Sensitivity: General

Green Star Buildings – Approach to Benchmarking Energy Efficiency

Options Review and Recommendation

Prepared for New Zealand Green Building Council
Prepared by Beca Limited

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Contents

Appendices

Revision History

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Document Acceptance

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Prepared by	Scott Smith		2/3/23
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on behalf of	Beca Limited		

Executive Summary

In New Zealand, the Ministry for Building, Innovation, and Employment (MBIE) have proposed absolute kWh/m² caps for building thermal performance and energy consumption, with supplementary caps for fossil fuel use and other related metrics (e.g. water consumption).

As the NZGBC adapts the GBCA's Green Star Buildings tools, they are seeking to establish an energy/operational carbon performance framework that can align (where practicable) with the future NZ Building Code settings.

The Green Star system in NZ certifies a wide range of non-residential buildings. The complexities of applying an absolute energy/operational cap to the range of buildings certified has led to a review of approaches globally and how this could be adopted successfully.

Globally, the use of absolute targets for building energy / operational carbon performance has increased in response to carbon reduction targets. These frameworks typically cover simpler building typologies, with carve-outs, alternative compliance pathways, and adjustment factors for more complex buildings.

To date, the proposals presented by MBIE have not provided sufficient detail on how these more complex, mixed use or bespoke buildings (often rated under Green Star) will be treated. Information provided to date indicates an overly simplistic approach that could create perverse outcomes for the NZ construction industry, including carbon leakage and increases in real world emissions.

This report presents a summary of a global scan of approaches, benefits, limitations, a preferred methodology and a pathway to delivering this over time.

Recommendations (DRAFT)

An absolute approach to building performance with energy/operational carbon caps is supported, but only if the caps are set at space level, with individual buildings establishing overall caps based on the mix of spaces included within the building envelope. These per m² caps should not include plug or process loads which are generally linked to the functional purpose of a non-residential buildings.

These caps will take time to develop. A relative approach to building performance (based on component efficiencies similar to the current NZBC methods) should be retained as a compliance pathway whilst space level caps are developed.

Options to include supplementary caps to focus on thermal envelope performance are presented for discussion. If thermal performance caps are used, climate adjustments should be applied to avoid dramatic and potentially unfair changes from current NZBC component level settings. These can be retired as the framework starts reducing caps and driving higher performance.

1 Background

The NZGBC has requested Beca review the current Green Star approach to benchmarking energy and operational carbon performance of buildings so that a "best practice" methodology can be adopted for the upcoming Green Star Buildings tool.

This review consists of the following:

- Presenting the methodology, benefits, and limitations of an "absolute" and a "relative" approach to setting energy/carbon benchmarks. (1-model vs 2-model)
- Understanding the current landscape of energy benchmarking approaches globally
- Propose a "best practice" methodology and a pathway to implementing this against the context of proposals, presented by the Ministry of Business Innovation and Employment (MBIE), for the future of NZ building code compliance via the Building for Climate Change (BfCC) programme.

The NZGBC wishes to implement a methodology that is:

- workable and fair
- rewarding to high performance / innovation and drives best practice
- able to align with NZ's carbon emissions reduction commitments
- able to align with the signalled direction of the NZ Building Code

This review has not considered any impacts on building occupant comfort and health, embodied carbon emissions or other sustainability indicators that could be impacted by the selection of a preferred methodology. For example, a change in methodology could incentivise more deep plan buildings with less natural light. It is anticipated that this is managed through other controls within the Green Star framework.

History of the Green Star NZ benchmarking method

The benchmarking approach used by Green Star in NZ has evolved over time. When the framework was launched in (Green Star Design v1) an "absolute" approach to setting energy benchmarks was adopted from the Australian version of the tool. This set the standard energy consumption at 120kWh/m² for office buildings (the only typology rated under v1). For the purposes of points allocation, this covered base building energy consumption only (excluding tenant lighting, plug loads and processes) with minor adjustments made to this energy coverage (and the target) based on scope definition changes in later updates.

