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Australian Building Codes Board
12/224 Bunda Street
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Dear Sir / Madam

RE: NATIONAL CONSTRUCTION CODE (NCC) 2022 PUBLIC COMMENT DRAFT (STAGE 2)

Moreland City Council welcomes the opportunity to provide a submission to the National Construction Code (NCC) 2022 Public Comment Draft (Stage 2) ('Draft NCC 2022').

Moreland City Council ('Moreland') is a leader in the field, encouraging energy efficient and zero carbon development. Moreland is pleased to provide this submission to the Australian Building Codes Board (ABCB) given our extensive undertakings within Council, alongside other Local Governments, as well as, working with State government authorities to improve our built environment and transition to zero net emissions.

This feedback has been prepared by council officers on behalf of Moreland and is based on endorsed Council policy.

The submission is divided into 3 sections:

1. Moreland's achievements and actions that support and deliver a series of elevated standards and metrics that address zero carbon development;
2. Moreland's experience pursuing elevated requirements and standards; and
3. Moreland's recommendations and key changes to the NCC 2022 technical standards given relevant insights.

Accompanying this submission is Moreland's 'NCC Public Comment Draft Response Sheet'.

If you require further information, please contact William Tolis, Environmentally Sustainable Development Strategic Planner; wtolis@moreland.vic.gov.au.

Yours sincerely,

Phillip Priest
Acting Director City Futures

1.0 Moreland's Achievements and Actions

1.1 Moreland Solar PV System and EV Infrastructure Technical Studies

In 2018, Moreland resolved to pursue initiatives to develop and incorporate zero carbon metrics and standards within the Moreland Planning Scheme. The project, 'Achieving Zero Carbon within the Planning Scheme', aims to support Moreland's *Zero Carbon 2040 Framework* and *Action Plan*. Both the *Zero Carbon Framework* and *Action Plan* were endorsed by Council in 2018 and 2019 respectively. Additionally, the 'Achieving Zero Carbon within the Planning Scheme' project has been committed to by Council as a statutory climate change pledge, made under the *Climate Change Act 2017* (Vic).

The objectives outlined within the 'Achieving Zero Carbon within the Planning Scheme' project (further detailed within Moreland Council's Notice of Motion (NOM) 33/18) required Moreland to investigate and develop standards or metrics for new development to ensure better roofs (pertaining to the inclusion of both solar photovoltaic systems and green infrastructure), electric vehicle infrastructure, and incorporating approaches for better waste management.

In order to address the relevant objectives, Moreland commissioned the development of a series of technical reports to assist with prescribing a level of Solar PV and EV infrastructure required for new development.

In June 2021, Moreland was proud to share with the community the Solar PV and EV Infrastructure Technical Studies ('Technical Studies') which outline a minimum amount of solar PV systems and EV Infrastructure for new development. The Technical Studies focused on applying metrics and standards on medium density development such as townhouses and dual occupancies (Class 1), apartments (Class 2), and storage or industrial (Class 7 and 8) development given the commonality of such development within the City of Moreland. The Technical Studies also included a level of cost benefit analysis and financial viability undertakings.

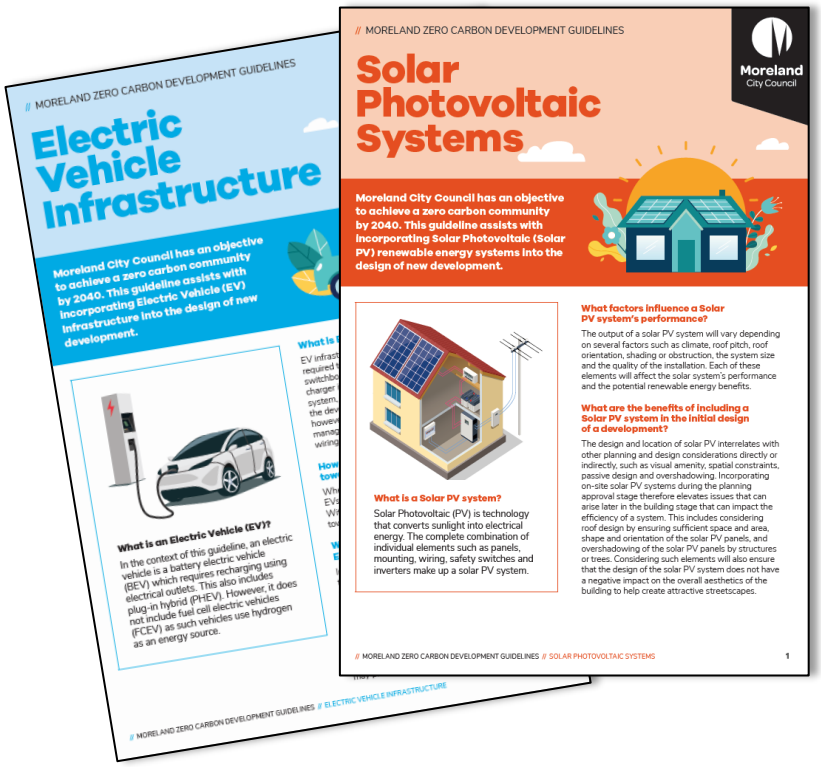
The metrics and standards prescribed, including supporting infrastructure, aim to address Moreland's overarching objective for zero carbon development and zero carbon emissions from the City of Moreland.

We credit and provide thanks to key personnel within the ABCB that assisted Moreland and the consulting team with key input to develop the Technical Studies and the series of recommendations that helped to establish the Moreland Zero Carbon Development Guidelines.

For access to the Technical Studies and additional content, please visit – Achieving Zero Carbon in the Planning Scheme.

1.2 Moreland Zero Carbon Development Guidelines

On the 4th October 2021, in line with UN World Habitat Day, Moreland was proud to share with its community and the development industry the release of our Moreland Zero Carbon Development Guidelines ('Guidelines'). The Guidelines simplify the content provided within the Technical Studies which encourage new development, through the planning permit application process, to implement Solar PV Systems and EV Infrastructure, as well as, the uptake of the Green Factor Tool to enhance urban greening and green infrastructure outcomes. The suite of Guidelines are accessible via – Achieving Zero Carbon in the Planning Scheme.



The metrics included for Solar PV and EV Infrastructure are a major stepping stone to support energy efficient and zero carbon development within the City of Moreland, and also across the State. The metrics specified also encourage new development to meet and hone in on some of the future requirements that may be prescribed through the NCC 2022. We have included the Solar PV and EV Infrastructure Guidelines, which detail the respective metrics, as Appendices to our submission.

Of particular relevance, the metrics also cover areas that the Draft NCC 2022 is yet to address. This includes new development providing a recommended, minimum capacity, Solar PV system and type of EV Infrastructure for Class 1 development. Additionally, for Class 2, 7 and 8 development, a recommended minimum Solar PV system capacity is specified, beyond that of a provision that is limited to advising a spatial roof area requirement only.

The Guidelines and future program of works from Moreland are emblematic of Local Government and Moreland, leading the way to support and shape the much-needed built environment outcomes. Providing a clear direction for industry and our community to create healthy and comfortable homes that have lower energy bills, more resilient to extreme weather and on the pathway to zero carbon.

1.3 Elevating ESD Targets Planning Policy Amendment Project

Through the actions of local government and the Council Alliance for a Sustainable Built Environment (CASBE), 31 councils have joined the initiative to develop resilient, zero-carbon buildings and urban places via the Elevating Environmentally Sustainable Development (ESD) Targets Planning Policy Amendment project ('the Joint Project').

The overarching objective of the Joint Project is for Councils to have a consistent set of zero carbon requirements specified within their respective Planning Scheme via a joint Planning Scheme

Amendment process. It is anticipated that the joint Planning Scheme Amendment process will take place next financial year (FY 2022/23).

The Joint Project includes a revised set of standards that require renewable energy and EV uptake, as well as, broader approaches to Integrated Water Management principles, sustainable transport and green infrastructure that new development should incorporate as a part of built environment changes to support zero carbon buildings. The Joint Project also strongly encourages electrification and gas-free development practices as means to achieve respective outcomes. Further information regarding the Joint Project may be accessed via CASBE's webpage – Elevating ESD Targets Planning Policy Amendment.

A consortium has been appointed to assist the Joint Project team by undertaking a technical review of the objectives and standards. This includes testing the standards and metrics on a series of development typologies throughout Victoria, detailing their financial viability and feasibility; including their financial and monetary societal impact of the development, as well as, the applicability of certain standards and metrics being prescribed within certain legislative frameworks; mainly a Council's Planning Scheme.

Moreland's actions to pursue a zero carbon Planning Scheme have been vital to support the outcome of the Joint Project. This includes the previously mentioned Technical Studies and the development of the Guidelines which detail prescriptive requirements that serve as a collective ambition for 31 Councils to have specified within their Planning Scheme.

As a collective, Councils have acknowledged that the Moreland Technical Studies and metrics specified within the Guidelines assist with advocating for the changes that are required to support zero carbon development.

1.4 ESD Roadmap and State Government Collaboration

The Victorian Government's Department of Environment, Land, Water and Planning (DELWP) released its 'Environmentally sustainable development of buildings and subdivisions A roadmap for Victoria's planning system' ('ESD Roadmap') in January 2021. The ESD Roadmap provides a pathway forward for a series of proposed and improved ESD changes to the built environment detailed within the Victorian State Planning Policy and Provisions contained within a Council's Planning Scheme. The ESD Roadmap aims to align planning and building frameworks cognisant of the Victorian State Government's interim emission reduction targets, climate change strategy and key sector pledges that are exercised under the *Climate Change Act 2017* (Vic) to address emission reductions throughout the State.

Given Moreland's leading work and undertakings, personnel from Moreland have been welcomed to provide input to several categorical Working Groups that serve the development of key deliverables detailed within the ESD Roadmap. Through such Working Groups, Moreland is strongly encouraging the Victorian State

Government to include prescriptive solar PV and EV infrastructure provisions, as well as, other metrics and standards, as a part of the State Planning Policy and Provisions.

