Chameleon
Smarter World

Smart Cities, Green Energy & Transportation
Glossary of Terms

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INTRODUCTION

PURPOSE

This document forms part of a collection of artefacts and documents for the handover of knowledge to students enrolled in the School of Information Technology (IT) two Capstone units run by Deakin Universities Faculty of Science, Engineering and Built Environment (SEBE). Specifically, this document has been authored for students assigned to the Chameleon virtual company established by the SEBE IT Capstone program.

AUDIENCE

The Chameleon virtual company includes both undergraduate and postgraduate students from a variety of IT disciplines, many of whom may be unfamiliar with specific terms commonly used in relation to smart cities, green energy and transportation and related industries and academic disciplines. As such, this document has been prepared to assist these new Chameleon company students become familiar these specific terms. The document also serves as a useful reference for those already familiar with these specific industries, initiatives and related academic domains by providing a collection of terms from informative or normative sources.

ATTRIBUTION & REFERENCES

It should be noted that this glossary of terms is a collection of definitions from a variety of informative and normative references from across the internet. Copyright in the wording of each definition is credited to the original author from which the definition was sourced.

References to each source can be found listed underneath each term.

All content in this introduction section, all synonyms, and terms with no reference or source provided are the original work of the document author.

GLOSSARY OF TERMS

APIs

An application programming interface (API) is a set of definitions, protocols, and tools for building application software.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

AUTOMATED VEHICLE (AV)

Vehicle designed or adapted to be capable, in at least some circumstances or situations, of safely driving itself and may lawfully be used when driving itself, in at least some circumstances or situations, on roads or other public places.

Source/s: UK Automated and Electric Vehicles Act, 2018

AUTONOMOUS DRIVING

See Self-Driving Car

AUTONOMOUS VEHICLE

A vehicle that is capable of sensing its environment and moving with little or no human input.

Synonym/s: autonomous car, robot car, self-driving car, driverless car

Source/s: Wikipedia Glossary of AI

BATTERY ENERGY STORAGE SYSTEMS (BBES)

A group of devices, equipment, management and control logic capable of storing electric power so that it can later be fed into the grid. It allows solar and wind power plants to overcome their intrinsic limitations in terms of flexibility and dispatching.

Source/s: The glossary of sustainable energy | Enel Green Power

BEACON TECHNOLOGY

Small network transmitters that identify, track and interact with connected systems via Bluetooth low energy. Often used indoors, beacons transmit small amounts of data up to 50 meters.

Source/s: CTIA-Smart-Cities-Playbook.pdf

BIOMASS

Collective term for organic matter that can be used to generate electricity, transformed into fuel or used directly to produce heat. It comes primarily from industrial and urban waste, from energy crops, and from biological products, waste and residues generated by farming, forestry or related industries. It's generally considered a renewable energy source since, unlike fossil fuels, the sources from which it is obtained are produced continuously.

Source/s: The glossary of sustainable energy | Enel Green Power

BLUETOOTH LOW ENERGY (BLE)

A wireless personal area network that gives devices with reduced power consumption and cost a communication range similar to standard Bluetooth.

Source/s: CTIA-Smart-Cities-Playbook.pdf

BROWN POWER

Electricity generated from the combustion of fossil fuels, such as coal, oil, and natural gas, which generates significant amounts of greenhouse gases.

Source/s: https://www.iavm.org

CARBON NEUTRAL

An entity (for example, a business) that does not increase or decrease the total amount of greenhouse gas emissions in the atmosphere. Carbon neutrality can be achieved by counteracting carbon emissions with carbon reduction measures, or by eliminating carbon emissions altogether.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

CARBON OFFSET

A reduction of greenhouse gases measured in tons of carbon dioxide avoided, sequestered or destroyed.

Source/s: Green-e Glossary | Green-e

CARBON POSITIVE

An entity (for example, a business) that removes more greenhouse gas from the atmosphere than it produces.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

CHIRPS

Protocols that allow the “things” in IoT to communicate and exchange data.

Source/s: CTIA-Smart-Cities-Playbook.pdf

CIVIC TECH

Civic Tech is a general term to describe a wide range of technologies that bring society and government together. For example, it can help to improve civic engagement, or to help improve public service delivery. These technologies are often developed by non-profit groups (such as ‘Code for Canada’), but also the private and public sector.