When the NZGBC expanded the scope of their Green Star framework to include Industrial and Education buildings the single model approach was reviewed. This review found that a 2-model approach (which compares the proposed building to the same building with minimum performing components) would be fairer due to the increased variability in building functions, hours of use, process load, etc. During the consultation process three key concerns were raised about the limitations of a relative approach to benchmarking:

1. the sensitivity of relative performance to hours of use (which could be gamed)
2. the inability to reward building form and orientation (which is held constant)
3. the ability to trade building fabric performance against building system efficiency could lead to poor outcomes for the long term energy efficiency of the building

The first concern was partly addressed - standardised input assumptions for different building types although some inputs (ventilation rates, internal gains) were defined by the project.

The second concern was not addressed - the decision to adopt a methodology that did not directly reward building form and orientation was accepted on the basis that it would create a fairer modelling process across project types and that few projects were making form and orientation decisions based on modelling outcomes. The option to set the benchmark based on the average of multiple solar orientations was discarded as overly complex.

The third concern was addressed - the use of an “intermediate” model tested the building fabric performance in isolation. The Green Star points were split on this basis.

This change in approach was reflected in changes to the Building Code of Australia (BCA) happening at the same time. The BCA’s energy efficiency requirements (Section J) were phasing out an absolute target compliance pathway with buildings being forced into a relative performance approach. This also included an “intermediate” style model to protect against poor fabric performance. This approach was eventually also adopted by the GBCA and has continued to be used in all future versions of the Green Star tool.

The latest version of Green Star NZ Design and As-Built v1.1 has removed the building envelope performance test due to the improvement in building code insulation performance.

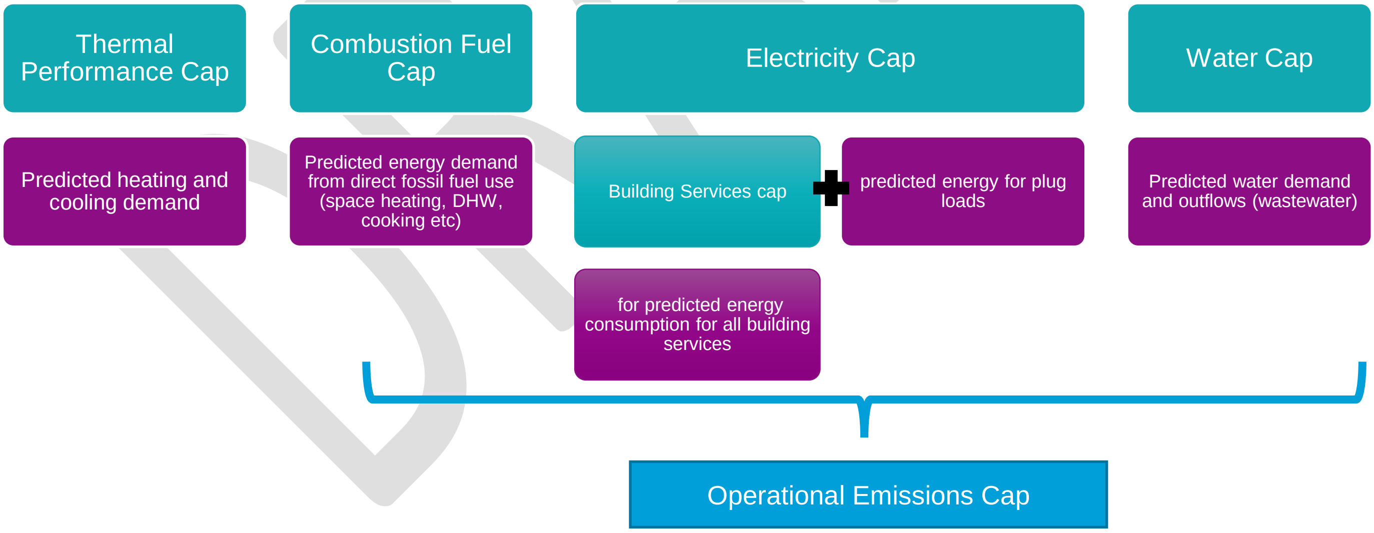
Building for Climate Change

MBIE’s Building for Climate Change (BfCC) programme is proposing an absolute approach to building energy and carbon performance for building code compliance.

This is described in MBIEs “Transforming Operational Efficiency” released August 2020 – available here https://www.mbie.govt.nz/dmsdocument/11793-transforming-operational-efficiency

This has been supplemented by targeted consultation with industry groups, presenting more detailed proposals. Whilst these are in draft and not currently government policy, it presents a technical methodology for assessing building compliance against absolute caps.