1.5 Other Supporting Roles

Moreland has also been participating with a key advocacy project being pursued by several Victorian Greenhouse Gas Alliances. The project titled 'Ensuring Victoria's planning and building systems effectively tackle climate change' has been established to explore, consider, develop and advocate for solutions to address climate change and support Victoria's commitment to net zero greenhouse gas emissions through the authorising environment of the planning and building frameworks. Key recommendations and outcomes from the project to date are aligned towards planning and building reform through changes to legislative instruments such as the *Climate Change Act 2017* (Vic), the pursuit of elevated requirements via Planning Scheme amendments, and necessary changes to the NCC and other regulatory frameworks which include the provision for Victorian specific variations where there are gaps identified.

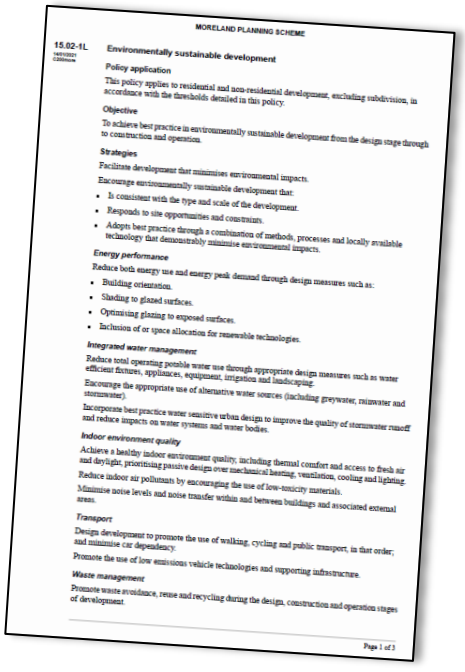
2.0 Moreland's Experience Pursuing Elevated Requirements and Standards

2.1 Background

Moreland's overarching objective to achieve a zero carbon community by 2040, and perhaps earlier, is a key driver supporting the various actions, projects and commitments that Moreland has embarked on. In terms of influencing development outcomes, arising from a level of prescription, the changes have been led through the Victorian planning framework with the use of the Moreland Planning Scheme. The Moreland Planning Scheme is the key legislative instrument utilised to ensure that a proposed development conforms with certain development requirements in order to be granted a planning permit and approved plans from Council, pursuant to the *Planning and Environment Act 1987* (Vic).

2.2 The ESD Policy within the Moreland Planning Scheme

Moreland was one of the first councils in Victoria to have an ESD Policy within its Planning Scheme (Clause 15.02-1L – Environmentally sustainable development). Since 2015, approximately 20 other Councils throughout the State of Victoria have obtained a similar ESD Policy that is reflected within their respective council Planning Scheme.


MORELAND PLANNING SCHEME

15.02-1L

Environmentally sustainable development

Policy application

This policy applies to residential and non-residential development, excluding subdivision, in accordance with the thresholds detailed in this policy.

Objective

To achieve best practice in environmentally sustainable development from the design stage through to construction and operation.

Strategies

Facilitate development that minimises environmental impacts.

Encourage environmentally sustainable development that:

- Is consistent with the type and scale of the development.
- Responds to site opportunities and constraints.
- Adopts best practice through a combination of methods, processes and locally available technology that demonstrably minimise environmental impacts.

Energy performance

Reduce both energy use and energy peak demand through design measures such as:

- Building orientation.
- Shading to glazed surfaces.
- Optimising glazing to exposed surfaces.
- Inclusion of or space allocation for renewable technologies.

Integrated water management

Reduce total operating potable water use through appropriate design measures such as water efficient fixtures, appliances, equipment, irrigation and landscaping.

Encourage the appropriate use of alternative water sources (including greywater, rainwater and stormwater).

Incorporate best practice water sensitive urban design to improve the quality of stormwater runoff and reduce impacts on water systems and water bodies.

Indoor environment quality

Achieve a healthy indoor environment quality, including thermal comfort and access to fresh air and daylight, prioritising passive design over mechanical heating, ventilation, cooling and lighting.

Reduce indoor air pollutants by encouraging the use of low-toxicity materials.

Minimise noise levels and noise transfer within and between buildings and associated external areas.

Transport

Design development to promote the use of walking, cycling and public transport, in that order, and minimise car dependency.

Promote the use of low emissions vehicle technologies and supporting infrastructure.

Waste management

Promote waste avoidance, reuse and recycling during the design, construction and operation stages of development.

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The ESD Policy consists of an overarching objective pertaining to 'best practice' which is also enshrined in the Sustainable Design Assessment in the Planning Process (SDAPP) framework that is also supported by Moreland. Subject to the requirements and conforming to the ESD Policy, an application for development, via the planning permit application process, is required to demonstrate how their proposed development meets the notion and overarching objective of 'best practice' development.

In the context of energy efficiency, and with respect to the NCC, several Councils have supported the position that 'best practice' entails exceeding the stipulated NCC requirements at, or in excess of, 10%. For example, as per the NCC 2019 Volume 2, Class 1 development is required to meet a minimum 6 star NatHERS energy efficiency rating. However, with respect to application of the ESD Policy within the Moreland Planning Scheme, the expectation is for development to meet a 10% exceedance on the NCC minimum; that being an average minimum 6.5 star NatHERS energy efficiency rating throughout the development which therefore supports the notion of 'best practice'. This has led to improved development outcomes throughout the City of Moreland that exceed minimum NCC stipulations.

2.3 The Moreland Design Excellence Scorecard

In March 2019, Moreland facilitated the Moreland Design Excellence Scorecard program. The voluntary program comprised of a trial tool that was utilised to benchmark and define design excellence within the City of Moreland. The tool aimed to improve the design quality and liveability of Class 1 and Class 2 development above the standard requirements of the Moreland Planning Scheme; particularly Moreland's ESD Policy. There were two Scorecards, serving as the tool established under the program – one for Class 1 townhouse/ multi-unit developments and one for Class 2 apartment developments.

From an energy efficiency perspective, key requirements of the Scorecard, pertaining to Class 1 development, included:[1]

- A minimum average 7 star NatHERS energy efficiency rating for the development;
- An average 2 kW solar PV system per dwelling; and
- Gas free dwellings.

Key requirements of the Scorecard, pertaining to Class 2 development included:[2]

- The development achieving an average 7 star NatHERS energy efficiency rating for medium density development and an average 7.5 stars NatHERS energy efficiency rating for high density development;
- Ensuring that the development is gas free; and
- Providing a roof top that has maximised its respective coverage with solar PV systems or with a mix of communal open space, landscaping and solar PV.

Through the application of Moreland Design Excellence Scorecard, development within the City of Moreland is already meeting and exceeding the Draft NCC 2022 requirements and standards.

Further information regarding the Moreland Design Excellence Scorecard and program can be accessed via – Design Excellence Scorecard.

[1] Respective outcomes that are detailed within the Scorecard are in the process of being updated to reflect that new development, trialing the Scorecard, adhere to the metrics specified within the Moreland Zero Carbon Development Guidelines.

[2] Respective outcomes that are detailed within the Scorecard are in the process of being updated to reflect that new development, trialing the Scorecard, adhere to the metrics specified within the Moreland Zero Carbon Development Guidelines.

2.4 Familiarity with Moreland's Development Requirements and Expectations

The ESD Policy, Planning Scheme, drivers, as well as, other Moreland initiatives have fostered the positive development outcomes within the City of Moreland. As such, Moreland and its development community have gained experience meeting and exceeding the current minimum Draft NCC 2022 requirements in some cases.

Whilst Moreland is leading and setting the benchmark for certain initiatives and projects such as the incorporation of minimum solar PV and EV infrastructure requirements for new development, there are considerable limitations. The most prominent being that the NCC stipulates the minimum requirements which Moreland and other councils are required to advocate in order for new development to exceed. Considerable advocacy, programming, and resourcing is required by Moreland to encourage development to exceed such minimum standards and areas where the NCC is silent or falls short of relevant expectations – be it through amendments to the Moreland Planning Scheme, statutory pledges made pursuant to the *Climate Change Act 2017* (Vic), or the formation of incentivised programs such as the Moreland Design Excellence Scorecard and guidance documentation such as the Moreland Zero Carbon Development Guidelines – all of which have certain limitations with respect their legal weight and/or authority.

Our submission draws upon Moreland's leadership and experience articulating to the development community improved outcomes and setting relative expectations and benchmarks within industry. The recommendations and key insights provided as a part of this submission continue to advocate for necessary and improved outcomes for Moreland and the broader development community.

3.0 Comments and Recommendations

The types of development that are most frequented within the City of Moreland are categorised as Class 1 (domestic residential – attached houses, such as townhouses and dual occupancies) and Class 2 (domestic apartment) development. Class 7 and 8 (warehouse storage and industrial facilities) and Class 5 and 6 (office and retail), whilst present within the City of Moreland, are less common when an application for development is lodged before Council.

Upon review of the proposed Draft NCC 2022 changes, Moreland officers have provided a series of key insights and recommendations based upon their experience when dealing with development and engaging with personnel involved in the built environment sector across several stages of the development process. Cognisant of the development typology most frequented within the City of Moreland, majority of the key insights and recommendations pertain to Volume 2 of the Draft NCC 2022, with tailored comments to Volume 1 of the Draft NCC 2022 regarding Class 2 apartment builds.

Please note, accompanying this submission is Moreland's 'NCC Public Comment Draft Response Sheet'.

3.1 Class 1 Development (NCC 2022 Volume 2)

Item	Draft NCC 2022 Proposed Changes
H6P2 – Energy Usage	**The energy value of a building's domestic services must not exceed 70% of the energy value with:** **(a) a 3-star ducted heat pump, rated under the 2019 GEMS determination, heating all spaces that are provided with heating: and** **(b) a 3-star ducted heat pump, rated under the 2019 GEMS determination, cooling all spaces that are provided with cooling: and** **(c) a 5-star instantaneous gas water heater, rated under the 2017 GEMS determination, providing all domestic hot water**

Comments and Recommendations

- Through the application of Moreland's ESD Policy as a part of the Moreland Planning Scheme, applications for development generally stipulate as a part of their submission a minimum 4 star heating and cooling system, as well as, 6 star gas instantaneous hot water systems. Therefore, the common approach pursued by development within the City of Moreland exceeds the minimum requirements articulated with the Draft NCC 2022.
- As such, Moreland requests clarification as to the basis for selecting 3 star rated systems as the benchmark given several other councils exercise similar requirements and have created an informal cultural precedent throughout Victoria.
- Therefore, Moreland recommends that the current star ratings proposed within the Draft NCC 2022 are increased to align with commonplace practices and expectations currently achieved such as minimum 4 star heating and cooling system, as well as, 6 star gas instantaneous hot water systems – this is also a demonstrated practice that is experienced throughout other Victorian local government jurisdictions.
- Furthermore, Moreland has been advocating for new development to incorporate electric heat pump hot water systems, as opposed to gas systems; thus phasing out the adoption of technologies which support fossil fuels and hinder emission reduction.
- Additionally, when a development application refers to incorporating gas instantaneous systems, such development proposal does not assist the development application to reflect the notion of 'best practice' via the planning permit application process when required to conform to Moreland's ESD Policy requirements.
- On such premise, Moreland strongly encourages that development is built gas free and is fully electrified, promoting that the NCC 2022 should move towards phasing out fossil fuels as per the wider emission reduction targets that have been declared at the State and Local Government level.

