DEC

Decentralised Energy Canada

POWERING THE 21ST CENTURY

Anouk Kendall, President, Decentralised Energy Canada

April 7, 2022

State of the DE Industry

Annual Presentation to Alberta Innovates

DECENTRALISED ENERGY CANADA

Canada's industry association for decentralised energy

Connecting industry to opportunities that accelerate the global transition to a sustainable, resilient and affordable energy future.

Core Activities:

- International trade facilitation
- Industry consensus building
- Training and education
- Project de-risking
- Market research
- Events and networking

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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OUR MISSION

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

+13,000

Active Subscribers Worldwide

20

Years of Experience

105

Members

50%+

of Canada's Provinces and Territories Served

$32.3B+

Members' Gross Revenue

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WHAT IS DECENTRALISED ENERGY (DE)?

Defined as heating, cooling or electrical energy that is produced, managed and/or stored close to load(s).

Encompasses onsite energy generation, microgrid/ smart grid enabling technologies and energy efficiency measures.

No capacity limit but typically less than 50 MW.

Most are connected to the distribution wires (not the transmission wires).

COMING SOON – NATIONAL TECHNICAL SPECIFICATION

SCC CCN

CSA GROUP™

TECHNOLOGIES INCLUDE:

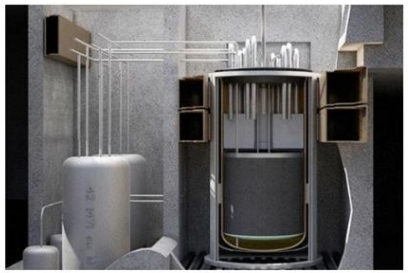
DISTRICT ENERGY

COGENERATION

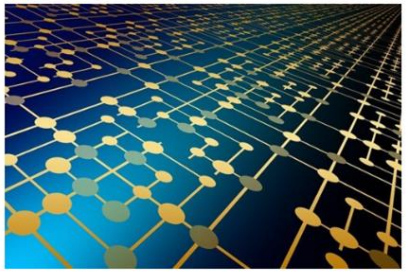
SOLAR ENERGY

EARTH ENERGY

BIOENERGY



MODULAR REACTORS



SMART GRIDS & MICROGRIDS

ENERGY STORAGE

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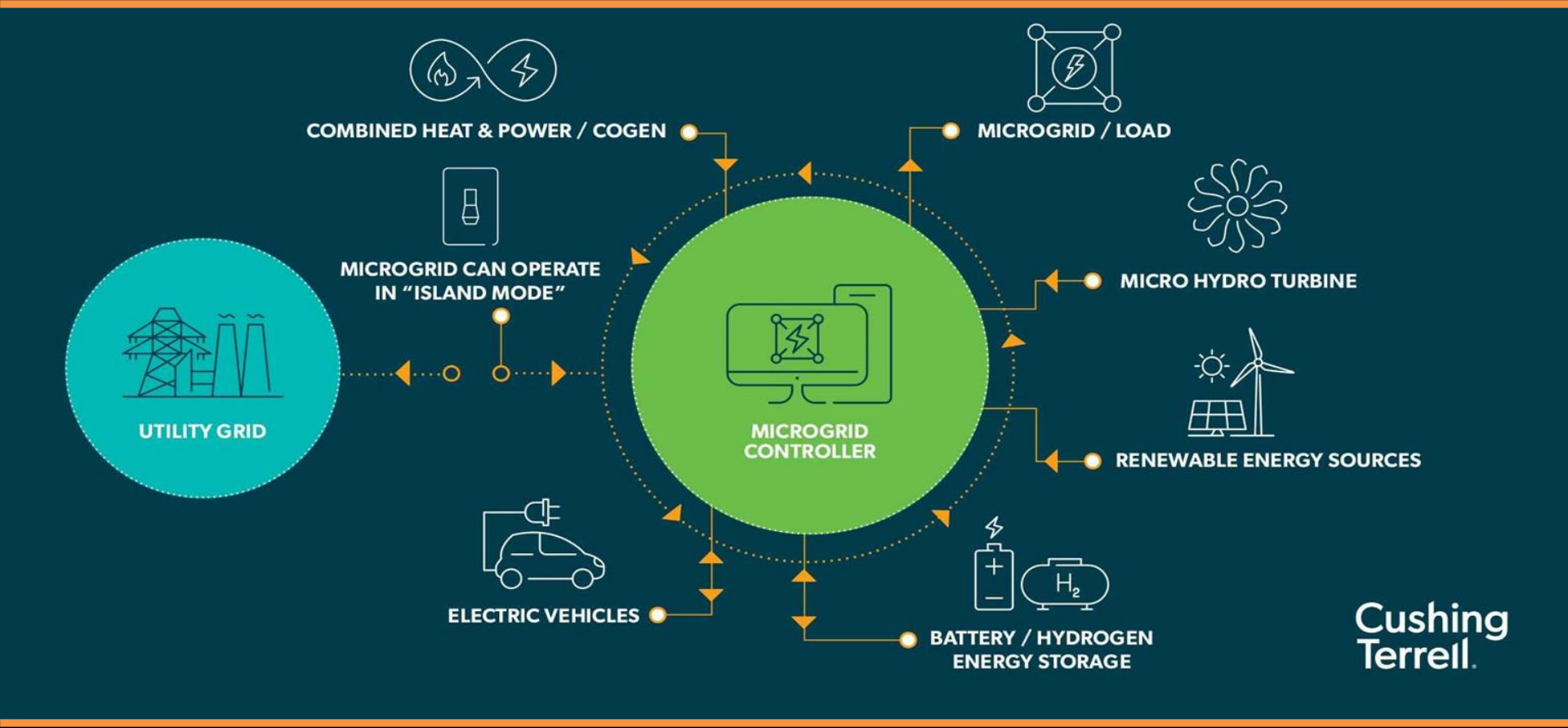
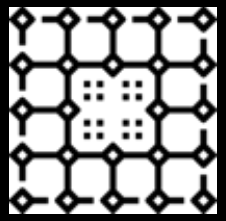
INTEROPERABILITY CRITICAL

