



Power-To-X and PGM

IPMI European Chapter,
17-19th November 2020, Lisbon

Dr Michelle Lynch



Enabled Future Limited

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While we import carbon, we export climate change with human impact on a scale we never could have envisioned



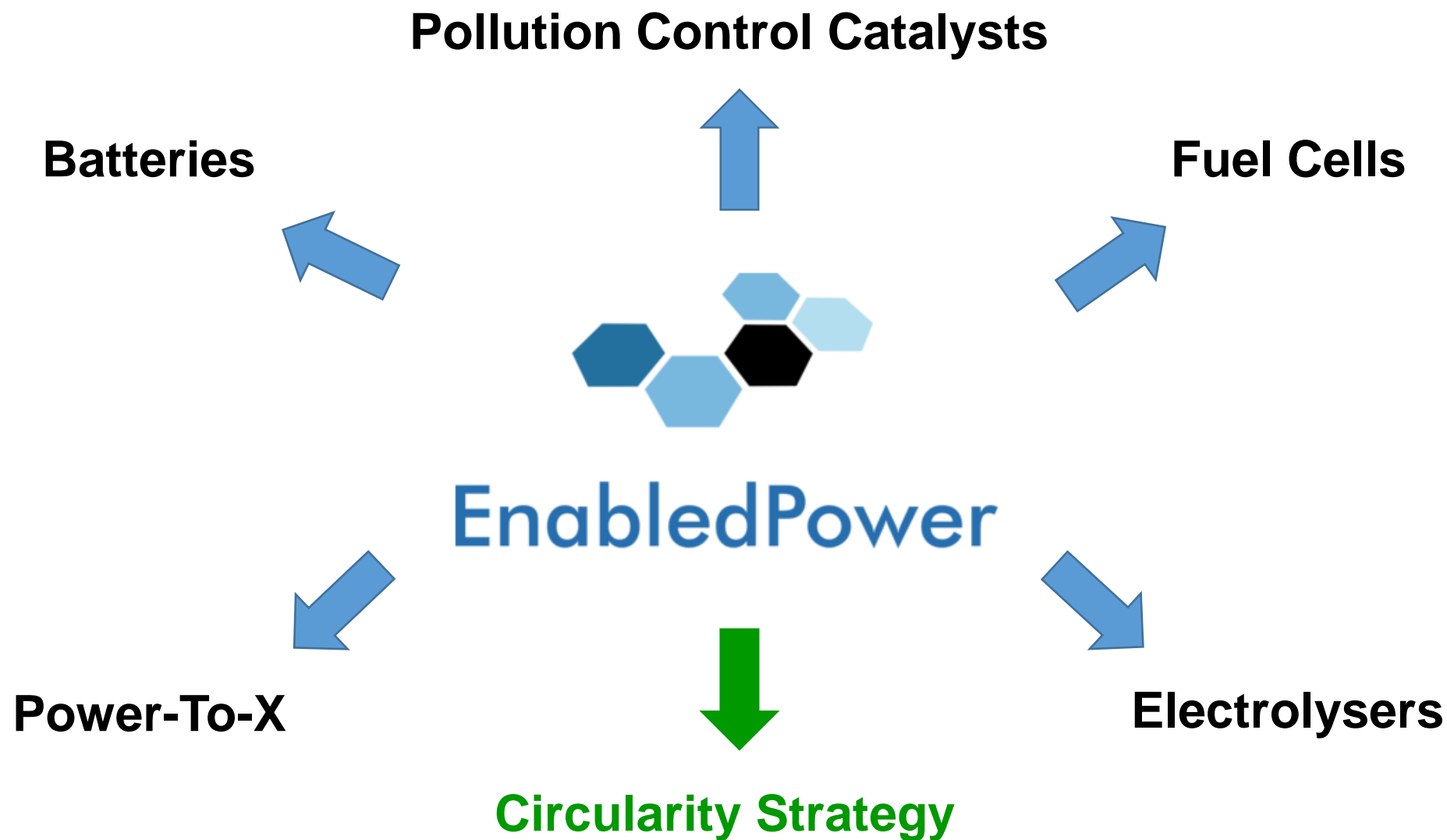


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The Enabled Power Market Vertical delivers projects on sustainable energy storage and renewable power systems