Item	Draft NCC 2022 Proposed Changes
S42C2 – 7 star NatHERS energy efficiency rating	**A building must achieve an energy rating, including the separate heating and cooling load limits, using, of greater than or equal to 7 stars.**

Comments and Recommendations

- Moreland welcomes this change noting that, according to the Commonwealth Scientific and Industrial

Research Organisation (CSIRO), the average star rating for new Class 1 development within the City of Moreland, in the last 2 years, is 6.4 stars.[3] An increase to 7 star development would see a 0.6 star rating improvement across the development profile within the City of Moreland.

- However, as earlier indicated, as per the Moreland ESD Policy within the Moreland Planning Scheme, the notion and application of 'best practice' would require a 10% improvement with respect to the minimum star rating requirement specified within the NCC. This would arguably require that, via the planning permit application process and where a proposed development is required to adhere to Moreland's ESD Policy, new development may be required to meet an average minimum 7.5-7.7 star energy efficiency rating (~10% in addition to 7 stars).
- Whilst Moreland supports an additional 1 star improvement to the NCC 2019, Moreland is mindful of the impediments associated with continuing to pursue additional 1 star incremental improvements to the minimum standard in the future (i.e. resulting in trade-offs with respect to glazing and thus daylighting which affects indoor environment quality performance and internal amenity).
- Rather, Moreland recommends that new development and respective standards should focus on more stringent matters involving air leakage and tightness, thermal breaks and bridging and ventilation – an approach facilitated via the *PassivHaus* development model and series of standards.
- Moreland is also mindful of the role of the Victorian Building Authority (VBA) to ensure compliance with the minimum 7 star energy efficiency rating; in addition to development that purport exceeding the minimum star rating requirement. Therefore, Moreland strongly advocates that insulation audits are undertaken as a form of managing compliance.

Item	Draft NCC 2022 Proposed Changes
S42C2 – Ceiling Fans	Where a ceiling fan is required as part of compliance with S42C2(1)(b) or (c),

Comments and Recommendations

- Moreland acknowledges that ceiling fans are only specified for certain climate zones.
- Moreland recommends that the provision for ceiling fans includes climate zone 6 (pertaining to Victoria) as cooling demand, associated with peak energy demand, in Summer can be very high with the use of ceiling fans improving the cooling required to a development, as well as, comfort.

Item	Draft NCC 2022 Proposed Changes
S42C3 – Net Equivalent Energy Usage (Solar PV Systems)	For net equivalent energy usage, a building must achieve a whole-of-home rating of not less than H6P2 using *house energy rating software*.

Comments and Recommendations

- Moreland is aware that the Draft NCC 2022 Volume 2 does not provide clear direction for new development to incorporate or provide a minimum amount of solar PV.
- The inclusion of a solar PV standard or metric safeguards development to provide a minimum amount of solar, as opposed to, implementing solar PV systems as a final consideration when utilising the whole-of-home tool in order for the development to meet necessitated performance requirements.
- With development adhering to a prescriptive solar PV standard or metric specified, this will

[3] CSIRO, Local Government Areas Energy Rating Dashboards – Moreland, 2021, https://ahd.csiro.au/dashboards/energy-rating/lga/.

retrospectively assist development to meet the whole-of-home assessment performance outcomes.

- The inclusion of solar PV systems is also partly a governed requirement of the Planning framework whereby allowable spatial provision, orientation, layout, connectivity and issues such as overshadowing are required to be considered and appropriately managed to ensure that beneficial users of the solar PV systems are not adversely affected.
- Whilst the whole-of-home tool may serve as an option for a development to calculate the amount of solar PV required, the use of the whole-of-home tool at the Planning stages of development may pose technical constraints with user uptake given that detailed design parameters have yet to be determined at such an early stage of the development process. This may also impose additional costs for consultants to utilise whole-of-home tools at both the Planning and Building permit application processes to relatively gauge the amount of solar PV required in order to meet the performance standard.
- Hence, specifying a certain, minimum amount, of solar PV will assist development understand the requirements from the initial stage of development. Additional solar, that is provided in addition to that which is specified by a minimum application standard or metric from the onset, may be specified at the later stages of the development process with the aid of the whole-of-home tool in order to meet respective performance requirements.
- Moreland strongly recommends adopting the following metric, specifying the minimum solar PV system installation for Class 1 development, detailed as follows:

Class 1: Solar PV System Metric

Provide the following solar PV system for each dwelling:

- *A minimum 3 kW for each 1-2-bedroom dwelling; and*
- *An additional 1 kW for each additional bedroom*

Based upon the Technical Study commissioned that derived such metric and through the investigation of several case studies, from a Class 1 perspective, the cost associated to adhere to such metric ranged from 0.5-1.4% of the cost, as a proportion of, total construction cost.

Further details regarding such metric are provided as a part of Appendix A of this submission with the Technical Reports supporting the development of such metric accessible via – Achieving Zero Carbon in the Planning Scheme.

Item	Draft NCC 2022 Proposed Changes
S42C3 – Net Equivalent Energy Usage (EV Infrastructure)	For net equivalent energy usage, a building must achieve a whole-of-home rating of not less than H6P2 using house energy rating software.

Comments and Recommendations

- Moreland is aware that the Draft NCC 2022 Volume 2 does not provide clear direction for new development to incorporate EV infrastructure.
- The inclusion of an EV within a development, as well as, the appropriate EV infrastructure necessary for charging such vehicle can affect a development's energy demand and hence it's energy performance.
- Such impact should be incorporated within the whole-of-home tool for completeness, however, more appropriately including the suitable EV infrastructure for each, individual, development to ensure effective charging, whilst also managing peak load, as well as, appropriate connection type.
- Moreland strongly recommends adopting the following metric, specifying the minimum EV infrastructure to be incorporated within a Class 1 development, detailed as follows:

Class 1: EV Infrastructure Metric

Provide the following EV infrastructure to each dwelling that includes:

- Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging.*
- Load management systems that ensure that:
  - EV charging occurs outside of peak electricity demand hours; and
  - The EV infrastructure does not adversely impact the site's maximum demand.

* The inclusion of an EV charger unit (Active EV Charging) is not expected.

Based upon the Technical Study commissioned that derived such metric and through the investigation of several case studies, from a Class 1 perspective, the cost associated to adhere to such metric ranged from 0.02-0.39% of the cost, as a proportion of, total construction cost.

Further details regarding such metric are provided as a part of Appendix A of this submission with the Technical Reports supporting the development of such metric accessible via – Achieving Zero Carbon in the Planning Scheme.

3.2 Class 2+ Development (NCC 2022 Volume 1)

Item	Draft NCC 2022 Proposed Changes
J1P3 – Energy Usage	The energy value of the domestic services of a sole-occupancy unit of a Class 2 building or Class 4 part of a building must not exceed the energy value with- (a) a 3-star ducted heat EMS determination heating all spaces that are provided with heating: and (b) a 3-star ducted heat pump, rated under the 2019 GEMS determination, cooling all spaces that are provided with cooling: and (c) a 5-star instantaneous gas water heater, rated under the 2017 GEMS determination, providing all domestic hot water.

Comments and Recommendations

- Through the application of Moreland's ESD Policy as a part of the Moreland Planning Scheme, applications for development generally stipulate as a part of their submission a minimum 4 star heating and cooling system, as well as, 6 star gas instantaneous hot water systems. Therefore, the common approach pursued by development within the City of Moreland exceeds the minimum requirements articulated with the Draft NCC 2022.
- As such, Moreland requests clarification as to the basis for selecting 3 star rated systems as the benchmark given several other councils exercise similar requirements and have created an informal cultural precedent throughout the State of Victoria.
- Therefore, Moreland recommends that the current star ratings proposed within the Draft NCC 2022 are increased to align with commonplace practices and expectations currently achieved such as minimum 4 star heating and cooling system, as well as, 6 star gas instantaneous hot water systems – this is also a demonstrated practice that is experienced throughout other Victorian local government jurisdictions.
- Of particular relevance, given the frequency and duration of occupants within such development, Moreland recommends that Class 3 rooming and boarding houses, and Class 9 aged care facilities should also have the energy rating standards raised for heating and cooling requirements.
- Furthermore, Moreland has been advocating for new development to incorporate electric heat pump hot water systems, as opposed to gas systems; thus phasing out the adoption of technologies which support fossil fuels and hinder emission reduction.
- Additionally, when a development application refers to incorporating gas instantaneous systems, such development proposal does not assist the development application to reflect the notion of 'best practice' via the planning permit application process when required to conform to Moreland's ESD Policy requirements.
- On such premise, Moreland strongly encourages that development is built gas free and is fully electrified, promoting that the NCC 2022 should move towards phasing out fossil fuels as per the wider emission reduction targets that have been declared at the State and Local Government level.