The two documents provided propose that all buildings are subject to absolute caps that reduce over time to navigate NZ towards a zero-carbon future. The figure below shows the structure and coverage of the caps.



The publicly available proposals provided to date indicate that the absolute value used for each cap will apply to all building types, and will reduce over time.

To support the use of absolute caps, standardised internal environment settings are being proposed to cover air temperature, comfort, moisture, ventilation etc. Similar to the caps proposed, these seem to be standardised across all building typologies and uses, and would be used as energy modelling inputs.

Our understanding is that building typology specific caps and internal environment settings are being considered as the framework is further developed.

2 Comparison of Benchmarking Methods

2.1 Absolute (1-model) approach

The absolute approach to setting energy performance benchmarks involves the development of a building level performance target, usually expressed in kWh/m² p.a. This can also be expressed in operational carbon terms ($kgCO_2e/m^2$ p.a) using assumed fuel types.

To assess compliance, a model of the proposed building design is developed with a set of standardised operational criteria. Assessed energy (or carbon) performance is compared to the target value. If adopted for Green Star, points would be allocated on the basis of achieving increasingly challenging caps, or a percentage improvement over a baseline cap.

The following table highlights the key benefits and limitations of an absolute benchmark approach along with potential mitigations for each limitation.

Benefits	Limitations	Mitigations
Absolute values could be notionally set from a top-down basis, aligning with national carbon emissions budgets and/or net zero targets, although adjustment factors for real world performance would be needed for absolute alignment..	Variability in building typologies/space mixes means that both caps and inputs for assessment need to be developed to a high level of detail for fair representation. If caps are not representative then a building may need to reduce functional output to achieve compliance which could place additional burden elsewhere (carbon leakage)	Develop a comprehensive range of building and space typologies with specific absolute values accounting for the following: • Building typology • Individual space use / intensity • Hours of use • Climate
Setting building level targets fosters innovation in energy efficiency as it takes a system wide view of energy efficiency.	May be less representative of real-world performance as standardised inputs will misrepresent real use	Communicate purpose of the model as a compliance model and how this reduces costs. Help building owners understand the value of supplementary performance modelling
More cost-effective compliance pathway with only one model required, and standardised inputs that can be readily templated.	Variations in modelling software means results will differ between different modellers. Compliance may be more (or less) challenging depending on software utilised.	Undertake analysis of software variability and restrict use of software that is not within an appropriate margin – likely that there are bigger differences due to modelled level of detail which could be at the modeller's discretion.
	Any system that defines functional unit (e.g. m²) could be subject to gaming through increases in the functional unit.	No mitigation for non-residential buildings proposed if m² used – likely that financial constraints minimise building floor area.
	Where the functional unit is not a good descriptor of building functional output (e.g. health outcomes) it may disincentivise higher levels of efficiency. E.g. including greater levels of service.	No mitigation proposed – Caps may need revision if building intensity changes. Alternative functional units could be used for some building types.

A sample of global compliance and certification frameworks that utilise an absolute approach are presented with commentary in the table below:

Precedents	Commentary
NZ Building for Climate Change proposals	Refer Background section above.
European Directive on Energy Performance of Buildings – Proposed Amendments (2021)	The EU is proposing to set absolute building level caps for energy consumption of housing (60kWh/m²p.a) and office buildings (70kWh/m²p.a) that apply across all member states. This includes energy for heating, cooling, ventilation, hot water, and lighting. Other building types are to have caps set by individual member states with the cap established by determining a "cost-optimal" level of performance. However, this "cost-optimal" level of performance would now have to include carbon emissions and other environmental and health externalities. Some EU countries have already moved to an absolute value approach for buildings. Notably France, which has developed kWh/m²p.a figures for a wide range of building typologies, split by function, air conditioning needs, and hours of operation with adjustment for climate, altitude and "immediate environment factors". This is split into a cap value for heating, cooling and lighting demand and a second cap value for primary energy consumption. In Denmark, Building Regulation 10 (BR10) specifies limits for residential and non-residential buildings but includes incremental adjustments for high consumption buildings. Note - plug loads are not included in any EU methodology and are controlled through other legislative means within the EU.
Passive House Standard	The Passive House Institute's Passive House Standard (Classic) sets absolute building level performance criteria for heating demand (or heating load), cooling demand (+dehum allowance), pressurization test results, and Renewable Primary Energy (PER) demand (60 kWh/m² p.a.). Plug loads are included in the Passive House Standard but the limit criteria only apply to "typical residential, educational and office/administrative buildings". Where high energy demands exist the limit may be exceeded after consultation with Passive House Institute.

