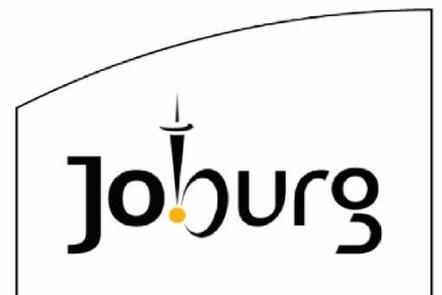




THE CITY OF  
JOHANNESBURG

GREEN BUILDING  
POLICY:  
NEW BUILDINGS

TRANSITIONING TOWARDS A LOW  
CARBON FUTURE



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## DEFINITIONS

In this document, the meanings of terms are to be understood in the context of and as defined in the National Building Regulations and Building Standards Act, 103 of 1977 (NBR) and the City of Johannesburg Land Use Scheme, 2018. The following definitions are included:

**Act** means the National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977); and Rules, as amended.

**Baseload energy use intensity:** Energy consumption of a building per annum in kWh expressed with reference to floor area (m<sup>2</sup>) [kWh/ m<sup>2</sup>/a], calculated at design stage taking only fixed building services into account, including lighting, space heating and cooling, vertical transport and hot water, excluding operational loads

**Building Regulations** means the National Building Regulations made in terms of the Act, as amended.

**Competent Person:** Person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of the National Building Regulations (SANS 10400 Part A).

**Construction waste:** Building material and rubble generated on a site as a result of the construction process.

**Council:** The Council of the Municipality referred to in section of the Constitution, 1996; of the City of Johannesburg Metropolitan Municipality established in terms of the Municipal Structures Act, 1998 read with Government Notice 1866 published in Provincial Gazette Extraordinary no 128 of 30 June 2010, as amended.

**Demolition waste:** Building materials and rubble generated on a site as a result of demolishing a structure on the site.

**Embodied carbon:** The carbon footprint of a material. It considers how many greenhouse gases (GHGs) are released throughout the supply chain and is often measured from cradle to (factory) gate, or cradle to site (of use).

**Energy efficiency (EE):** Energy consumption of a building per annum in kWh expressed with reference to floor area (m<sup>2</sup>) [kWh/ m<sup>2</sup>/a].

**Energy sub-metering:** Sub-metering enables one to fine tune operational procedures to minimise consumption and to detect any operational problems early.

**Energy Use Intensity (EUI):** The total sum of annual energy consumed on-site divided by the building net floor area (calculated and measured in terms of kilowatt hours per square metre (kWh /m<sup>2</sup>)).

**Energy Performance Certificate:** A certificate issued by an accredited body in respect of an existing building that indicates the energy performance of that building. These are issued in accordance with the South African National Standard SANS 1544: 2014 Energy performance certificates for buildings, published by the South African Bureau of Standards in terms of the Standards Act 8 of 2008.

**Green Building:** A building that, in its design, construction and operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment.

**Greenhouse gas (GHG):** Gases that contribute to the greenhouse effect by absorbing infrared radiation emitted by the earth's surface. Often reported in terms of carbon dioxide equivalents based on their global-warming potential.

**Greywater harvesting:** This is the collection of waste water from bathtubs, showers, hand wash basins, clothes washers and laundry tubs, which can then be processed into reusable water for other non-potable purposes such as irrigation, flushing water closets and urinals.

**HVAC** – Heating, Ventilating and Air Conditioning

**Land development application:** An application for the erection of buildings or structure on land, or the change of use of land, including township establishment, the subdivision or consolidation of land or any deviation from the land use or uses permitted in terms of an applicable land use scheme.

**LED:** Light-Emitting Diode

**Mandatory standards:** Standards that the City of Johannesburg has made compulsory and which must be achieved for approval of a building plan.

**New building:** New permanent building construction, including major refurbishments.

**Net Zero Carbon (NZC) Building:** A building that is highly energy-efficient by design, with the energy used drawn from renewable energy sources, whether on-site or off-site, so that there is a zero net carbon emissions on an annual basis.

**Off-site renewable energy:** Energy generated from renewable sources outside the boundaries of the building site.

**On-site renewable energy generated:** Energy from renewable sources produced at the building site.

**Operational energy:** the energy required during the entire service life of a structure, such as lighting, heating, cooling, and ventilating systems, including operating building appliances

**Operational load:** Refers to the total energy consumption of the building including all building services and functions. Excludes energy used in construction processes.

**Operational waste:** Waste generated during the normal operation of a building and is liable to be disposed continuously or periodically.

**Plug Load:** The energy used by products that are powered by means of an ordinary AC plug (e.g. 100, 115, or 230 V). This term generally excludes building energy that is attributed to major end uses (HVAC, lighting, water heating, etc.)

**Promoted standards:** Voluntary standards that the City of Johannesburg encourages and supports in order to improve the sustainable performance of the built environment.

**Rainwater harvesting:** This is the collection of water from natural precipitation which can be treated into potable water for drinking or other purposes such as irrigation, toilet flushing.

**Rational Design:** Design approach quantified, using set models or values, to allow optimal performance of a building and optimal comfort level for its occupants.

**Renewable Energy:** Energy generated from renewable resources. Examples of energy sources include sunlight, wind, rain, tides, waves and geothermal heat, biomass and biogas.

**Resource efficiency:** The optimisation of the use of resources to ensure that they can be continuously replenished, or to ensure that there is an endless amount of it that can be captured or harnessed and useful towards providing energy without there being a decrease in supply.

**Resource efficient building:** Refers to a development that consumes minimal energy and water, and decreases waste generated from the building operations, offering positive impacts to relevant stakeholders.

**Site:** Any erf, lot, plot, stand or other piece of land on which a building has been, is being or is to be erected.

**Small-Scale Embedded Generator:** Power generation under 1MW/1000kW, which are located within the distribution network and produce for own their own use or feed excess back into the grid.

**Smart meter:** An electronic device that records information such as consumption of electric energy and current. Smart meters communicate the information to the consumer for greater clarity of consumption behaviour, and electricity suppliers for system monitoring and customer billing. Smart meters typically record energy near real-time, and report regularly, short intervals throughout the day. Smart meters enable two-way communication between the meter and the central system.