Item	Draft NCC 2022 Proposed Changes
J3D3 – Average energy rating of not less than 7 stars and each dwelling individually achieves an energy	The sole-occupancy units of a Class 2 building or a Class 4 part of a building must— (a) for reducing the heating or cooling loads— (i) collectively achieve an average energy rating of not less than 7 stars, including the separate heating and cooling load limits; and (ii) individually achieve an energy rating of not less than 6 stars, including the

rating not less than 6 stars	**separate heating and cooling load limits.**

Comments and Recommendations

- Moreland welcomes this change noting that, according to the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the average star rating for new Class 2 development within the City of Moreland, in the last 2 years, is approximately 7.5 stars.[4] An increase to a 7 star average development would not see an immense star rating improvement across the development profile within the City of Moreland.
- As such, an average 7 star rating for Class 2 development is not difficult to achieve, coupled by the development expectations that are already required by Moreland.
- However, as earlier indicated, as per the Moreland ESD Policy within the Moreland Planning Scheme, the notion and application of 'best practice' would require a 10% improvement with respect to the minimum star rating requirement specified within the NCC. This would arguably require that, via the planning permit application process and where a proposed development is required to adhere to Moreland's ESD Policy, new development may be required to meet an average minimum 7.5-7.7 star energy efficiency rating (~10% in addition to 7 stars) with the individual minimum dwelling required to achieved a 6.5 star energy efficiency rating (~10% in addition to 6 stars).
- Whilst Moreland supports an additional 1 star improvement to the NCC 2019, Moreland is mindful of the impediments associated with continuing to pursue additional 1 star incremental improvements to the minimum standard in the future (i.e. resulting in trade-offs with respect to glazing and thus daylighting which affects indoor environment quality performance and internal amenity).
- Moreland recommends exploring the possibilities of increasing the minimum window area for daylighting and natural ventilation to avoid windows being reduced, as well as, the method by which ventilation is measured within the NCC whereby the area of ventilation is measured by the area of glazing and not the area that is effectively open for natural air to pass through.
- Additionally, Moreland recommends that new development and respective standards should focus on more stringent matters involving air leakage and tightness, thermal breaks and bridging and ventilation – an approach facilitated via the *PassivHaus* development model and series of standards.
- Moreland is also mindful of the role of the Victorian Building Authority (VBA) to ensure compliance with the average minimum 7 star energy efficiency rating; in addition to development that purport exceeding the average minimum star rating requirement. Therefore, Moreland strongly advocates that insulation audits are undertaken as a form of managing compliance.

Item	Draft NCC 2022 Proposed Changes
J3D3 – Heating and Cooling Load Limits [see Draft NatHERS Heating and Cooling Load Limits specifications]	**The sole-occupancy units of a Class 2 building or a Class 4 part of a building must—** **(a) for reducing the heating or cooling loads—** **(i) collectively achieve an average energy rating of not less than 7 stars, including the separate heating and cooling load limits; and** **(ii) individually achieve an energy rating of not less than 6 stars, including the separate heating and cooling load limits.**

[4] CSIRO, Local Government Areas Energy Rating Dashboards – Moreland, 2021, https://ahd.csiro.au/dashboards/energy-rating/lga/.

Comments and Recommendations

- Heating and cooling load limits have been updated for Class 2 sole occupancy units.
- The City of Moreland is situated within 2 NatHERS Climate Zones – Melbourne and Tullamarine, each with its own unique set of heating and cooling load limits.
- When distinguishing between the proposed Draft NCC 2022 changes and the current NCC 2019, the following changes have been documented accordingly with particular respect to cooling load limits.
- Distinct to the Building framework and the NCC, through the Victorian Planning framework, the Victorian Department of Environment, Land, Water and Planning (DELWP) gazetted Planning Scheme Amendment VC136 (April 2017) which entailed new planning provisions for apartment development referred to as the Better Apartment Design Standards (BADS) and accompanying BADS Guidelines.
- Amendment VC136 affected all Planning Schemes (i.e. all councils) throughout the State of Victoria.
- The 2 significant Planning Scheme clauses amended by Amendment VC136 were Clause 55.07 and Clause 58 by introducing a series of Standards pertaining to apartment development (essentially Class 2 development that is colloquially referred to under the Building framework).
- With respect to energy efficiency and the thermal performance of an apartment development, specifically, Clause 55.07-1 (Standard B35 – Table B4) and Clause 58.03-1 (Standard D6 – Table D1) introduced relevant details pertaining to maximum cooling load requirements (i.e. limits) that Class 2 dwellings should not exceed.
- As specified within Tables B4 and D1 respectively, the City of Moreland is situated within 2 NatHERS Climate Zones – Melbourne and Tullamarine, each with its own unique set of cooling loads (30 and 22 MJ/m^2.annum respectively).
- When comparing the Class 2, Draft NCC 2022, cooling load requirements for 7 and 6 star dwellings against the Victorian Planning framework BADS cooling requirements, the following differences were noted.

Class 2: Draft NCC 2022 Cooling Load Comparison with the Victorian Planning framework Better Apartments Design Standard (BADS)Requirements (units in MJ/m^2.annum)

	BADS (cl 55 and 58)	7 star NCC 2022 Requirement	% Diff. with BADS	6 star NCC 2022 Requirement	% Diff. with BADS
Zone 21 (Melbourne)	30	27	-10%	38	26.67%
Zone 60 (Tullamarine)	22	48	118.18%	49	122.73%

- Whilst the Draft NCC 2022 cooling load requirement for the Zone 21 (Melbourne) NatHERS Climate Zone appear to be relatively aligned with the BADS cooling load requirement, there are concerns with the Zone 60 (Tullamarine) cooling load specifications.
- The compliant cooling load requirement for both 7 star and 6 star dwellings, with respect to the Draft NCC 2022, exceed double that which is permissible under the BADS framework (a percentage differential greater than 100%, as noted in the table above).
- The concern, framed alternatively, is that whilst under the Building framework (i.e. Draft NCC 2022) a Class 2 development may be deemed compliant meeting respective cooling load requirements, such Class 2 development may not meet the more detailed and narrowed criteria that is covered under the Planning framework (i.e. BADS).
- The issue may espouse the *ultra vires* doctrine or bring rise to the argument to follow specific, purposive or national authoritative requirements that override generic or state-based approaches cognisant

however of state-based directives and legislation that serve to reduce emission reduction. This is due to the broad ranging and conflicting cooling load specifications detailed within each jurisdictional instrument.

- Moreland strongly recommends a review of the cooling loads requirements to decrease the Zone 60 (Tullamarine) NatHERS Climate Zone cooling load requirement by a % level commensurate to reductions for the other NatHERS Climate Zones. This will also resolve confusion and conflict when development applications are designing development to meet both requirements which should innately complement one another.

Item	Draft NCC 2022 Proposed Changes
J3D4 – Ceiling Fans	Ceiling fans in a sole-occupancy unit of a Class 2 building or a Class 4 part

Comments and Recommendations

- Moreland acknowledges that ceiling fans are only specified for certain climate zones.
- Moreland recommends that the provision for ceiling fans includes climate zone 6 (pertaining to Victoria) as cooling demand, associated with peak energy demand, in Summer can be very high with the use of ceiling fans improving the cooling required to a development, as well as, comfort.

Item	Draft NCC 2022 Proposed Changes
J9D5 – Renewable Energy Provisions	Facilities for solar photovoltaic and battery systems

Comments and Recommendations

- Moreland welcomes solar PV requirements specified within the Draft NCC 2022 Volume 1.
- Moreland is aware that the Draft NCC 2022 Volume 1 does not provide clear direction for new development to incorporate a minimum capacity amount of solar PV for proposed development but rather 20% of a development's roof area allocated for solar PV.
- The inclusion of a solar PV standard or metric, with the inclusion of a capacity unit, safeguards development to provide a minimum amount of solar, as opposed to, a minimum amount of allocated and available roof area or space that is subject to exemptions and limitations.
- The metric developed and specified by Moreland which is directed towards providing a minimum solar PV capacity amount, includes a 20%-25% roof area coverage in the backend calculations when specifying capacity. This is reasonably consistent with the proposed approach outlined in the Draft NCC 2022, yet provides further detail and context, with roof area metrics having been worked into the back end, as to Moreland's expectations from a capacity perspective.
- Furthermore, a metric specifying a certain, minimum amount, of solar PV capacity will assist development to understand the requirements from the initial stages of development. This will allow development to gauge the design of the roof to ensure suitability, the roof area to set aside and allocate for solar PV, however, also allows discretion for improved, innovative, technology to be embedded within the development which addresses the necessary minimum capacity specified and thus frees up available roof space (e.g. building integrated PV [BiPV] that does not necessitate the allocation of roof area coverage).
- With respect to Performances Requirement B1P1 of the Draft NCC 2022 Volume 1, Moreland strongly warrants the requirement for Class 7b development (warehouses) to include an additional permanent roof load of not less than 0.15 kPa to support the addition of solar PV panels. Such outcome is consistent with Moreland's findings and of which is ubiquitously addressed in the Moreland solar PV

metric specified for Class 7 and 8 development.

- Based upon Moreland's respective undertakings, Moreland strongly recommends adopting the following metrics, specifying the minimum solar PV system installation for Class 2 (Apartment), as well as, Class 7 and 8 (Warehouse storage and Industrial facility) development, detailed as follows:

Class 2: Solar PV System Metric

- *Provide a solar PV system with a capacity of at least 25 W per square meters of the development's site coverage*; or*
- *1 kW per dwelling.*

* Capacity of solar PV system in kW = $\frac{\text{Site coverage (m}^2\text{) x 25 (W/m}^2\text{)}}{\text{1,000 (W/kW)}}$

Classes 7 and 8: Solar PV System Metric

- *All roofs must be structurally designed to be able to accommodate full solar PV coverage, excluding areas set aside for plant equipment or areas significantly shaded by other structures; and*
- *Include a solar PV system that is:*
  - *Sized to meet the energy needs of the building's services (lightning, air-conditioning, industrial processes); or*
  - *Maximised based on the available roof area; or*
  - *Where no industrial process is proposed, a minimum of 1.5 kW per tenancy plus 1 kW for every 150 m² of gross floor area.*

Based upon the Technical Study commissioned that derived such metric and through the investigation of several case studies, from a Class 2 and Class 7 and 8 perspective, the cost associated to adhere to such metric ranged from 0.18-0.34% and 0.4-0.7% respectively of the cost, as a proportion of, total construction cost.

Further details regarding such metrics are provided as a part of Appendix A of this submission with the Technical Reports supporting the development of such metrics accessible via – Achieving Zero Carbon in the Planning Scheme.

Item	Draft NCC 2022 Proposed Changes
J9D4 – Electric Vehicle Infrastructure	Facilities for electric vehicle charging equipment
Comments and Recommendations	
• Moreland commends the work undertaken for proposed EV infrastructure and equipment pertaining to Class 2 development within the Draft NCC 2022 Volume 1.	

