hysteresis of 5 KJ/kg and 1˚ C needs to be implemented to prevent short cycling of economy mode.

Strategy 2 (when return sensors are not available)

Enable economy cycle when the outside air enthalpy is less than 50~52 kJ/kg˚C and the outside air temperature is less than 22˚C.

Occasionally, you'll find that the BMS would refer to outside air dew point instead of enthalpy. In this case, enable economy cycle when the outside air dew point is less than 12˚ C. Again, a hysteresis of 5 KJ/kg and 1˚C needs to be implemented to prevent short cycling of economy mode.

Strategy 3 (When humidity sensors are not available)

Enable economy cycle when the outside air temperature is less than return air temperature and less than 22˚C. A hysteresis of 1˚C needs to be implemented to prevent short cycling of economy mode.

Optimisation 6

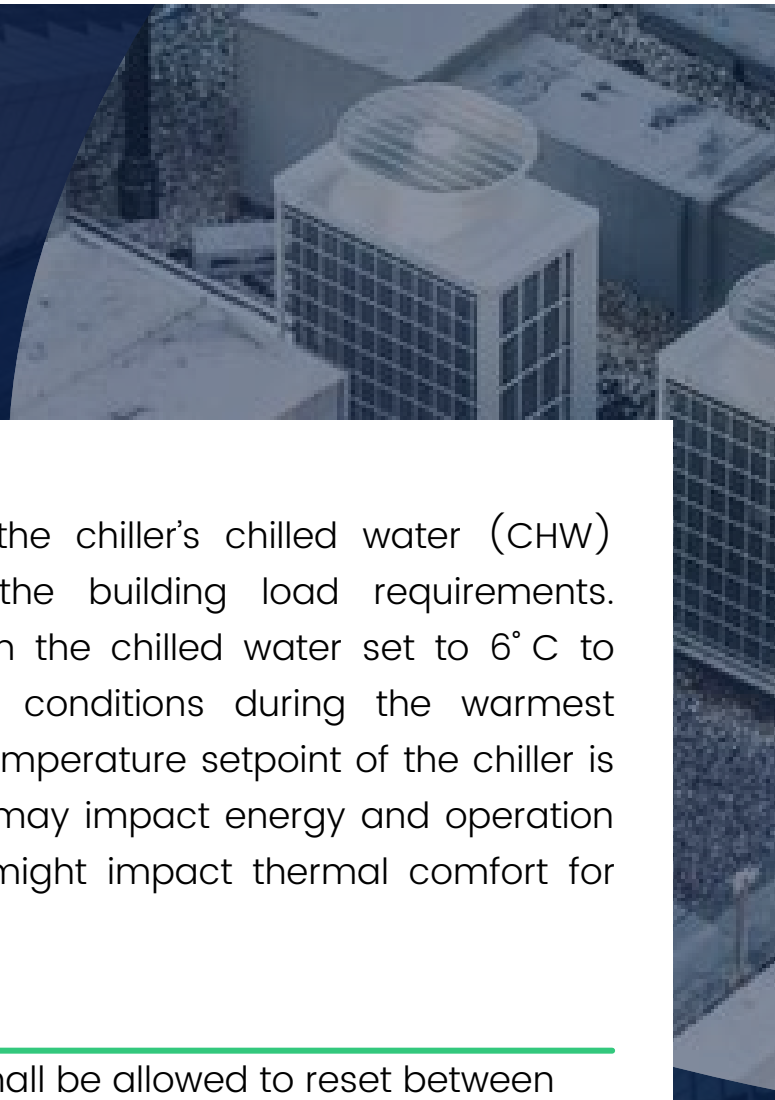
6 NIGHT PURGE OPERATION

In warmer climates, buildings require additional cooling during the evening period, when ambient light and temperature conditions are more favourable. In commercial offices that are unoccupied over the weekend, buildings act as thermal storage, and temperatures may soar. This places a massive load on building air conditioning. To minimise this load, a night purge is recommended—preferably on Mondays—to ventilate the building during early morning hours and remove the excess cooling load.

