Canada's Sustainability Standards Roadmap - Part 1

March 2023

Ushering in a New Era of Decentralised Energy

DEC

Decentralised Energy Canada

DECENTRALISED ENERGY CANADA (DEC)

DEC is a federally incorporated, non-profit, industry association serving as Canada's market access hub for the Decentralised Energy (DE) industry. Our services support decision-makers from the public and private sectors as they develop strategies for transitioning to clean, efficient, resilient and affordable energy systems. Our members include Canada's earliest champions of sustainable energy and represent stakeholders throughout the full value chain from material sourcing, equipment production, end-use management through to disposal/recycling processes.

OUR MISSION

To disrupt the Canadian energy status quo and create opportunities for decentralised energy by convening, educating and engaging stakeholders.

OUR VISION

To remove barriers facing Canada's decentralised energy industry and accelerate the transition to a sustainable, resilient and affordable energy future.

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Introduction

Understanding our Sustainability Challenge

THE CHALLENGE STATEMENT
Business as usual ultimately puts the human population at risk.

'Sustainability' is defined as an ability to sustain an activity indefinitely while protecting ecological, human, and economic health and vitality. Sustainable business practices improve the quality of our lives, protect our ecosystem and preserve natural resources for future generations.

Today's land use practices and demands on resources to support essential services are unsustainable.

Three global trends that are amplifying our sustainability challenge are:

1. the global population has surpassed 8 billion,
2. extreme weather and natural disasters are increasingly regular with economic losses averaging USD 240 billion per year (a six-year average of 2017-2022[1]), and
3. skyrocketing demands for natural resources to support Industry 4.0 and Industry 5.0[2].

Three detrimental consequences of unsustainable development include:

1. resource depletion,
2. destruction of natural ecosystems and biodiversity, and
3. stockpiles of ever-increasing quantities of unmanaged waste.

Global Sustainability Goals

In response to these mounting pressures, the United Nations worked with member countries to establish and adopt 17 Sustainable Development Goals (SDGs), also known as Global Goals, to protect people and the planet. The SDGs seek to tackle deep, underlying, interconnected

[1] Source: Munich Re, https://www.munichre.com/en.html

[2] While the theme of Industry 4.0 revolves around connectivity through cyber-physical systems, Industry 5.0—while also aligned with platforms made possible by Industry 4.0—also addresses the relationship between "man and machine," otherwise known as robots or cobots.

challenges across our societies, economies, and natural systems. The 17 SDGs are broad vision statements that state the challenge, why it is important, and set a goal.

SDG EXAMPLE:
Sustainable Development Goal #7 (SDG 7) - Affordable and Clean Energy
Challenge - 789 million people around the world lack access to electricity
Why it Matters - energy systems support all sectors
Goal - To ensure access to affordable, reliable, sustainable and modern energy for all.

SDGs are important when broadly communicating the cost of unsustainable growth and development to all audiences. However, they are not legally binding and work is still needed to tie SDGs to community and business initiatives such as pre-existing business structures such as Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG), and the more recently developed municipal Natural Assets Management (NAM) Frameworks.

A New Era of Opportunities

The impacts of population growth, extreme weather and natural disasters are easy to comprehend. However, society is still digesting the impacts that Industry 4.0 and 5.0 will have on society including:

- widespread Electrification of Things (EoT),
- the rise of prosumers and radical changes in energy ownership, and
- the emergence of transactive energy[3].

Energy systems are critical and essential for supporting the human population. Industry 4.0 and 5.0 are causing deep and complex transformational changes in how we generate, manage, and consume energy including:

1. different resource requirements (e.g., metal and chemical elements),
2. a fundamental change in the value chain (i.e., tasks performed throughout the full life cycle), and
3. a redesigned supply chain (i.e., logistics from production to consumption to end of life asset management).

In contrast with traditional energy systems[4], Industry 4.0 and 5.0 will be supported by energy systems that are not predominantly owned by the utility sector. The ownership structure of energy generation, storage and management is shifting to what is referred to as an energy

[3] "An internet-enabled free market, where customer devices and grid systems can barter over the proper way to solve their mutual problems, and settle on the proper price for their services, in close to real time." Source: Greentech Media

[4] Energy systems include infrastructure for generating, managing and delivering heating, cooling, and electricity.

democracy[5] where energy ownership shifts from a **utility-centric business model** to an **equitable and accessible shared model**. A transition to democratised energy requires a high degree of innovation and presents an opportunity for decentralised energy systems that are embedded in buildings and communities and designed to protect the environment, support local economies, and contribute to the health and well-being of all people.