The frameworks shown above have some key common features:

1. Caps across multiple scopes to ensure that the building does not trade between fabric performance and systems performance
2. Caps that vary based on the level of inherent energy intensity for a specific building typology or function
3. Supplementary limits on fossil fuel combustion, renewable energy contribution, and air-tightness
4. They all attempt to define a level of allowable building energy consumption that can be considered "net zero" when powered by renewables / electricity only.

2.2 Relative (2-model) approach

This approach involves evaluating a building's energy efficiency in relation to a "reference building" that is defined by element specific energy performance targets. This requires the development of two separate models which are compared against each other:

Proposed Building Model

A detailed, whole-building energy simulation model of the proposed building: This model simulates the energy consumption of the building, taking into account factors such as building envelope, heating and cooling systems, lighting systems, and building occupancy. The model provides a detailed analysis of the energy consumption of the building. The model can also highlight areas where different design and operational choices affect the energy performance of the building.

Reference Building Model

A simplified, reference building model: This model represents the baseline energy consumption estimate for the building, based on prescriptive building characteristics and energy consumption patterns for the building type. The reference building model provides a way to compare the energy consumption of the proposed building to typical energy consumption patterns for the building type, and to assess the energy savings potential of different design and operational choices.

Both models use pre-defined standardised operational profiles and process loads that are representative of typical operation but will differ from reality.

The following table highlights the key benefits and limitations of a relative benchmark approach along with potential mitigations for each limitation.

Benefits	Limitations	Mitigations
Model inputs can be more representative of real-world operation which may be more reflective of actual performance	Relative performance is unable to give information on whether the carbon emissions associated with a particular design are aligned to a zero-carbon future.	Component level efficiency requirements could be developed to align with science-based targets, based on assumptions of "typical designs" for all building typologies, growth projections and sector level budgets.
Modelling techniques, assumptions, simplifications, and calculation engines are consistent between the proposed model and the reference building model. Relative improvements are more resilient to differences in approach/software between those undertaking assessments.	Does not reward building form or orientation which may significantly impact on heating/cooling demand in buildings with lower occupancies, ventilation rates, and internal gains.	Introduce a supplementary activity which assesses/benchmarks on the basis of optimal orientation for the proposed building form. No mitigation for built form proposed.
Component level performance requirements make it easier for supply chains to provide standardised products that achieve compliance, potentially improving costs and availability.	Can be subject to gaming where inputs that are not standardised (e.g. hours of use) can be manipulated to skew heating and cooling demands, or other building energy end uses in favour of the building seeking compliance.	Propose limits to user defined inputs or provide standardised inputs that can only be deviated from by less than a nominal margin. This may still be subject to gaming and would add complexity to modelling and compliance assessment.

Benefits	Limitations	Mitigations
	Energy efficiency is generally defined at component level, and this may not reward absolute energy reductions (e.g. reducing the quantum of services).	No mitigation proposed - likely that financial constraints minimise extent of services.
	More expensive compliance pathway as it requires multiple models and bespoke inputs.	Highlight the value of having a more representative model that can be directly utilised for performance modelling.

A sample of global compliance and certification frameworks that utilise an absolute approach are presented with commentary in the table below:

Precedents	Commentary
Current NZBC / Green Star Method	Refer Background section above.
European Directive on Energy Performance of Buildings - Operative	The current EU directive allows flexibility in approach for member states as long as the method applied is based on a cost-optimal analysis of building elements (i.e. built up from component level efficiencies against the cost of these components). This informs either absolute caps or relative performance requirements for all buildings, based on "typical" building typologies. It appears that whilst many member (and ex-member) states currently utilise relative performance requirements that provide separate envelope and HVAC performance settings (e.g. Part L in UK / Ireland, EnEV in Germany), they are moving towards absolute targets.
National Construction Code (NCC) Section J Australia	Australia's NCC utilises a relative performance assessment based on component level performance – as noted in the section above, the NCC previously included absolute values but these were retired.
ASHRAE 90.1 - USA	This relative performance model specifies component level performance for buildings with a 2-model approach to evidencing compliance. It also includes default HVAC system typologies linked to building function to reduce the risk of poor system architecture, and a test for building solar performance that increases compliance difficulty for buildings with poor orientation. It does not however assess poor building form.
LEED - International	The LEED methodology references ASHRAE 90.1 and rewards relative performance improvements based on % energy reductions.
BREEAM	The BREEAM methodology references UK Part L (relative building code model) and rewards relative performance improvements based on % energy reductions.

