Gas Transmission

The session will start at **14.02** to allow people to finish previous meetings

Innovation Stakeholder Engagement

November 2020

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Innovation at nationalgrid

Welcome and Opening

Thank you for joining us today

Please feedback via SLIDO

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#NGG3

Who will be speaking today?

Mark Lissimore
Head of Engineering and Asset Management

Corinna Jones
Innovation Manager

Jennifer Pemberton
Stakeholder Manager

Room hosts

Tom Neal
Net Zero

Steve Johnstone
Asset development for risk mitigation

Dave Hardman
Automation and measurement

Mat Currell
Digital systems and simulation

Feona Weekes
Materials and processing

Matt Nevin
Business Process and communication
Holly Kinch

Logistics

- Should last for approximately about 60 min
- Questions via slido #NGG3
- All callers will be placed on mute
- We will circulate the slides and a recording of this webinar
- We will be moving into breakout groups using the additional log in details

Agenda

1. Innovation Strategy through to 2050
2. Innovation Process for RIIO-2
3. RIIO-2 Key Themes & Activities
4. RIIO-2 Innovation Roadmaps - Breakout groups
5. How to get involved?

1

Innovation Strategy through to 2050

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Our Strategy for RIIO-2: The Foundation

Fit for the Future

Ready for Decarbonisation

Decarbonised Energy System

NET ZERO 2050

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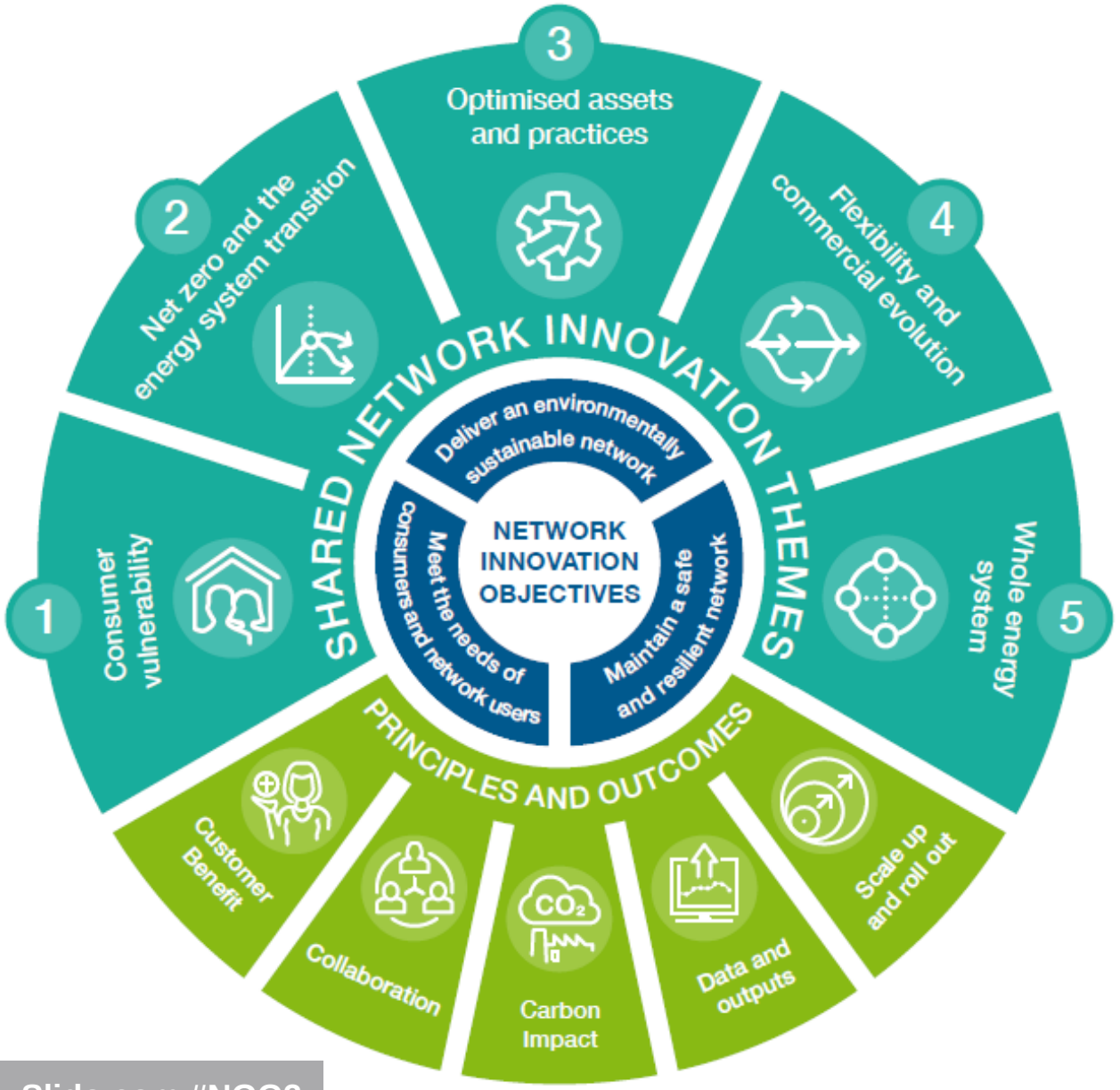
ENA Strategy Links



Fit for the Future
Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future.

Ready for Decarbonisation
Focusing strongly on how the NTS will transport a blended mix of 'green' gases and focus on future technology to better manage the assets we own.

Decarbonised Energy System
Working predominantly on hydrogen, we'll explore how the gas will interact with the NTS, how trading could be managed, and whether direct offtakes for hydrogen can support the transport and commercial markets.

Consumer vulnerability
Ensuring that everyone can experience the benefits of energy transitions

Net Zero and the energy system transition
Facilitating and accelerating the UK's transition to Net Zero greenhouse gas emissions

Optimised assets and practices
Industry leading techniques for optimising assets and practices for energy networks

Flexibility and commercial evolution
Increasing the flexibility, transparency and efficiency of the energy system

Whole energy system
Joined up and efficient approaches across multiple aspects of the energy system

Principles and outcomes
Customer benefit, Collaboration, Carbon impact, Data and outputs, Scale up and roll out

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Fit for the Future

Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future

Fit for the Future (2021 – 2030)

Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future.

Sub Topic	Description	BAU Innovation	Allowance Innovation
Modernising Our Systems	Ensuring National Grid is operated utilising the latest in software and hardware across all its business functions. This also includes advances in wearable technology & smart PPE.	• Innovative modules and additions to existing core software packages • Asset data collection techniques • Pigging and corrosion monitoring • Storage solutions and data capture • Core systems updated • Drone applications • Monitor leaks from aircraft or drones • New methods of removing hazardous materials from site.	• Implement new systems specific to the gas industry • Bespoke analytics software • New methods of inspection • Studies into the effect hydrogen could have on the NTS • Smart drawings • 'In-field' data capture and visualisation • Digital twins and shadow control rooms • Research and trials into the latest prevention software • Swarm Robotics • Tools that remain in the network • Autonomous robotics on site, in-pipeline repair • Networks capable of notifying when a leak is occurring • Remote monitoring of emissions using AI driven solutions • Research and development centre on the site of a decommissioned site.
System Readiness and Advanced Analytics	Embedded systems require a feed of rich data, leading to the ability to drive advanced analytics. Innovative solutions are required to collect huge quantities of high quality data and analyse it to provide business insight.		
Asset Integrity Management	Confirming and maintaining the integrity of the National Transmission System (NTS) as the move towards a decarbonised energy system begins.		
Digitisation and Digital Twin	Migrating the large amount of hard-copy data and processes across GT and GSO into a digital format to facilitate more efficient interrogation. Investigating the part artificial intelligence can play in digitalisation.		
Cyber and Infrastructure	Protecting National Grid from the threat of cyber terrorism to all its operations.		
Robotics	Apply robotics to the operations of National Grid to automate functions or remove the need for the workforce to operate in hazardous environments.		
Leak Detection and Emissions Monitoring	Early detection of leaks on the network and effective methods of monitoring emissions across the network.		
Decommissioning	The safe, controlled and efficient decommissioning of redundant assets. Effective use of decommissioned assets to aid in the understanding of the NTS and decision-making for its future.		

Ready for Decarbonisation

Focusing strongly on how the NTS will transport a blended mix of ‘green’ gases and focus on future technology to better manage the assets we own

Ready for Decarbonisation (2025 – 2050)

Focus strongly on how the National Transmission System (NTS) will transport a blended mix of 'green' gases and focus on future technology to better manage the assets we own.