Synonym/s: Civic technology

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

CLEAN TECH

Technology that is designed with environmental sustainability in mind, including renewable energy sources.

Synonym/s: Clean technology

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

CLIMATE CHANGE

A change in weather patterns, and the associated changes in the oceans and land surfaces, attributed primarily to the increase of atmospheric greenhouse gases caused by human activity, for example burning fossil fuels.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

CONNECTED AUTOMATED VEHICLE (CAV)

Automated vehicle equipped with wireless communications technology that enables data transfer with other vehicles, infrastructure or other networks.

Synonym/s: Connected Autonomous Vehicle (CAV)

Source/s: BSI CAV Vocabulary v3.0

CONNECTED DEVICES

A connected device (or smart device) is an electronic device, generally connected to other devices or networks, that can operate to some extent interactively and autonomously.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

DECARBONISATION

Phasing out of dependence on carbon-containing fossil fuels, and carbon embedded in other societal and industrial processes (travel, manufacturing)

Source/s: https://www.eesc.europa.eu/glossaries/glossary/lets-speak-sustainable-construction

DIGITAL TWINS

A digital twins is a virtual representation of a physical product, service, or asset. It can be a digital replica of an individual object, such as a vehicle or building, but can also be extended to larger scales, such as entire cities. Here are just some of the latest stories, opinions on digital twins.

Source/s: Smart Cities World - Digital twins

DISTRIBUTED GENERATION

Small, modular, decentralized, grid-connected or off-grid energy systems located in or near the place where energy is used.

Source/s: Green-e Glossary | Green-e

DRY STEAM GEOTHERMAL PLANT

A system that is more complex and powerful than a flash steam geothermal plant (see definition), using high-temperature, high-pressure steam to produce energy: in this case the steam is sent directly to the turbine.

Source/s: The glossary of sustainable energy | Enel Green Power

ELECTRIC VEHICLE (EV)

Electric vehicles completely rely on one or more electric motors for propulsion.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

ELECTRICITY GRID

The grid is a term used to describe the network of wires and cables which transport electricity from power plants to end users.

Source/s: Green-e Glossary | Green-e

ENERGY EFFICIENCY

The degree to which an entity (for example, a business) uses energy effectively and moderates its need for electricity through energy-saving measures.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

ETHICAL SMART CITY

A city whose diverse communities are celebrated and actively engaged in the consideration, creation and integration of technological or data-driven solutions, and where the needs of residents are represented in the community's built and networked environment.

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

FEED-IN TARIFF

The amount a household or business is paid for excess renewable energy that it feeds into the supply grid.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

FLASH STEAM GEOTHERMAL PLANT

A power plant, usually of small dimensions, that extracts fluid composed of water and steam from an extraction well: the steam is separated from the water in a specific device, and channeled to a turbine to produce energy.

Source/s: The glossary of sustainable energy | Enel Green Power

FOSSIL FUELS

Hydrocarbons found in the top layer of the earth's crust that are believed to have been formed from the fossilized remains of plants and animals subjected to high levels of heat and pressure over millions of years. Some fossil fuels include methane, liquid petroleum and coal. Fossil fuels are considered nonrenewable because they take millions of years to create.

Source/s: https://www.iavm.org

GENERATOR

A plant or factory that produces electricity, such as a solar farm.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

GEOFENCING

A technology that creates virtual boundaries around a physical area, usually through a combination of GPS and RFID tags, in order to trigger an action on a connected device.

Source/s: CTIA-Smart-Cities-Playbook.pdf

GEOTHERMAL ENERGY

Natural heat and steam from within the earth that is captured to generate electric power. Geothermal energy can also be used for space heating or industrial steam.

Source/s: Green-e Glossary | Green-e

GLOBAL CLIMATE CHANGE

Changes in the climate due to an enhanced greenhouse effect and a resulting rise in global average temperature.

Synonym/s: Climate change

Source/s: Green-e Glossary | Green-e

GREEN PRICING

Green pricing refers to an optional utility service that enables customers of traditional utilities to support a greater level of utility investment in renewable energy by paying a premium on their electric bill to cover any above-market costs of acquiring renewable energy resources.

