Research Roadmap 2021 Summary

BIOMETHANE

European Gas Research Group

GERG
THE EUROPEAN GAS RESEARCH GROUP

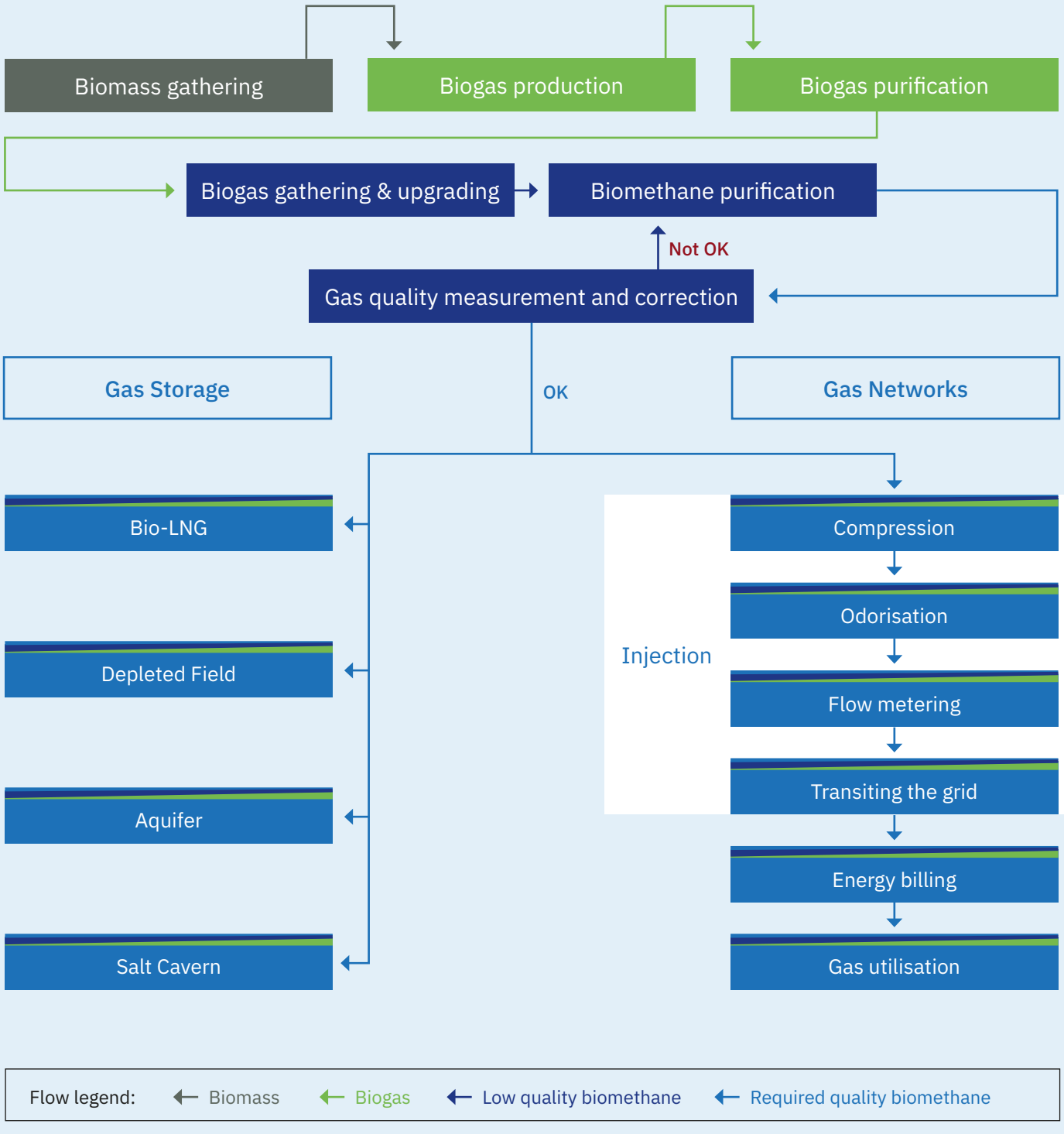
INTRODUCTION

Biomethane can contribute to **decarbonising the European energy system**, as it can be regarded as carbon neutral or even carbon negative depending on biomass source, production process, and factors such as carbon capture or CO_2 utilisation being applied in its lifecycle. Together with hydrogen, its development will allow us to increase the share of **renewable gases** in Europe.