Sub Topic	Description	BAU Innovation	Allowance Innovation
Compressor Strategy	Making full use of the existing compressors to handle the changes in flow of gases around the NTS and looking towards mobile compressors.	• Small scale amendments to the existing compressor strategy • Data collection techniques • Proven and safe AR equipment for National Grid examples • On site 'smart' assets • Develop 3D printing techniques • Address legality issues • Small scale studies and trials • Increased use of Building Information Modelling (BIM).	• Mobile compressor units • Innovative algorithms • AI / ML packages • Investigating AI solutions to drive equipment reliability • Further applications of AR in the Utilities industry • Embedded sensors / wires on the pipeline • Integrated smart assets and dashboards • Printing out in the field • Self-healing paint • Alternative and maintenance free pipeline materials • New techniques and materials • Digital twins • Use of hydrogen machinery / generators.
Artificial Intelligence (AI) and Machine Learning (ML)	Using machines to automate tasks and making smart devices (AI) and for them to learn from the initial input of commands or information so they can make ongoing decisions without human intervention (ML).		
Augmented Reality (AR)	Accessing a virtual data source whilst carrying out a task by wearing a device the user can interact with.		
Smart Networks	Build on the sensor, robotics and new material industries to create a network that is aware of itself in terms of its operation and integrity.		
New Materials and Printing Parts	Research and trials into new materials that mimic the strengths of a material but none of the weaknesses. 3D printing of parts for the NTS both in workshops and out in the field.		
Decarbonising Construction	Driving down carbon emissions during all stages of construction from design, through build to considering the operation and maintenance once completed.		

Decarbonised Energy System

Working predominantly on hydrogen, we'll explore how the gas will interact with the NTS, how trading could be managed and whether direct offtakes for hydrogen can support the transport and commercial markets

Decarbonised Energy System (2021 – 2050)

Working predominantly on hydrogen: how hydrogen will interact with the National Transmission System (NTS), how trading could be managed and whether direct offtakes for hydrogen can support the transport and commercial market.

Sub Topic	Description	BAU Innovation	Allowance Innovation
Hydrogen Mix / Blending / De-blending	Understand the full potential of the NTS in terms of what blend of gases can be transported, how this will be facilitated, where will it come from and how it will be extracted.	• Transportation of a low per cent of blended gas across the UK • Extension of allowance funded projects to up-scale across the NTS • Small scale studies into transmission specific challenges • Small scale advances in current modelling technologies • Extension of allowance funded projects to up-scale across the NTS • Feasibility studies into potential connection points • Small scale studies into the impact of new markets • Studies into whether this technology is available • Feasibility studies into the impact and application of this technology.	• Can the NTS be used to transport up to 100 per cent hydrogen • Allow specific quantities of a blended gas to be extracted • Hydrogen connection and offtake studies • Detailed studies into the effect of hydrogen within the NTS • Detailed studies that would benefit the wider high pressure gas transportation industries • New demand forecasting techniques and processes • New modelling techniques • Specific studies on key areas that need to be addressed • Innovative software advancements for the SO business • Multi-scale trials of connecting customers to a supply of hydrogen • Research into ways the NTS could facilitate the trade of carbon and hydrogen around the UK or globally • Pilot schemes to trial the technology • Innovative CCS techniques including carbon mineralisation • Transport of carbon through the NTS • CO_2 removal from the atmosphere.
Impact of Hydrogen on NGGT	On a molecular level, hydrogen is very different to natural gas and its impact will need to be fully understood on all aspects of the network. This includes but is not limited to, gas velocities, energy densities and impact on electrical and mechanical equipment.		
Pipeline Safety Case	Our current safety case to transport natural gas has been established, however significant investment is required to prove the safety case with hydrogen in areas such as fracture propagation, thermodynamics and proximity distances.		
Whole System Demand Forecasting	Operating in a decarbonised energy system will require a full review of demand forecasting techniques and procedures. This will cover modelling scenarios with both hydrogen and natural gas, increased variability in supply and demand and network configuration options into the future.		
System Operation for a Decarbonised Energy Network	The current System Operator (SO) business is based around a natural gas market which will be subject to potential changes. This will cover metering, gas quality sampling, flow measurement, SCADA, billing, software and training.		
Hydrogen for Transport and Industry	Provide hydrogen or blended gases to fuel heavy transport networks such as rail, air, maritime and haulage industries. Provide large commercial customers with a direct supply of hydrogen or blended gases for their industries.		
Future Markets	Play an active role in any new gas markets that are set up to trade biogases, hydrogen or carbon dioxide.		
Hydrogen for Compressors and Power	Use of hydrogen within a compressor turbine and to power the prime movers used in compressor units. Providing hydrogen to power generation.		
Carbon Capture, Utilisation and Storage	The process of capturing waste carbon dioxide, transporting it to a storage location and safely locking it away to prevent the release into the atmosphere.		

2

Innovation Process for RIIO-2

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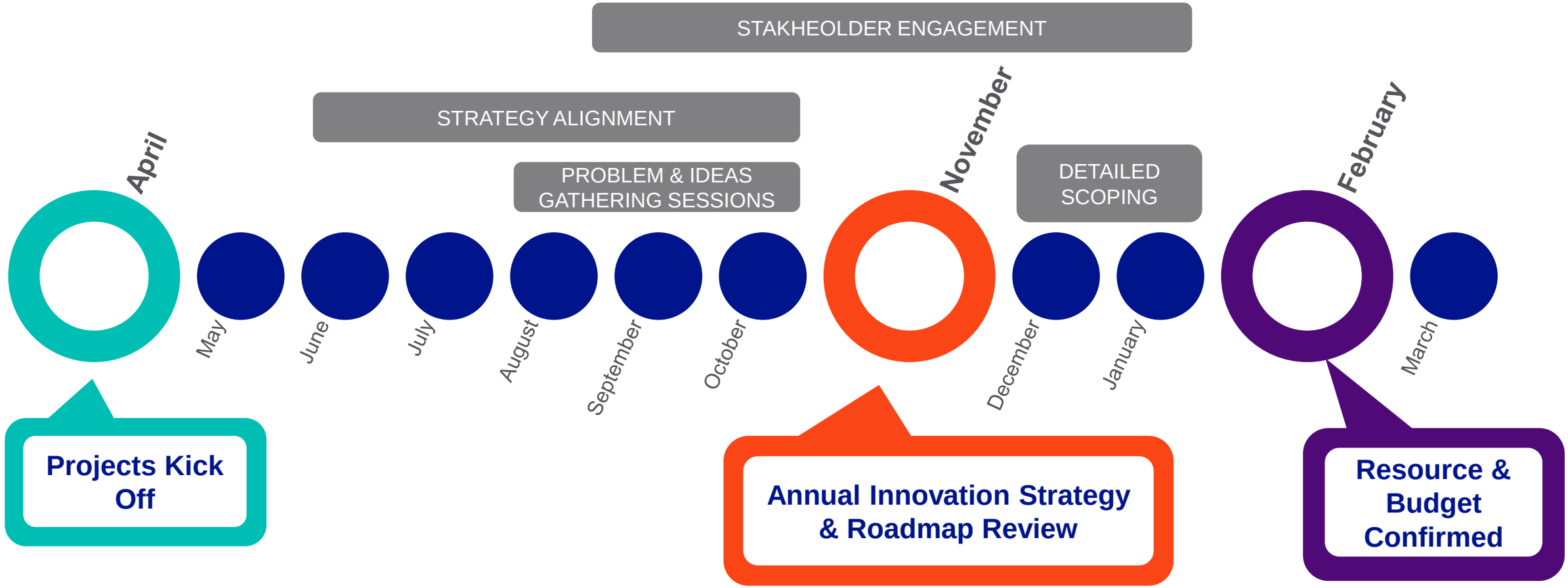
Innovation Annual Process

Build a focussed plan for the year ahead and detail the needs and benefits



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RIIO-2 Key Themes & Activities

