# Study on the potential for implementation of hydrogen technologies and its utilisation in the Energy Community

## Potential in EnC Contracting Parties – preliminary study outcomes

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  - Moving to actions (a roadmap) and pilot projects

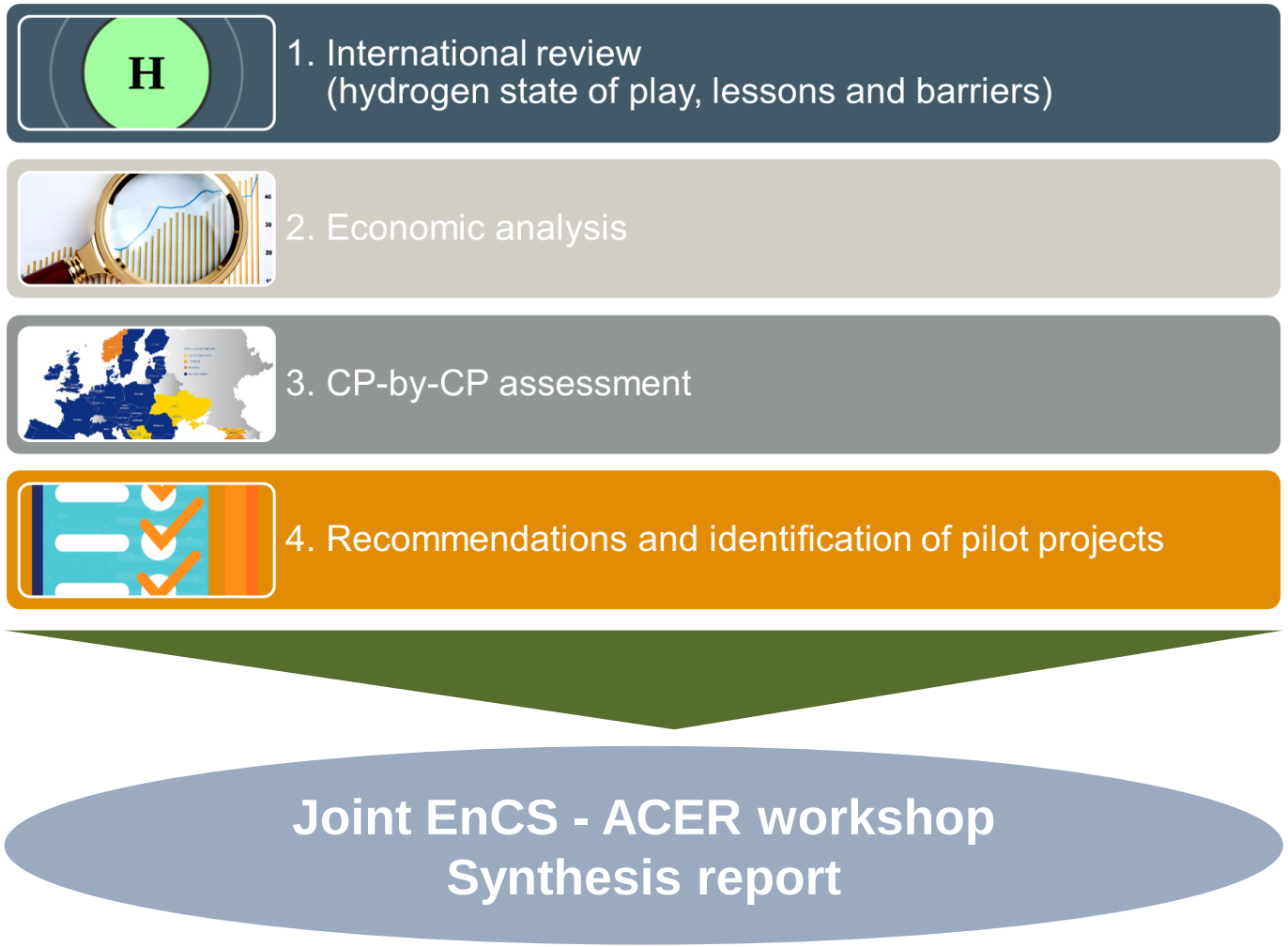
# Potential in EnC Contracting Parties – preliminary study outcomes