- Self-healing, dynamic participation and asset optimisation.
- MUSH as well as commercial and industrial campuses.

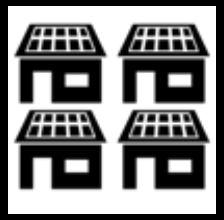




Smart Grids

Electricity networks that allow devices to communicate between suppliers to consumers, allowing them to manage demand, protect the distribution network, save energy and reduce costs

(European Commission, 2012)



Microgrids

Energy systems (electrical and thermal) with a defined geographical boundary (e.g., a community or campus) that can connect to a larger regional grid or operate autonomously (i.e., "island mode")

Mini-Grids

Off-grid energy systems (electrical and thermal) with an aggregate power rating <15MW

(United Nations Framework Convention on Climate Change (UNFCCC)

Nanogrids

Off-grid energy systems (electrical and thermal) confined to one building not exceeding 100 kW of power

(IEEE)

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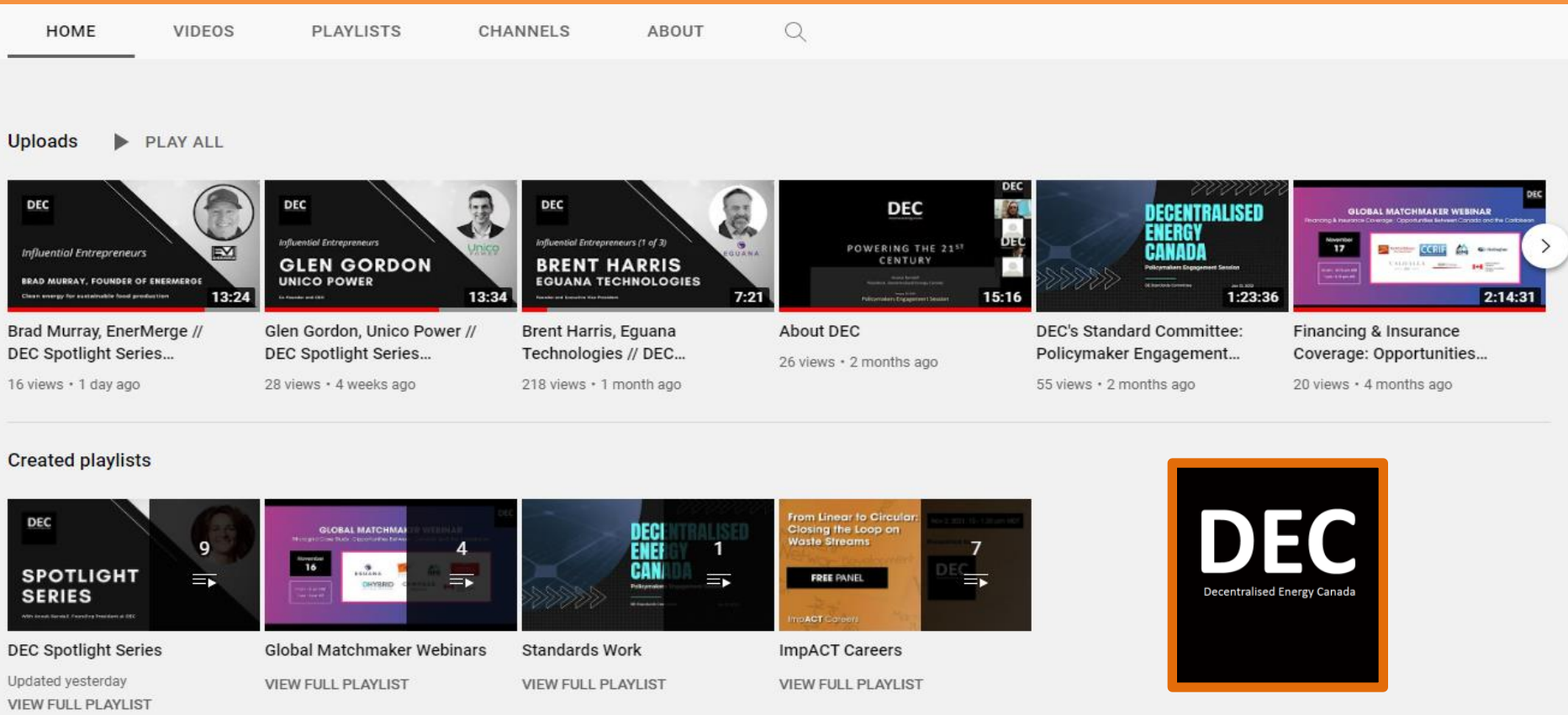
GLOBAL DE COMPANIES

AB Energy Canada
ABB Limited
Aclara
Advanced Micro Devices Inc.
AES Distributed Energy
Ameresco, Inc.
Ansaldo Energia S.p.A.
Arcus Power *
Ballard Power Systems Inc.
Bergey WindPower Company
Bloom Energy Corporation
C3 AI Inc.
Canadian Solar Inc.