The EU taxonomy explicitly recognises processes like anaerobic digestion as sustainable economic activities which therefore facilitates financing for biogas and biomethane projects. However, there is still a need for supporting policies, market guarantees and technology readiness to ensure a safe, efficient and cost-competitive large-scale deployment.

Figure 1 represents a schematic view of the biomethane value chain, with a specific focus on the flows: biomass, biogas and biomethane. This roadmap addresses every step involving a flow composed of biomethane (either in input or in output of a value chain element).

Figure 1: Biomethane value chain



BIOMETHANE TODAY & IN THE FUTURE

Despite of the very low share renewable gases have in today's total supply, Europe is gradually experiencing a remarkable growth in the production of biomethane. According to EBA's biomethane map 2020, 18 European countries were already involved in **biomethane production**.

Extensive research and development are required to guarantee a **seamless, safe and cost-efficient integration of biomethane in the grid**, while contributing to Europe's decarbonisation objectives. Example focus areas include the feedstock used for biogas **production** (agricultural, energy crops, landfill, among others), the most suitable **upgrading** technologies (membrane separation, cryogenic separation, pressure swing adsorption, among others) and **gas quality** (billing, trace components, metering, etc.). These and other topics are described with more detail in the roadmap.

GERG has been actively involved in research to remove barriers to biomethane introduction for many years, and is currently delivering a flagship project on behalf of **CEN/TC408** which looks to update the standards in a way that allows for maximum implementation levels without unduly penalizing the industry, particularly with regard to trace components. We also worked very closely with the Pipeline Research Corporation International **(PRCI)** in completing their research gap analysis, and both these project provide important input to our roadmapping process.

GERG'S RESEARCH ROADMAP PROCESS

The process is a **collaborative effort** by industry experts that **defines research and development gaps** and integrates the results of other ongoing initiatives in Europe and internationally. It will be used as a tool to inform the larger R&D community, as well as policy makers, facilitating the creation of targeted research projects.

Brainstorming phase

Gathering of insights from GERG industry professionals and experts.

Definition of research topics

Scoping of research knowledge gaps and evaluation of criticality.

Production of the roadmap

Summary of results and recommendations for the most prominent research topics.

Project creation in the GERG Programme Committees

Distribution and Utilisation

Transmission and Storage

LNG

THE NEED FOR FURTHER RESEARCH

The GERG Biomethane Research Roadmap focuses on two critical main areas: gas quality and value chain . With the help of experts in the sector, at GERG, we have identified the **gaps** and **challenges** to tackle in order to safely and efficiently integrate biomethane in European gas grids. More than **40 research topics** have been proposed, with different priorities and timeframes.