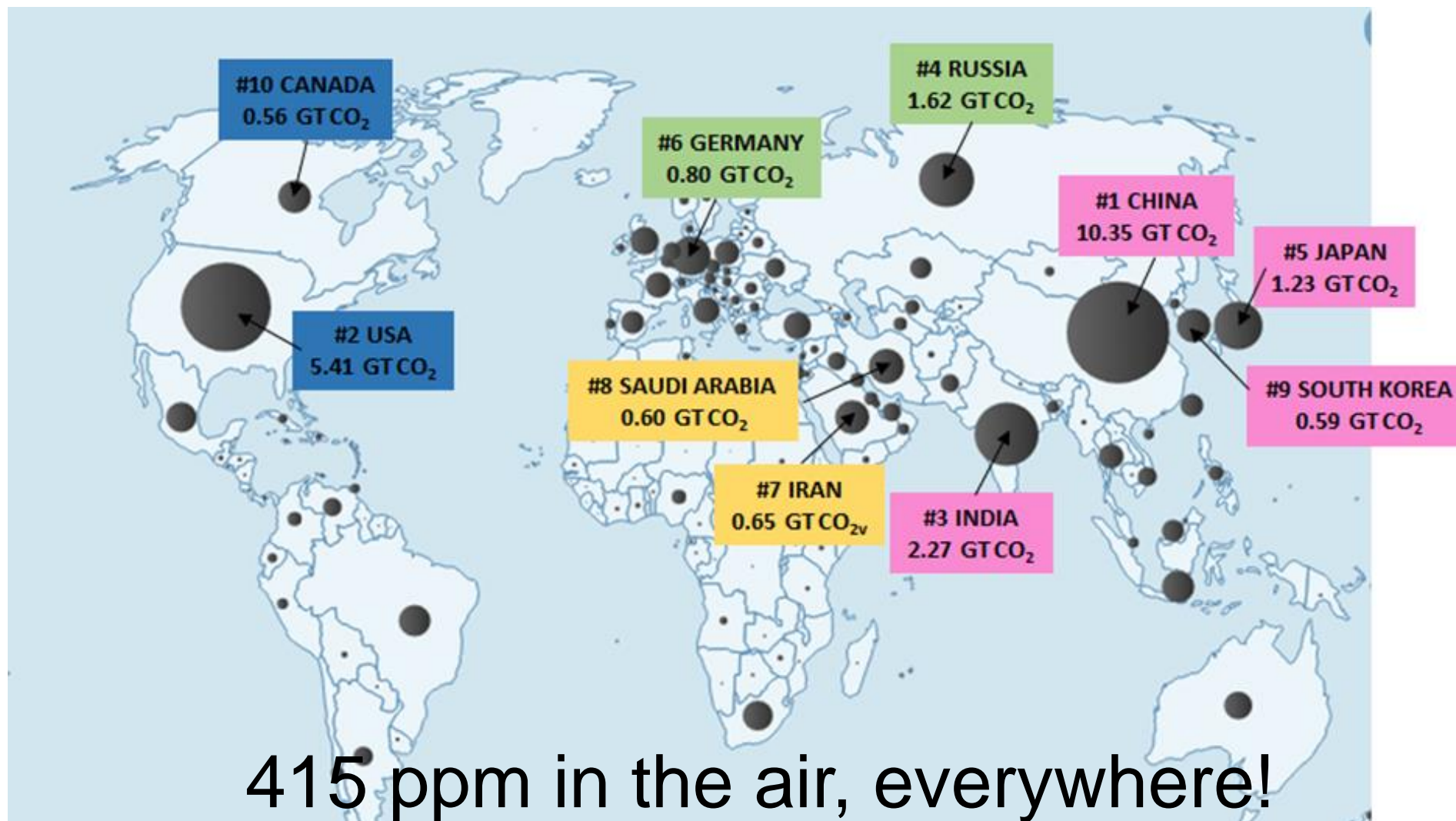
Contents



- It's a global problem
- Power-To-X drivers
- PGM Opportunities
- Mapping the solutions