Capstone Turbine Corp.
Caterpillar, Inc.
Cisco Systems Inc.
Clarke Energy
Cummins, Inc.
Cushing Terrell
Cyanconnode Holdings Plc
Discovergy GmbH
Doosan Heavy Industries & Construction
E.ON SE
E3 Metals
Eaton
Eavor
eDecisions
Eguana Technologies Inc. *
Electronic Grid Systems Inc.
Enel X North America
ENERCON GmbH
EnerMerge *
Esmart Systems
Esyasoft Technologies Pvt., Ltd.
Firecomms
First Solar
FlexEnergy Solutions
FuelCell Energy, Inc.
Fujitsu Ltd.
General Electric
Globema
Gram Power
Grid4C
Honeywell
Huawei Technologies Co., Ltd.
IBM
Internat Energy Solutions Canada
Ironcor Solar Structures
Itron
Kamstrup
Landis+Gyr
MiEnergy
Mitsubishi Electric Corp.
Mitsubishi Heavy Industries Ltd.
Modern Huts
Nu:ionic Technologies
Nutana Power
Open Systems International Inc. (Osi)
Oracle
Power Plus Communications (PPC)
RenuWell Energy
Rolls-Royce plc.
RWI Synthetics
S&C Electric Co.
Sagemcom
SALT Energy
Schneider Electric
Sensus
Sharp Corp.
Siemens AG
SMA Solar Technology AG
Solarify
Sparkmeter Inc.
Suzlon Energy Ltd.
Synthica Energy
Tantalus
Tech Mahindra
Terrestrial Energy Inc.
Toyota Turbine and Systems Inc.
Trane Canada
Trilliant Holdings
Unico Power *
Vestas Wind Systems A/S
VOLTA
Wartsila Corporation
Wattwatchers
Wipro Ltd.
XZERES Wind Corp.