Value Chain

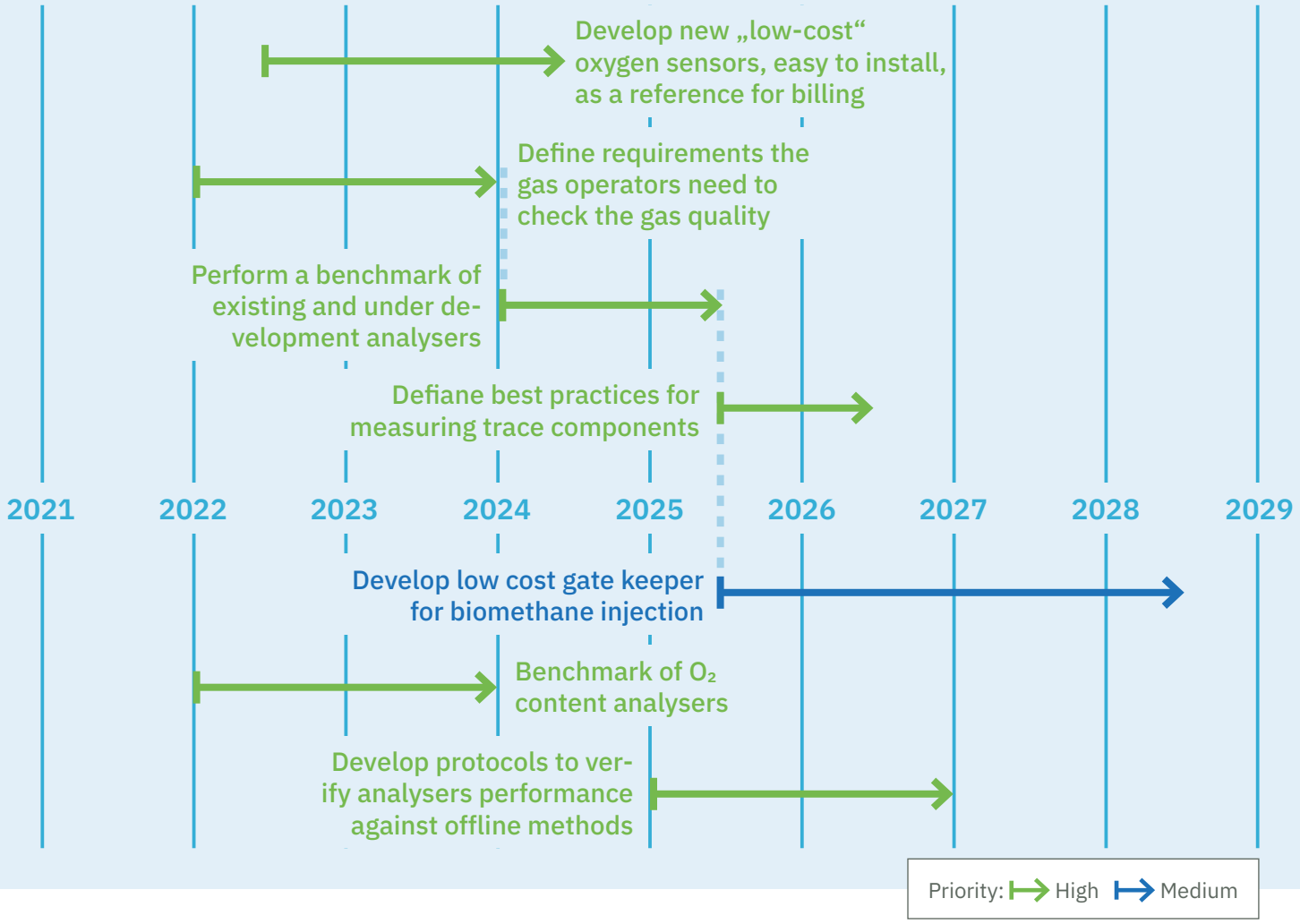
Upgrading and gathering
Injection
Storage
Methane emissions

Gas Quality

Overall gas composition
Impact of siloxanes
Sulphur and terpenes
Safety
Odorisation
Analysers and meters
Energy billing

Timeline example: R&D Topics Analysers and meters category (gas quality section)

Figure 2: R&D Topics Analysers and Meters Category



Key gaps and priorities identified

VALUE CHAIN

- Review of **purification/upgrading processes** based on the production/use needs.
- Guidelines on **biogas gathering** system.
- Benchmark about the technical aspects of **injection** adaptation to biomethane.
- Recommendations for managing **summertime production** (decision tree).
- Evaluation of formation (rock and water) damage due to **trace components**.
- **Oxygen removal** units for UGS and sensitive end-users.
- Sources of **methane emissions** from the biomethane **value chain** and their relative importance.
- **Emission factors** definition for biomethane assets through measurement campaigns.
- **Best practices** on measurement methods for biomethane plants.
- **GHG saving potential** of the biogas/biomethane industry.
- Best practices for all process blocks in order to **limit GHG emissions**.

GAS QUALITY

- **Data collection** on the distribution of biogas/biomethane production processes/feedstock used, and on the resulting composition of the gas.
- Possible **interaction** between several components (O_2, CO_2, sulphur, etc.).
- **Siloxanes** impact on sensors.
- Siloxanes impact on HDV engines.
- Evaluation of sources of **terpenes**.
- Limit value and impact of **terpenes** on elastomers.
- **Sulphur content** limit definition.
- Impact of **trace components** on corrosion and odorisation.
- Practical operating guidelines to prevent or mitigate **odour masking**.
- „low-cost“ **oxygen sensors**, easy to install, as a reference for billing.
- Gas operators **requirements** to check **gas quality**.
- Benchmark of existing and under development **analysers**; protocols to verify their performance against offline methods.
- **Best practices** for measuring trace components.
- Benchmark of **O_2 content analysers**.
- State of the art for energy **billing** practices in Europe.
- Regulatory requirements of **tracking** specifically for distribution and city grids.
- Trade-off between number of sensors and model **performance**.

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