Carbon footprints are global – and are traded: we are responsible for both our domestic and imported carbon



Source Data: Global Carbon Atlas (2015)

Graphic: The Catalyst Group Resources (TCGR), CO₂ Start-ups for Venture Capital; 2017; CO₂CC Program, Author: Dr M.K. Lynch, Enabled Future Limited



Visible adverse climatic events are costing big money and fossil fuels are becoming an ever bigger financial liability

This article is more than 5 months old

World's biggest sovereign wealth fund to ditch fossil fuels

Norway's Government Pension Fund Global gets go ahead to divest \$13bn of investments



North Sea oil companies such as Premier and T...
The world's largest sovereign we...
Norway's assets, has been given...
divestment to date by dropping 1

FINANCIAL TIMES

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Latest on Sveriges Riksbank

- Riksbank set to exit negative rates with December rise
- Norwegian krone and Swedish krona lose ground
- Krona extends fall against the euro as trade tensions bite

Sveriges Riksbank **Added**

Riksbank dumps Canadian and Australian debt in green push

Swedish central bank to avoid regional bonds with 'large climate footprint' for reserves

Tommy Stubbington YESTERDAY 19

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Sweden's central bank has ditched bonds issued by Australian and Canadian regions on the grounds that their carbon emissions are too high, as part of its push to use monetary policy in the battle against climate change.

Sveriges Riksbank has sold debt from the Australian states of Queensland and Western Australia, and the Canadian province of Alberta from its portfolio of

FINANCE • ESG INVESTING

A 24-Year-Old Is Suing Pension Fund for Not Being Green Enough

By Matthew Burgess and Bloomberg November 13, 2019



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European Investment Bank: 'We will stop financing fossil fuels'



The European Investment Bank / Credit: Chris Mueller

Multilateral bank says world's 'most ambitious climate investment strategy' will unlock €1tr of climate action and environmental sustainable investment through to 2030

The European Investment Bank (EIB) last night approved plans to halt lending to fossil

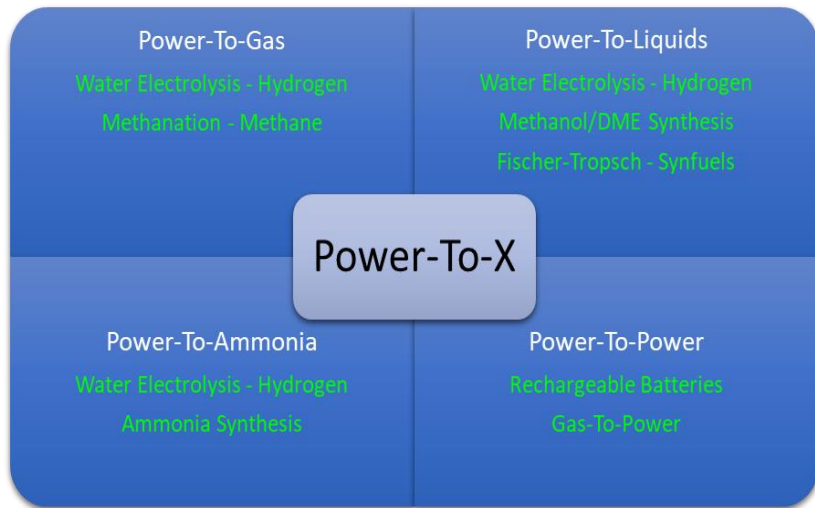
Life after fossil fuels...