To reap the environmental, social, and governance benefits of an energy democracy requires a commitment from decision-makers to cautiously consider **what problems and who's problems they are adopting**. In an energy democracy the regulatory landscape is going to undergo deep transformation that will impact all segments of community and industry - where does the responsibility lie? Now is the time for us to consider all of the scenarios for energy system ownership and adopt standards that account for the full life cycle of impacts by first building consensus around industry best practices.

"A standard is a document that provides a set of agreed-upon rules, guidelines or characteristics for activities or their results. Standards establish accepted practices, technical requirements, and terminologies for diverse fields. They can be mandatory or voluntary and are distinct from Acts, regulations and codes, although standards can be referenced in those legal instruments."

(Source: Standards Council of Canada, https://www.scc.ca/standards/what-are-standards)

What's Covered in this Roadmap

In 2021, Decentralised Energy Canada (DEC) convened industry leaders to prepare a decentralised energy standards landscape scan, to report on the state of regulations, and to initiate efforts to develop institutional and corporate readiness around standards that integrate sustainable development goals (SDGs).

Understanding the regulatory hierarchy and the fundamental role that standards can play in changing the regulatory landscape, these recommendations are intended for consideration by industry working groups and standards development organisations (SDOs). DEC is a national industry association that can support the efforts of SDOs by engaging its industry network and by hosting working sessions and forums to support effective communication between the diverse supply chain stakeholders.

This 2023 Sustainability Standards Roadmap - Part 1 serves as a launch pad for the decentralised energy industry that can be used as we rethink the role that standards can play in industry best practices and regulations as a whole.

This is a 'visionary', or 'theme-based' roadmap made up of several goals that are intended to be advanced simultaneously. The goals reflect the changes happening in the DE industry at large.

[5] Energy democracy is a structural change and redistribution of authority as it relates to energy systems. It enables participation and ownership by all parts of the population.

In creating our national DE Standards Roadmap, DEC hosted a strategy session with representatives from industry, utilities, municipalities, Indigenous organisations, and non-governmental organisations. Contributors identified key questions that must be answered and communicated effectively throughout the industry value chain if we are to successfully integrate sustainability into standards and industry best practices for decentralised energy in Canada.

Questions that Guide Sustainability Planning

1. Why are sustainable development goals needed to transition to clean, affordable and reliable energy systems?
2. How can standards or industry best practices related to energy systems help us measure and report SDGs?
3. How can design-thinking make this an easier process?
4. What industry practices do we feel are important if we are to adequately navigate the energy transition while anchoring our development to ethical and responsible principles?
5. In an energy democracy where anyone can own an energy system, what parts of the value chain and supply chain can we monitor and regulate to ensure sustainability?
6. What is our destination i.e., what does success look like?
7. What short-term wins can we commit ourselves to in sustainable standards development?

This is only the beginning of a much larger industry effort. The next steps are to use this visionary roadmap to identify focus areas for standards development.

About the Decentralised Energy Industry

A global shift to smaller, decentralised energy systems producing thermal and electrical energy close to the customer is transforming the way we generate and deliver energy. Our energy future is quite different from what we know now.

DEC defines **Decentralised Energy (DE)** as kinetic and/or potential energy (thermal, radiant, chemical, nuclear, and electrical) that is created and/or stored close to the point(s) of consumption. DE encompasses onsite energy generation, energy storage, and energy efficiency measures. DE projects vary in size and there is no set maximum capacity because systems are designed to meet local demand.

Microgrids and Virtual Power Plants (VPP) are important terms used in the decentralised energy industry and they are critical features of future energy systems. Microgrids consist of multiple, interconnected power sources, storage devices and energy management systems within a defined geographical boundary that act as a single controllable entity. Microgrids can operate in grid-connected or island mode (disconnected from the grid). Virtual Power Plants (VPP) are

digital electricity management systems that aggregate the capacity of multiple decentralised energy systems that are digitally accessible on one network (like multiple microgrids). VPPs can aggregate and manage electricity from various systems on the grid remotely.