**Solar reflectance:** A measure of the ability of a surface material to reflect sunlight and limit heat island impacts.

**Solid waste:** Waste, refuse or rubbish that is generated by occupants during the use of a building.

**Sustainable sanitation:** A sanitation service that meets user and environmental requirements at consistent levels, without undue and extended interruption of access. It would typically encompass all the five aspects of sustainability i.e. environmental integrity (e.g. reduce resource use, reuse and recycling), social equity, economic efficiency and appropriateness, and underpinned by institutional support.

**Urban heat island:** urban area that is warmer than the surrounding rural area.

**Vegetative roof:** A roof that supports soil and live vegetation. Such a roof is to be suitably designed structurally and with waterproofing and must be designed to be easily accessed for maintenance and irrigation purposes

## 1. INTRODUCTION

### 1.1 Changing the development trajectory

In response to growing climate change concerns and an imperative to transition to sustainability, the City of Johannesburg<sup>1</sup> has formulated this policy to guide the development of new green buildings within the City. The aim of the City’s first Green Building Policy is to promote resource efficiency and set high-performance standards for all new buildings within Johannesburg’s built environment, on a pathway towards a low carbon future.

Accelerating the transition of Johannesburg to a sustainable city is central to service delivery and economic growth- and the health and well-being of our communities and citizens.

Although the City of Johannesburg has continuously been improving service delivery in key sectors, including energy, waste management, water and sanitation, and public transport, the challenges are exacerbated by rapid urbanization and population growth in a city still struggling with the legacy of apartheid spatial development. This results in an inefficient city across sectors, increased greenhouse gas emissions and over-reliance on limited natural non-renewable resources and increased vulnerability to shocks. This not only severely limits the City’s economic growth potential and global competitiveness, but impacts the quality of life of all citizens. The poor remains the most vulnerable and the result is deepening poverty affecting the majority of the City’s residents.

Climate change is one of the major challenges affecting global society. The main concern related to climate change is global warming, which is based on a ‘greenhouse’ effect. Commitment and decisive, effective action is required to reach global commitments that will limit future warming to below 1.5°C. South Africa<sup>2</sup>, and the major metropolitan cities in the country- including Johannesburg- have committed to addressing climate change, through finding new ways to balance development priorities with efforts to reduce the resource, energy and carbon intensity of our economy. South Africa is ranked among the top 20 countries measured by absolute carbon dioxide (CO<sub>2</sub>) emissions, with emissions per capita in the region of 10 metric tons per annum. Gauteng estimated its CO<sub>2</sub> emissions for 2030 to be a third of the national emissions trajectory. This is being driven primarily by the electricity intensive economy responsible for about one third of South Africa’s energy consumption and GDP.

The biggest opportunities for emissions reduction can only be realized through a significant transition in urban form, energy sources, transportation and resource efficiency. The built environment (i.e. urban form) produces a third of the world’s carbon dioxide emissions and, thus, needs to be at the forefront of efforts to drastically reduce the amount of CO<sub>2</sub> generated. Intervention in the way buildings are constructed and operated is the carbon mitigation action with the lowest abatement cost when compared to other sectors, and both municipalities and national government have significant control over the construction of buildings.

### 1.2 Strong national and provincial legislative and policy direction

The Green Building Policy for new buildings derive its impetus from a number of legislative and policy frameworks from national to the local level, addressing climate change, environmental sustainability, natural resources and infrastructure:

National policies, regulations and initiatives with direct bearing on buildings				
2011	DEFF: National Climate Change Response Paper	National	Climate White	Identifies the regulation of commercial and residential building standards to enforce green construction practices as one of its mitigation strategies to ensure emissions reductions while limiting job contraction and promoting the green economy – it stipulates up scaling of energy efficiency (EE) in public, commercial, buildings. The importance of renewable

<sup>1</sup> Led by Development Planning Department and supported internally by an inter-departmental project steering committee. The policy formulation was informed by extensive stakeholder engagements and supported by the C40 South African New Buildings Programme (Towards Net Zero Carbon).

<sup>2</sup> South Africa is a signatory to the Paris Agreement, an international agreement to mitigate climate change and limit global warming to below 1.5°C above pre-industrial levels tabled at the 21st Conference of the Parties (COP21) of the UNFCCC (2015).

		energy (RE) as a priority programme is also recognized and is reflected in regulatory frameworks enabling this programme development
2012	Presidency: National Development Plan	Identifies the transition to a low-carbon economy and sustainable resource management as one of ten priority areas. Commits to EE requirements in SA National Standards to achieve NZC building standards by 2030
2011	DPW: National Framework for Green Building	Focuses on adoption of green building regulations, standards and best practice amongst public buildings
2011	DTIC: National Building Regulations – Amendment SANS 10400 XA v1	Details EE building code requirements for building approval
2015	DMRE: National Energy Efficiency Strategy - draft	Sets out EUI reduction targets by building sector
2019	DMRE: National Integrated Resource Plan (electricity supply plan)	Sets out RE targets/ plan
May 2020	NT: Sustainable Financing Initiative Report - National Treasury	Aims to regularize, build capacity and awareness across financial sector to redirect R2tn capital to lower carbon and Climate Change risk future
Oct 2020	DMRE: Amendment to Section 34 Electricity Amendment Act	Enables municipalities to develop their own power generation projects and to procure from IPPs
Dec 2020	DMRE: Energy Performance Certificates mandatory for non-residential buildings	EPCs to be issued by an accredited body and displayed – valid for 5 years. Monitored by DMRE

Table 1: Net Zero Carbon (NZC) City policy in line with national policy directions

Provincially, strategies such as Gauteng Climate Change Response Strategy and Plan (2017) specifically identify the need for the building sector to be transformed to ensure significant carbon emissions reduction.

The Department of Trade, Industry and Competition (DTIC) is the custodian of the National Building Regulations Act, Act No. 103 of 1977 governing building design. The enactment in 2011 of SANS 10400XA introduced a new era of energy efficiency requirements for new buildings in South Africa. Currently a revised draft SANS 10400XA is the subject of Committee review following public comment and it is anticipated that this will be enacted in 2021. The new SANS 10400XA will substantially improve the country's drive to achieve more energy efficient new buildings. Unfortunately the standards (current and proposed) for new buildings set in the NBR are insufficient to meet the net zero target by 2030.