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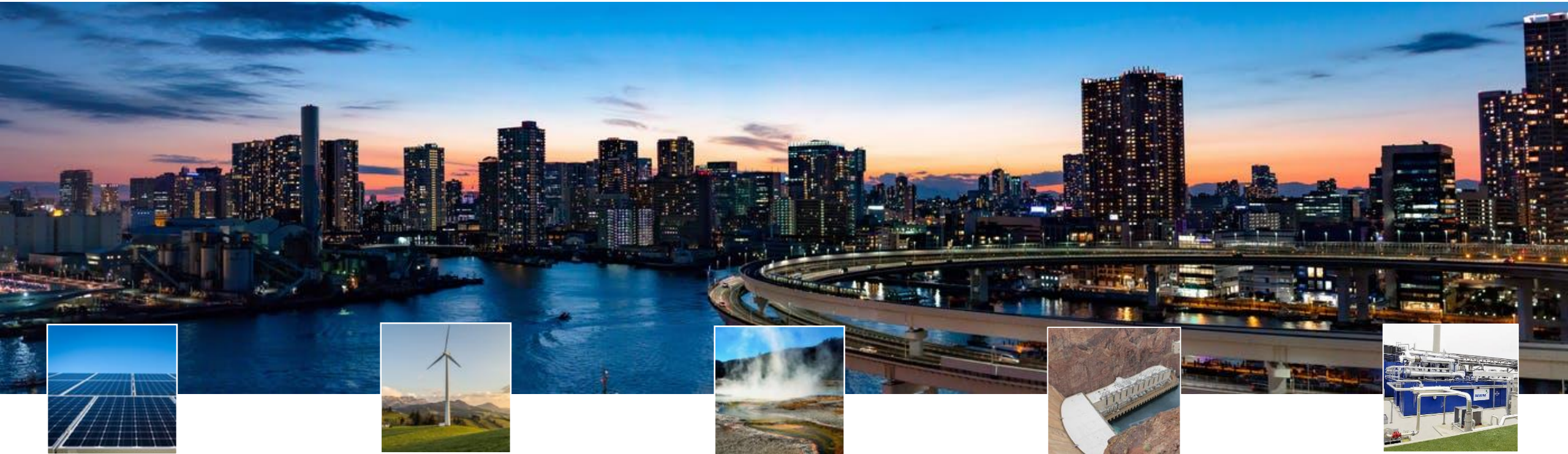


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Power-To-X tackles “hard to abate” sectors and enables the move towards the smart, circular city of the future



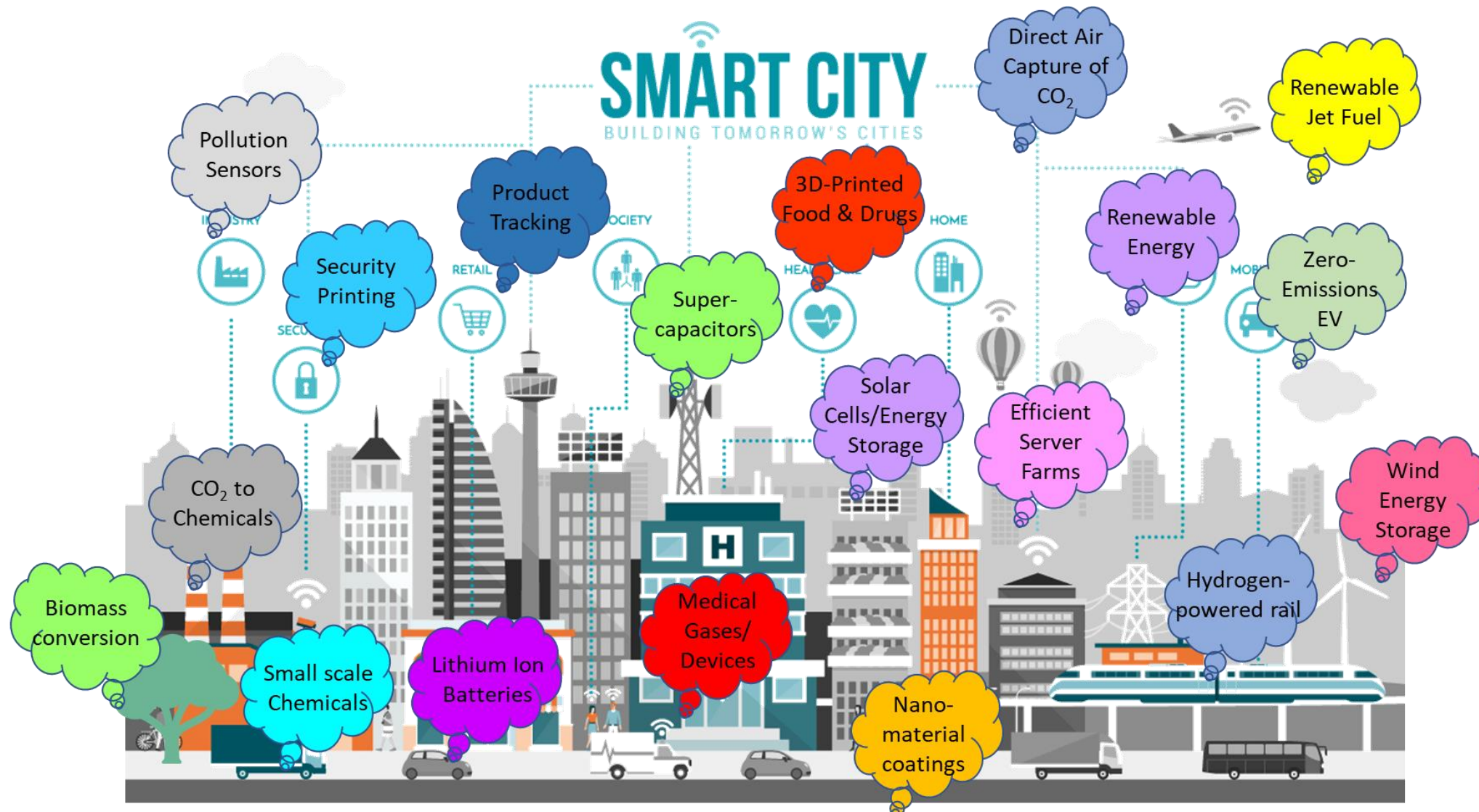
“By 2020 the number of smart cities will reach 600 worldwide, and 5 years later almost 60 percent of the world’s GDP will be produced in them”