## Objectives of assignment and structure of tasks

Key findings from supporting reports
Bringing it all together – the synthesis report

# The study's purpose is to assess the potential of hydrogen production, transport and use in the Contracting Parties*

- Document and evaluate the **state of play** in more developed markets and in the CPs
- Draw on **findings and lessons** from international experience and identify **enabling** mechanisms for using hydrogen
- Identify **barriers and risks** to hydrogen deployment and mechanisms for addressing or mitigating against them
- Develop a set of **tiered recommendations** across project, national and Energy Community levels




*The Energy Community Contracting Parties are Albania, Bosnia and Herzegovina, Georgia, Kosovo*, Moldova, North Macedonia, Montenegro, Serbia and Ukraine*

# Potential in EnC Contracting Parties – preliminary study outcomes

Objectives of assignment and structure of tasks

**Key findings from supporting reports**

Bringing it all together – the synthesis report

# Key findings – international review

- **Hydrogen drivers**
  - Demand pull – net zero targets
  - Supply push – increasing commerciality
- **High potential or promising end use sectors**
  - Heavy duty transport
  - Heavy industry
  - Heating (where there is a natural gas grid)
- **Hydrogen policy frameworks and instruments**
  - Strategies and targets (commitment and direction)
  - No “silver bullet” (combination of policies)
- **Regional / country tailoring**
  - Renewable hydrogen / decarbonise heat / maximise wind potential
  - Hydrogen exports to substitute for LNG and coal
  - Hydrogen in transport / fuel cell vehicle industry

- **Opportunities for CPs**
  - Increasing demand for hydrogen in Europe
  - Global or regional trade in hydrogen
  - Existing demand sectors (fossil-based hydrogen)
  - EU policy and funding support
- **Risks of inaction by the CPs**
  - Uncompetitive industry (given increasingly tight decarbonisation requirements)
  - Lack of interconnectivity (eg in transport)
  - High import dependence