Considering the overall South African<sup>3</sup> and City of Johannesburg<sup>4</sup> climate change commitments, greater efficiencies and significant carbon emission reductions will be required over the next decade. This can only be achieved if the major metropolitan areas of the country put additional policies, by-laws and actions into effect to close the remaining gaps to achieve net zero carbon emissions for new buildings by 2030. Building regulations are a Schedule 4, Part B, legislative competence. The City of Johannesburg municipality is therefore empowered to administer building regulations, and thus also to 'make and administer by-laws for the effective administration' of Local Government Matters (section 156(2) of the Constitution).

Achieving this target is core to South Africa meeting the DMRE's National Energy Efficiency Strategy targets, DFFE's climate commitment as outlined in the Nationally Determined Contribution and detailed in the SA Low Emissions Development Strategy (2020) and the net zero building target for 2030 as outlined in the National Development Plan. It is also in line with the 2019 Integrated Resource Plan and core to the post-COVID recovery approach to 'build it back better'.

<sup>3</sup> National Development Plan 2030

<sup>4</sup> City of Johannesburg Climate Action Plan, 2021

### 1.3 City of Johannesburg leading the way

Many of the City's spatial, environmental and infrastructure policies, strategies and by-laws already address urban form, resource efficiency and low-carbon development as part of the City's overall sustainability framework in support of the City's long-term Joburg 2040 Growth and Development Strategy (GDS). The City vision as declared in the recently revised GDS emphasises: "**vibrant, equitable African city, strengthened through its diversity; a Smart city that provides real quality of life; a city that provides sustainability for all its citizens; a resilient and adaptive society.**"

Outcomes 1 and 2, with the focus on resilient quality of life and environment, are key:

- *Outcome 1: Improved quality of life and development-driven resilience for all.*
- *Outcome 2: Provide a resilient, liveable, sustainable urban environment – underpinned by smart infrastructure supportive of a low-carbon economy.* This outcome speaks to six outputs which include sustainable and integrated delivery of water, energy, waste management, improved eco-mobility, sustainable human settlements and climate change resilience and environmental protection.

The City of Johannesburg has taken a significant step towards outlining a plan of action to deliver on its commitment towards the objectives of the Paris Agreement and the Deadline 2020 commitment – it approved a Climate Action Plan (CAP) in 2021. The City's CAP is a strategic plan with the objective to prioritise evidence-based transformational actions, to transition the City towards an emission neutral, climate resilient city by 2050. It sets out specific targets and interventions related to affordable clean energy; optimising energy efficiency buildings; enabling next generation mobility; improving water management and improving water supply and treatment.

This Green Building Policy for new buildings aims to outline a pathway towards achieving net zero carbon energy targets as one of the priority actions identified in the CAP. This would be the first decisive step in the direction of changing the development trajectory towards a more sustainable, low-carbon built form.

The Green Building Policy: New Buildings is part of a larger system of spatial, infrastructure and development management - and ultimately to achieve deep efficiency and renewable resource systems, will require systemic and precinct level approaches. Technical advances and innovative systems approaches are encouraged to emerge to tackle the dynamic technological, social and economic complexities.

The City's Smart City Strategy (2021-2026) identifies **Sustainable, Liveable and Resilient City** as one of the eight pillars of the strategy – and the key interventions related to this strategy will furthermore support the implementation of the Green Building Policy.

### 1.4 What if we don't act now?

The urgency of reducing greenhouse gas emissions and other environmental impacts, together with increasing non-renewable resource scarcity is driving the change to a more sustainable built environment. There is a critical window of opportunity to address buildings and construction in the coming decade to avoid locking in inefficient buildings for decades to come.

Most of South Africa's greenhouse gas (GHG) emissions result from the consumption of fossil fuels, such as is in the generation of electricity. Approximately 36% of all GHG emissions from the largest four metros are as a result of the energy used in the built environment. The long lifespan of buildings (40-120 years) and the rapidly growing building stock in South African cities make energy efficiency in buildings a key strategy in reducing GHG emissions.

By directing new building developments in the city along a greener and more sustainable trajectory, the growth of the city does not have to equate to an acceleration of climate change. Significant opportunities exist for decreasing emissions from buildings through reducing energy demand in buildings and then supplying remaining energy demand with energy generated from renewable energy sources. Any inefficient building built now, "locks in" high energy use into the future, because although retrofitting with efficient technologies (such as efficient lighting) can help reduce energy demand,

passive building design can reduce the number of energy services required in the first place. Buildings are also consumers of services such as energy, water as well as producers of waste. They are essential to tackling service delivery challenges if developed in a manner that minimizes resource consumption. Furthermore, buildings should be designed to be resilient to climate change impacts, such as flooding and drought.

### 1.5 Purpose of the policy

The aim of the Green Building Policy: New Buildings is to actively promote resource-efficient design, construction and operational practices for all new buildings, including major refurbishments, in Johannesburg in order to mitigate the lifecycle impacts of buildings on the environment while maximising positive social and economic impacts.

The objective is to achieve low to net zero carbon by 2030 for all new buildings in the city by 2030.

This policy is intended to help plans examiners, inspectors, designers, developers, owners, occupants and energy consultants who wish to submit a building application to the City of Johannesburg.

### 1.6 Policy approach

Realizing low to net zero carbon targets are challenging and require major shifts in the built environment industry and the behaviour of users. The policy approach is to outline a pathway over time, to reach targets set out for the next thirty years, with a specific emphasis on critical changes to be made within the first decade.

The intention is to improve energy efficiency (EE) and reduce energy use intensities (EUI) in buildings in a phased approach over time. The targets are subject to review in response to improvements and innovations in technologies and in response to data regarding the actual energy consumption of buildings.

A programme will need to be developed to monitor the operational energy use of buildings through metered data, to support compliance with operational targets and to provide reliable data to inform future policy reviews.

The approach emphasises the need for all building categories to firstly minimise and optimise the use of energy in building services by using passive design principles for thermal comfort and ventilation, as well as suitable natural lighting and efficient building services; thereafter meeting the buildings' occupational needs through the provision of renewable energy (whether on-site or off-site). Voluntary inclusion of renewable energy before 2030 is promoted, but it is not mandatory until 2030.