Source: McKinsey, Smart Cities, June 2018

*“The future will adopt **Above Ground Carbon**” to create products using **Circular Carbon Pathways**”*

Source: Enabled Future Limited, Circular Carbon Pathways for a Sustainable Future, June 2019

The future is green electrons with a busy day swinging through the branches of sectors from residential, to ground transport to aviation – needing PGM in some shape or form at each stage

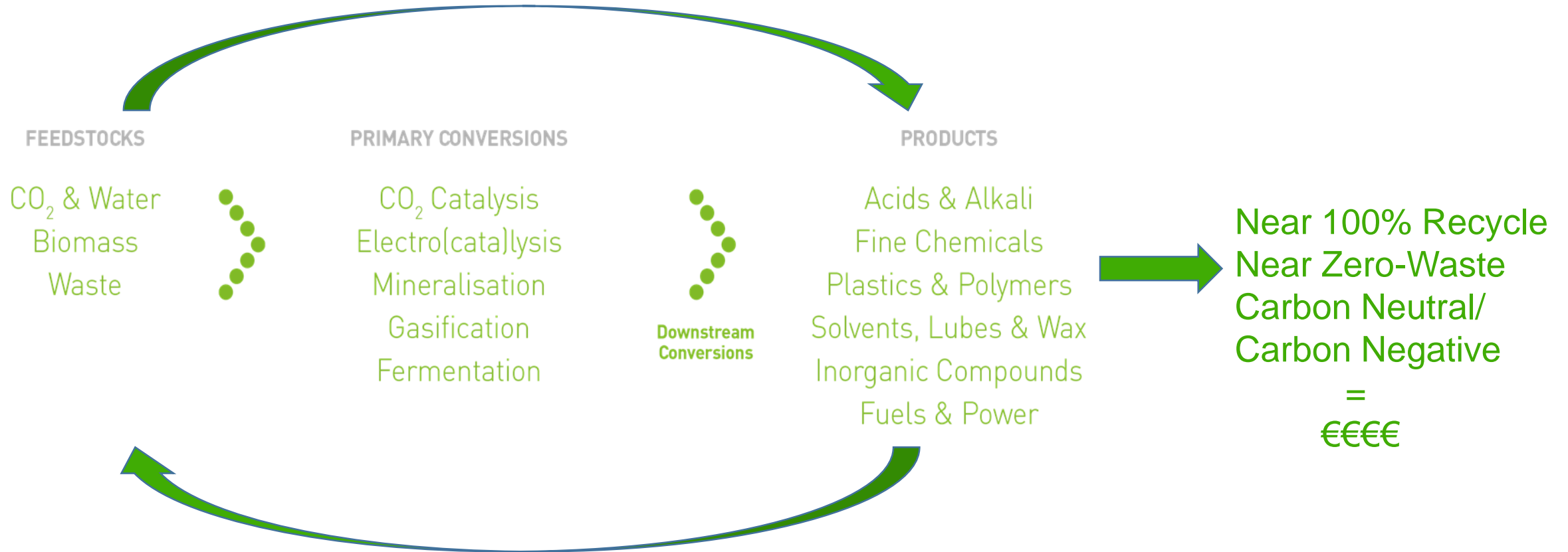


Source: Modified from original Smart City figure on Arcweb.com

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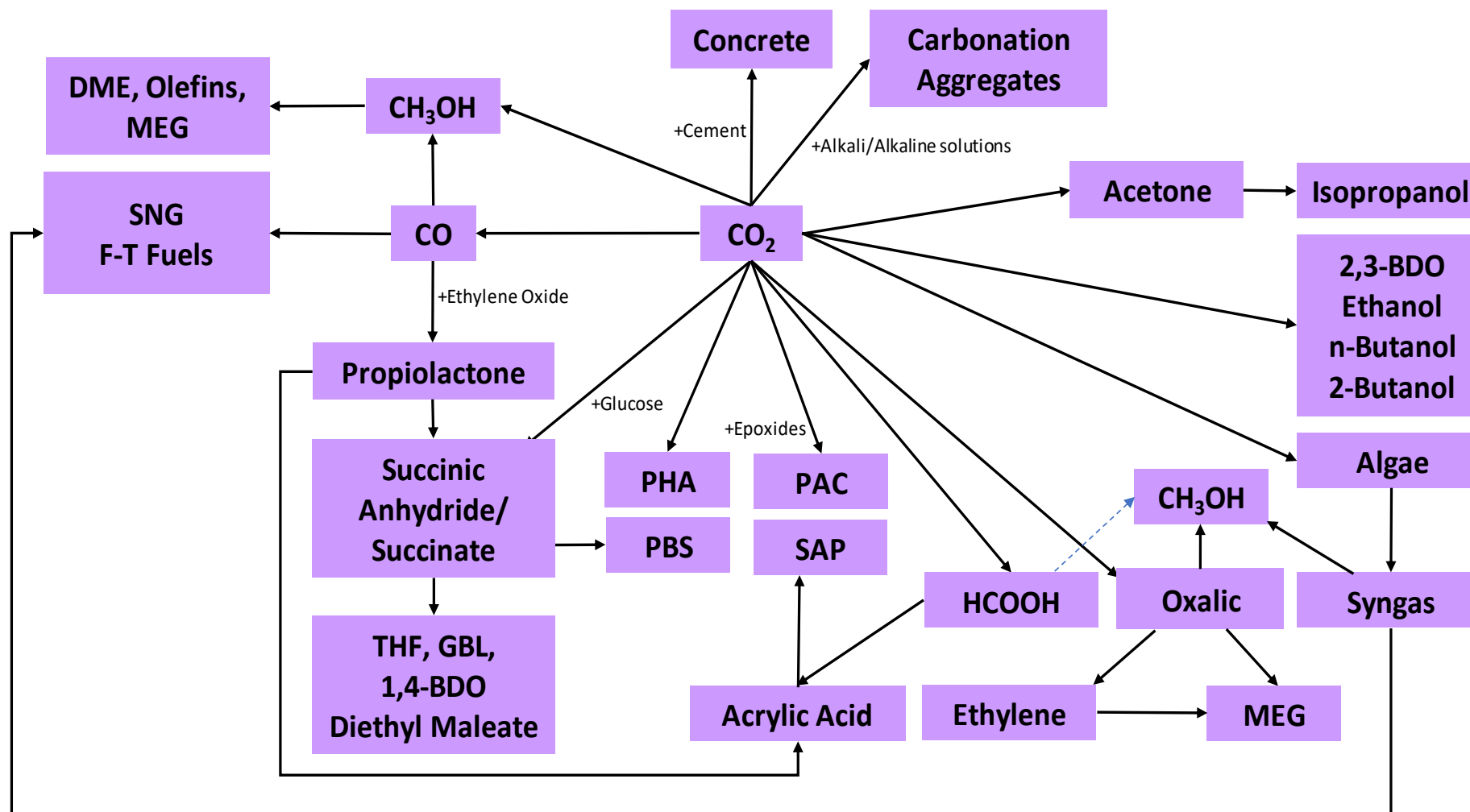
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New modes of chemistry are Power-To-X modalities and we are set to see a redistribution of PGM demand