Benefits of DE:

- Deferred costs of new energy transmission capacity
- Resiliency and flexibility as they are structured by many small production units instead of a few large units
- Democratisation of energy as the decision-making, responsibility and ownership will be to regional or local level
- Increased resource efficiency as the short distances between production and consumption leads to efficiency gains
- Increased scalability and modular growth compared to centralised energy systems

Seven drivers of DE adoption:

1) **Global Commitments to Emissions Reductions:** 197 countries have adopted the *Paris Agreement* and, of those, 179 have solidified their climate proposals with formal approval.
2) **Traditional Electrical Grid Challenges:** Expensive, limited functionality, and time consuming. Today, as much as 50% of a consumer's bill can be delivery charges.
3) **Energy Democracy and the Rise of Prosumers:** When a consumer also produces energy, they are called prosumers. The structure of ownership of energy is changing rapidly. Most DE systems are developed by prosumers whether they are designing to meet industry, commercial or residential energy demands.
4) **Digitalisation of Utilities:** Digital information could unlock $1.3 trillion of value for the electricity sector. Four high-value themes are: asset life cycle management, grid optimisation and aggregation, integrated customer services and beyond the electron.
5) **Lower Cost Renewable Energy and Storage:** Solar PV modules prices are down ~90% since 2009 and wind turbine prices are down ~55-60% since 2010. Battery prices have also significantly decreased by ~87% since 2010.
6) **Extreme Weather and Natural Disasters:** Hurricanes, severe storms, wildfires, floods and other weather events since 2017 have resulted in a total combined economic loss of over $1.4 trillion dollars world-wide.
7) **Electrification of Society:** The global transition to net zero has begun and electricity for data centres, transportation and agriculture will be required. More than 90% of all passenger vehicles in the U.S., Canada, Europe and other rich countries could be electric and autonomous by 2040.

A look at the electricity component of our energy future reveals some challenges ahead. For over a century, we have relied on the same electricity infrastructure to deliver thousands of megawatt hours generated at large generation plants connected by thousands of kilometers of transmission and distribution wires. The flow of electricity until now has been one-way (i.e.,

from the generation plant to the consumer) and the electricity supply mix serving large geographic areas has typically been dominated by one or two main electricity generation sources (e.g., hydro, nuclear, coal, natural gas etc.).

Two consequences stemming from the rise of the prosumer and the charge and discharge behavior of an electrified society are:

- an increased demand for two-way flow of energy between devices embedded in our energy infrastructure, and
- interoperability between various energy generation and management technologies to connect and exchange energy information in an affordable, reliable and sustainable manner.[6]

Barriers to DE implementation

1) **Government Support for Market Research & Accessibility:** Very little government funding has been invested in the development of publicly available market research for DE and the accessibility of this information to be disseminated to the public.
2) **Traditional Economic Model:** The way electricity is produced, distributed, and traded via energy technologies is changing in response to the shift to DE. Therefore, the valuation of aggregation is required.
3) **Traditional Utility Models:** Traditional utilities are facing challenges. Anyone can own an energy generation system but 'beyond the electron' business models are required and could be provided by progressive utilities that pivot in response to market transformation.
4) **Navigating Standards:** Standards and best practices are spread out and the need for clear and accessible standards are required.

Overview of DE Standards Landscape

DEC has been working in partnership with the Standards Council of Canada to improve the dissemination of information between the decentralised energy industry and standards development organisations (SDOs) to accelerate the development of standards and regulations that reflect the needs of modern energy systems.

"*The Standards Council of Canada (SCC) is Canada's voice on standards and accreditation on the national and international stage. SCC actively drives collaboration and builds relationships, promoting Canadian priorities and accessing global networks to continuously improve Canadians' quality of life and economic prosperity*." (https://www.scc.ca/)

Many types of standards exist to establish accepted practices, technical requirements, and terminologies for diverse fields. They can be mandatory or voluntary and are distinct from Acts,

[6] Read more about 'Why is Transactiove Energy Important' https://ieee-tesc.org/more-about-transactive-energy/

regulations and codes, although standards can be referenced in those legal instruments. Ultimately, the aim of standards is to achieve an optimum degree of order in a given context.