Source/s: Green-e Glossary | Green-e

GREENHOUSE GAS (GHG)

Gases that trap heat in the atmosphere and are emitted through natural processes and human activities. Green-e® Climate addresses GHG emissions reductions that originate from any gas that has been determined by the Intergovernmental Panel on Climate Change (IPCC) to have a radiative forcing effect on the atmosphere, including but not necessarily limited to the six principal GHGs included in the Kyoto Protocol: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride (CO2, N2O, CH4, HFCs, PFCs and SF6).

Source/s: Green-e Glossary | Green-e

GRID

The physical network that connects energy producers with energy consumers.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

HYBRID VEHICLE

Vehicle that uses a combination of two engine types. Cars are most commonlypetrol-electric hybrids.

Source/s: https://www.iavm.org

HYDROELECTRIC

A technology that produces electricity from moving water that turns a generator.

Source/s: Green-e Glossary | Green-e

INTERNET OF THINGS (IOT)

The Internet of things - (IoT) describes physical objects (or groups of such objects) that are embedded with sensors, processing ability, software, and other technologies, and that connect and exchange data with other devices and systems over the Internet or other communications networks.
The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), independently and collectively enable the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. The IoT can also be used in healthcare systems.
There are a number of concerns about the risks in the growth of IoT technologies and products, especially in the areas of privacy and security, and consequently, industry and governmental moves to address these concerns have begun, including the development of international and local standards, guidelines, and regulatory frameworks.

Source/s: https://en.wikipedia.org/wiki/Internet_of_things

KILOWATT HOUR (KWH)

A measure of the electrical energy consumed by a 1-kilowatt machine over the course of an hour (also a measure of the electrical energy produced by a 1-kilowatt generator, such as a solar panel, over the course of an hour).

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

LIVABILITY

Livability (or quality of life) is the general well-being of individuals, communities, and societies.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

LOAD

The amount of electricity a consumer uses.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

LORA

LoRa is a long range, low power wireless platform that is the prevailing technology choice for building internet of things (IoT) networks worldwide.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

LOW-POWER WIDE-AREA NETWORK (LPWAN)

Low-Power Wide-Area Network (LPWAN) is a type of wireless telecommunication wide area network designed to allow long range communications at a low bit rate among connected objects.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

MESH NETWORKS

Type of internet networking that offers more reliable connections. They create connections between all devices in the network, and information is passed from one device (or node) to the next until to reaches its destination.

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

MULTI-MODAL TRANSPORTATION

Multi-modal transportation systems include a wide range of transporation options including walking, bicycling, bus, light rail, train, ferry, and shared mobility services.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

NARROWBAND INTERNET OF THINGS (NB-IOT)

Standards-based LPWAN radio technology for IoT devices and services. It delivers indoor coverage, low cost, long battery life, high connection density and significantly improved power consumption, system capacity and spectrum efficiency. It uses a subset of the LTE standard with bandwidth limited to a single narrow band of 200 kHz.

Source/s: CTIA-Smart-Cities-Playbook.pdf

NATIONAL CARBON OFFSET STANDARD (NCOS)

A set of rules overseen by the federal Department of the Environment and Energy that organisations must adhere to in order to receive carbon neutral certification.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

NATIONAL ELECTRICITY MARKET

The name for Australia's wholesale electricity market. It includes generators, the grid and retailers.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

NET METERING

A method of crediting customers for electricity that they generate on site in excess of their own electricity consumption. Customers with their own generation offset the electricity they would have purchased from their utility. If such customers generate more than they use in a billing period, their electric meter turns backwards to indicate their net excess generation. Depending on individual state or utility rules, the net excess generation may be credited to their account (in many cases at the retail price), and carried over to a future billing period, or ignored.

Source/s: https://www.iavm.org

NET ZERO ENERGY (BUILDING)

A building that offsets at least 100% of its greenhouse gas emissions.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

OFFSITE POWER

A power-generation system (for example, a solar farm) that exports the electricity it produces to the grid for onward distribution.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

ONSITE POWER

A power-generation system (for example, rooftop solar) that services the building upon which it is located (for example, a house).