Optimisation tips

Night Purge usually operates when ambient conditions are at their lowest, generally between 2am and 4am. It's purpose is to exhaust the warm air has built up in the building when the internal temperatures are high (> than 25℃). This usually occurs in warmer climates and is apparent in office buildings when HVAC isn't operated for an extended period (i.e. over the weekend).

Therefore, the recommendation is to operate the supply fan with the economy dampers 100% open to introduce cooler air into the building whilst exhausting the warm air out of the building without operating the central chilled water system. It's important that the fans don't operate for extended periods beyond 1 hour. If operated for more than one hour, an assessment needs to be done on the thermal benefit over the energy consumption.



Optimisation 7

CHW TEMPERATURE SETPOINT

The BMS is capable of adjusting the chiller's chilled water (CHW) temperature setpoint based on the building load requirements. Buildings are typically designed with the chilled water set to 6˚C to maintain internal thermal comfort conditions during the warmest month. Knowing when to raise the temperature setpoint of the chiller is critical, as resetting down too early may impact energy and operation of the chillers, while resetting up might impact thermal comfort for occupants.

Optimisation tips

Chilled water temperature setpoint shall be allowed to reset between the minimum and maximum setpoints.

- The chilled water temperature setpoint shall reset up if the average chilled water valve position is less than 60%
- The chilled water temperature setpoint shall reset down if the average chilled water valve position is greater than 70%
- The chilled water temperature setpoint will reset at a rate of 0.5˚C every 5 minutes
    - The minimum chilled water temperature setpoint = 6˚C
    - The maximum chilled water temperature setpoint = 9˚C

Note: all temperatures are adjustable

Building analytics in action

CASE STUDY: 193 NORTH QUAY

Kyko Group's 193 North Quay, a 10-story office building in Brisbane, is a shining example of how operational efficiencies and building analytics can combine to promote NABERS rating success.

In 2013, the building unofficially received a NABERS rating of 'zero'. This triggered Kyko Group into action, with Director Bill Jenkings engaging CIM. The asset soon saw progressive improvements in its NABERS rating. Today, it boasts an 'Excellent' 5-Star energy rating, exceeding its target rating of 4-Stars.

CIM proposed a series of transformational recommendations at the site, central to which was deploying the PEAK Platform. Initially, given the age of the building, some refurbishments were identified requiring capital expenditure, including upgrades to its Building Management System (BMS) and installation of Variable Speed Drive (VSD's).

Kyko Group also achieved ROI in just 18 months. This is despite incurring separate costs over this period to upgrade the BMS and older equipment. Importantly, however, the energy savings achieved by the PEAK Platform made this capital expenditure possible. Further, average thermal comfort ratings are up, energy consumption is down, and tenant satisfaction has jumped.

With no significant capex investment, Kyko and CIM have achieved great results at 193 North Quay through continuous maintenance and optimisation.

5 star
Lift in NABERS rating

32.3%
drop in base building energy costs

17%
improvement in thermal comfort

4.8
GWh of energy saved

ABOUT CIM

We are a market-leading provider of building analytics software, making it easy to operate large buildings at their peak operational performance, to deliver economic and environmental benefits for shareholders, tenants and society.

The PEAK Platform, our advanced building analytics solution, provides a smart, simple and transparent way to get large buildings, and the people involved in running them, operating at peak performance. We power resource-efficient and environmentally responsible buildings by providing data-driven insights to maximise their operational efficiency and rapidly reduce their energy consumption.

What does the PEAK Platform give you?

01
Prioritised alerts with detailed fault identification & solutions to limit alarm fatigue

02
Effortless 'Click to Assign' workflow, so contractors can fix issues before they escalate

03
Deep dive & interrogate building performance, today and historically

04
Centralised tracking of contractor performance across multiple buildings

05
Address issues like temperature and humidity before a tenant complains

06
Deliver sustainability wins to drive environmental impact

Want to operate your building more efficiently to drive a higher NABERS rating?

Get in touch with the experts at CIM today.

CIM

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