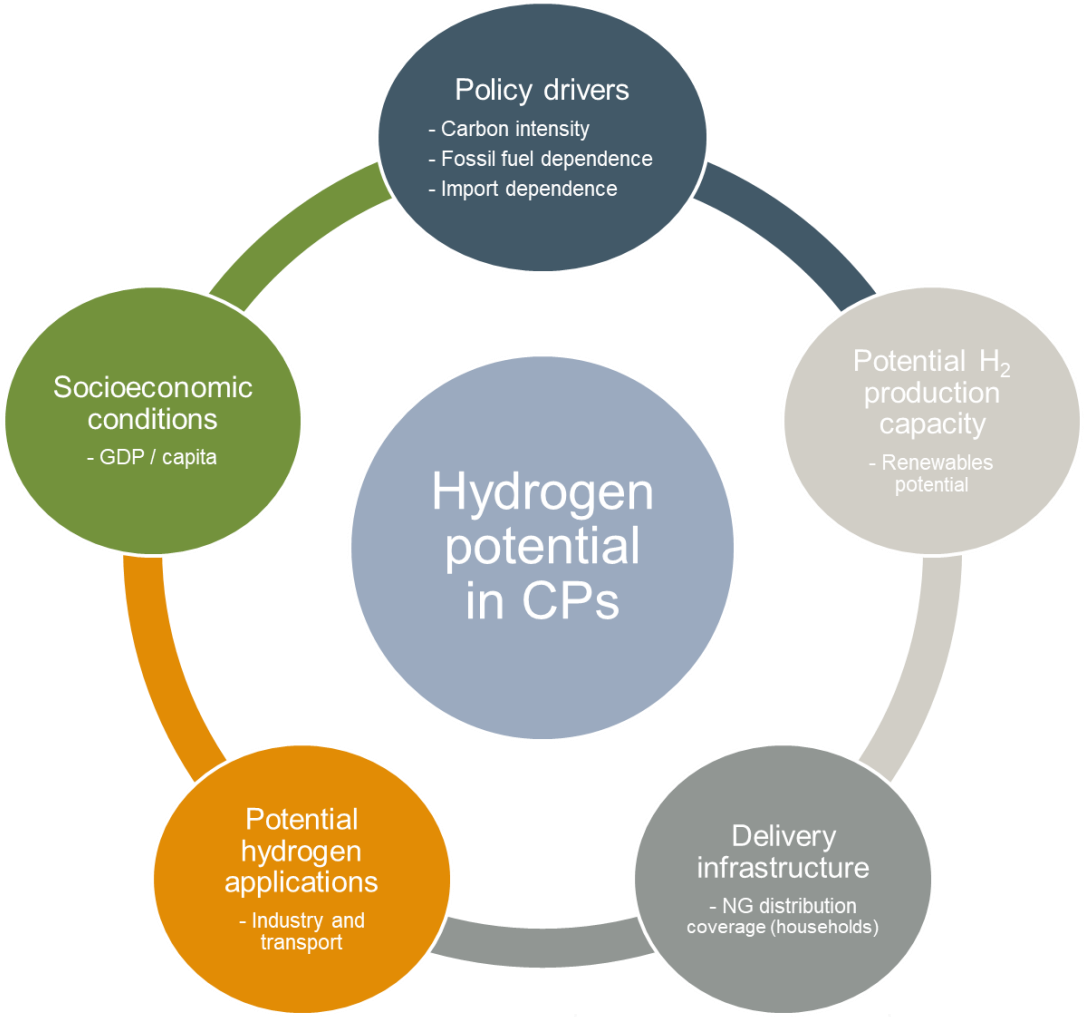
# Key findings – economic analysis

- **Transport**
  - Feasibility of **long-haul hydrogen trucking along dedicated routes** should be explored through pilot studies (eg in Serbia which has high diesel prices)
- **Industry**
  - For CPs with **coal-based ammonia production and without access to natural gas supply**, a combination of electrolysers with dedicated renewables and/or carbon prices could make renewable-based ammonia production economically competitive
  - In the **steel** sector, while more costly than traditional blast furnace production, direct reduction iron-electric arc furnace (DRI-EAF) using hydrogen offers **the prospect of supplying carbon-free steel**

- **Power and storage**
  - Hydrogen in future (~ by 2035) could offer a **lower LCOE than BESS at discharge durations above eight hours**
  - For lower capacity factors (under 15%), hydrogen storage is expected to be cost competitive with CCUS-fitted OCGT / CCGT units following full commercialisation
    - More favourable conditions (higher natural gas prices and lower hydrogen production costs) could see **hydrogen competitive for capacity factors up to around 30%**
- **Heating**
  - Low probability that hydrogen can be an economically competitive heating option, but **could be favoured where there is an existing gas distribution network**

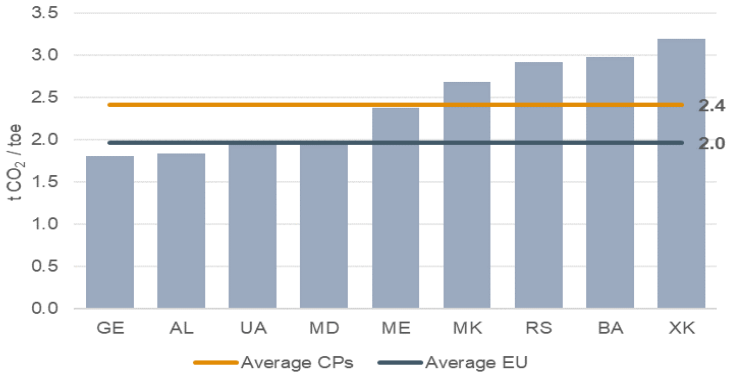
# Comparative assessment - our evaluation approach identifies some critical factors that could underpin hydrogen adoption

1. **Policy drivers –** the higher the carbon intensity and fossil fuel dependence, the greater the imperative to examine decarbonisation options
2. **Potential hydrogen production capacity –** renewables remain largely untapped in the CPs and could potentially be harnessed to produce hydrogen
3. **Delivery infrastructure –** natural gas pipelines likely to be the lowest cost option for delivering hydrogen to end users
4. **Potential hydrogen applications –** existing industries such as refining, ammonia and steel and new applications such as transport
5. **Socioeconomic conditions –** ability to adopt and/or support the development of newer technologies