SPOTLIGHT FEATURES

DEC YouTube Channel



www.deassociation.ca

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DE PRODUCTS

- Charging Infrastructure
- Controllers & Automation
- Electrolysers
- Energy Storage Technologies
- Hydrogen & Fuel Cells
- Heat Pumps
- Predictive Modeling Tools
- Microturbines
- Reciprocating Engines
- Small Modular Reactors
- Meters
- Substations
- Solar Photovoltaic (PV) Systems
- Turbines
- Wind Turbines


7 DRIVERS OF DECENTRALISED ENERGY SYSTEMS

1 Global Commitments to Emissions Reduction

197 countries have adopted the Paris Agreement – of those, 179 have solidified their climate proposals with formal approval.

2 Traditional Electrical Grid Challenges

Expensive, limited functionality, and time consuming. Today, >50% of a consumer bill can be delivery charges. Alberta alone has 26,000 km of transmission lines worth USD$88 billion but in rural areas there can be as few as 3 customers/ km.

3 Rise of Prosumers

When a consumer also produces energy, they are called prosumers. Most DE systems are developed by prosumers.
Global DE investments:
2000 USD $30 billion
2012 USD $150 billion
2020 USD $246 billion
2030 Forecast USD $919 billion

4 Digitalisation of Utilities

Digital transformation 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 module prices down by ~90% since 2009 and wind turbine prices down ~55-60% since 2010. Battery prices down by ~87% since 2010.

6 Extreme Weather and Natural Disasters

Total global economic losses from hurricanes, severe storms, wildfires, floods and other weather events:
2017 USD $330 billion
2018 USD $155 billion
2019 USD $166 billion
2020 USD $220 billion
2021 USD $280 billion Source: Munich RE

7 Electrification of Society

Electricity for data centers, transportation and agriculture. More than 90% of all passenger vehicles in the U.S., Canada, Europe and other rich countries could be electric and autonomous by 2040. An autonomous vehicle uses and generates around 4000 GB of data per day

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IMPORTANT TRENDS

1 Rebuilding with Resiliency

Rebuilding infrastructure with resilient design principles is key to ensuring that future natural disasters will not further hinder a community.

2 A New Era of Insurance Coverage

Given the wreckage that extreme weather events can cause, insurance coverage is, unsurprisingly, becoming more expensive. It is expected that insurance companies will begin to adapt their policies to accommodate resilient rebuilding strategies.

3 Communities Going Net-Zero

Climate action is in the air. At COP26, Canada pledged to reduce methane emissions, cap oil and gas emissions, reduce vehicle emissions, and set a global price on carbon. DEC anticipates to see an increasing number of Canadian communities and municipalities adopt net-zero targets to support these commitments.

4 Microgrids Abound

Microgrids are used to increase energy efficiency, reduce power disruptions, and to mitigate the consequences of outages when they do occur. They also make economic sense, particularly when supported by the right policies and technology, and can defer capital costs for transmission infrastructure.

5 Growth in Energy Storage

During power outages, energy storage can greatly increase the welfare and resiliency of a community. Energy storage options that demonstrate the lowest ecological footprint and net-zero emissions will be the focus of investor interest.

6 Harnessing Digitalisation

Currently, energy efficiency holds a very heavy weight in the industry. Digital technologies can gather data and offer real-world solutions that help to optimise systems interoperability and increase energy efficiency. Digital transformation has immense potential to unlock $1.3 trillion of value for the electricity sector.

7 From Linear to Circular

We live in a linear take-make-waste system, where virgin materials are often cheaper than the cost of repair and reuse, which creates an inordinate amount of waste. DEC expects to see the emergence of industry standards that support the circular economy throughout Canada in 2022.

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BARRIERS

1

Government Support for Market Research

Very little government money has been invested in the development of publicly available market research for the decentralised energy industry.

2

Traditional Economic Model

The way we produce, distribute and trade energy technologies is changing in response to the shift to decentralised energy. Valuing the aggregate is required.

3

Traditional Utility Models

Anyone can own an energy generation system. Beyond the electron business models are required.