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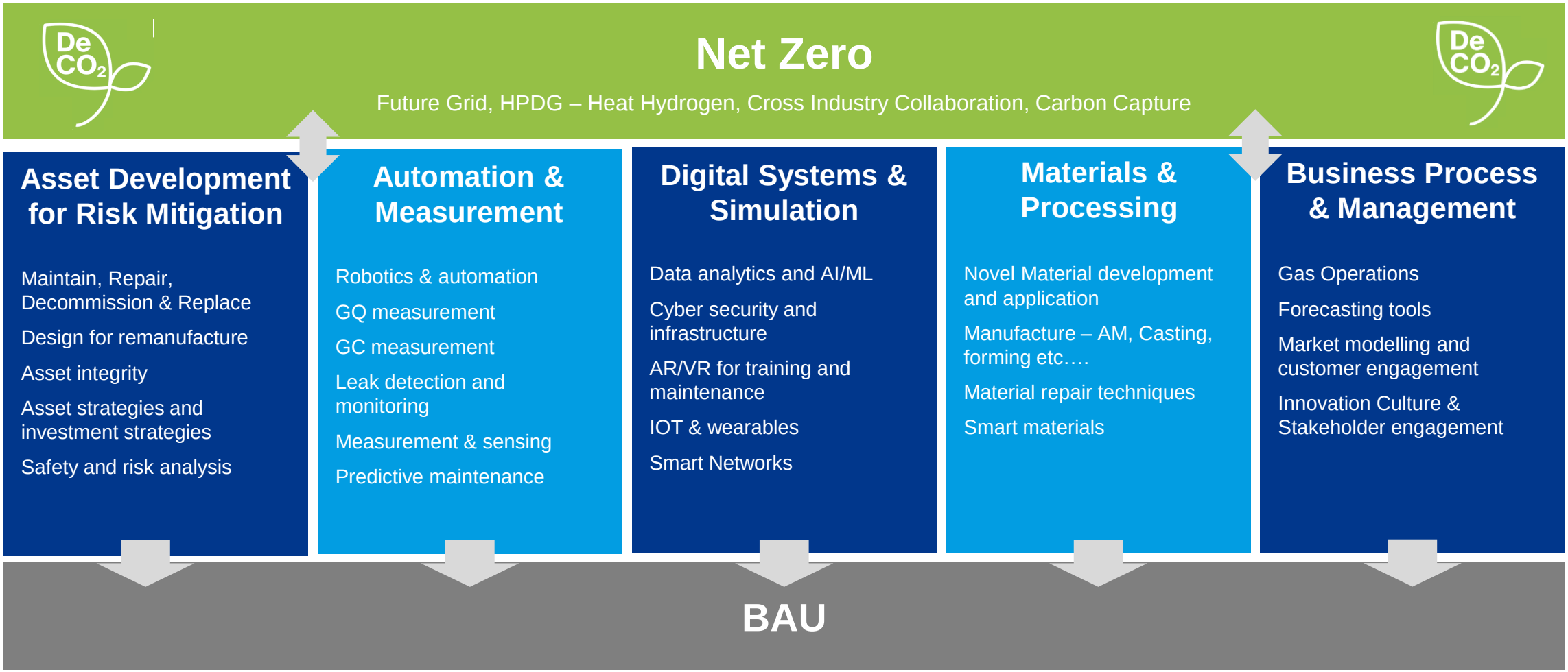
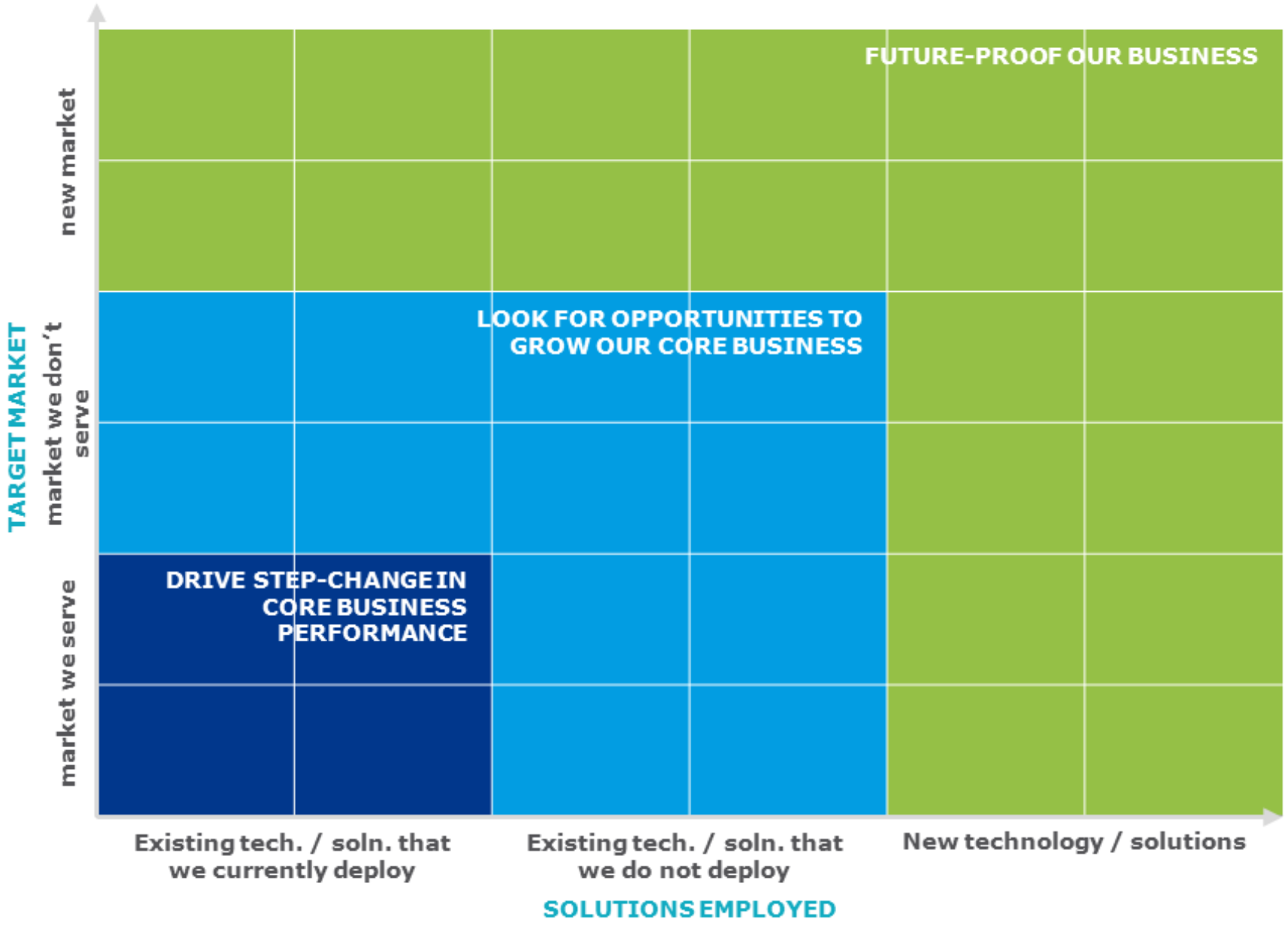
Innovation Technology Themes



Innovation Technology Landscape



4

RIIO-2 Innovation Roadmaps

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Gas Transmission

BREAK OUT GROUPS

Room 1 – **Asset Development** – Corinna Jones

Room 2 – **Automation & Measurement** – David Hardman

Room 3 – **Digital Systems** – Mat Currell

Room 4 – **Materials & Processing** – Feona Weekes

Room 5 – **Business Process** – Matt Nevin

Room 6 – **Net Zero** – Tom Neal

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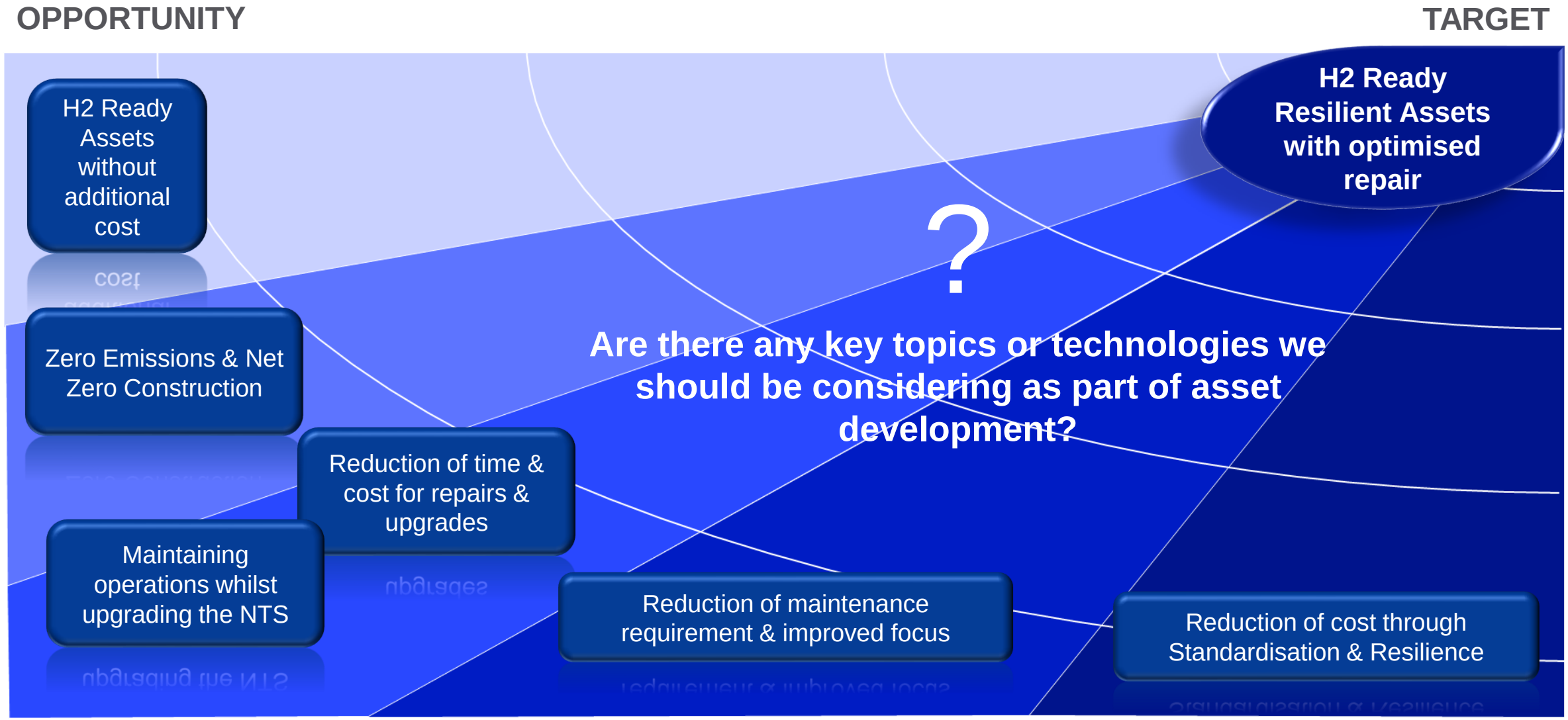
Asset Development for Risk Mitigation