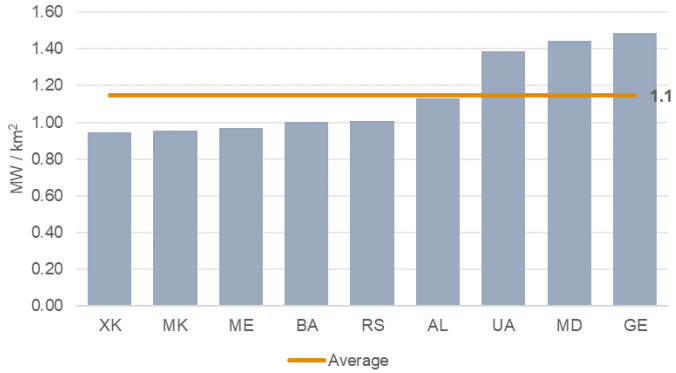


# Comparative assessment – none of the CPs scores unambiguously higher against all the assessment parameters

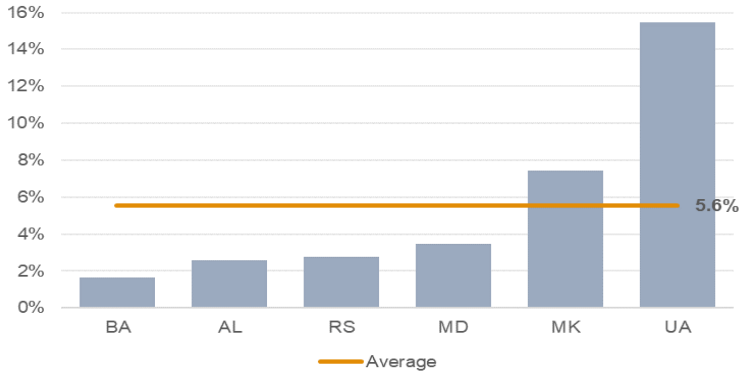
## Carbon intensity



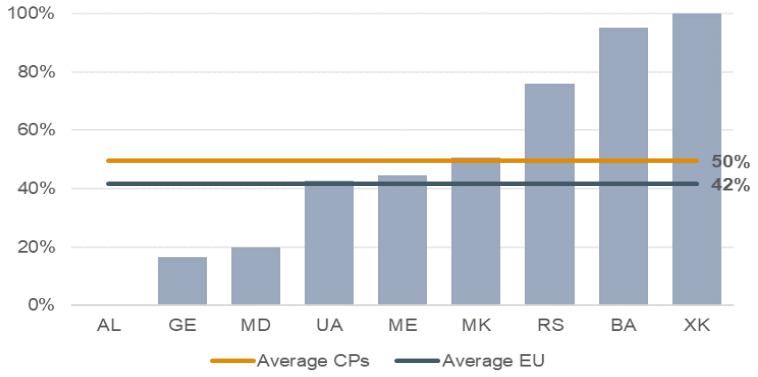

## Renewable energy technical potential



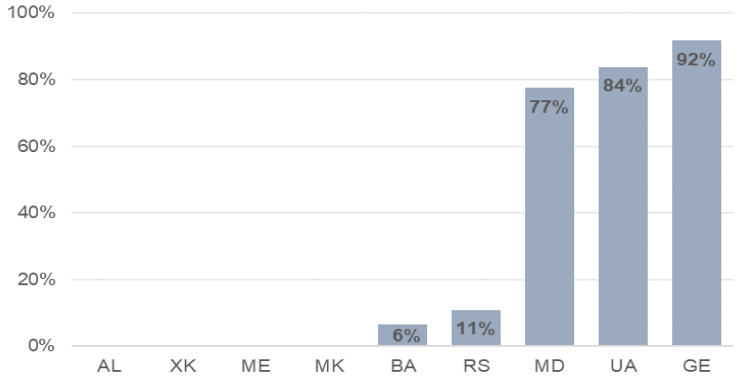

## Share of key industrial applications in total output



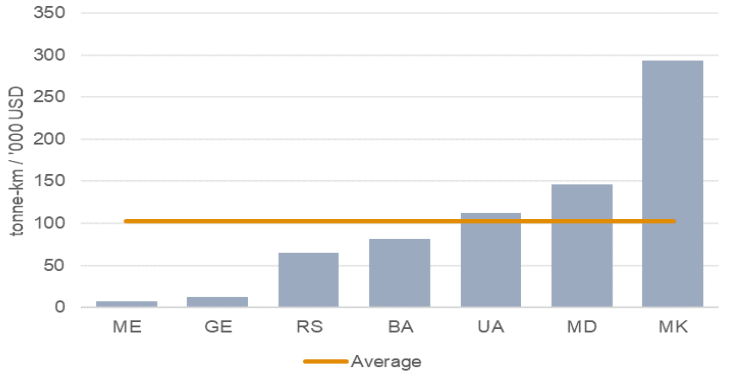

## Fossil fuel share in electricity demand




## Households connected to gas network



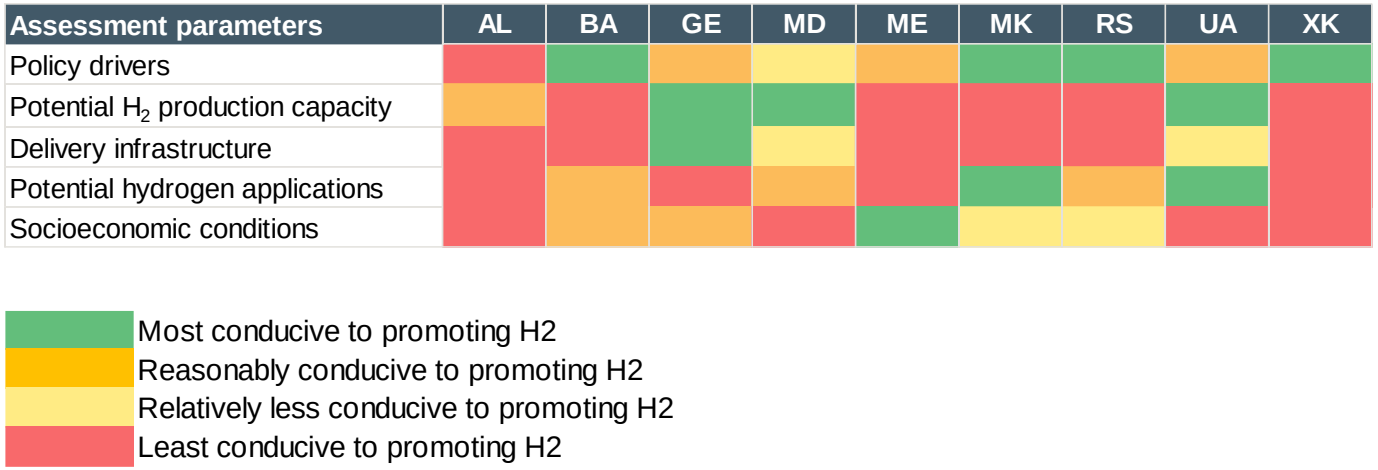

## Road freight transport per unit of output




*Data sources: International Energy Agency, Eurostat, UNDP, Energy Community Secretariat, CP statistical agencies, World Bank*

# Comparative assessment - relative appraisal of CP prospects of introducing hydrogen

- Decarbonisation should be featuring as a **priority** for the CPs
- The theoretical **potential for producing hydrogen** from renewables appears to be medium to high in most CPs
- Matching producers and users of hydrogen is likely to be the largest challenge for most of the CPs given the **lack of existing infrastructure**
- Many of the CPs have a **significant share** in their total output **of industrial applications** favouring the use of hydrogen **and freight transportation**




- The relatively limited economic capacity of the CPs could act as a constraint on promoting hydrogen

# Potential in EnC Contracting Parties – preliminary study outcomes

## Objectives of assignment and structure of tasks
## Key findings from supporting reports

## Bringing it all together – the synthesis report

# Summary of preliminary findings and interlinkages

## International review

- **Decarbonisation** agenda creating policy in support and increased demand
- **Industrialisation advances** bringing down costs but future levels remain uncertain
- **Storage is critical** and cheaper where underground options are available
- **Several end-uses of interest** with industry, transport, power and heating leading the way
- Range of ongoing **pilot projects** in EU across the full value chain