In Canada there are ten (10) standards that are relevant to the decentralised energy industry. Refer to our Standards Landscape Scan Final Report by clicking here. The Canadian Electrical Code (CEC) appears to be the most valuable and regularly referenced Canadian document. Section 64 of the 2021 CEC, namely 'Renewable Energy Systems', provides direction for the installation of specific equipment such as inverters, stationary fuel cell systems, small and large wind systems, micro-hydro power systems, hydrokinetic power systems and storage batteries and includes general requirements that would apply to each of the systems mentioned.

Notable considerations as we modernise Canada's industry standards include: 1) the need to create awareness around new terminology associated with decentralised energy and to establish industry consensus around definitions, and 2) adoption of new standards that can facilitate improved sustainability reporting.

National Technical Specification for Terminology

Terms such as transactive energy, prosumers, and energy democracy are recent additions to industry language and represent only a fraction of the new terms being adopted as we transition to modern energy systems. There is an immediate need for standardisation of terminology to improve our ability to communicate the challenges, risks, opportunities, and benefits associated with decentralised energy systems. Refer to Appendix 1 for a list of some key industry terms.

DEC has been supporting the Standards Council of Canada in their efforts to develop a National Technical Specification (NTS) for industry terminology. The CSA Group has been tasked with leading the development of the NTS to facilitate sectoral consensus, to achieve common language, and to encourage national interoperability. This will ultimately help to manage risks as we transition and lead to stronger DE market growth.

Emerging Sustainability Standards

Sustainability standards are needed to respond to global and national developments in sustainability reporting.

Notable commitments of the Government of Canada:

1) Clean Electricity Standard (NZ2035)
2) Critical Minerals Strategy
3) Canada's New 2030 Emissions Reduction Plan
4) 2020 Model Codes (Net Zero Energy Ready Standards by 2030)

5) Just Transition-Workforce Retooling, Diversity and Inclusion, and Community Engagement

When researching for standards that relate to sustainability our committee found two (2) National Standard of Canada (NSC), Canadian adopted, standards relating to Sustainability:

1. A.1.7 CAN/CSA-ISO 37120:15 Sustainable Development of Communities — Indicators for City Services and Quality of Life
2. A.1.8 CAN/CSA-ISO 26000:16 Guidance on Social Responsibility

In addition, we found four standards developed by the International Organization for Standardization (ISO) with sustainability as the focus:

1. B.3.7 ISO/TC 205 Building Environment Design
2. B.3.8 ISO/TC 268 Sustainable Cities and Communities
3. B.3.10 ISO/TC 323 Circular Economy
4. B.3.11 ISO/TC 324 Sharing Economy

Progress towards sustainability in Canada accelerated in 2021 when the Accounting Standards Oversight Council (AcSOC) and Auditing and Assurance Standards Oversight Council (AASOC) launched a committee to develop recommendations for developing Canada's sustainability standards. In 2022 the formation of the Canadian Sustainability Standards Board (CSSB) was approved with an aim to be fully operational by April 1, 2023. The CSSB will mirror the International Sustainability Standards Board (ISSB), established through the IFRS Foundation and will act on behalf of Canadians to ensure sustainability disclosures are standardised and as decision-useful as financial and audit reports.

Regulations at a Glance

In Canada, regulatory frameworks differ depending on the particular province or territory. Refer to our Policy and Regulatory Analysis Final Report by clicking here. Provincial regulators have jurisdiction over their province's energy generation, intra-provincial transmission, distribution, retail pricing, and wholesale markets. The wholesale electricity markets in Alberta and Ontario have unbundled and separation of functions (as it relates to generation, distribution, transmission, and retail) have quite strict requirements, whereas provinces in which Crown corporations dominate tend to have fewer requirements or regulatory frameworks in place. The heavy provincial (and territorial) ownership of Canadian electricity assets has a limiting effect on the role of the federal government, in particular, the federal regulation of inter-provincial electricity transmission and electricity exports. Provincial electricity regulators generally regulate on a public utility basis in relation to the non-competitive aspects of their markets which require "certificates of public convenience and necessity" or similar approvals for asset creation or facility expansions. This controls the terms and conditions of service between the regulated utilities and their customers.