4

Navigating Standards

Standards and best practices are spread out.

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HOW DEC SUPPORTS PROGRESS

1. ACCESS TO DATA - ACCESSIBLE DATA AND EVIDENCE-BASED DECISION-MAKING
2. CLEAN ELECTRICITY – URBAN, RURAL AND INDIGENOUS ENERGY SECURITY
3. CLIMATE ACTION - EMISSIONS REDUCTION, NET ZERO CARBON ECONOMY, AND CLIMATE RESILIENCY
4. ENERGY TRANSITION – ALIGNED TO SUSTAINABLE DEVELOPMENT GOALS

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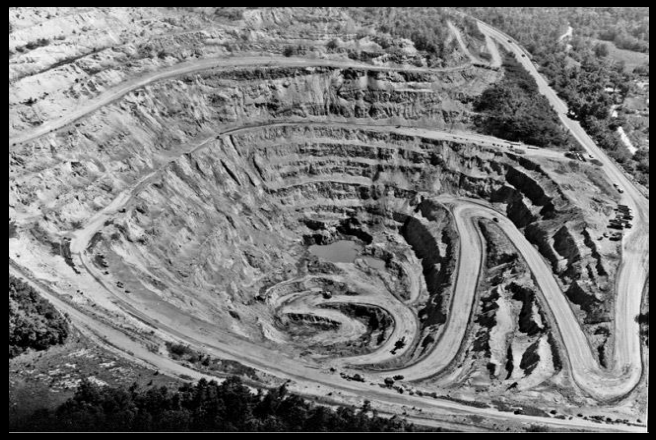
NOTABLE GOVERNMENT COMMITMENTS

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

ALBERTA OPPORTUNITIES

1. HYDROGEN
2. CRITICAL MINERALS
3. BIOGAS AND RENEWABLE NATURAL GAS (BIOMENTHANE)
4. DECENTRALISED ENERGY FOR LOCAL AND SUSTAINABLE FOOD PRODUCTION
5. DIGITAL TRANSFORMATION
6. DECARBONISED ELECTRICITY FOR DATA MANAGEMENT

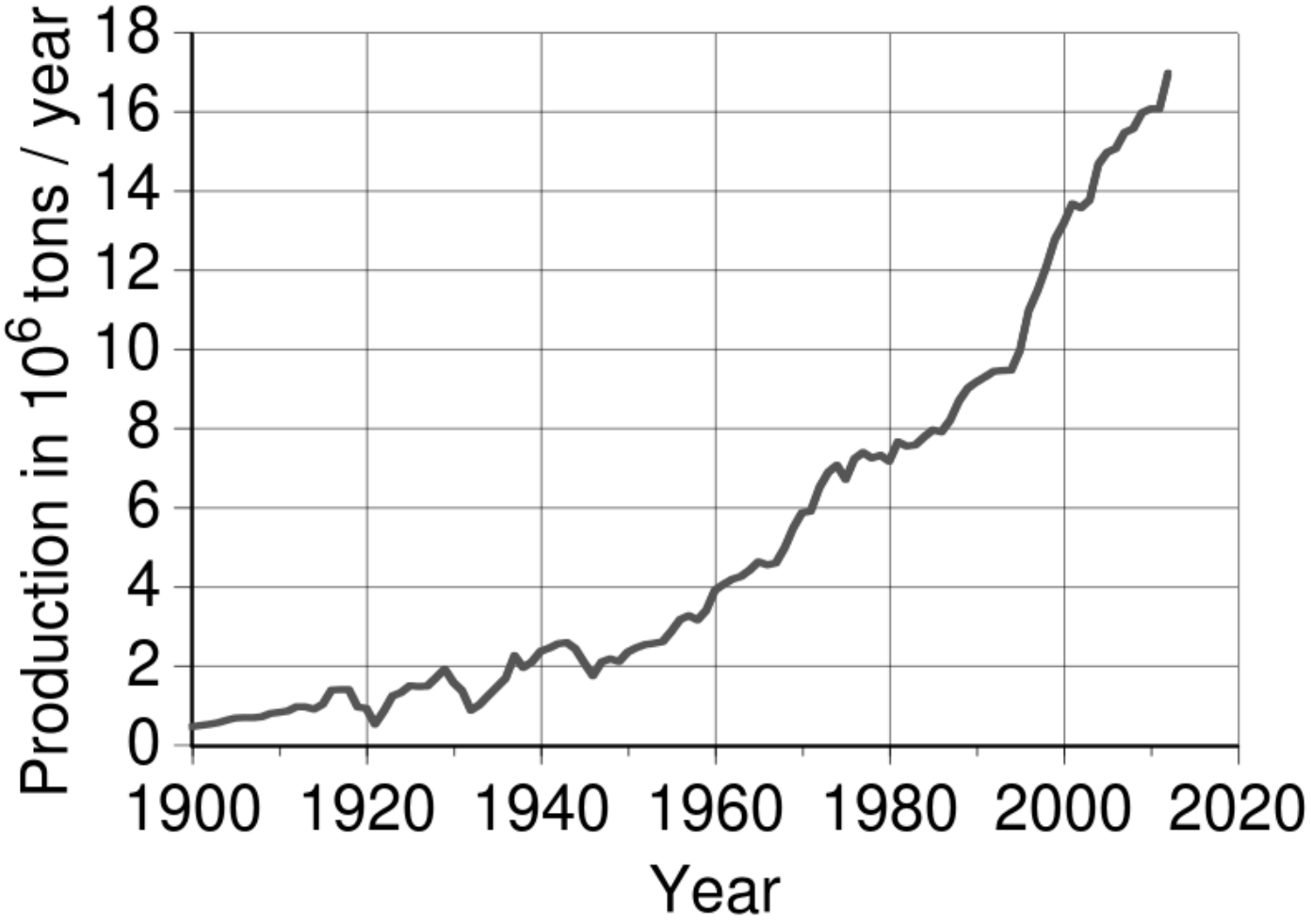
CRITICAL MINERALS - ELECTRIC IMPLICATIONS