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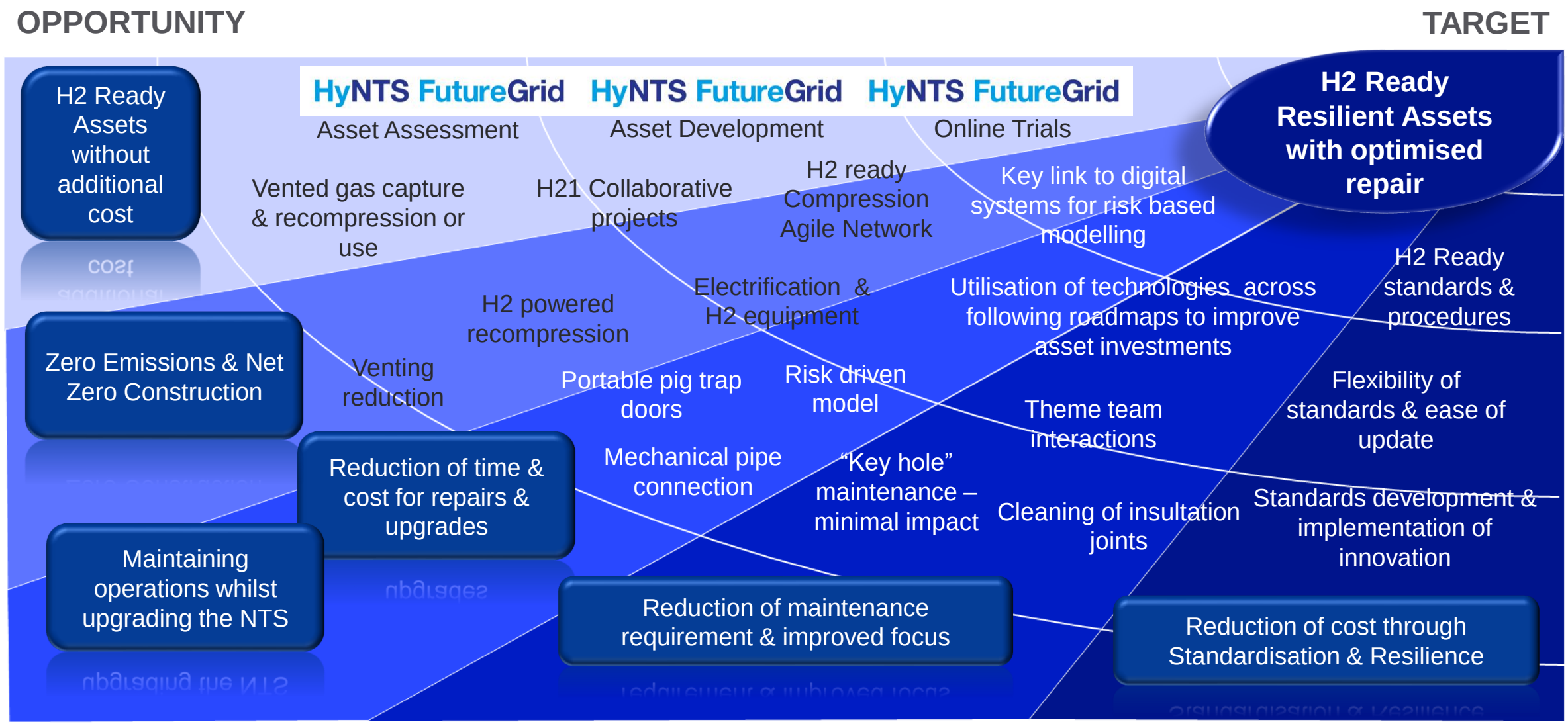
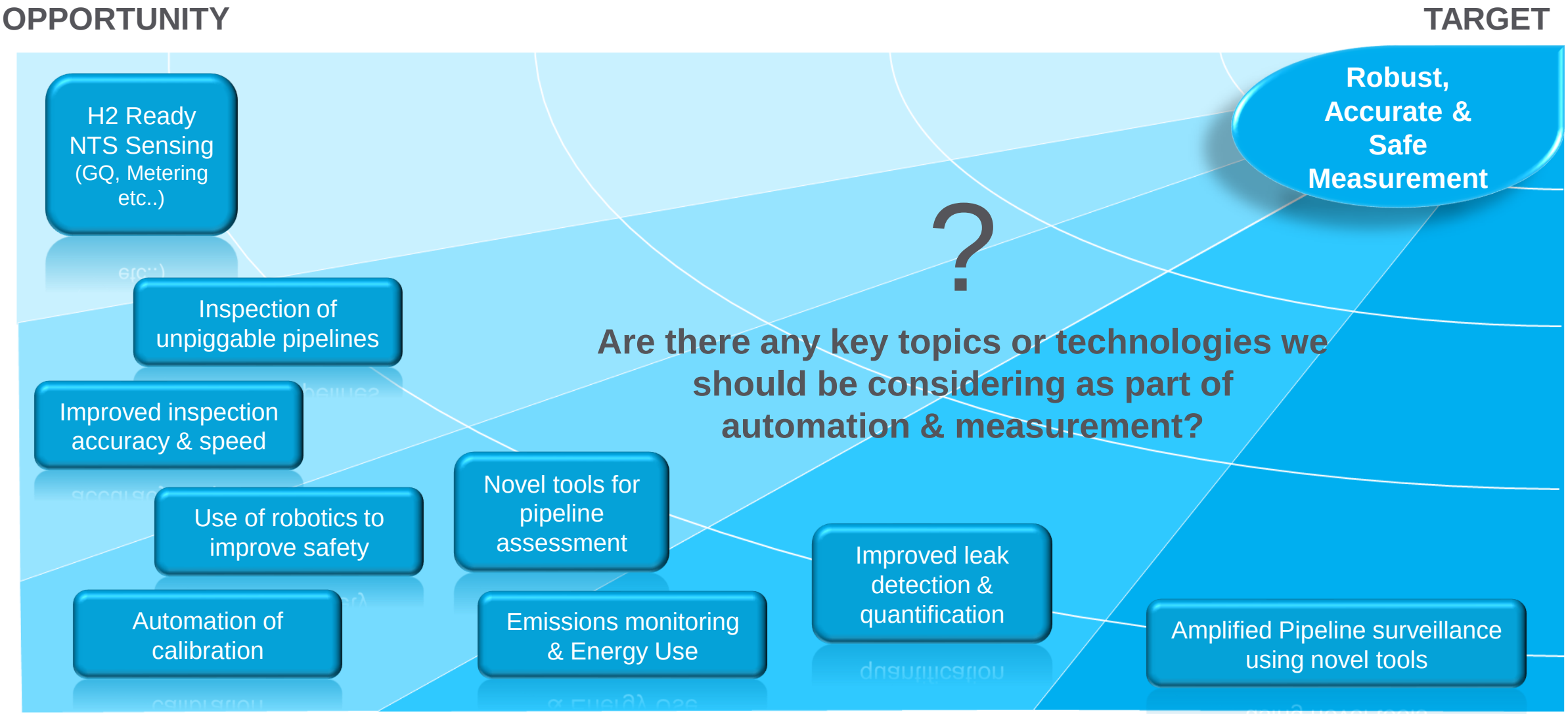
Asset Development for Risk Mitigation