## Economic analysis

- **Transport** interest led by **long-distance freight**
- **Industry** focused on **ammonia, steel and methanol** (especially where competing with **coal**)
- **Power generation** is most competitive as **peaking plant** and discharge durations needed of **>8 hours**
- **Heating** of potential interest to CPs with existing/planned **gas distribution grid**
- **Significant carbon price** still needed (directly or indirectly via other support)

## Comparative assessment

- **Transport corridors** open opportunities for long-distance freight → **UA, RS>XK>MK**
- **Industrial base** in relevant sectors → **UA, MK**
- **Policy drivers** strongest where coal use greatest → **RS, BA, XK,** but also import dependency → **GE**
- **Delivery infrastructure** for distribution → **GE, UA, MD** (but others joining)
- **Economic RES** potential for competitive production → **GE, UA, MD, AL**

Draw on three studies to develop “cohorts” of most attractive end-use and CP combinations

# Cohort 1 – Transport corridors for long distance freight

## International review

- **Example countries:** Norway and Japan
- **Pilot project:** heavy duty vehicles with filling stations → carbon free e-mobility system in Switzerland

Draw on three studies to de

## Economic analysis

- **Transport** interest led by **long-distance freight**

## Comparative assessment

- **Transport corridors** open opportunities for long-distance freight → **UA, RS>XK>MK**

### Cohort 1

- Examines the most attractive transport corridors for long-distance freight
- Analysis remains underway → to assess freight volumes and long-term potential
- Expected to include UA and corridor from RS to MK
- Potential for cooperation on pilot project between CPs where corridors extend across jurisdictions

# Cohort 2A – Industrial use for ammonia, steel and methanol

| International review | Economic analysis | Comparative assessment |
|---|---|---|

- **Example country:** Germany
- **Pilot project:** H2Future in Austria focusing on Voestalpine steel manufacturing site but also providing grid services

Draw on three studies to de

**Cohort 2A**

- **Industry** focused on **ammonia, steel and methanol** (especially where competing with **coal**)
- **Industrial base** in relevant industries → **UA, MK**

- Looks at where most promising industries are most heavily concentrated
- UA and MK are stand-out CPs for relevant industries, although steel making is widespread in the region
- Hydrogen more competitive where coal is the counterfactual (RS, BA, XK)

# Cohort 2B – Power generation and grid services

## International Review

- **Example country:** Netherlands
- **Example project:** the proposed conversion of the 1.32 GW Magnum CCGT plant in Netherlands to 100% hydrogen

Draw on three studies to de

## Economic analysis

### Cohort 2B

- Lack of low carbon flexible generation options (particularly hydro but also natural gas)

- **Power generation** is most competitive as **peaking plant** and discharge durations needed of **>8 hours**

- High $CO_2$ emissions
- Coal dependency in RS, BA and XK elevates
- Import dependency for power also concern → GE (hydro very seasonal resulting in spillage and import cycles)

## Comparative assessment

- **Policy drivers** strongest where coal use greatest → **RS, BA, XK,** but also import dependency → **GE**

# Cohort 3 – Blending or replacing natural gas for heating

| International review | Economic analysis | Comparative assessment |
|---|---|---|

- **Example country:** United Kingdom
- **Example pilot projects:** HyDeploy in UK (delivery to homes) and White Dragon in Greece (district heating)

**Cohort 3**

- Adoption of hydrogen space heating boilers a consideration with gas distribution infrastructure
- GE, UA and MD have networks in place while others (notably MK) have them in development or planning

- **Heating** of most interest where existing or planned **gas distribution grid** exists
- **Delivery infrastructure** for distribution → **GE, UA, MD** (but others joining

- Consider integrating dual fuel capability during development stage, as marginal cost is low
- District heating an additional consideration → may be stacked with industrial off-take

Draw on three studies to de

# Cohort 4 – hydrogen production for export

| International review | Economic analysis | Comparative assessment |
|---|---|---|