VANADIUM

LITHIUM

COPPER'S STORY OF RECYCLABILITY



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DIGITAL TRANSFORMATION UNLOCKS $1.3 TRILLION

Asset life cycle management

Technology solutions can enable real-time, remote-control or predictive maintenance to extend the life cycle or operating efficiency of the generation, transmission or distribution of assets and infrastructure.

Grid optimization and aggregation

Grid optimization is possible through real-time load balancing, network controls and end-to-end connected markets, enabled by connected assets, machines, devices and advanced monitoring capability.

electricity sector

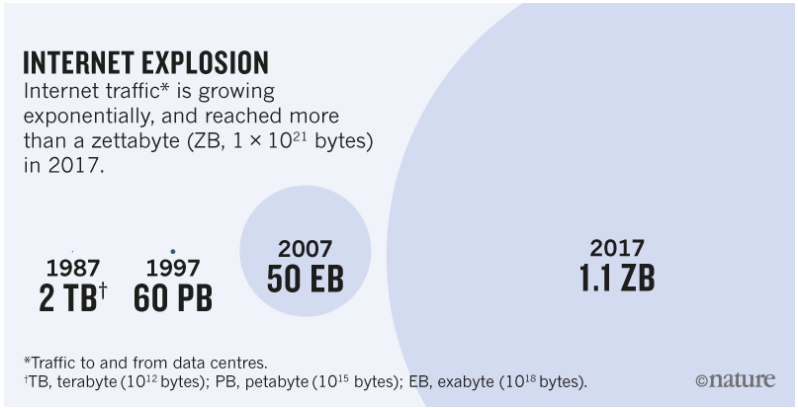
Integrated customer services

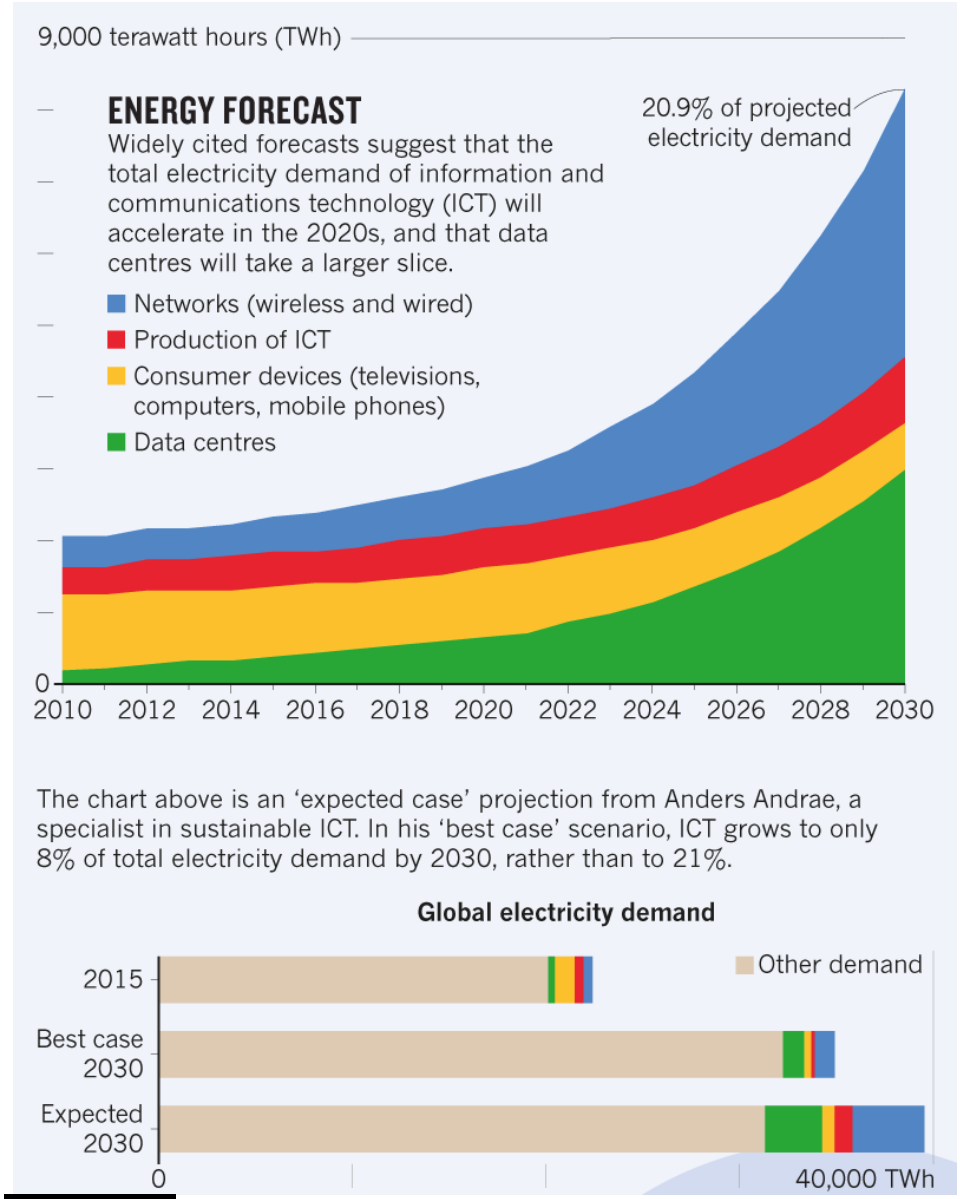
Innovative, digitally enabled products and services relating to energy generation and energy management are bundled into an integrated customer service.

Beyond the electron

Hyper-personalized connected services beyond the electricity value chain that adapt to the consumer. Electricity moves from being a commodity to becoming an experience.