2.3 Discussion and Preferred Method

There is a developing trend towards the use of absolute targets in compliance frameworks. This appears to be driven by a desire to define a "net-zero" or "zero-carbon" level of energy consumption and to align with global commitments to limit the extent of global warming to 1.5°C above pre-industrial levels.

The absolute value approach can more readily be used when cascading a global or national carbon emissions budget down to the property and construction sector. This aligns to the concept of a "science-based target" for building carbon emissions. The challenge with this "top-down" approach is in determining an appropriate limit for any specific building type. The limit needs to both drive improvement and recognise that some building typologies are closer to the limit of energy reduction potential than others.

In the absence of perfect information on an appropriate absolute limit, a relative performance (or "bottom-up") approach has been the predominant methodology.

Whilst both approaches have significant limitations, these can be managed through the development of more detailed/nuanced input data and/or supplementary controls on performance.

Both methods could be developed into "workable" and "fair" frameworks, although the complexity of a 2-model (relative approach) would be much higher compared to an absolute approach.

Even if complexity is accepted, the absolute approach can more readily achieve the following key elements:

- align with NZ's carbon emissions reduction commitments
- align with the signalled direction of NZ Building Code

On this basis, an absolute approach to setting benchmarks is considered the "best" approach and the preferred direction for future NZGBC tools.

Note that whilst this tries to connect more strongly to science-based targets, the absolute approach is still only assessing building design under a notional use case and therefore will seldom be reflected in real world energy and carbon performance. This notional use case is important to define so that those submitting for compliance/certification do not claim unrealistic use cases that make compliance simpler.

2.4 Alternative / Hybrid Approaches

Due to the limitations associated with both the absolute and relative approach to benchmarking, there is an option available to merge the two methodologies together, taking some component level performance requirements to control relative performance, and some absolute per m² based building caps to cover energy consumption. This allows a more nuanced compliance framework that can be applied where an overarching "typology" description is inadequate.

This can be done at the building level (providing a mixture of absolute and relative targets within a typology) or across all typologies with different compliance pathways for different typologies.

Building Level Hybrid

A building level hybrid mixes component level requirements and space level energy limits. The component compliance can be evidenced through element compliance or modelling relative performance. This method is particularly relevant for limiting energy consumption in highly serviced and complex buildings such as hospitals, laboratories, archival storage, etc. An example of this approach for healthcare buildings is presented below.

Example: NHS Net Zero Building Standard

A hybrid approach to setting energy limits is presented in the NHS Net Zero Carbon Standard, released February 2023 (https://www.england.nhs.uk/wp-content/uploads/2023/02/B1697-NHS-Net-Zero-Building-Standards-Feb-2023.pdf)

This assigns building performance targets for building insulation, air-tightness, glazing and hot water generation efficiency. This ensures building fabric is not traded against other efficiency measures and defines an elemental level of performance that creates consistency between all of their healthcare assets.

Each space type within the building is then defined based on the level of technology required within the space. An energy limit for the space is then developed based on building location, equipment gains, space category and percentage of circulation. This applies to most spaces within a hospital.

"Ultra High Tech / Specialist Spaces" such as CT scanning rooms are not provided with a limit. Instead, these spaces are provided with component level performance requirements for building systems (HVAC, lighting, DHW).

This combination of building envelope performance requirements, space level energy limits and relative performance assessment allows the framework to control envelope performance, limit energy consumption for the majority of spaces without creating unrealistic energy limits for specialist spaces.

A detailed flow chart of the methodology is reproduced in Appendix A:

Hybrid Method Across Typologies

This approach would use absolute performance targets for building typologies that are fairly represented by standardised inputs for functional use (e.g. housing, office, school, etc). This is a "1-model" system.