In addition to the pathway towards net zero carbon for all new buildings, development guidelines are set out addressing energy, waste and water.

It is important to note that the scope of this policy extends only to the design, construction and the operational energy use of new development. The consideration of embodied carbon currently falls outside the prescripts of this policy; however, the incorporation of local materials are highly encouraged. It is envisaged that future policy reviews will consider embodied carbon requirements.

The City will demonstrate its commitment by ensuring that new municipal buildings will adhere to the policy requirements and by piloting net zero carbon developments before 2030.

## 2. GENERAL REQUIREMENTS AND CONDITIONS FOR APPROVAL AND IMPLEMENTATION OF NEW GREEN BUILDINGS

### 2.1 Application

The Green Building Policy is applicable to all new buildings, including major refurbishments that require building plan approvals from the City of Johannesburg in accordance with the National Building Regulations. Major refurbishments are defined as *“construction that results in the fundamental remodelling or adaptation of existing elements of the building envelope, structure, and renewal of key building services.”* The NBR states: *“major addition is considered to be an extension of the floor area of more than 25% of the floor area of an existing building; Major alteration is considered to be the refurbishment, renovation or refitting of more than 25% of an existing building”*.

Aspects of green building development that are outside the boundary of the site of a particular development are not included in this policy, although the policy does seek to enable aspects beyond the site, such as non-motorised transport and recycling of waste. It is essential to integrate green buildings with sustainable urban planning and land-use practices, which means that the intent of approved precinct plans and urban design guidelines, service plans, zoning conditions and Site Development Plan requirements must be carefully considered when conceptualizing the overall development, even if only the building component falls directly within the scope of this policy.

### 2.2 Submissions

Building plan submissions to City of Johannesburg must demonstrate that the proposed development will comply with the mandatory standards outlined in the Green Building Policy. Compliance with mandatory and voluntary standards should be demonstrated through the submission of completed forms and any required supporting documentation. Complete and correct documentation must be provided; if not, the submission will not be assessed and will be returned for completion and resubmission.

It should be noted that submission requirements may be amended from time to time by the City of Johannesburg in order to support ongoing performance improvement in the built environment. It is the responsibility of persons wishing to submit applications for building plan approval to check that they are using the latest, and current, submission forms.

Submissions of building plan applications must be made by a competent person. Meeting the mandatory requirements will require an integrated design approach; specifically with regards to integrating energy modelling into the design process and providing supporting documentation meeting the City’s requirements. Up until 2025 compliance will be via the routes in the NBR. This means those using performance based must comply with the Energy Use Intensities (EUI) in the tables, but developers may still use the ‘deemed to satisfy route’.

### 2.3 Penalties for non-compliance

Submissions that do not comply with mandatory standards will not be approved until the submission is fully compliant with the City of Johannesburg’s Green Building Policy: New Buildings. Buildings found to be non-compliant with mandatory standards at the point of completion may have their occupation certificate withheld until the building is fully compliant.

If any incentives were applied as part of the land use application process and the envisaged performance is not achieved at building plan approval/occupation certificate phase, penalties will be imposed.

## 2.4 Green Building Incentive Scheme

The Municipality may, from time to time, provide incentives to submissions that not only comply with mandatory standards but also comply with promoted standards. Incentives may include but are not limited to the following non-financial and financial incentives:

- Expedited development application procedures
- Additional land development rights, including floor area, height and density
- Relaxation of specific planning requirements such as parking provision
- Formal recognition of performance through recognition.
- Reduced development contributions
- Access to reduced cost or free green building technical training and seminars
- Access to municipal negotiated discounts for energy efficient / sustainable technologies
- Access to municipal negotiated finance interest rate reductions from banks and financial institutions
- Assistance in applying for grants or tax incentives for investments in energy efficient/ sustainable technologies

### 2.4.1 Development contributions

In terms of the CoJ Development Contributions Policy (2021), the “exceptional circumstances” clause may be applied in the calculation of development contributions at the sole discretion of the City, in the case where there is guaranteed independence from the relevant municipal network, or networks, through the approved use of green infrastructure.

### 2.4.2 Additional land development rights for developments aiming to achieve net zero before 2030

Developments that will consist of new buildings or major refurbishments aiming to achieve net zero before 2030, *may* be considered for additional land use right (density, floor area ratio and height) at the time of consideration of land use applications. The applications will be evaluated on merit and the applications must explicitly provide motivation and details in support of such applications.

## 2.5 Starting date and review period of the policy

The policy will come into effect 90 days from the adoption of the policy by Council.

The policy should be reviewed within four years of its approval by Council and every five years thereafter. The review should assess the success of the policy and make relevant changes if any. Reviews may take place as and when required by Council, with due process to be followed.

## 2.6 Application of the policy within broader legislative framework

*The policy supports the City in executing its mandate in addressing aspects related to electricity reticulation, building regulations and municipal planning in terms of section 156 read with Schedule 4 Part B of the Constitution.*

The Green Building Policy will inform the assessment of building applications for all new buildings in the City from the starting date and may inform land use application decisions as part of the Incentive Scheme. Development proposals should comply with the mandatory policy requirements as they are entrenched in City’s approved policy. Non-compliance with these mandatory requirements will result in the rejection of a building or land use application.

The development proposals must however also comply with any other acts, regulations and municipal policies or by-laws which remain legally enforceable.

The principles contained in this policy are not to result in standards that are lower than the minimum standards of the NBR; should any changes made to the NBR result in the principles of this policy being of a lower standard, then the principles of the NBR are to be applied.

## 2.7 Green Building Policy and supplementary Green Building By-law

The municipality aims to use various instruments to ensure, and support, the development of a more sustainable built environment. These include:

- *Green Building Policy: New Buildings* - a policy applicable to all new buildings in the city that embeds and actions resource efficiency targets, mandatory and voluntary requirements, approval processes and related incentives that are required to transform the built environment towards a carbon-neutral status.
- *Green Building By-Law* - this will come into effect upon Council approval of such by-laws to provide legislative measures to ensure that a more sustainable built environment is developed, in accordance with the Green Building Policy: New buildings. It will be supplementary to the National Building Regulations and will apply to all development requiring City of Johannesburg building plan approval as defined in the National Building Regulations.