Automation & Measurement



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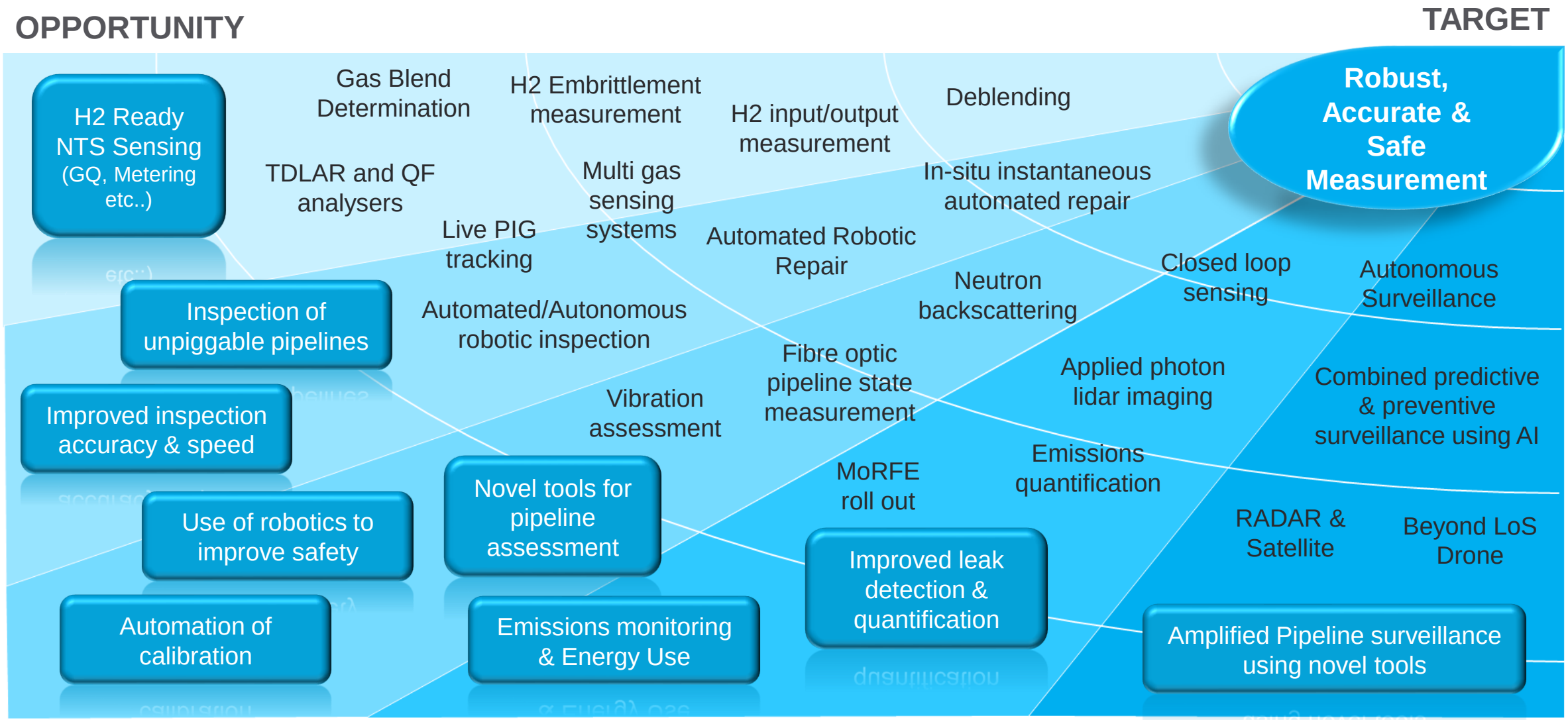
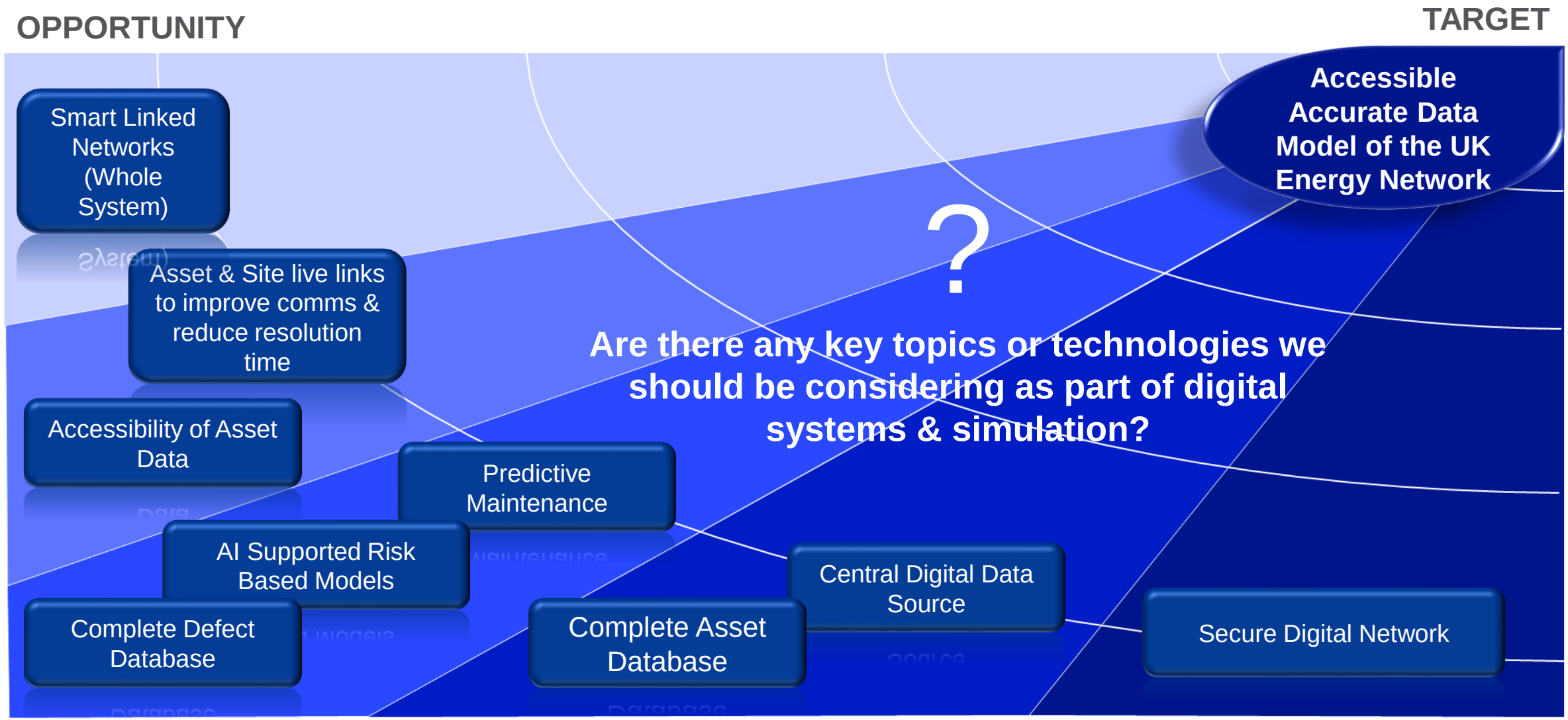
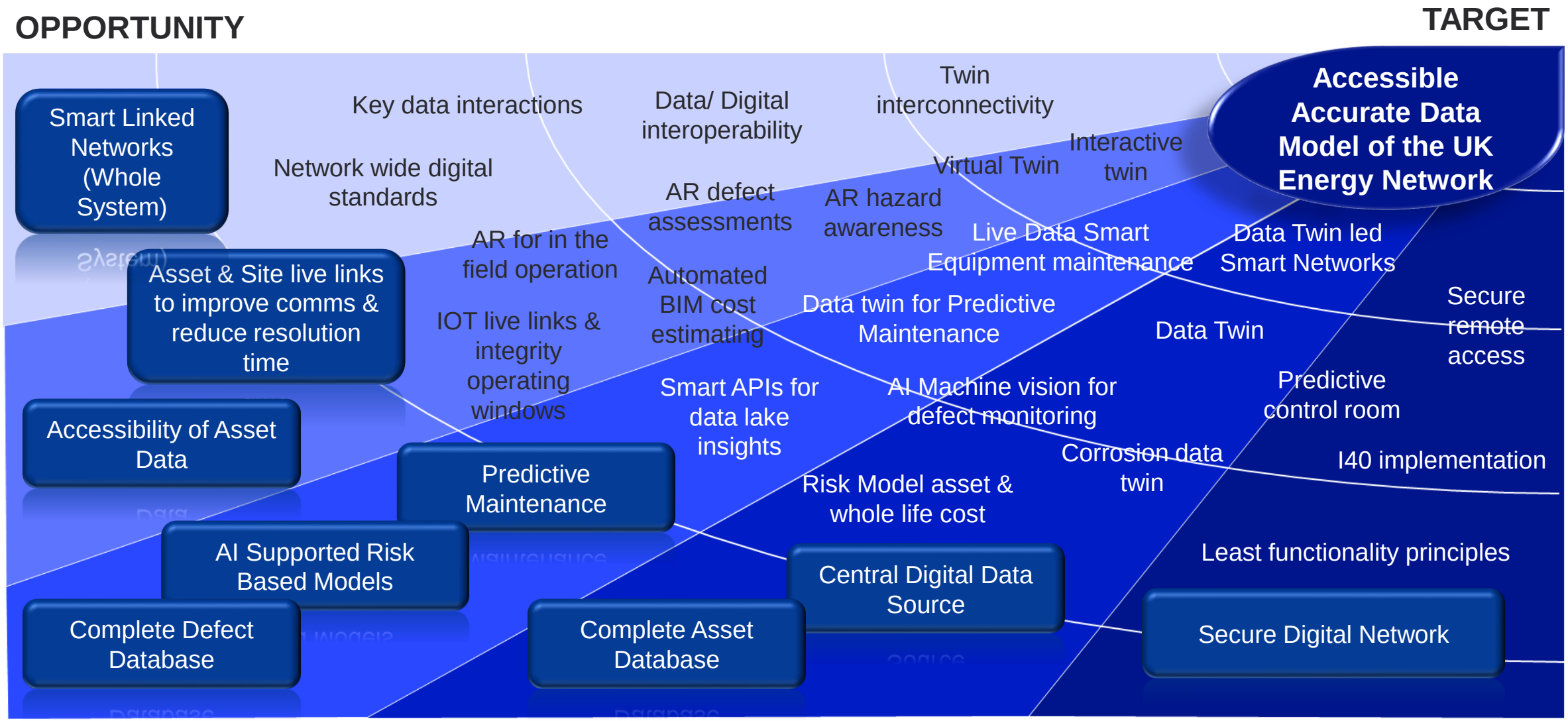
Automation & Measurement