It would then set component level performance targets for non-standardised spaces with either prescriptive or modelled compliance. Where modelling is required the component level performance requirements define the "reference building" against which a proposed building is assessed. This is a "2-model" system.

Both Hybrid approaches increase the complexity of the compliance framework (due to multiple pathways) and inherit many of the limitations of both systems. However, it helps to resolve issues of fairness and misrepresentation for more complex buildings whilst maintaining the benefits of a top-down approach to benchmarking for many buildings. There is value in a hybrid approach as it can act as a transitionary compliance framework pending the development of more nuanced absolute targets.

3 Proposed Approach (DRAFT)

Whilst an absolute method is preferred, the following would need to be developed to mitigate the limitations of this approach:

- Absolute targets that fairly reflect the typology being assessed, with the ability to adjust for factors such as climate, hours of use, occupancy, ventilation, and plug or process loads where there is significant variability within the typology cohort
- A mechanism to recognise the mixed-use nature of many buildings, where multiple typologies are included in the building subject to a single compliance model (e.g. building consent or Green Star)

As a way of stepping towards this preferred absolute method, a hybrid approach, which improves over time, is proposed.

Simple Description

Building typologies with well understood and largely uniform occupancies, hours of use, internal heat gains and functional requirements are required to achieve an absolute building energy/operational carbon cap. This would initially include:

- housing/residential (noting that housing is excluded from Green Star in NZ).
- office

Building typologies with poor uniformity across occupancy, hours of use, internal heat gains and functional requirements are provided with component level performance requirements as they are not well described by a single set of assessment criteria. Minimum compliance can be evidenced by component level comparison. Improvement (and Green Star points) would require modelling of a Reference and Proposed building performance in 2-model method.

Over time, the relative performance pathway is retired as more nuanced building typology definitions and absolute building energy/operational carbon caps are developed.

Building Typology	Energy Caps	Relative Performance Requirements
Housing / Residential	N/A for Green Star	
Office	V1.0	X
Schools	V1.1	X
Retail	V1.2	X
Tertiary Education	V1.2	X
Healthcare	Etc	X
Laboratory	Etc	X
Industrial Warehouse	Etc	X
Industrial Process	No cap	X

The absolute energy/carbon cap will also specify “standard” building use modelling inputs for the purposes of compliance/performance assessment. The energy covered by the assessment shall be similar to that already covered under the Green Star Energy Modelling Methodology and will explicitly exclude plug and process loads.

Challenges with Proposal

Challenge	Option(s)	Discussion
Significant effort to develop specific caps and standardised inputs for each building typology.	Develop over time, with iterations of the standard including more building typologies. Alignment with MBIE methodology would help avoid duplication of effort.	Need to agree exclusions / inclusions with MBIE to achieve alignment with caps
No thermal performance cap (focussing on building form and envelope performance) could result in trading envelope (a long-lived asset) against HVAC performance.	Include an "Absolute Thermal Demand Cap" which would limit the energy required to heat and cool the occupied spaces based on a nominal occupancy, internal conditions, internal heat gains. This cap could only be achieved through effective design of building form, orientation, and envelope performance. **Option 1:** No thermal performance cap **Option 2:** Building typology specific cap that adjusts for hours of use/internal heat gains, climate (supports more targeted decarb investment) **Option 3:** Single Cap for all buildings (supports future change in use)	• Option 1 relies on NZBC managing compliance (Green Star can focus on overall performance only) • Option 2 will take more time to develop • Option 3 (Single Cap) would be simple to implement, drive higher investment in envelope, but could increase emissions in cooling dominated buildings
No variability for climate adjustments means different compliance effort/costs for different locations – some locations may have reductions in min. performance (e.g. AKL insulation levels).	Include climate adjustment factors. Possibly best suited if an "Absolute Thermal Demand Cap" is used to prioritise passive design.	• More complex to implement with time needed to develop. • NABERSNZ studies showed that only dehumidification is an issue.
Large number of buildings have to undertake more complex and non-NZBC aligned relative method	Provide all building typologies with an absolute energy cap (potentially the same cap) that may initially be incredibly challenging for highly serviced buildings. Allow buildings that do not fit into the typology definition/cannot achieve cap a relative compliance pathway.	• Might result in increasing caps over time which would be subject to significant criticism. • Buildings with legitimate caps may try and use this as a compliance loophole.
Buildings with a large variety of spaces that could be included in single or multiple buildings (are bespoke in nature and will never be fairly described by a building typology. E.g. • Office building with retail, café, gymnasium • Hospital building with wards, surgical suites, chapel, laundry • School building with auditorium, music rooms, teaching labs, classrooms	Provide space level energy/operational carbon caps that are summed across building spaces to provide a bespoke building level cap.	• Recognises that all buildings are relatively unique. • Most buildings have minor non-typical spaces, caps would have to exist at time of release. • Comparability between buildings more challenging / more complex method to communicate • More effort to develop space level caps • Allows more challenging caps to be set for each space type