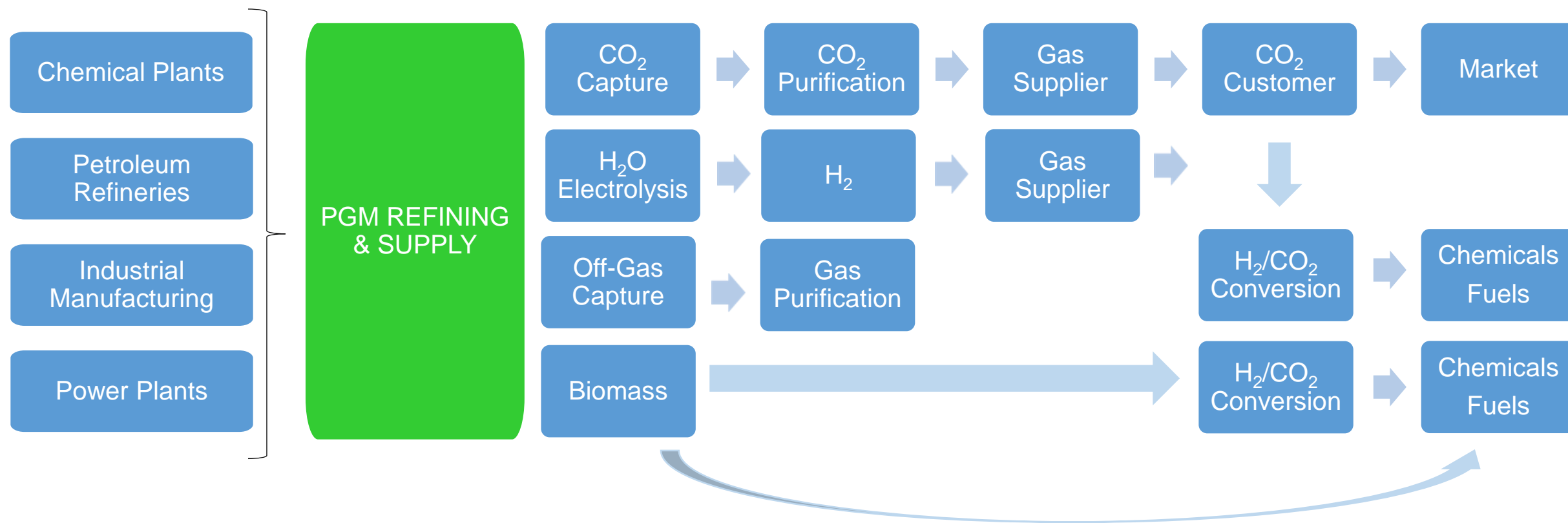


Near term opportunity for new PGM is electrolysis hydrogen and longer term adoption of new catalysis modalities



The move to decentralisation and Power-To-X will create new PGM demand, sales and refining opportunities