- Moreland recommends that the electrical distribution boards dedicated to serving electric vehicle charging in a carpark be sized to support the future installation of the specified electric vehicle charger in all of the car parking spaces to ensure EV readiness of the development and minimise the extent and cost of retrofitting.
- Adopting such requirement will also align with further supporting future needs as per J9D4(3) whereby 'A carpark in or serving a Class 2 building must contain a designated space for cable trays to support the future installation of 32 A single phase final sub-circuits to each car parking space.'
- Moreland recommends that the extent of ensuring EV readiness extends to motor cycle, moped, electric bicycle or scooter parking, as well as, providing clarity as to the extent that the specifications constitute EV readiness to shared, communal, spaces such as visitor car parking spaces.
- Moreland strongly recommends adopting the following metric, specifying the minimum EV infrastructure to be incorporated within a Class 2 development, detailed as follows:

Class 2: EV Infrastructure Metric

Provide the following EV infrastructure to each apartment development:

Capacity and Load Management

- Dedicated EV distribution board(s) in each carpark storey that is capable of:
  - Supplying a minimum Level 2 (Mode 3) 7 kW, 32 Amp single phase dedicated circuit to all residential car parking spaces; and
  - Managing the maximum demand load of the development so that it does not exceed the site capacity, while providing a minimum average of 12 kWh of charge to each car parking space (particularly during off peak periods).
- Dedicated space for cable trays to support the future installation of EV cabling from the distribution board to the edge of each car parking space.
- Additional EV infrastructure, as required, which may include power use metering and communication systems, and conduit installations.

Motor cycle, moped, electric bicycle or scooter parking

- A 10-15 Amp charging outlet to every 6 bicycle parking spaces.
- Prominent, accessible and secure locations for the bicycle parking and other personal mobility devices.

Shared or Communal Space EV Charging

- A minimum of 1 Active EV charging unit should be installed at a shared or communal parking space, where relevant.
- Shared or communal EV charging spaces should be located in highly visible, priority locations, to encourage EV uptake.
- Clear signage must be provided to indicate that EV charging is available at the shared or communal spaces.

Parking Facilities
Parking facilities for low and zero emission vehicles should be located in a prominent, accessible location to encourage easy access by building occupants and visitors, ahead of larger and emission intensive vehicles.

Based upon the Technical Study commissioned that derived such metric and through the investigation of several case studies, from a Class 2 perspective, the cost associated to adhere to such metric with respect to capacity and load management details ranged from 0.10-0.18% of the cost, as a proportion of, total construction cost.

Further details regarding such metric are provided as a part of Appendix A of this submission with the Technical Reports supporting the development of such metric accessible via – Achieving Zero Carbon in the Planning Scheme.

Item	Draft NCC 2022 Proposed Changes
J1V1 and J1V5 – Verification Methods	**Changes to and introducing Verification Methods**

Comments and Recommendations

- With respect to Verification Method J1V1, the Draft NCC 2022 enables the use of the NABERS energy assessment for other building classes other than Class 5 (Offices). This approach provides more options and can include common areas of apartment buildings, hotels and shopping centres.
- However, the NABERS energy model excludes swimming pool heating/cooling/pumping and other common area plug loads. Such areas and loads are subject to a large amount of energy consumption.
- Moreland requests clarity as to how the energy use profile of such large areas are captured when an application utilises the NABERS assessment pathway.
- Moreland acknowledges that Verification Method J1V5 has been introduced to the Draft NCC 2022. Verification Method J1V5 is similar to a JV3 assessment however is applicable to Class 2 development. This requires the proposed building to be modelled and compared against a reference model as per the DtS requirements and operational schedules. This allows for a single energy model for a Class 2 development.
- The issue with such Verification Method is similar to that of which is expressed when utilising the JV3 assessment method; that being, there is less transparency conveyed by the model when reviewed by a third-party. The modelling results are as good as the report or what is provided in the application. Hence, the NaTHERS certificates are a more transparent process, easy to verify and a part of an already existing and verified accreditation scheme.
- Moreland issues concerns that such Verification Method could be open to misuse and thus undermine the energy efficiency performance of Class 2 development, with a strong preference placed on NaTHERS performance modelling.

3.3 Areas of Support, Encouragement and Other Statements

Item	Draft NCC 2022 Proposed Changes
H6O1 and J1O1 – Energy Efficiency Objective	The Objective now expands on reducing greenhouse gas emissions to also include 'Improved occupant health and amenity and improve resilience of the building to extreme weather and blackouts'
Comments	
• Moreland welcomes this positive outcome. • The inclusion of occupant health, amenity and resilience strengthens Moreland's current position and requirements with respect to the provision of solar PV, daylighting and thermally improved building fabric.	

Item	Draft NCC 2022 Proposed Changes
H4F7 and F8V1 – Glazing Elements and Condensation Management Requirements	Building elements in areas subject to water vapour or condensation must be constructed to reduce risks to the health of building occupants
Comments	
• Such requirement may have an impact on the thermal performance of glazing elements. • Improved thermal performance of glazing would be required to minimise thermal gradients, conduction and moisture laden air at the surface of the glazing to ensure that it does not reach dew point. As stipulated, compliance is required to be verified using AIRAH DA07 Criteria for Moisture Control Design Analysis in Buildings which requires calculations for mould index for an external wall assembly. • The ABCB housing provisions outline the requirements for wall constructions for condensation management for a DtS solution. • This is a positive outcome and could improve thermal performance of fabric.	

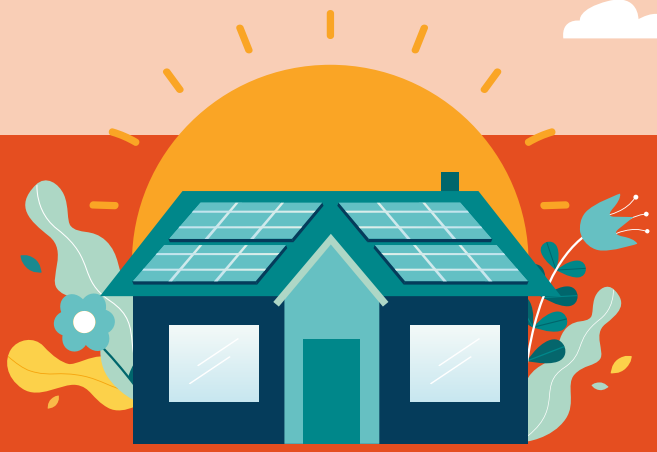
Item	Draft NCC 2022 Proposed Changes
H6V2 – Reference Building Verification Method	Verification using a reference building
Comments	
• The Verification Using a Reference Building (VURB) method has been made slightly more stringent which is a positive improvement. • Previously the VURB was open to much interpretation and exploitation. • Criteria for modelling the reference building has been expanded whereby DtS fabric requirements have been expanded and operating schedules introduced. As such, modelling protocols are clearer. • Nonetheless, Moreland does not receive development applications that utilise the VURB method given that for Class 1 development, generally, the NatHERS energy efficiency rating pathway is exercised.	

Item	Draft NCC 2022 Proposed Changes
F8D4 – Exhaust Systems	Exhaust systems specifications
Comments	
• Minimum flow rates specified for bathrooms/kitchens which have exhaust systems that operate continuously and requirements around interlocking the exhaust system with the light switch etc. This was not there previously in NCC 2019. • Moreland supports the slight improvements and changes.	

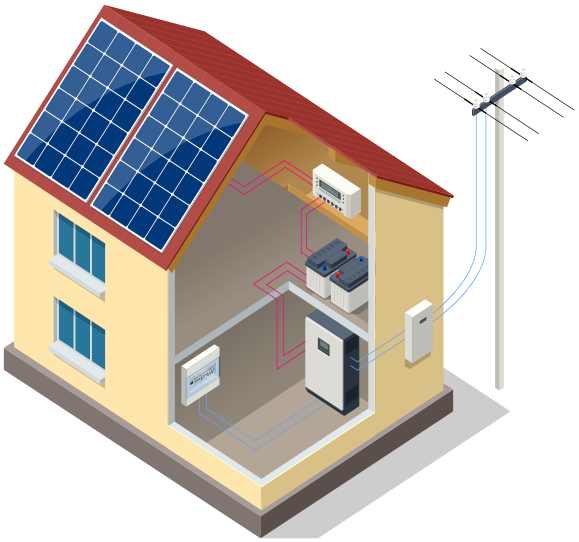
Appendix A –

Moreland Zero Carbon Development Guidelines for Solar Photovoltaic (PV) Systems and Electric Vehicle (EV) Infrastructure

Solar Photovoltaic Systems



Moreland City Council has an objective to achieve a zero carbon community by 2040. This guideline assists with incorporating Solar Photovoltaic (Solar PV) renewable energy systems into the design of new development.



What is a Solar PV system?

Solar Photovoltaic (PV) is technology that converts sunlight into electrical energy. The complete combination of individual elements such as panels, mounting, wiring, safety switches and inverters make up a solar PV system.

What factors influence a Solar PV system's performance?

The output of a solar PV system will vary depending on several factors such as climate, roof pitch, roof orientation, shading or obstruction, the system size and the quality of the installation. Each of these elements will affect the solar system's performance and the potential renewable energy benefits.

What are the benefits of including a Solar PV system in the initial design of a development?

The design and location of solar PV interrelates with other planning and design considerations directly or indirectly, such as visual amenity, spatial constraints, passive design and overshadowing. Incorporating on-site solar PV systems during the planning approval stage therefore elevates issues that can arise later in the building stage that can impact the efficiency of a system. This includes considering roof design by ensuring sufficient space and area, shape and orientation of the solar PV panels, and overshadowing of the solar PV panels by structures or trees. Considering such elements will also ensure that the design of the solar PV system does not have a negative impact on the overall aesthetics of the building to help create attractive streetscapes.

Will including a Solar PV system achieve a net zero carbon emissions building?

While renewable energy is an important element to achieve net zero emission development, another imperative element is energy efficiency. Regardless of how many solar panels can be installed, if energy efficiency is not at the core of the development, net zero emissions may never be realised.

With good thermal performance, energy efficient services and behavioural awareness, the medium density development (townhouses, units and dual occupancies) have the potential to achieve net zero emissions from the proposed metric.