Also, there is a heavy awareness of the importance of ensuring that the constitutionally-protected rights of Canada's Indigenous Peoples are respected throughout the decision-making processes of energy development. In particular, most energy regulation in Canada regularly assesses whether the Honour of the Crown in relation to Indigenous Peoples has been maintained, they have been adequately consulted with throughout decision-making processes, and that their interests have been accommodated.

The Need for Transparency

Energy policy and regulations play a key role in aiding an equitable energy transition and intersect with many of the other areas. Policy can be complex - misinformation and a misalignment to social benefits are major barriers to progress. A substantial gap that must be addressed is the integration of sustainable development goals such as affordable and clean energy, reduced inequalities and responsible consumption and production into energy policy. An important knowledge gap relates to the full life-cycle of energy in its various forms. Another knowledge gap includes the relationship between electrification and energy efficiency policies and housing justice issues.

Consumers and investors are increasingly demanding proof of sustainability in their decision-making process. Developing mandatory or prescribed policy and regulations is less important than concise and consistent ways to measure sustainability.

In an age of energy democracy and transactive energy there is a mounting urgency for the integration of distributed ledgers and other digital data management solutions that can synthesise the vast information between many sites and technologies to provide accurate and reliable transparency around the sustainability performance of our energy systems.

A New Era of Sustainability Standards

Valuing our Natural Assets and Ecosystems

Natural assets are stocks of natural resources or ecosystems that contribute to the provision of one or more services required for the health, well-being, and long-term sustainability of a community and its residents. Community leaders and planners are beginning to appreciate that natural assets are ecosystem features that provide, or could be restored to provide, services just like the other engineered assets. The process of identifying, valuing and accounting for natural assets in community financial planning and asset management programs, will enable the development of leading-edge, sustainable and climate-resilient infrastructure.

ROADMAP FEATURE

The right to a healthy environment and the protection of natural assets and ecosystems should have greater value when designing sustainable energy systems.

Valuing Locational Benefits of Energy Systems

Effective energy policy must consider the economic valuation, planning, and regulatory considerations for assessing locational value primarily in their role in deferring, mitigating, or eliminating the need for infrastructure investments and strengthening community resilience. The strategic positioning of DE systems increases transfer efficiency, reduces emissions, and decreases energy costs. By shifting generation from centralised energy to decentralised energy, the energy sector opens a broad array of power source options and will accelerate the transition to a diversified, robust, and resilient energy system.

ROADMAP FEATURE

The full life cycle benefits of energy systems that are integrated into the designs of buildings, campuses and communities should be valued in regulations and financing mechanisms.

Valuing Energy Security

Energy security means ensuring adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardise society. While energy security has always been a pillar of energy policy, diversifying energy supply and emissions reduction have not been adequately addressed and will radically change the landscape of energy policy. Diversifying energy supply enables a society to mitigate the impacts of disruption in one energy input by increasing the use of other energy sources. Achieving energy security provides a breeding ground for entrepreneurship, innovation, and research and development. We are under increasing pressure to develop cost-effective policies that will both ensure the security of our energy system and support our sustainable development goals. A diversified supply mix of DE systems addresses this need.

ROADMAP FEATURE

Regulations, financing mechanisms and insurance policies should reward developers and operators of energy systems that demonstrate resilience in extreme weather and natural disasters.

Next Steps

The three Roadmap Features listed above require the following next steps in developing sustainability standards for the decentralised energy industry can be broadly broken down into five distinct focus areas:

1. Modernisation of Levelised Cost of Energy (LCOE) calculations - to consider external costs such as locational value, extreme weather resilience, and principles of sustainability.
2. Value Chain (tasks) and Supply Chain (logistics) Mapping Exercise - to map the system and resources required to move decentralised energy products and services from supplier to customer and map the primary and secondary activities of the industry value chain and identify gaps.
3. Energy Democracy 101 - understanding the concept and its impact on the way we design, operate and govern energy systems and how energy policy and standards can better incorporate local knowledge and the environmental justice concerns of local communities.
4. Lead by Example - An Industry Declaration – embracing the three roadmap features and the action items listed above will strengthen public trust by consulting with key participants in the decentralised energy industry to agree on principles that can guide a commitment to operate responsibly and sustainably, from manufacturing to operations and end-of-life management and the advancement of the UN Sustainable Development Goals (SDGs).