## 3. PATHWAY TOWARDS REACHING NET ZERO CARBON

### 3.1 Description of the proposed pathway<sup>5</sup>

- 3.1.1 The approved SANS 10400 XA (2011) energy efficiency standards, as part of the National Building Regulations, forms the base of the current energy intensity values.
- 3.1.2 The Draft SANS 10400 XA Version 2 2020, provides the target energy use intensities for 2021 – this would require a significant improvement of energy efficiencies and includes additional categories of buildings targeted in order to meet national targets.
- 3.1.3 The energy use intensity target for years inclusive of 2021-2024 will not include plug loads as per the current SANS 10400 XA. However, as NZC considers the full operation load (i.e. the renewable energy provided must meet the full operation load), applicants are encouraged to consider full operation load at time of plan submission and approval.
- 3.1.4 There is a requirement, by 2023, for applicants to report on the energy use intensity (EUI) of the base building (excluding plug loads) as part of the building plan approval application. This will allow developers to become acquainted with the building design tools and the reporting requirements.
- 3.1.5 The pathway 2025 EUI values are representative of 30% energy efficiency improvement from Draft SANS 10400 XA (2020).
- 3.1.5 The pathway 2030 EUI value represents the 2025 EUI target plus a further 25% energy efficiency improvement from the Draft SANS 10400 XA (2020) (55% in total improvement).
- 3.1.6 The pathway 2040 and 2050 value targets are a further 10% improvement on the 2030 values. However these EUI values are indicative only and will be reviewed at a later date based on technology and material development.

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<sup>5</sup> The rationale in developing the pathway is described. The new SANS 10400XA has not been published yet at the time of approval of the policy. The EUI values are captured as fixed values in Table 2.

3.1.7 Embodied energy is not currently part of the NZC requirements. However, the policy encourages that lifecycle cost is considered in the extraction of materials, manufacturing, design, construction and operation and demolition of new developments.

**3.2 Building Energy Use Intensity targets and requirements**

To achieve net zero carbon for all new buildings by 2030, the following is required:

- 3.2.1 Firstly, for all building categories to significantly improve energy efficiency first, through integrated passive design, technology and building systems improvements. To determine whether a building’s energy use intensity is meeting the required energy use intensity value, a building’s annual energy use intensity (excluding plug loads) relative to its net floor area is calculated and measured in terms of kilowatthours per square metre (kWh /m<sup>2</sup>). Annual energy use intensities are outlined in Table 2.
- 3.2.2 Secondly, for the residual energy requirements to be met through the provision of renewable energy (RE), mandatory from 2030 onwards for the building categories as outlined in Table 3. In order to be NZC, the provision of RE is for the full operational load of the building.

This approach is illustrated below:

- A. **Reducing** building energy demand for **heating, cooling and lighting** through passive heating/ ventilation /cooling design and improved building envelope/ daylighting performance techniques;
- B. **Reducing** total building energy demand and operational building use energy demand through the **installation of high efficiency mechanical, lighting and power systems**, and energy efficient appliances; and
- C. **Supplying** remaining building energy needs from a **renewable source of energy**, (on-site to the extent possible and optimal and then off-site) where necessary.

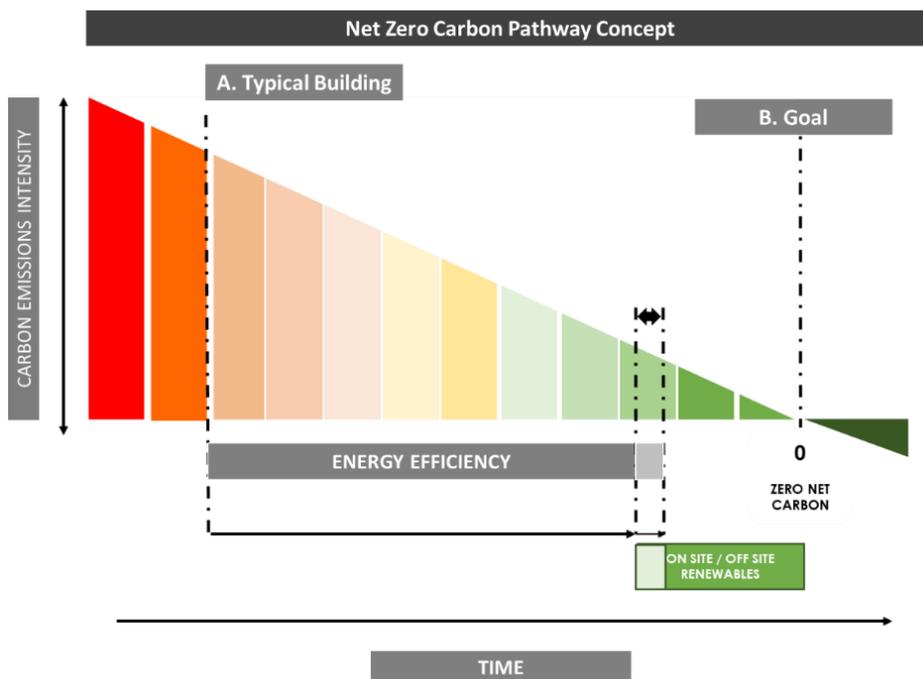


Figure 2: Zero Net Carbon Pathway Concept (Image adapted from Architecture 2030)