- **Example country:** Morocco
- Has signed an MoU with Germany for exports

**Cohort 4**

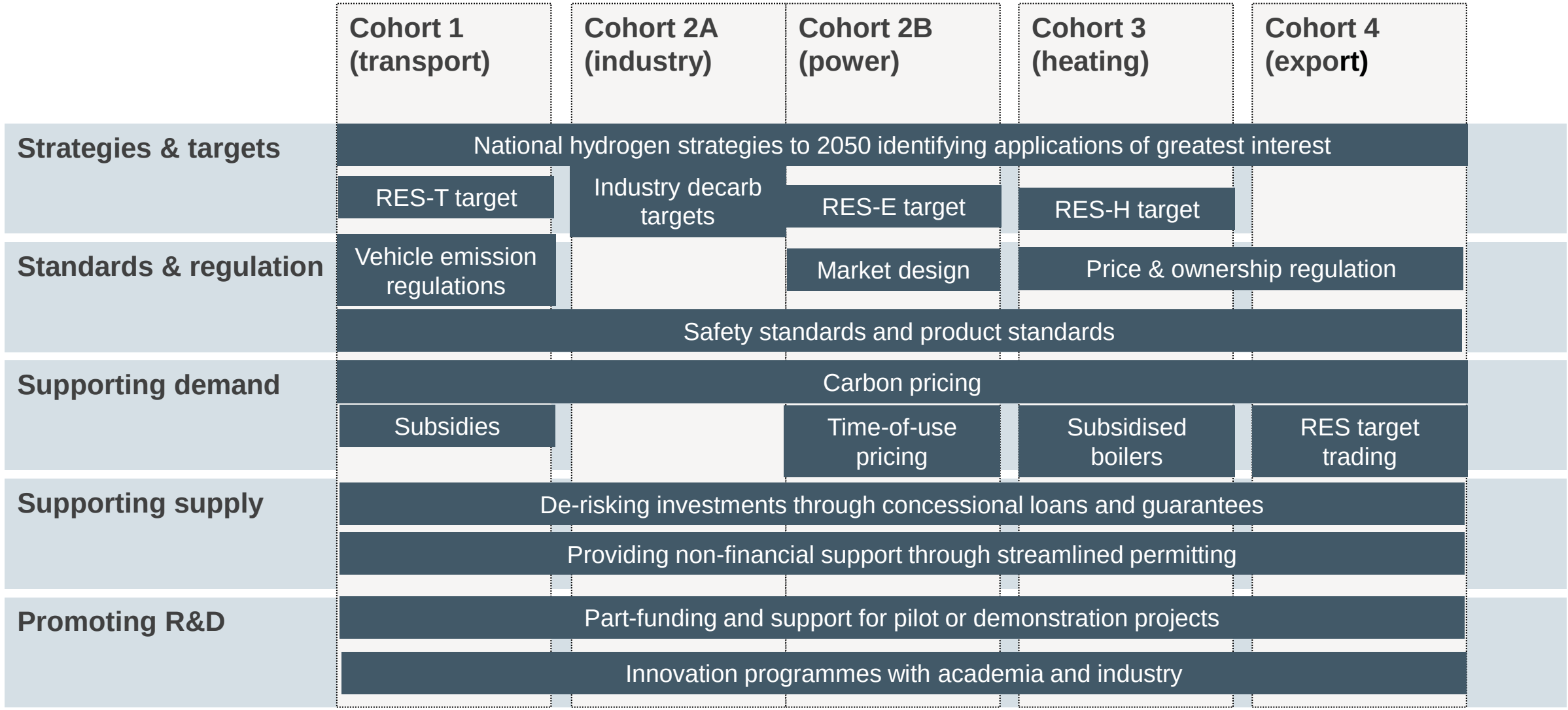
- Low cost and extensive RES potential clearest in GE, UA, MD and AL
- Export of hydrogen from GE (at least to EU) is relatively complex due to locality
- Pipeline delivery from UA, MD or AL will require studies on capability and upgrade requirements

- **Significant carbon price** still needed (directly or indirectly via other support)
- **Economic RES** potential for competitive production → **GE, UA, MD, AL**

- Internal trading between CPs also a potential consideration (eg UA sales to RS)

Draw on three studies to de

# Potential policy pathways (preliminary examples)



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