Conclusions

In a world where population growth, extreme weather, natural disasters, resource depletion, and mounting waste management pressures have no end in sight, **the challenge statement** we find ourselves grappling with is: with regard to the energy systems that support our communities, business as usual ultimately puts the human population at risk.

The way we design and operate our energy systems must change if we are to sustain our growing demands for energy. An ideal goal is to transition to modern energy systems that are benign, resilient and affordable.

This requires a full life cycle understanding of our energy systems from primary materials sourcing and system design through to end-of-life recycling or repurposing. At every point in an energy system's lifespan we should be asking ‘who’s problems are we making worse and what future problems are we adopting?’

It is imperative that we prepare for the value chain and supply chain transformations by developing clear ecosystem maps and guiding principles for integrating sustainability principles into decision-making around industry tasks and processes.

We can increase the uptake of sustainability standards by leading by example and showcasing successful energy systems that demonstrate minimal resource needs and optimised recycling. There is a lot of work to be done to prepare for our sustainable energy future.

Appendix 1

Acronyms, Regulatory Terms and Key Industry Terms

Acronyms

American National Standards Institute (ANSI) – The ANSI designation indicated the standard was developed or adopted in compliance with the USA's national standards development requirements. Often identified by the "ANSI" descriptor in the title.

International Standard – An international standard published by any international standards/standards development organisation (SDO) and made available to the public. Examples of SDOs include the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the Institute of Electrical and Electronics Engineers (IEEE), and the International Telecommunication Union (ITU). These standards can be adopted by countries as national standards or used independently.

Industry Standard – A document, established by consensus and approved by a recognized body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.

National Standard of Canada (NSC) – A standard developed by a Standards Council of Canada (SCC) accredited standard development organization following SCC prescribed requirements and guidance, resulting in a full consensus document designated as a National Standard of Canada. Intended as the standard of choice for national use. Often identified as "CAN" descriptor in the title.

Regulatory Terms

Policy
A policy is a set of statements of principles, values and intent that outlines expectations and provides a basis for consistent decision-making and resource allocation in respect to a specific issue. Policies are one of the chief tools of governance. Policies are only documents and are not law, however, policies can lead to new laws. To become law, legislation must be approved by Parliament. Proposed legislation is introduced in Parliament in the form of a bill which provides the basis to amend or repeal existing laws or put new ones in place. (Source: Government of Canada)

Act
An Act is a statute that establishes control or directives based on legal authority. Source: Standards Council of Canada

Regulation
A regulation is a statutory instrument made by exercising a legislative power conferred by an Act of Parliament. Regulations have binding legal effects. If a voluntary standard is referenced in a regulation, it becomes mandatory. Source: Standards Council of Canada

Code
A code is broad in scope and is intended to carry the force of law when adopted by a provincial, territorial or municipal authority. A code may include any number of referenced standards. Source: Standards Council of Canada

Standards
A code tells you what you need to do, and a standard tells you how to do it. A standard is a document that provides a set of agreed-upon rules, guidelines or characteristics for activities or their results. Standards establish accepted practices, technical requirements, and terminologies for diverse fields. Most standards aim to achieve an optimum degree of order in a given context. Because they are easy to recognize and reference, standards enable organisations to ensure that their products or services can be manufactured, implemented and sold around the world. Source: Standards Council of Canada

Common Regulatory Hierarchy

1. Act
2. Regulation
3. Code
4. Standards

DEC has been supporting the Standards Council of Canada in their efforts to develop a new national technical specification – Terminology for the Decentralised Energy Industry. The CSA Group has been tasked with leading the development of the NTS to facilitate sectoral consensus, to achieve common language, and to encourage national interoperability. This will ultimately help to manage risks as we transition and lead to stronger DE market growth.