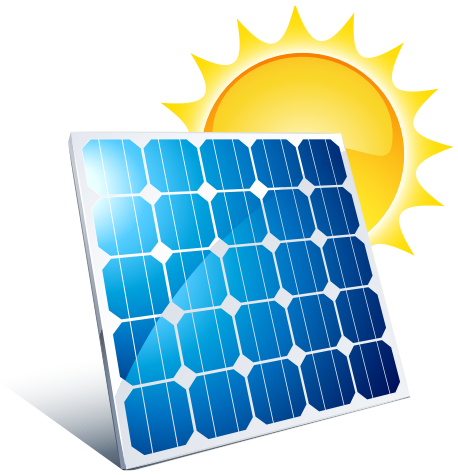
Apartment buildings however may not achieve net zero emissions from on-site renewable and energy efficiency alone. Off-site renewable energy purchasing may be required to complement the metric proposed to achieve a net zero emissions building.

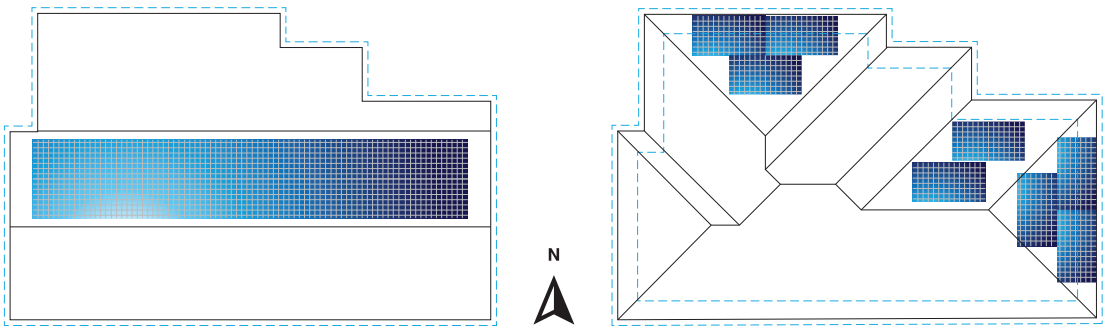
Industrial development very much depends on its usage and whether any energy intensive process would be taking place, but generally, and due to a large roof area, many warehouses can potentially achieve net zero emissions from on-site renewable energy generation.

Moreland Solar PV Metrics

Supported by Moreland City Council's zero carbon agenda, new development within the City of Moreland are encouraged to include on-site renewable energy in the form of solar PV systems.

The size, design and location of the solar PV system differs depending on the building typology. Therefore, 3 various solar PV metrics have been developed to assist new development with incorporating solar PV systems.



METRIC 1: **Medium Density Development (townhouse and standalone dwellings)**	
Metric Specifications	Provide the following solar PV system for each dwelling: • A minimum 3 kW for each 1-2-bedroom dwelling; and • An additional 1 kW for each additional bedroom
Design Guidance	Roof design is the most critical element in the dwelling's design to achieve the solar PV metric for medium density development. A solar friendly roof design includes: • Pitched and flat roofing to allow the solar panels to be placed continuously facing North, East or West (or any direction in between). • Panels placed on no more than two roof orientations (A). • A roof that includes large amounts of valleys and changes in direction cannot accommodate enough solar PV modules to achieve the metric (B).  A. B.
Elements to include on plans	• A roof plan showing the location of the solar PV panels • The pitch angle of all roofs. • Spatial provision for any future battery storage solutions in accordance with AS/NZS 5139:2019.

METRIC 2: **Apartments**	
Metric Specifications	• Provide a solar PV system with a capacity of at least 25 W per square meters of the development's site coverage*; or • 1 kW per dwelling. *Capacity of solar PV system in kW = $\frac{\text{Site coverage (m}^2\text{) x 25 (W/m}^2\text{)}}{\text{1,000 (W/kW)}}$
Design Guidance	The solar PV system must be located: • On a suitable roof, balcony or other area that can facilitate substantial energy generation from solar PV panels. • Within areas that will not be shaded by adjacent structures and positioned so not to self-shade. • In an area other than a void or lightwell, skylight, green roof, roof terrace, mechanical plant, drone landing pad, or other plant to be installed (unless the solar panels are installed over part of the green roof, roof terrace or plant). This can include the top of the lift shaft (lift overrun) and stair shafts, where suitable. • Be readily accessible for cabling. A pergola may also be used, on top of a roof terrace, that assists with balancing competing outcomes. Solar modules may also be located in areas other than the roof such as vertical solar PV panels on walls and building integrated PV (BiPV) systems.
Elements to include on plans	A roof plan that includes: • The roof area in metres square (m^2). • The location of the solar PV panels, dimensions, tilt angle and capacity. • Green roof or roof terrace. • Mechanical and other plant equipment. • The pitch angle of all roof forms. • Spatial provision for any future battery storage solutions in accordance with AS/NZS 5139:2019.

METRIC 3: **Industrial**	
Metric Specifications	• All roofs must be structurally designed to be able to accommodate full solar PV coverage, excluding areas set aside for plant equipment or areas significantly shaded by other structures; and • Include a solar PV system that is: – Sized to meet the energy needs of the building's services (lightning, air-conditioning, industrial processes); or – Maximised based on the available roof area; or – Where no industrial process is proposed, a minimum of 1.5 kW per tenancy plus 1 kW for every 150 m^2 of gross floor area.
Design Guidance	• Within areas that will not be shaded by adjacent structures and positioned to minimise self-shading. • In an area other than a void or lightwell, skylight, green roof, roof terrace, mechanical plant, drone landing pad, or other plant to be installed (unless the solar is installed over part of the green roof, roof terrace or plant) and can include the top of lift and stair shafts where suitable. • Be readily accessible for cabling
Elements to include on plans	A roof plan that includes: • The location of the solar PV panels, dimensions, tilt angle and capacity. • Green roof or roof terrace. • Mechanical and other plant equipment. • The pitch angle of all roof forms.

Source: Solaris (2021)

Other Design Guidance for all PV systems

Solar PV layout and angles

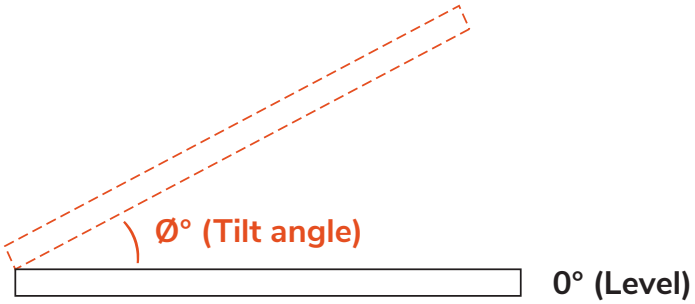
When designing the roof and placing the solar PV panels, a 1050 x 1700 mm sized solar PV module with a power rating output of 340 W can be assumed. Larger panels of 1050 x 2100 mm with a power rated output of 400 W may be utilised however will need to be specified within the design and annotated on plans. Manufacturer specifications can differ and it is encouraged to request information regarding a panel's size, power rating output, effective capacity, and installation requirements and limitations (e.g. racking and cabling on a roof).

Smaller buildings, such as townhouse developments, should place panels to face 1-2 different directions only (e.g. East and West) and therefore generally operate with only one inverter. When panels are facing two directions the inverter must have two Maximum Power Point Terminals (MPPTs). System designs with more than two directions will require micro-inverters installed at the back of each panel.

Please note that modules in series will have the electrical current of the least productive module whereby strings in parallel will have the same voltage as the least productive string. For this reason, the above has been specified.

Large developments, such as apartment and industrial buildings can have a larger solar PV system that may require multiple inverters. When multiple inverters are used, the solar PV system can accommodate panels facing more than two directions.

The tilt angle, being the angle between the horizontal plane and the panel, must be at least 10 degrees to allow for self-cleaning. In Melbourne, a tilt angle equal to the latitude (38 degrees) results in the highest annual energy production.



The system however may be designed to suit different requirements, limitations and usage profile.

Shading

Solar PV panels should not be shaded. Partial shading may impact the energy output of the system. Shading can be caused by trees, nearby buildings, and structures on the rooftop.

Self-shading is inflicted when the tilt of the front row of the solar PV panels overshadow the rear solar PV panels behind them. Therefore, clearance (a gap) between the strings (the rows of panels) must be considered and be appropriate for the tilt angle to improve the solar PV system's performance.

Alternative solutions

Where it is demonstrated that a metric cannot be met, an alternative solution and design approach may be appropriate. The alternative solution will need to be discussed on a case-by-case basis and must be supported by Council Officers.

Further Information

For additional guidance and details, please refer to:

Moreland City Council Renewable Energy Standard (Moreland City Council, 2021)

Moreland Zero Carbon Planning

Moreland City Council 90 Bell Street, Coburg 3058 **www.moreland.vic.gov.au**

Moreland Language Link

廣東話 9280 1910
Italiano 9280 1911
Ελληνικ 9280 1912

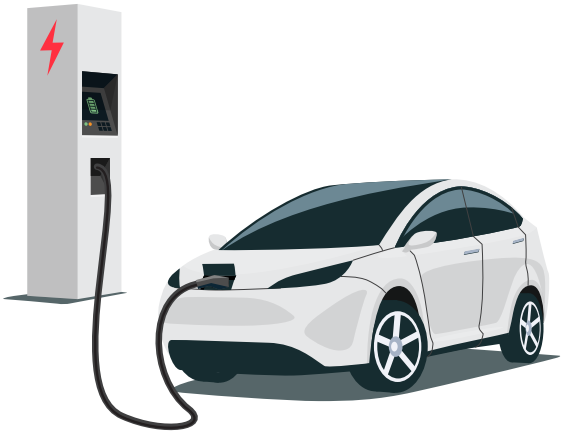
عربي 9280 1913
Türkçe 9280 1914
Tiếng Việt 9280 1915

हिंदी 9280 1918
普通话 9280 0750
ਪੰਜਾਬੀ 9280 0751

All other languages
9280 1919

Electric Vehicle Infrastructure

Moreland City Council has an objective to achieve a zero carbon community by 2040. This guideline assists with incorporating Electric Vehicle (EV) Infrastructure into the design of new development.



What is an Electric Vehicle (EV)?

In the context of this guideline, an electric vehicle is a battery electric vehicle (BEV) which requires recharging using electrical outlets. This also includes plug-in hybrid (PHEV). However, it does not include fuel cell electric vehicles (FCEV) as such vehicles use hydrogen as an energy source.