- 3.2.3 The baseload energy use intensity of the building shall be:
  - 3.2.3.1 As stipulated in Table 2 for the year of construction; *or*
  - 3.2.3.2 Where a building does not have building services, such as lifts and HVAC, for which the energy consumption can be determined by design, substantial energy efficiency improvement shall be deemed to be achieved where: a. the water heating for 100% of the hot water requirement is provided by a non-electrical resistance heating system, and b. the lighting power density is as per SANS 10400 Part XA until 2024 and from 2025 onwards, the lighting power density is 30% less than that stipulated in SANS 10400 Part XA, and c. all other deemed to satisfy requirements of SANS 10400 Part XA are followed.
  - 3.2.3.3 For additions or alterations, only that portion of the building that is new shall be required to comply.
- 3.2.4 The energy use intensity is the energy used by the building in its base operation (e.g. HVAC, lighting, hot water heating, lifts), divided by the net floor area.
- 3.2.5 All buildings, except building categories H3 and H4 and Category 1 buildings, shall have energy sub-metering in order to monitor and control energy use in the building.
  - 3.2.5.1 Sub-metering shall measure all substantial ( $\geq 100$  KVA) energy consumption areas. As a minimum, plug circuits and light circuits shall be monitored separately. Where HVAC systems and other major building services are installed, these shall be monitored separately.
  - 3.2.5.2 Sub-metering systems shall enable data to be captured and presented over time and enable energy profiles to be generated. Data from these meters shall be readily accessible to the managers of buildings or facilities and (in future) be available for the City to evaluate for bench-marking purposes.
- 3.2.6 Industrial buildings are not included as a building category for which EUI is prescribed; however it is strongly encouraged that industrial buildings be voluntarily designed as energy efficient as possible and their operational energy requirements be met by RE.

Design Energy Use Intensity per building type showing progressive targets, relative to year of construction.									
Building classification and occupancy		Description of building	Energy Use Intensity (EUI) kWh/m2/annum						
			2011	2021	2023	2025	2030	2040	2050
Public gathering	A1.1	<b>Entertainment and public assembly.</b> Venues where people gather for sedentary behaviour	420	60	60	42	27	21	15
	A1.2	<b>Entertainment and public assembly.</b> Venues where people gather for non-sedentary behaviour	420	90	90	63	41	32	23
	A2.1	<b>Theatrical and indoor sport.</b> Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral or cinematographically performances	420	80	80	56	36	28	20
	A2.2	<b>Theatrical and indoor sport.</b> Occupancy where persons gather for sport performances	420	90	90	63	41	32	23
Places of instruction	A3.1	<b>Places of instruction</b> Conference halls, auditoria, lecture halls, instruction venues, research laboratories and intermediate scale places of learning	420	80	80	56	36	28	20
Schools	A3.3	<b>Places of instruction</b> Schools – urban, suburban and rural locations	420	45	45	32	20	16	11
Worship	A4	<b>Worship</b> Large venues	120	40	40	28	18	14	10
	A4	<b>Worship</b> Small venues		35	35	25	16	12	9
Detention	E1	Place of detention		60	60	42	27	21	15
Hospitals	E2	<b>Hospital</b> Large regional, general and academic hospitals		135	135	95	61	47	34
	E2	<b>Hospital</b> Medium sized short stay hospitals, day hospitals		70	70	49	32	25	18
	E3	<b>Other institutional (residential)</b> Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for		90	90	63	41	32	23
	E4	Health Care		90	90	63	41	32	23
Retail	F1	Large shop floor area >250 m2.	240	110	110	77	50	39	28
	F2	Small shop <250m2		60	60	42	27	21	15
Offices	G1	Large multi storey office buildings, banks, consulting rooms and similar uses with lifts and energy consuming services that operate on a typical daytime occupancy.	200	80	80	56	36	28	20
	G1	Standalone blocks and campus of buildings (or both) that form an office park but operate separately		60	60	42	27	21	15
	G1	Offices and call centres that operate for extended hours		110	110	77	50	39	28
Residence	H1	Hotel	650	110	110	77	50	39	28
	H2	<b>Dormitory</b> Occupancy where groups of people are accommodated in one room		55	55	39	25	19	14
	H3	<b>Domestic residence</b> Occupancy consisting of two or more dwelling units on a single site.		55	55	39	25	19	14
	H4	<b>Dwelling house (Other than Category 1)</b> Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuilding, if any.		55	55	39	25	19	14
	H5	<b>Hospitality</b> Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit		55	55	39	25	19	14
Other	<b>Category one building (&lt; 80 m2 )</b>			55	55	55	55	35	33
<b>Notes:</b>									
1	2023: With compulsory EUI reporting at plan approval stage								
2	As per SANS 1400XA:2011, the EUI values are for the building base loads (i.e.exclude plug loads). However, as NZC considers the full operation load (i.e. the RE provided must meet the full operation load), applicants are encouraged to consider full operation load at time of plan submission and approval.								
3	Pathway values have been independently peer reviewed by local energy experts								

Table 2: Annual Energy Use Intensities (EUI)

### 3.3 Renewable energy requirements

The proposed minimum renewable energy generation requirements for building use have been set to ensure maximum energy efficiency, considering the following:

- 3.3.1 Once a building has reduced its site energy demand to meet the prescribed standards, it will require renewable energy (RE) to be provided (on-site or off-site) for the portion of the predicted operational energy load indicated from in Table 3 from 2030.
- 3.3.2 For major alterations and additions, this is applicable only to the portion of the building that forms part of the works, except the H3 and H3 building categories, which are exempt from alterations or additions.
- 3.3.3 Renewable energy sourced to meet the residual building energy use intensity should be on-site (to the extent possible and optimal) and where on-site potential cannot meet demand requirements, off-site through power procurement schemes such as Tradable Renewable Energy Certificates (TRECs) or through a contribution to the City's RE Generation Programme. Carbon offsets shall be considered for all new developments from 2030.
- 3.3.4 Buildings constructed before 2030 shall make provision for future installations of renewable energy in the following ways:
  - 3.3.4.1 The distribution board shall be designed and installed to facilitate the future addition of renewable energy.
  - 3.3.4.2 Space for battery storage (if applicable for the planned system) shall be provided in a suitable location.
  - 3.3.4.3 The position of future on-site RE installation, such as PV panels, shall be indicated on plan.
- 3.3.5 The system may be grid-tied, in which case appropriate applications shall be made and the plans must be approved by City Power.
- 3.3.6 The predicted operational load shall be determined by a competent person. As a guide, the predicted load should be 20% more than the baseload, although this will vary per building category and building use<sup>6</sup>.
- 3.3.7 In addition to renewable energy generation, energy storage must be adopted as a demand side management tool. Battery energy storage systems and alternative storage technologies shall be used for scheduling and load management functions. The City's electricity grid network also provides an opportunity for energy storage.
- 3.3.8 All renewable energy generation including storage must comply with the National Distribution and Renewable Energy Grid Code.
- 3.3.6 Residential buildings smaller than 80 m<sup>2</sup> (Category 1 buildings) are exempt from the requirement to provide RE to meet the full operational load.