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

ON-SITE RENEWABLE ENERGY

Renewable energy that is consumed at the same location where it is produced. On-site generation is a form of distributed energy generation.

Source/s: Green-e Glossary | Green-e

OPEN DATA

Open data is data that is freely available to everyone to use and republish as they wish, without copyright, patent, or other restrictions.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

OPEN SMART CITY

An Open Smart City is where all sectors and residents collaborate in mobilizing data and technologies to develop their communities through fair, ethical, and transparent governance that balances economic development, social progress, and environmental responsibility.

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

OPEN STANDARDS

Open standards are publicly available standards developed through a broad consultation process that govern the application of a particular domain or activity.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

PHOTOVOLTAIC (PV)

The conversion of light into electricity. The term “solar PV” refers to rooftop solar systems that convert sunlight into electricity.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

REAL-TIME

Real-time computing describes hardware and software systems that are able to respond very rapidly to continuously occurring external events.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

RENEWABLE ENERGY

Electricity generated from resources that naturally replenish themselves over a period of time.
Energy produced by non-finite (or “green”) resources such as sunlight, wind and water. Fossil fuels (for example, coal and oil) exist in limited quantities and are therefore not considered sources of renewable energy.

Source/s: Green-e Glossary | Green-e

SENSORS

A sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SHARED TRANSPORTATION

Shared transportation is a term for describing a demand-driven vehicle-sharing arrangement in which travelers share a vehicle either on-demand or over time.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SILOED CITIES

Siloed cities have poor integration between different city responsibilities, across departments, amongst communcation networks, and with other regional governments.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SMART CITY

A resilient, inclusive and collaboratively-built city that uses technology and data to better the quality of life for all people. A smart city uses information and communications technology (ICT) to enhance livaiblity, workability, and sustainability.

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

SMART ENERGY

Refers to a process of using devices build on renewable sources of energy that are also more cost-effective.

Source/s: Smart Cities Glossary - Evergreen FCC Portal (futurecitiescanada.ca)

SMART INFRASTRUCTURE

Smart infrastructure refers to the integration of smart technologies into the fundamental facilities and systems serving a city, country, or other area including the services and facilities necessary for its economy to function.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SMART METER

A smart meter is an electronic device that records information such as consumption of electric energy, voltage levels, current, and power factor. Smart meters communicate the information to the consumer for greater clarity of consumption behavior, and electricity suppliers for system monitoring and customer billing.

Source/s: Smart meter - Wikipedia

SMART PARKING

Smart parking is a vehicle parking system that helps drivers find a vacant spot using sensors and communications networks.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SMART TRANSPORTATION

Smart transportation aims to provide innovative services relating to different modes of transportation and traffic management and enable various users to be better informed and make safer, more coordinated, and better use of transportion networks.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

SOLAR CELL

An electrical device that converts light into electricity.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

SOLAR PANEL

A panel comprising multiple solar cells

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

SOLAR POWER

Sources that use solar radiation to produce electricity. Photovoltaic technologies convert sunlight directly into electricity. Solar thermal electric facilities use the heat of the sun to generate electricity.

Source/s: Green-e Glossary | Green-e

SOLAR THERMAL

A technology that uses heat from the sun to heat water. The hot water can either be used by households or used to generate steam – the steam then powers a turbine, creating electricity.

Source/s: https://renewableenergy.cityofsydney.nsw.gov.au/article/146-glossary-of-terms

SUSTAINABILITY

Sustainability within a given geographical context refers to maintaining and enhancing ecological, social, and economic health.

Source/s: https://rg.smartcitiescouncil.com/master-glossary

URBAN DATA PLATFORM

An urban data platform provides a common digital environment for the aggregation of data across multiple city responsibility areas and departments

Source/s: https://rg.smartcitiescouncil.com/master-glossary

VEHICLE-TO-EVERYTHING (V2X)

Unidirectional or bidirectional sharing of data between vehicles and other vehicles, infrastructure, other road users or any other communication system.
NOTE: The definition is not intended to indicate that a vehicle is necessarily connected to everything but reflects that vehicles can be connected to a broad spectrum of systems of which vehicle-to-vehicle, vehicle-to-infrastructure and vehicle-to-grid communications are examples.

Source/s: BSI CAV Vocabulary v3.0