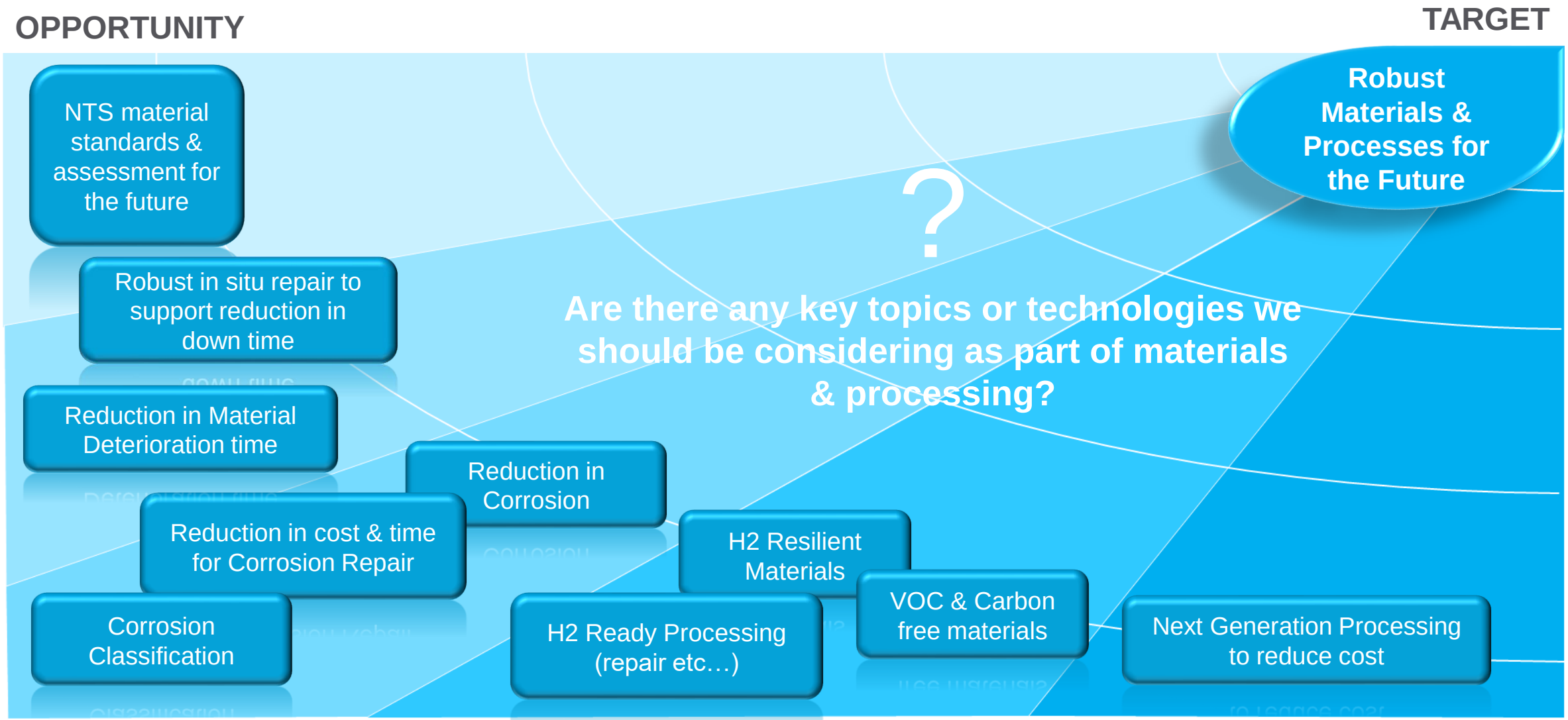
Digital Systems & Simulation



Digital Systems & Simulation



Materials & Processing



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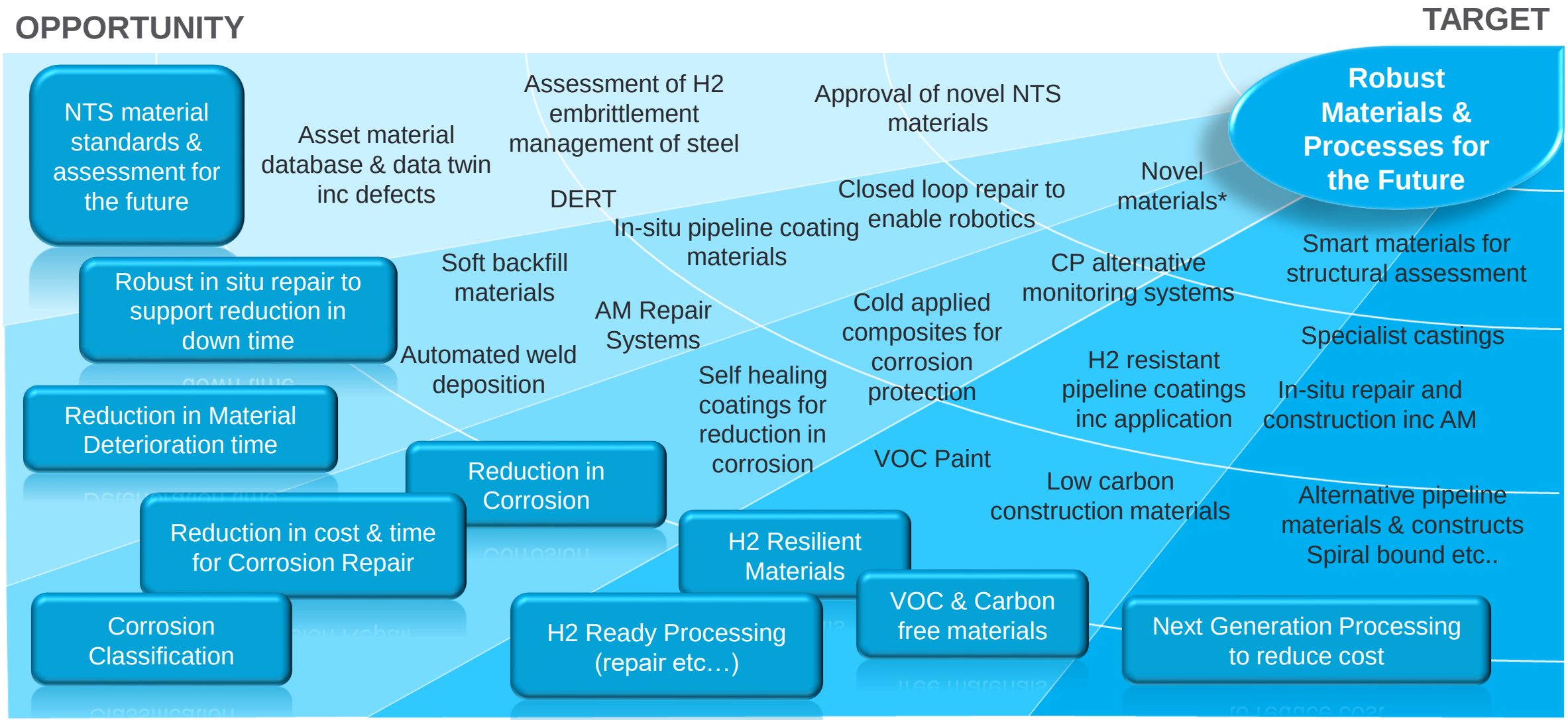
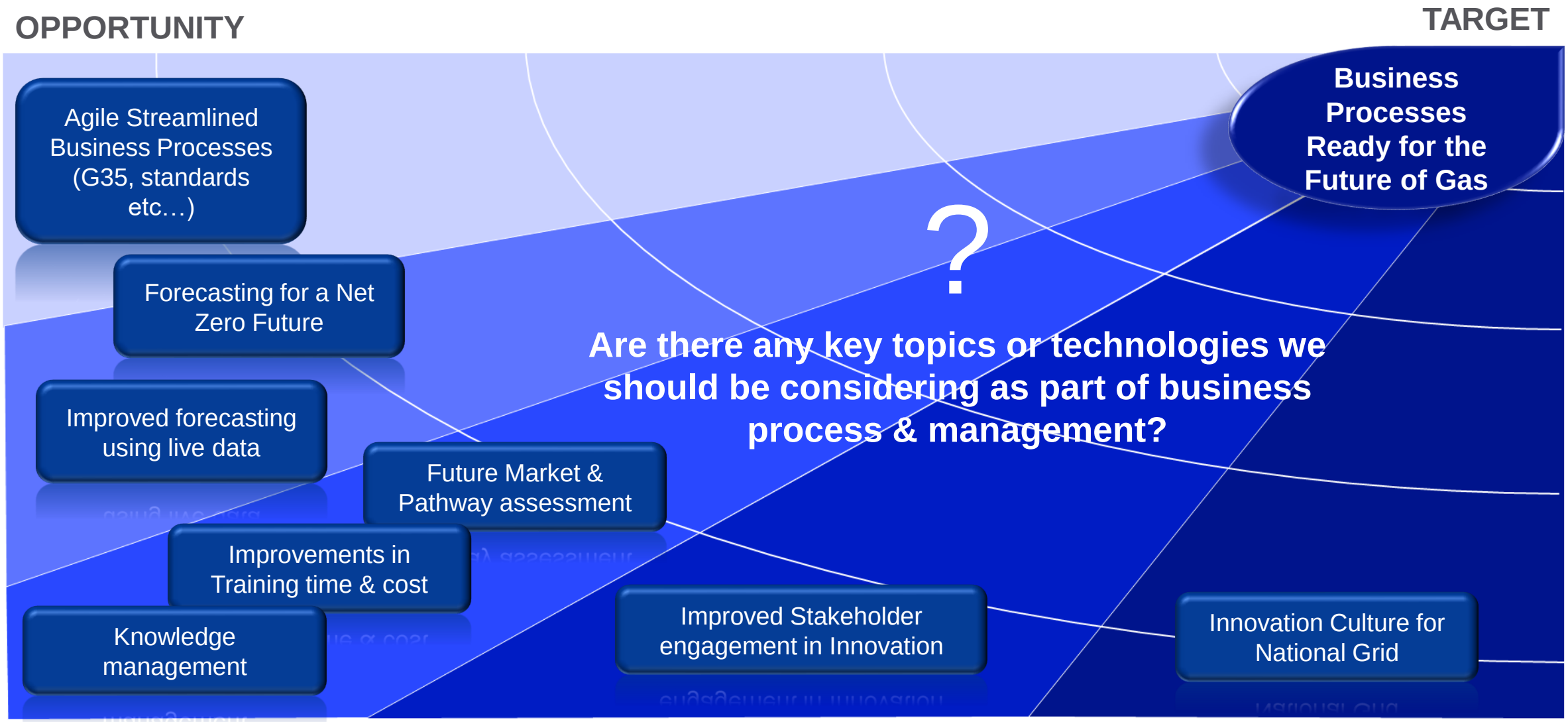
Materials & Processing



* Novel materials such as Bio composites, metal matrix composites, core materials etc…