Table 3 outlines percentage of renewable energy generation required by 2030 for a building to reach net zero carbon:

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<sup>6</sup> A table with predicted operational loads per building category will be developed to further guide this aspect

Building classification and occupancy		Description of building	Percentage annual energy demand (operational load) met through renewable energy <sup>(1)</sup>
			2030
Public gathering	A1.1	<b>Entertainment and public assembly</b> (Venues where people gather for sedentary behaviour)	100%
	A1.2	<b>Entertainment and public assembly</b> (Venues where people gather for non-sedentary behaviour)	100%
	A2.1	<b>Theatrical and indoor sport</b> (Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral or cinematographically performances)	100%
	A2.2	<b>Theatrical and indoor sport</b> (Occupancy where persons gather for sport performances)	100%
Places of instruction	A3.1	<b>Places of instruction</b> (Conference halls, auditoria, lecture halls, instruction venues, research laboratories and intermediate scale places of learning)	100%
Schools	A3.3	<b>Places of instruction</b> (Schools – urban, suburban and rural locations)	100%
Worship	A4	<b>Worship</b> (Large venues)	100%
	A4	<b>Worship</b> (Small venues)	100%
Detention	E1	Place of detention	100%
Hospitals	E2	<b>Hospital</b> Large regional, general and academic hospitals	100%
	E2	<b>Hospital</b> Medium sized short stay hospitals, day hospitals	100%
	E3	<b>Other institutional (residential)</b> Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for	100%
	E4	Health Care	100%
Retail	F1	Large shop floor area >250 m2.	100%
	F2	Small shop <250m2	100%
Offices	G1	Large multi storey office buildings, banks, consulting rooms and similar uses with lifts and energy consuming services that operate on a typical daytime occupancy.	100%
	G1	Standalone blocks and campus of buildings (or both) that form an office park but operate separately	100%
	G1	Offices and call centres that operate for extended hours	100%
Residence	H1	Hotel	100%
	H2	<b>Dormitory</b> (Occupancy where groups of people are accommodated in one room)	100%
	H3	<b>Domestic residence</b> (Occupancy consisting of two or more dwelling units on a single site)	100%
	H4	<b>Dwelling house (other than Category 1 buildings)</b> Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuilding, if any	100%
	H5	<b>Hospitality</b> (Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit)	100%
<b>Category 1</b>		(< 80 m2 )	nil
<b>Notes:</b>	Compulsory to meet the net zero carbon requirement		

Table 3: Renewable Energy Requirements

### 3.4 Required documentation

Applicants are required<sup>7</sup> to submit the following documentation with the building plan application<sup>8</sup>:

- 3.4.1 Documents with drawings, data and calculations sufficient to ascertain compliance with the applicable annual energy performance target for buildings and their sites, using predictive modelling.
- 3.4.2 A computer simulation model report of the development demonstrating the energy use intensity completed and signed off by a competent person. This is calculated based on the total predicted annual energy use intensity of the entire building energy simulation divided by the *net floor area*.
- 3.4.3 Proof of Small-Scale Embedded Generation application form and/or admissible renewable energy procurement certification.

## 4. PROMOTED DESIGN AND DEVELOPMENT INTERVENTIONS TOWARDS IMPROVED RESOURCE EFFICIENCY

This section outlines the key areas of interventions, standards and guidelines the policy encourages and supports to improve the sustainability performance of the built environment<sup>9</sup>.

### 4.1 Water efficiency

The policy promote voluntary standards and interventions that aim to lower the *water consumption* during the construction and operation to the maximum extent feasible for all building categories by:

- A. **Reducing** water consumption through water-sensitive design, construction and operation of buildings.
- B. **Reducing** operational building use water demand through the **installation of efficient water harvesting and reuse systems**, and water efficient appliances.

Promoted standards and guidelines include<sup>10</sup>:

- 4.1.1 Low water-use or non-sewered sanitation should be installed.
- 4.1.2 If non-potable water (e.g. greywater and/or rainwater) is used to flush toilets, there shall be a double reticulation system so that either municipal or alternative water can be used to flush, depending on availability. The reticulation for non-potable water shall be completely separated from the potable reticulation system in such a way that back-siphoning of alternative water into the municipal supply is prevented.
- 4.1.3 Future alternative reticulation should be accommodated in design and construction. Water reticulation and waste water systems shall be designed to accommodate the use of greywater and/or rainwater to flush toilets, even if such a system is not installed.
- 4.1.4 Where baths are installed, a shower fitting shall also be provided, whether within the bath or a separate shower within the same room. For ablution facilities with multiple baths and showers there shall be at least one shower per bath or each bath shall be fitted with a dedicated shower fitting.
- 4.1.5 The flow rate of shower heads and taps shall not exceed the maximum flow rate as per the latest version of SANS 3088.
- 4.1.6 All buildings shall provide sustainable sanitation services that considers appropriate sanitation technologies, grey-water management, and incorporate approaches to reduce, reuse, recycle and recover water.

<sup>7</sup> These requirements may be amended from time to time by the City of Johannesburg

<sup>8</sup> Voluntary before 2030 - where renewable energy is used to meet residual building energy on-site; mandatory from 2030 where renewable energy is required

<sup>9</sup> Acknowledging City of Tshwane's Draft Policy and by-laws and the extensive CSIR work supporting it

<sup>10</sup> Compliance with approved NBR standards and existing by-laws are mandatory

- 4.1.7 The use of greywater harvesting systems are promoted in buildings for which a suitable facilities management plan is in place to ensure proper maintenance of the system.
- 4.1.8 Provision shall be made for rainwater harvesting and onsite water storage, taking into account the projected occupancy and functions within the building shall be used to design systems.
- 4.1.9 Water to top up swimming pools and ornamental ponds with a volume of 2 m<sup>3</sup> or more shall be sourced from harvested rainwater.
- 4.1.10 All buildings larger than 1 000 m<sup>2</sup> shall have water sub-meters to monitor and manage water consumption on the site and in the building. These meters shall be installed to separately measure all major water uses (zone/water use point) including irrigation, bathrooms, kitchens, washdown areas, HVAC systems and recycled water supply. Meters shall be capable of being monitored easily manually or electronically. If the water consumption of one of the large water uses can be calculated by simply subtracting the other metered data from the total consumption, such an area does not need a separate meter.