Key Industry Terms

Bi-Directional Metering
Biodiesel
Bioenergy
Bioethanol fuel
Biogas
Biomethane
Capacity Factor
Circular Economy
Climate Action
Cogeneration
Collaborative Consumption
Combined Cycle Power Plant
Combined Heat and Power (CHP)
Community Energy
DC Optimisers
Decentralised Energy/Decentralized Energy (DE)
Decentralised/Distributed Ledger
Democratisation of Energy
Digitalisation of Energy
Distributed Energy
Distributed Energy Interconnection
Distributed Energy Networks
Distributed Energy Resource
Distributed Energy Resource Management System (DERMS)
Distributed Generation
Distributed Networks
District Energy
Earth Energy
Electric Vehicles (EV)
Electrification
Electromagnetic Induction Charging
Embedded Generation
Energy Democracy
Energy Equity
Energy Security
Energy Storage
Energy Transition
Fleet Electrification
Green Hydrogen
Inverter
Landfill Gas
Levelised Cost of Energy (LCOE)
Micro Inverter
Microgrid
Minigrid
Modular Reactors
Nanogrid
Net Zero
Photovoltaic Pavement
Power Controls
Prosumer
Pumped Storage
PV Meter
Renewable Natural Gas (RNG)
Responsible Consumption
Responsible Production
Sharing Economy
Small Modular Nuclear Reactors
Small-Scale Power Generation
Smart Grids
Solar Canopy
Solar Energy
Solar Panel
Solar Panel
Solar Photovoltaic Energy Systems
Solar PV Array
Solar PV Module
Solar PV System
Solar Thermal Collector
Storage Batteries
String Inverter
Supercapacitors
Superconductivity
Sustainable Development Goals (SDGs)
Time of Use (TOU) Energy Metering
Transactive Energy
Trigeneration
Virtual Power Plants (VPP)

Appendix 2

Examples of Sustainability Policy and Legislation

Solar Canopies Legislation for Parking Lots

In France, new legislation approved through the Senate in November 2022, requires all parking lots with spaces for at least 80 vehicles – both existing and new – to be covered by solar panels. Starting July 1, 2023, smaller carparks that have between 80 and 400 spaces will have five years to comply with the new measures. Carparks with more than 400 spaces have a shorter timeline: They will need to comply with the new measures within three years of this date, and at least half of the surface area of the parking lot will need to be covered in solar panels. https://electrek.co/2022/11/08/france-require-parking-lots-be-covered-in-solar-panels/

Circular Economy and Sustainable Produce Policy

The European Commission adopted the new Circular Economy Action Plan (CEAP) in March 2020 including a Sustainable Product Policy Framework. CEAP announces initiatives along the entire life cycle of products. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

An example of corporate leadership in circular economy:
https://www.vestas.com/en/sustainability/environment/zero-waste

National Standard of Canada on Sustainability

National Standard of Canada (NSC), Canadian adopted, standards relating to Sustainability:

1. A.1.7 CAN/CSA-ISO 37120:15 Sustainable Development of Communities — Indicators for City Services and Quality of Life
2. A.1.8 CAN/CSA-ISO 26000:16 Guidance on Social Responsibility

International Organization for Standardization on Sustainability

Standards developed by the International Organization for Standardization (ISO) with sustainability as the focus:

1. B.3.7 ISO/TC 205 Building Environment Design
2. B.3.8 ISO/TC 268 Sustainable Cities and Communities
3. B.3.10 ISO/TC 323 Circular Economy
4. B.3.11 ISO/TC 324 Sharing Economy

Critical Minerals Recycling Acts

Two federal laws in the United States of America are relevant to lithium-ion battery recycling.

1. The Mercury-Containing and Battery Management Act requires companies to accept and recycle used batteries and could act as a template for future lithium-ion battery recycling.
2. The Resource Conservation and Recovery Act specifies legal frameworks for the safe disposal of hazardous and non-hazardous solid waste.

Current legal discussions in the USA are concentrating on possible frameworks for future lithium-ion battery recycling.

Charging Ahead: Ensuring Equity and Reliability in Canada's Electric Vehicle Network

This report provides an overview of Canada's EV charging infrastructure, followed by a summary of the key issues surrounding charging infrastructure deployment, such as location, physical design, reliability, and payment options. Finally, policy considerations are offered for the federal government to keep in mind as it develops a robust EV charging network:

- Deploy EV charging infrastructure through an equity lens
- Incorporate accessible design practices at the outset
- Ensure reliability for drivers
- Promote inclusive payment options