Business Process & Management



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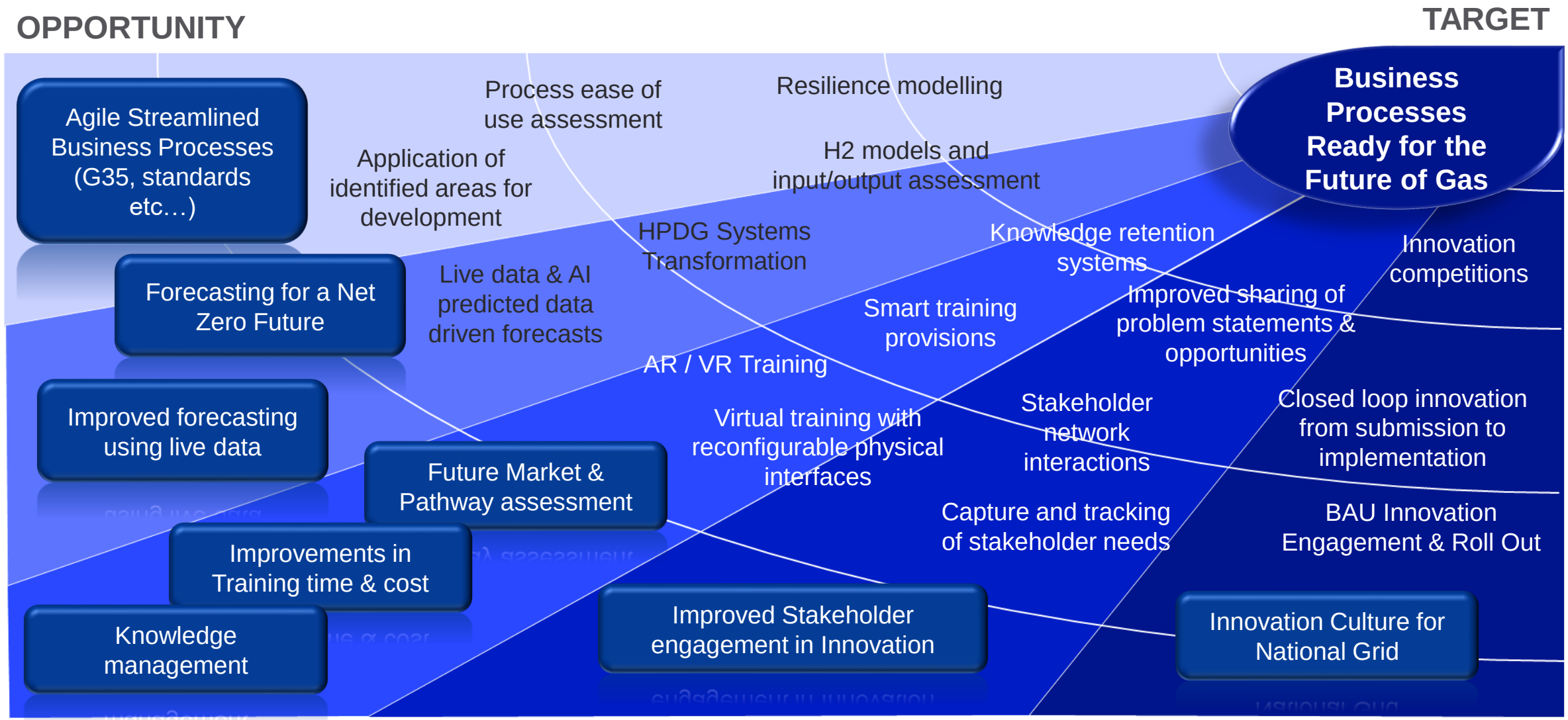
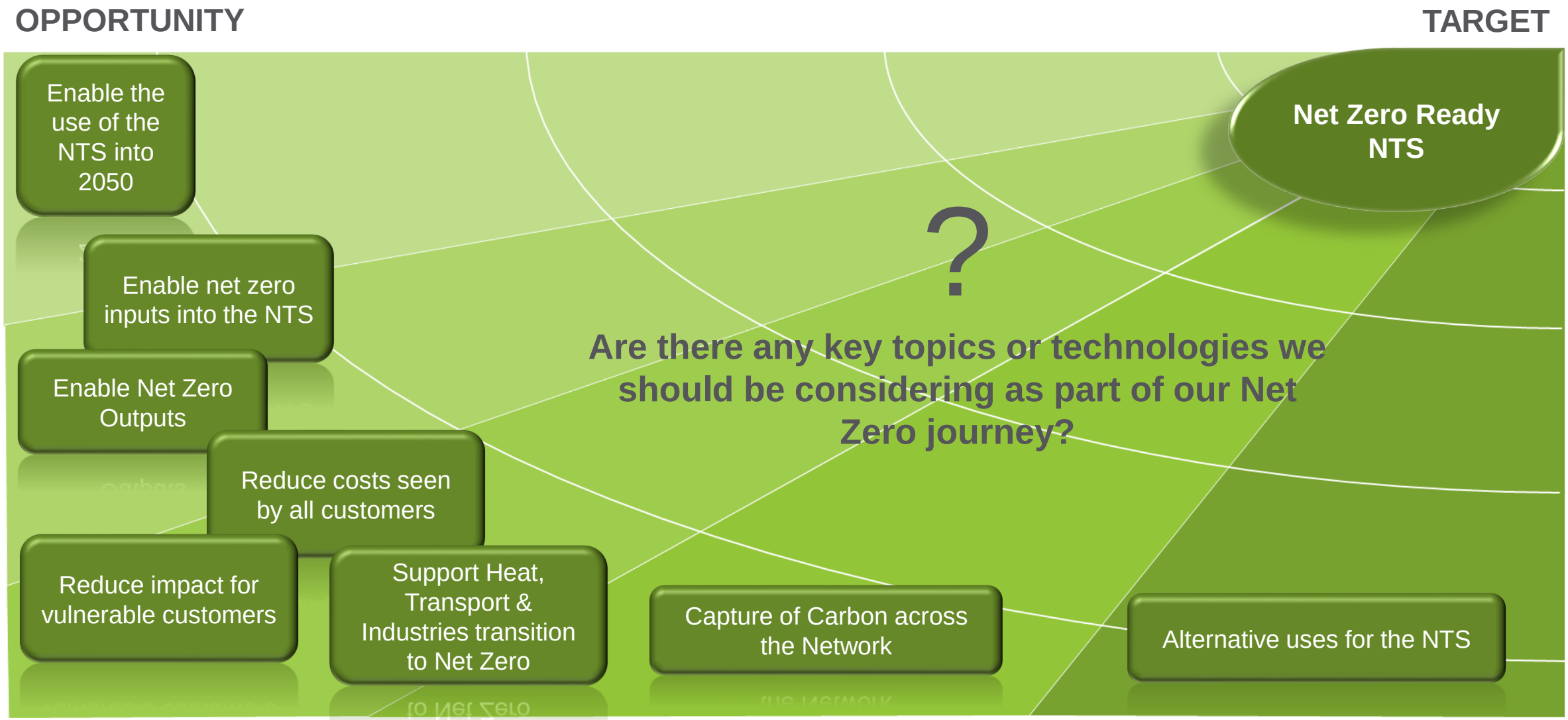
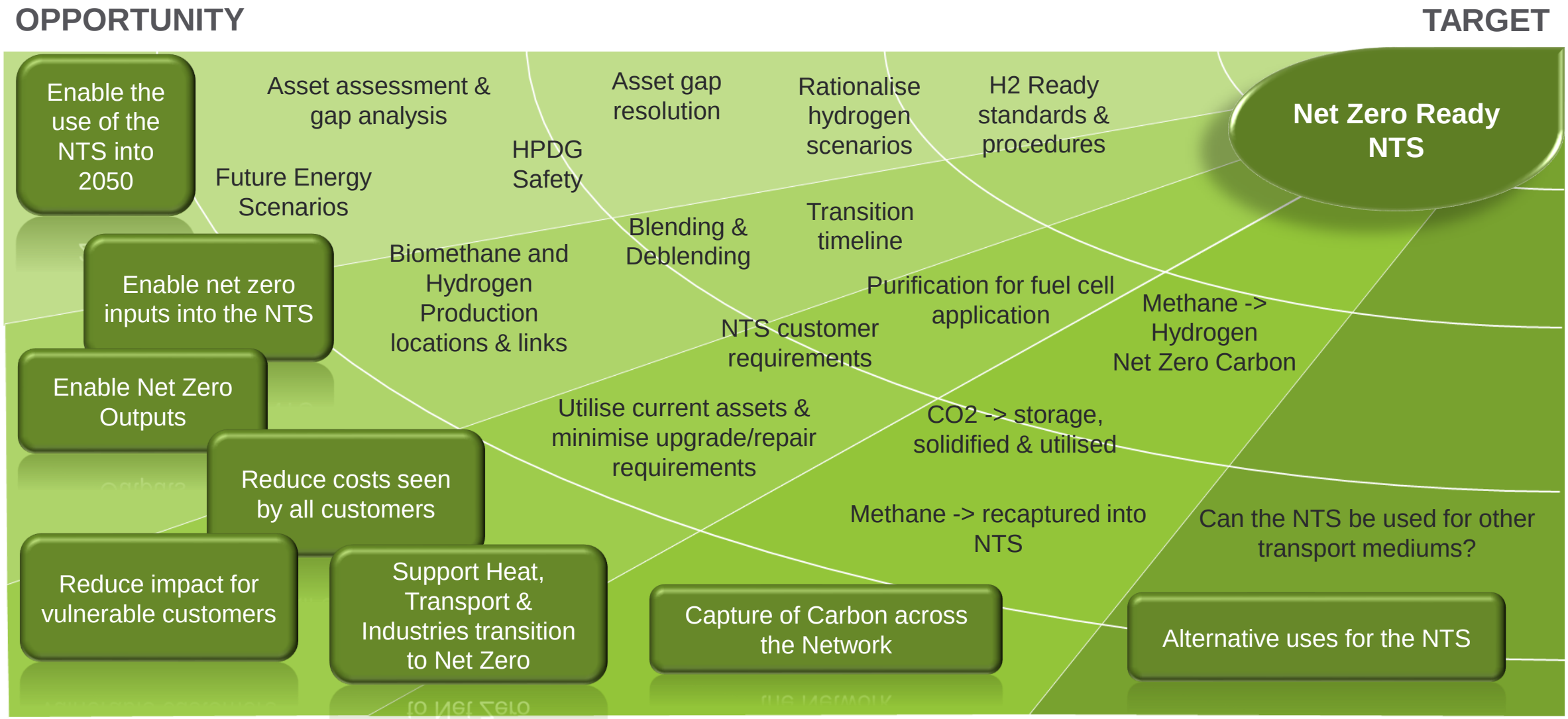
Business Process & Management



Net Zero


OPPORTUNITY
TARGET
Enable the use of the NTS into 2050
Enable net zero inputs into the NTS
Enable Net Zero Outputs
Reduce costs seen by all customers
Reduce impact for vulnerable customers
Support Heat, Transport & Industries transition to Net Zero
Capture of Carbon across the Network
Alternative uses for the NTS
Net Zero Ready NTS
?
Are there any key topics or technologies we should be considering as part of our Net Zero journey?

Net Zero



Summary of breakout sessions

Room 1 – **Asset Development**
Room 2 – **Automation & Measurement**
Room 3 – **Digital Systems**
Room 4 – **Materials & Processing**
Room 5 – **Business Process**
Room 6 – **Net Zero**

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Thank you for joining us today

Operating the network	Thu 05th Nov @ 10.30 – 11.30	Register here
Building skills today for a Net Zero	Mon 09th Nov @ 13.30 – 14.30	Register here
Reducing methane emissions: opportunities and barriers	Thu 12th Nov @ 11.00 – 12.00	Register here
Gas Markets Action Plan (GMaP)	Mon 16th Nov @ 10.00 – 11.00	Register here
Mapping our hydrogen transition	Wed 18th Nov @ 14.00 – 15.00	Register here
Net Zero construction2025/26 roadmap	Thu 19th Nov @ 10.00 – 11.00	Register here
Heating our homes in a Net Zero future	Fri 20th Nov @ 9.00 – 10.00	Register here
Planning the network	Mon 23rd Nov @ 14.00 – 15.00	Register here
HyNTS FutureGrid	Tue 1st Dec @ 14.00 – 15.00	Register here

5

How to get Involved?

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Steps to RIIO-2

I have an idea...

Get in touch

If you'd like to be added to our mailing list,
or have a question or idea you'd like to discuss,
just email **box.GT.innovation@nationalgrid.com**
Or find us on social media:

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