What is EV Infrastructure?

EV infrastructure includes the electrical components required to recharge the car; from the main switchboard to the charger. It does not include the charger itself which is generally considered an 'Active' system, as opposed to, 'EV Ready'. Depending on the development type, EV infrastructure may include, however is not limited to: distribution boards, load management systems, metering communication, wiring, circuit breakers, and cable trays.

How does EV infrastructure contribute towards achieving zero carbon emissions?

When charged with 100% renewable electricity, EVs may be considered zero emissions vehicles. With zero or low tailpipe emissions, EVs also contribute towards improved air quality.

Why should new development be built with EV infrastructure – termed 'EV ready'?

Industry, including the car industry, have identified that EVs are the way of the future to meet the growing need to address car emissions contribution to climate change, with many car manufacturers outlining plans to phase out conventional fuel vehicles. With knowledge of this expected change, future proofing infrastructure is becoming increasingly important. The availability of charging infrastructure is key to accelerate EV uptake. This is especially in apartment buildings where retrofitting existing infrastructure may prove increasingly difficult and costly.

What are the charging parameters and industry standards?

Charging is described by several parameters: namely 'level' and 'mode' which respectively describe the charging infrastructure used, as well as, 'type' which describes the plug configuration. The parameters originate from North American and European standards.

- Charging 'levels' are used to categorise the rated power, voltage and current of the charging system. There are 3 different EV charging levels (as defined by SAE International J1772 and IEC 62196-2).

Different levels of charging in North America: SAE configurations

Level 1
- Supply from household outlet
- Portable EV charging cable
- 120 V 1 phase AC; 12-16 Amp
- Charging power 1.4 kW or 1.9 kW

Level 2
- Supply from household outlet or EV charge point
- Portable EV charging cable
- 208-240 V 1 phase AC; 12-80 Amp (**Typ. 30 Amp**)
- Charging power 2.5 kW to 19.2 kW (**Typ. 7 kW**)

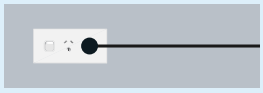
Level 3
- Supply from 208-600 V 3 phase AC
- Stationary EV charging cable
- 400 Amp (Typ. 60 Amp)
- Charging power up to 240 kW (Typ. 50 kW)

Source: E-Mobility Simplified (2019)

- Charging 'modes' are used to categorise the mode of power delivery, protection installation and communication/ control of charging system. There are 4 different EV charging modes (as defined by IEC 61851-1). Modes 3 is currently considered the most suitable for charging EVs in multi-dwelling developments.
- Charging 'types' detail the physical shape of an EV plug and charging capabilities. Most EVs in Australia have a type 2 plug. A CCS2 is another form of type 2 plug that enables fast charging using Direct Current (DC).

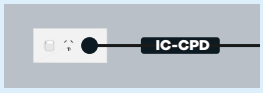
Different modes of charging

Household Outlet (230 W)



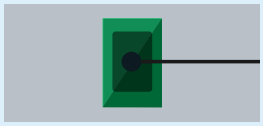
Mode 1
- Alternating Current (AC) charging
- Regular household outlet
- Un-safe – not recommended to use

Household Outlet (230 W)



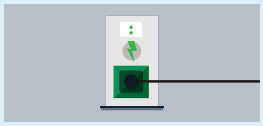
Mode 2
- AC charging
- In-cable control and protection (IC-CPD)
- Limited to 3.7 kW (16 Amp) in residential use or 7.4 kW (32 Amp) for industrial

Dedicated EVSE



Mode 3
- AC charging
- Control, communications and protection functions incorporated in the charge point (Electric Vehicle Supply Equipment – EVSE)
- Wide range of charging: 3.7 kW to 43 kW

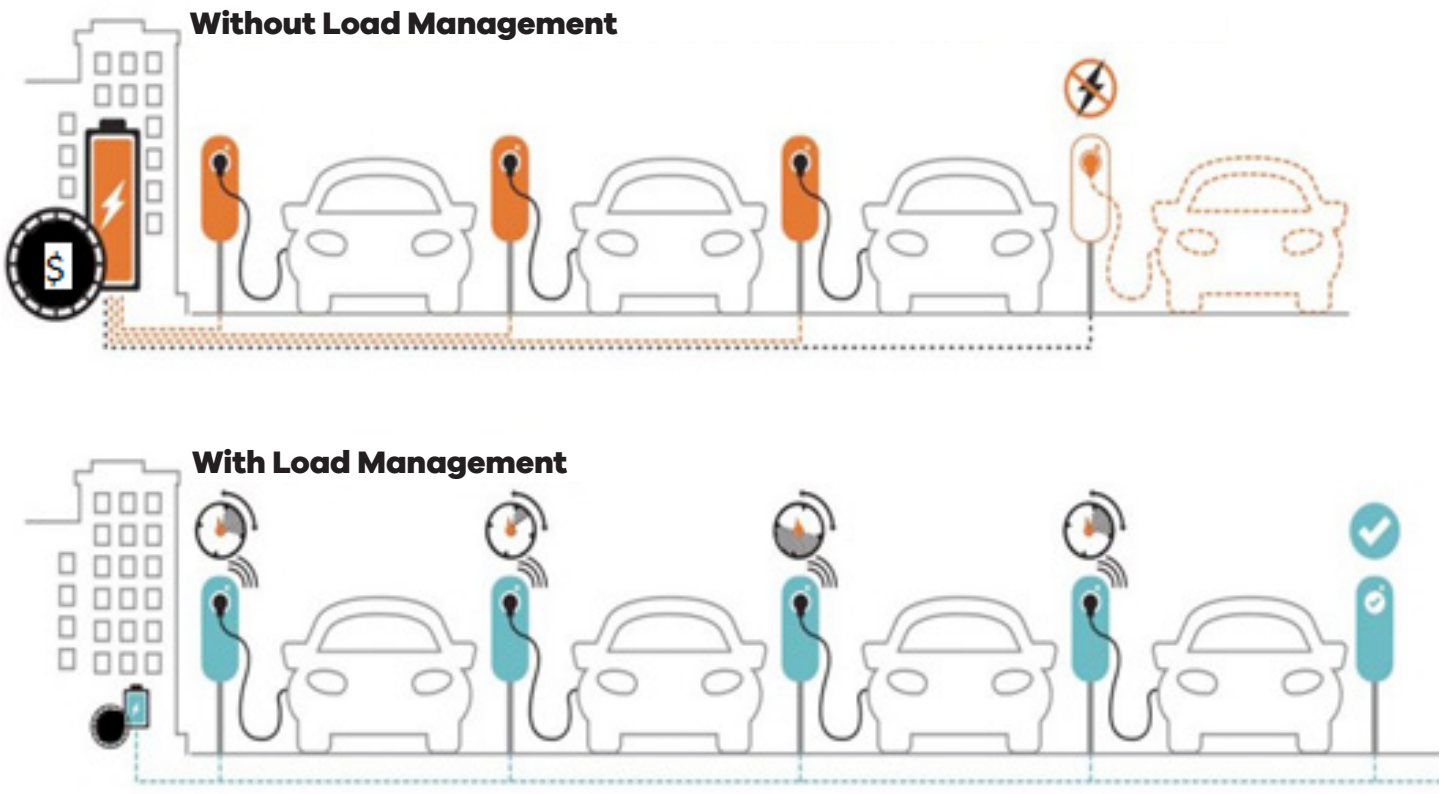
DC Charger



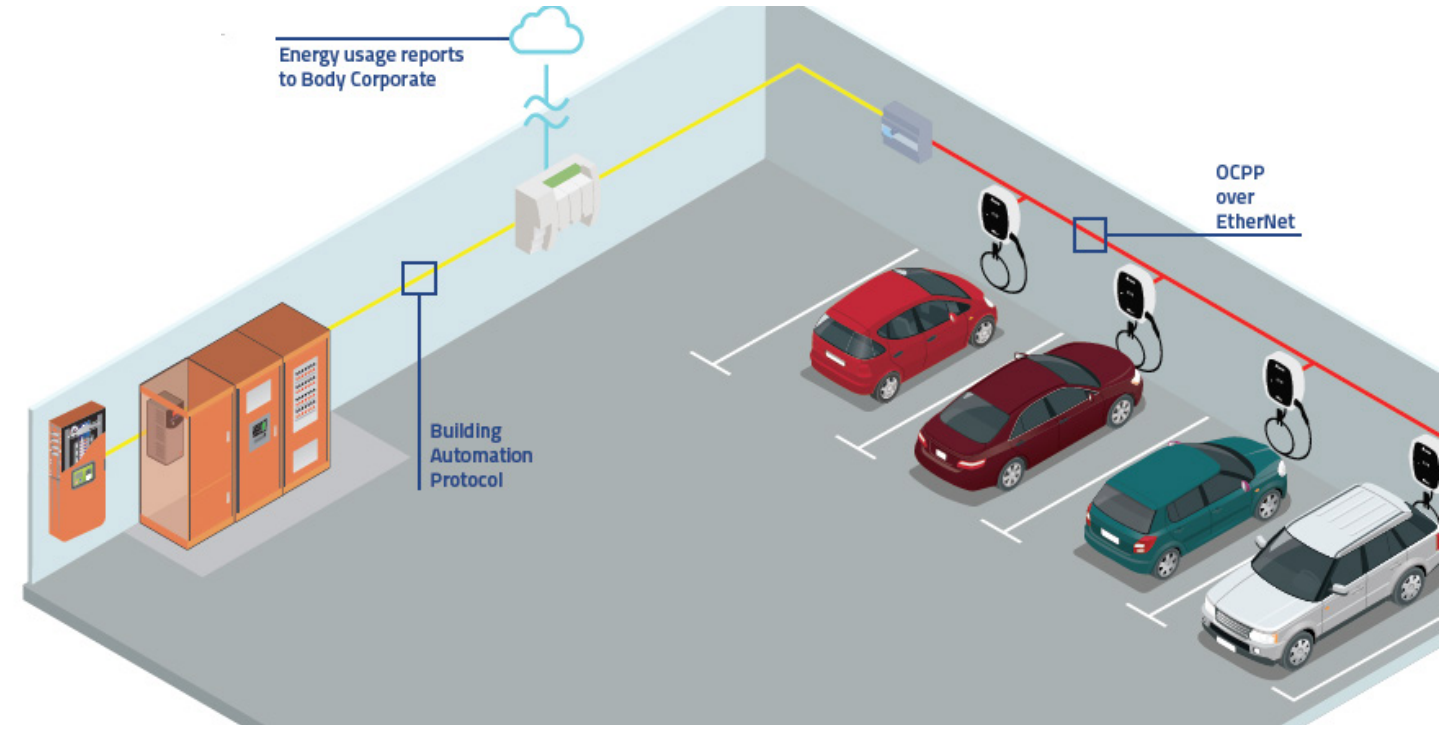
Mode 4
- Direct Current (DC) charging
- Option of either CHAdeMO or Combined Charging System (CCS)
- For public and commercial charging applications
- Wide range of charging capabilities – over 150 kW

What is load management?