THE GREAT DATA FLOOD





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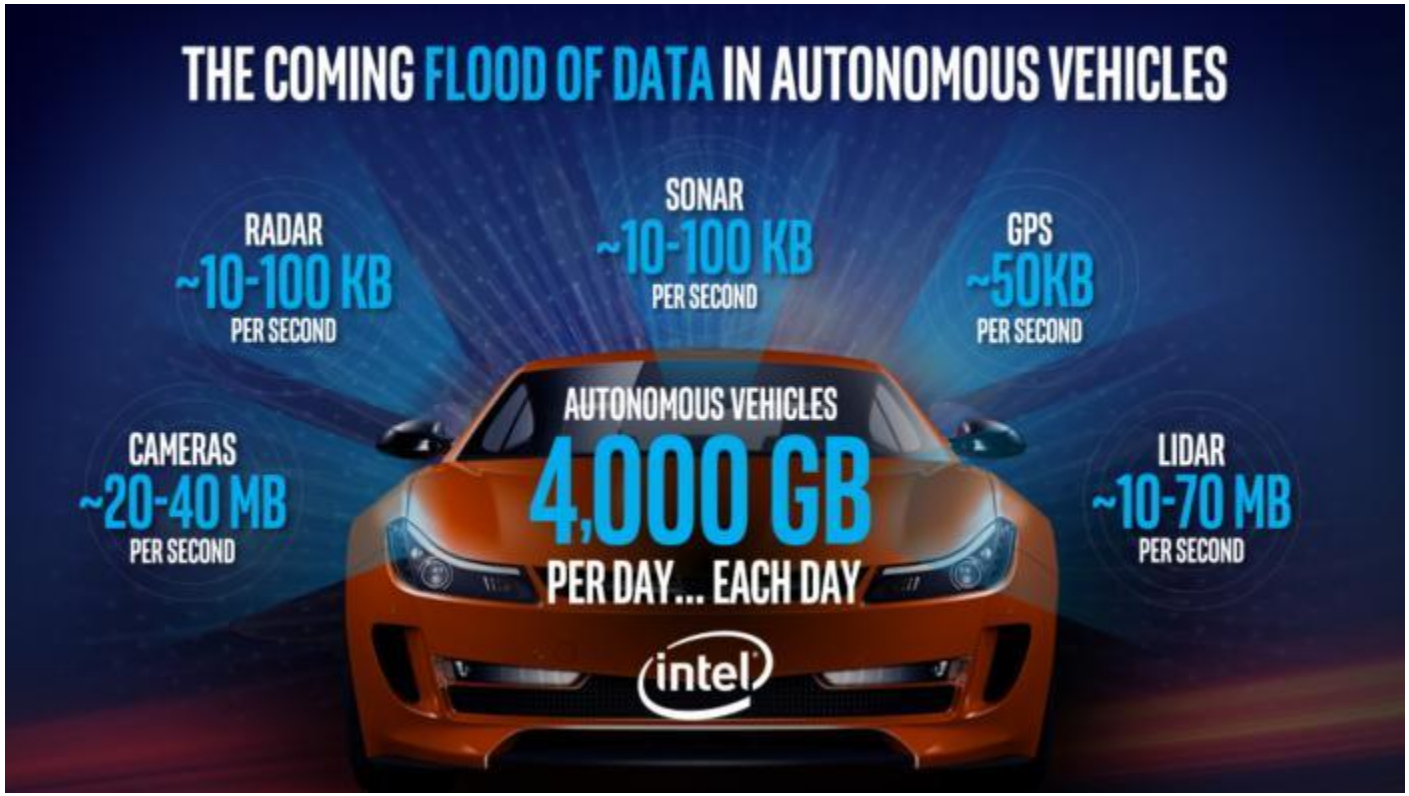

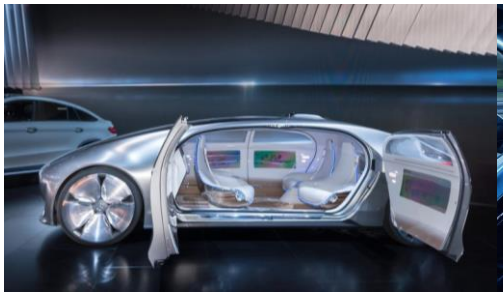

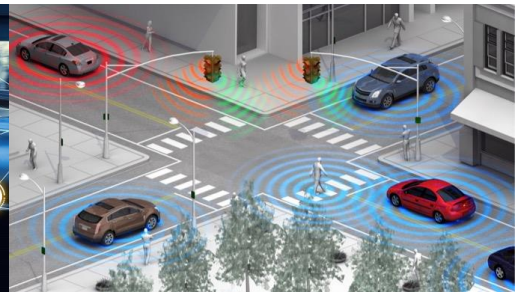

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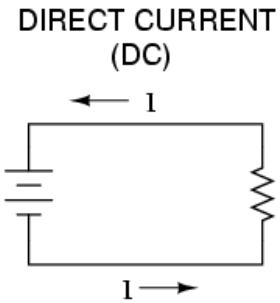
WAR OF CURRENTS



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THANK YOU

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