Connections with Compulsory Disclosure

Compulsory disclosure, with regards to building energy/carbon performance refers to the requirement for building's owners or managers to publicly report information about a building's energy consumption / carbon performance. This is likely to be reported against a performance framework similar to NABERSNZ with different levels awarded a rating (nom. Stars or A-F letters).

It is likely that a relative 2-model approach will produce a "Proposed Building" model that more accurately reflects real world performance.

An absolute approach can be made more accurate if space level caps are used as this increases the realism of the building representation.

In all cases, the real-world performance will not be estimated through a compliance modelling exercise. If building owners/managers wish to understand real world performance, then additional performance modelling with real world stress tests and sensitivity assessments should be undertaken. This should be clearly communicated in any decision around compliance modelling methodology.

The normalisation factors utilised in any compulsory disclosure scheme should be reflected in the building code/Green Star methodology.

We anticipate the following normalisation factors will be developed for compulsory disclosure:

- Building size
- Space types
- Occupancy per space type
- Hours of Use per space type
- Climate (for some typologies)

We anticipate metering will be used to separate out process loads and tenant impacts.

4 Next Steps

- Discuss Proposal and Options with NZGBC Expert Reference Panel
- Present to MBIE and seek alignment where needed
- Agree Final Proposal for GS Buildings
- Procure development of performance caps (MBIE)

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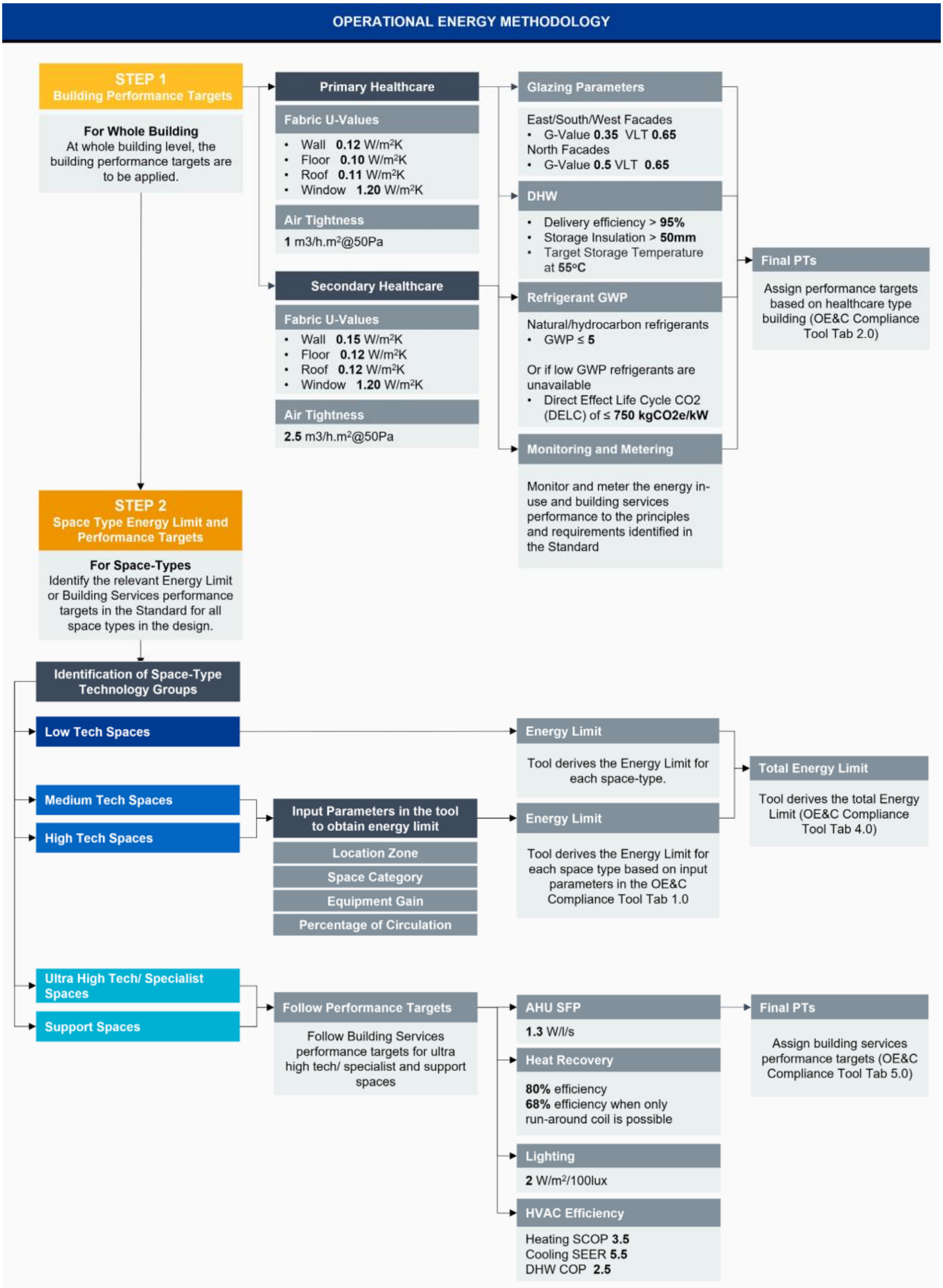
Appendix A – NHS Net Zero Building Standard Flowchart