Load management is simply defined as the scheduling of charging EVs. Incorporating a load management system within a development reduces the maximum electricity demand to a building and provides better grid stability. Load management is a key element that supports a cost effective and stable EV charging system and can be facilitated in various forms; from simple timers to a more sophisticated smart and dynamic controlled system.



Source: WATT Consulting Group (2018)



Source: NHP (2020)

Moreland EV infrastructure Metrics

Supported by Moreland City Council's zero carbon agenda, new development within the City of Moreland are encouraged to include EV charging infrastructure. The design and requirements of the EV infrastructure differs depending on the building typology and are reflected in the two EV metrics provided.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**

Metric Specifications

Provide the following EV infrastructure to each dwelling that includes:

- Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging.*
- Load management systems that ensure that:
  - EV charging occurs outside of peak electricity demand hours; and
  - The EV infrastructure does not adversely impact the site's maximum demand.

* The inclusion of an EV charger unit (Active EV Charging) is not expected.

Design Guidance

Base EV infrastructure for each dwelling includes:

- A dwelling switchboard ('load centre') with a dedicated circuit sufficient to supply 1 x 7 kW 32 Amp electric vehicle charging station.
- Cabling capped off at an isolator in readiness for a future 7 kW 32 Amp electric vehicle charging station. An active 15 Amp General Power Outlet (GPO) may be installed in the interim that may later be converted to an EV charging unit.
- Clear signage placed next to the junction box, isolator, or GPO that indicates that the circuit cabling can accommodate charging an EV at 32 Amp.
- A pre-set timer to ensure EV charging does not occur during peak demand hours. Peak demand generally occurs during weekdays from 6am to 9am in the morning and from 4pm to 10pm in the evening.

Maximum Demand

Adding EV charging infrastructure will increase the maximum demand of the dwelling, which in some typologies and locations is an acceptable outcome. In other typologies (such as 5-10 unit development), increasing the maximum demand may prove costly due to network connection fees.

Australian Standard AS/NZS 3000:2018 (Wiring Rules) Section 2.2.2 specifies multiple methods to determine the maximum demand. Relevant methods include (a) Calculation and (b) Assessment which are applied as follows with respect to the following Options:

Behind-the-Meter Load Management

Option 1:

Available Capacity (preferred)

- 2.2.2(a): Calculation: which is based on adding all the loads and their diversity factors. When using this method, the 32 Amp associated with the EV infrastructure must be added to the maximum demand on the basis of 100% usability rate. This increases the maximum demand of each unit by 32 Amp and that of a block of up to 5 units by 32 Amp per unit. In some locations, this means a higher network connection fee, in this case, method 2.2.2(b) may be more feasible.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**	
Design Guidance	**Option 2:** **Load Shedding (preferred)** • 2.2.2(b) Assessment: which can be based on demand management. Demand management may consist of monitoring and control devices such as – A load shedding contactor; – A contactor and current transformer/sensor; – A current limiting device; – A Programmable Logic Controller (PLC); – A building management system; or – An approved charge control module which supplies the EV charger only when there is spare capacity within the dwelling, ensuring that the maximum demand of the dwelling (as per the mains breaker) is not exceeded. This method allows the load to be managed behind the meter and within the boundary of each private dwelling. This means that the maximum demand of the block will be that of all dwellings added together, or in the case of a load management strategy (e.g. rotational delayed start), maximum demand may be less than that which would be the case under a 'charging always available' arrangement. **Site-Wide Load Management** When behind-the-meter methods lead to a maximum demand for the block that is higher than the maximum allowance of the street's infrastructure as determined by the DNSP, another dynamic site-wide load management method may be considered. **Option 3:** **Owners' Corporation EV Circuit Control** • A device capable of disconnecting each EV charger from its supply in the dwelling (contactor) may be controlled by a signal from a master controller. • The master controller may be installed on common property and managed by the owners' corporation. • The installation of a master controller ensures that EV charging may only occur when there is sufficient spare capacity within the site. • A low voltage instrumentation wire runs from the master controller to the load centre of each dwelling and is connected to the EV circuit breaker. • Metering requirements may not necessarily be required for the owners' corporation. • Additional capacity may not necessarily be required for the site.
Elements to include on plans	EV infrastructure specifications need to be detailed and demonstrated on relevant plans. *As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site.

METRIC 2: **Apartments**

Metric Specifications

Provide the following EV infrastructure to each apartment development:

Capacity and Load Management

- Dedicated EV distribution board(s) in each carpark storey that is capable of:
  - Supplying a minimum Level 2 (Mode 3) 7 kW, 32 Amp single phase dedicated circuit to all residential car parking spaces; and
  - Managing the maximum demand load of the development so that it does not exceed the site capacity, while providing a minimum average of 12 kWh of charge to each car parking space (particularly during off peak periods).
- Dedicated space for cable trays to support the future installation of EV cabling from the distribution board to the edge of each car parking space.
- Additional EV infrastructure, as required, which may include power use metering and communication systems, and conduit installations.

Motor cycle, moped, electric bicycle or scooter parking

- A 10-15 Amp charging outlet to every 6 bicycle parking spaces.
- Prominent, accessible and secure locations for the bicycle parking and other personal mobility devices.

Shared or Communal Space EV Charging

- A minimum of 1 Active EV charging unit should be installed at a shared or communal parking space, where relevant.
- Shared or communal EV charging spaces should be located in highly visible, priority locations, to encourage EV uptake.
- Clear signage must be provided to indicate that EV charging is available at the shared or communal spaces.

Parking Facilities

Parking facilities for low and zero emission vehicles should be located in a prominent, accessible location to encourage easy access by building occupants and visitors, ahead of larger and emission intensive vehicles.

METRIC 2: **Apartments**

Design Guidance

Base infrastructure for an apartment building includes:

- 1 or more distribution boards provided to each car parking level with a capacity to meet the future charging capacity of the level required. The location of the distribution boards should be centrally located at the parking spaces to reduce individual cabling costs for EV owners.
- An approved power use metering system.
- Cable trays and/or conduit installed to service each residential parking space to accommodate future EV cabling (power and communications).

The location of EV charging units

- Whether the design includes EV charging units ('Active') or is EV Ready, the design should ensure that infrastructure will be readily accessible and not obstructed.
- Where storage cages are provided in, and around, car parking spaces, ensure that future charging will be feasible and EV infrastructure is not obstructed.

Designs that include EV charging units (Active EV Units)

- Electricity supply to EV charging units may utilise common property electricity rather than electricity individually metered to a dwelling, with metering of individual circuits to each EV space via a NMI pattern (installed in, or adjacent to, the distribution board).
- Metering should be in a location that is accessible locally by an owners' corporation representative or appointee, and should have a means for communicating the kW consumed (e.g. pulse output or communications protocol) so that if a remote meter reading solution is desired by the owners 'corporation in the future, it can be implemented.
- Spatial provisioning for NMI metering within load centres should be included until regulations are clarified.

Load Management

- The load management system can be physical or cloud based systems.
- Load management should be designed to manage the predicted increase demand when using future EV charging to prevent exceeding the maximum electricity capacity for the site.
- The development should include site wide load management that can operate EV charging circuits within and between relevant spaces that comprises either:
  - Static load management – a system that charges all vehicles at the same time, which equally allocates a reduced load managed charge;
  - Rotational (time-shared) load management – a system that equally allocates charging based on a fixed schedule; or
  - Active/dynamic load management – a smart, communications-based and controlled charging system that responds to the energy requirements of the development and supplies EV charging to vehicles based on availability.
- The load management system (whether a separate system or in-built in charger types) should be scalable so that it can accommodate an increasing number of EVs as they are introduced to the building over time, up to the point where the development can accommodate EV charging to all residential parking spaces, as a minimum.

Elements to include on plans

EV infrastructure specifications need to be detailed and demonstrated on relevant plans.

* As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all the EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site. This includes the size and location of each cable tray and/or conduit to be installed to service each residential car parking space.

Other Design Guidance

Engaging the relevant expert to prepare the design

An electrical engineer has the expertise to design the base infrastructure and load management system within an apartment and mixed use development. EV charging infrastructure must be designed by a suitably qualified electrical engineer and installed by a licensed electrician. All works must be undertaken in accordance with the wiring rules and any other State or Federal regulations.

Protocol for ongoing management

The ongoing management of EV infrastructure and the EV system should be kept in mind when embedding relevant infrastructure within a development. New owners should be made aware of such systems, as well as, the owners' corporation.

Communicating the availability of such systems and resources within a development will ensure that responsibilities and protocols can be established that enables ongoing effective load management, metering and cost allocation, as well as, the equitable use of shared or common charging stations.

Alternative solutions

Where it is demonstrated that a metric cannot be met, an alternative solution and design approach may be appropriate. The alternative solution will need to be discussed on a case-by-case basis and must be supported by Council Officers.

Further Information

For additional guidance and details, please refer to:

Moreland City Council Low Emission and Electric Vehicles Standard (Moreland City Council, 2021)

Moreland Zero Carbon Planning

Moreland City Council 90 Bell Street, Coburg 3058 **www.moreland.vic.gov.au**

Moreland Language Link

廣東話	9280 1910	عربي	9280 1913	हिंदी	9280 1918	All other languages	
Italiano	9280 1911	Türkçe	9280 1914	普通话	9280 0750	9280 1919	
Ελληνικ	9280 1912	Tiếng Việt	9280 1915	ਪੰਜਾਬੀ	9280 0751		