## 4.2 Waste management

The policy promotes voluntary standards and interventions for every type of building to effectively manage its *waste stream* to the extent that maximum diversion of waste from landfill is ensured. It aims to lower the waste generated during the building's construction and operational phase and promote waste minimization and upcycling of waste materials. This can be achieved by:

- A. **Reducing, reusing and recovery** of waste streams to **convert them to valuable resources** with minimum solid waste sent to landfills over the course of the year.
- B. **Sourcing** waste from other sites and diverting waste from landfills for on-site **reuse** (on-site to the extent possible and optimal and then off-site) where necessary.

Promoted standards and guidelines include<sup>11</sup>:

- 4.2.1 Recycling storage areas shall be provided for all buildings with a gross floor area of more than 500 m<sup>2</sup> or for sites where the total cumulative gross floor area is more than 500 m<sup>2</sup> (such as townhouse developments). Recycling storage areas shall be covered with a roof, well-ventilated, protected from vermin and located where there is easy vehicle access for collection (such as near a street access).
- 4.2.2 There shall be a Waste Management Plan in place before construction starts indicating a commitment to divert at least 30% (by mass) of *construction waste* from landfill by recycling or reusing materials. The Waste Management Plan shall indicate that diverted waste shall be recycled or re-used including the destination of such diverted material.
- 4.2.3 At least 50% (by mass) of *demolition waste* shall be reused or recycled. There shall be a Waste Management Plan in place before work commences on the site confirming a commitment to divert at least 50% (by mass) of demolition waste from landfill by recycling or reusing materials, and the destination of such diverted material. This shall be stipulated on the demolition plans.
- 4.2.4 Buildings with a gross floor area of more than 500 m<sup>2</sup> or for sites where the total cumulative gross floor area is more than 500 m<sup>2</sup> (such as townhouse developments) are required to provide a Waste Management Plan for *operational waste* diversion to demonstrate the following:

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<sup>11</sup> Compliance with approved NBR standards and existing by-laws are mandatory

4.2.4.1. Describing how all generated waste is monitored, which types of waste will be collected for recycling or for reuse, how recycling will occur, and who is responsible for the various aspects of the plan.

4.2.4.2 Operational waste must be managed through sorting, recycling, and reuse of materials.

### 4.3 Eco-mobility and ecology

The policy promotes voluntary standards and interventions to support the use of public transport, including non-motorised transport and enhancing the ecological features on a site and reducing heat islands. Most interventions will be evaluated on Site Development Plans, including aspects such as landscaping, parking and walkways. The following can be addressed with building plan submission:

Promoted standards and guidelines include<sup>12</sup>:

4.3.1 Provision can be made to facilitate the use of non-motorised transport for all occupancy buildings types except for D4, H4, H3, J1, J2 and J3 by providing secure, weather-protected bicycle storage and change rooms with lockers and showers.

4.3.2 To mitigate the build-up of heat island on the site, the roof shall be such that either a. at least 50% of the total roof area on the site shall have an aged solar reflective index of at least 55%; or b. at least 30% of the roof area shall be a vegetative roof.

4.3.3 Use of Solar reflectance materials should be maximized.

4.3.4 Developments shall reserve 10% of total site area towards open spaces, recreational and other functional spaces and/or improve public interface of buildings and the resultant quality of the public realm.

4.3.5 Consideration should be given to provision for electrical vehicle charging bays (and when making operational load prediction).

## 6. COMPLIANCE

6.1 Compliance will be as per City's building plan approval processes. Submission requirements will be set out in building plan submission forms.

6.2 Drawings, calculations and computer energy simulation modelling must be undertaken by a competent person and in accordance with the City's requirements.

6.4 Energy modelling software must demonstrate Agrément certification and reflect the correct data for Johannesburg microclimate and energy zone.

## 7. PERFORMANCE MONITORING

7.1 The City may monitor water and energy use intensity through regular analysis of electricity usage through meter reading and utility accounts; or through sub-metering information to be shared with the City on voluntary basis.

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<sup>12</sup> Compliance with approved NBR standards and existing by-laws are mandatory

- 7.2 For buildings within the ambit of the SANS 1544 regulation, energy monitoring and evaluation may be done through the EPC process as envisaged by Department of Energy (Draft regulations for the Mandatory Display and Submission of Energy Performance Certificates for Buildings published by the Minister of Energy 2018 and based on SANS 1544 EPC for Buildings<sup>13</sup>), for all state-owned or occupied buildings over 1000m<sup>2</sup> and all private buildings over 2000m<sup>2</sup> which comprise of building types A1, A2 A3, & G1. All buildings required to provide and display an updated Energy Performance Certificate under SANS 1544 are encouraged to voluntarily submit on an annual basis copies of these certificates to the City of Johannesburg.
- 7.3 Residential and office buildings with a floor area above 500 m<sup>2</sup> and sectional title schemes are encouraged to display annual Energy Performance Certificates (voluntary) and voluntarily submit on an annual basis copies of these certificates to the City of Johannesburg.

## 8. IMPLEMENTATION

The implementation of this policy will be supported by the development of a Green Building By-law. This By-law will enforce compliance with the green building design principles and net zero carbon targets by describing a set of performance standards, and outline requirements for the monitoring and evaluation of operational energy use in buildings.

The Department of Development Planning (Building Development Management Directorate), Department of Environment and Sustainable Infrastructure (EISD), City Power, Joburg Water and Pikitup are the main custodians of this policy and subsequent implementation.

## 9. DEVIATION FROM POLICY REQUIREMENTS

The following deviations may be considered:

- 9.1 Deviations for major refurbishments may be considered, specifically in the case of low cost and affordable housing developments with site specific constraints that will make meeting the EE and/or RE beyond 2025 unfeasible, subject to detailed modelling and motivation. Such deviations will be at the City's discretion.



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<sup>13</sup> Published in July 2015