OPERATIONAL ENERGY METHODOLOGY
STEP 1
Building Performance Targets
For Whole Building
At whole building level, the building performance targets are to be applied.
Primary Healthcare
Fabric U-Values
Wall 0.12 W/m²K
Floor 0.10 W/m²K
Roof 0.11 W/m²K
Window 1.20 W/m²K
Air Tightness
1 m3/h.m²@50Pa
Secondary Healthcare
Fabric U-Values
Wall 0.15 W/m²K
Floor 0.12 W/m²K
Roof 0.12 W/m²K
Window 1.20 W/m²K
Air Tightness
2.5 m3/h.m²@50Pa
Glazing Parameters
East/South/West Facades
G-Value 0.35 VLT 0.65
North Facades
G-Value 0.5 VLT 0.65
DHW
Delivery efficiency > 95%
Storage Insulation > 50mm
Target Storage Temperature at 55ºC
Refrigerant GWP
Natural/hydrocarbon refrigerants
GWP ≤ 5
Or if low GWP refrigerants are unavailable
Direct Effect Life Cycle CO2 (DELC) of ≤ 750 kgCO2e/kW
Monitoring and Metering
Monitor and meter the energy in-use and building services performance to the principles and requirements identified in the Standard
Final PTs
Assign performance targets based on healthcare type building (OE&C Compliance Tool Tab 2.0)
STEP 2
Space Type Energy Limit and Performance Targets
For Space-Types
Identify the relevant Energy Limit or Building Services performance targets in the Standard for all space types in the design.
Identification of Space-Type Technology Groups
Low Tech Spaces
Medium Tech Spaces
High Tech Spaces
Ultra High Tech/ Specialist Spaces
Support Spaces
Energy Limit
Tool derives the Energy Limit for each space-type.
Input Parameters in the tool to obtain energy limit
Location Zone
Space Category
Equipment Gain
Percentage of Circulation
Energy Limit
Tool derives the Energy Limit for each space type based on input parameters in the OE&C Compliance Tool Tab 1.0
Total Energy Limit
Tool derives the total Energy Limit (OE&C Compliance Tool Tab 4.0)
Follow Performance Targets
Follow Building Services performance targets for ultra high tech/ specialist and support spaces
AHU SFP
1.3 W/l/s
Heat Recovery
80% efficiency
68% efficiency when only run-around coil is possible
Lighting
2 W/m²/100lux
HVAC Efficiency
Heating SCOP 3.5
Cooling SEER 5.5
DHW COP 2.5
Final PTs
Assign building services performance targets (OE&C Compliance Tool Tab 5.0)