Model for Future Production of Chemicals and Fuels with PGM Opportunities



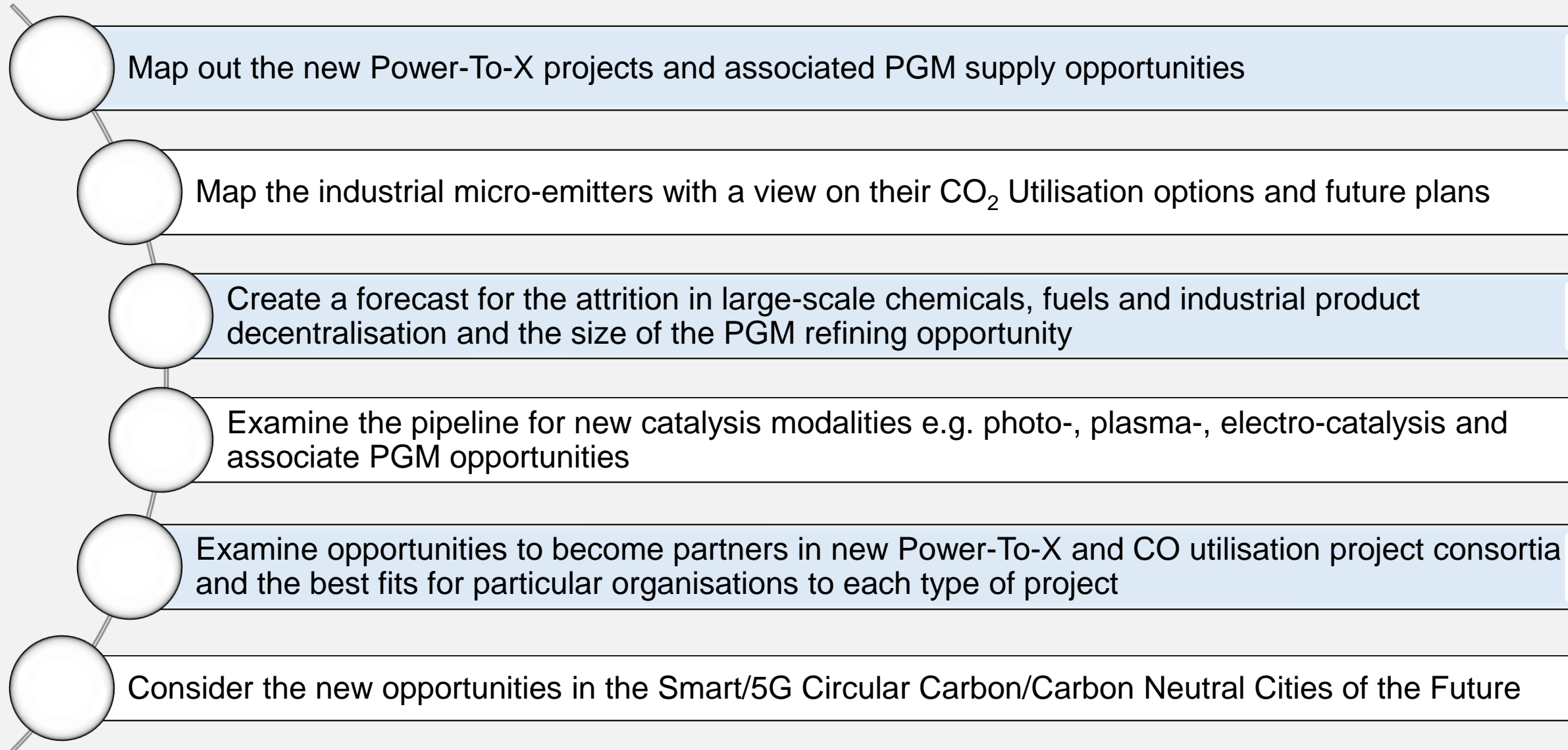
PGM Refining from Capacity Reduction - 1,000,000's Tr Oz New PGM Demand Redistributed PGM Sales

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Much new information is required to leverage opportunities and to be included in the evolving Power-To-X supply chain



Forthcoming reports from EFL and partners will answer the key questions for CO₂U and Power-To-X in detail

“PGM Supply Chain Opportunities Resulting from Chemicals and Fuels Manufacturing Decentralisation, Power-To-X Projects and CO₂ Utilisation from Industrial Micro-Emitters”

Enabled Future Limited, 2020

“Intelligence Report: Business Shifts in the Global Catalytic Process Industries, 2019-2025.” including the Special Feature: **“Climate Change Impacts on the Catalytic Process Industries”** The Catalyst Group Resources (TCGR) &

Enabled Future Limited, 2020

“Power-to-X: Techno-Economic, Commercial and Strategic Developments for Production of Energy Carrier Chemicals, Petrochemicals and Sustainable Fuels!” TCGR/EFL, 2020

Please get in touch for brochures and further info!

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Thank you & Q's



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