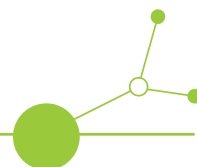


Regional Strategy for H2- Ready Regions - Ústí Region Transnational Context



Version 3
03 2026





Obsah

1. INTRODUCTION	3
1.1. PURPOSE, SCOPE AND ROLE OF THE REGIONAL STRATEGY.....	3
2. EUROPEAN CONTEXT OF ENERGY TRANSITION AND HYDROGEN DEPLOYMENT	4
2.1. HYDROGEN AS A STRATEGIC ELEMENT OF THE EUROPEAN ENERGY TRANSITION	4
2.2. INTEGRATED DEPLOYMENT AND REGIONAL HYDROGEN READINESS	5
2.3. REGULATORY, COMPETITIVENESS AND SEQUENCING CONSTRAINTS	5
3. SOCIO-ECONOMIC AND INDUSTRIAL PROFILE OF THE ÚSTÍ REGION	6
3.1. SOCIO-ECONOMIC VULNERABILITY, HUMAN CAPITAL AND ACCEPTANCE	6
3.2. TERRITORIAL DIFFERENTIATION AND SEQUENCING IMPLICATIONS	6
4. ENERGY SYSTEM CHARACTERISTICS AND DECARBONISATION CONSTRAINTS.....	7
4.1. SYSTEM INTEGRATION, INFRASTRUCTURE AND COST CONSTRAINTS	7
4.2. ENERGY SECURITY, SPATIAL AND ENVIRONMENTAL CONSTRAINTS.....	7
5. HYDROGEN AS A STRATEGIC INSTRUMENT FOR REGIONAL TRANSITION AND COMPETITIVENESS.....	8
5.1. STRATEGIC ROLE OF HYDROGEN IN REGIONAL INDUSTRIAL TRANSITION	8
5.2. SELECTIVITY, SYSTEM INTEGRATION AND THE HYDROGEN VALLEY LOGIC.....	8
5.3. INVESTMENT MOBILISATION AND MANAGED TRANSITION UNDER UNCERTAINTY.....	9
6. HYDROGEN VALUE CHAIN ASSESSMENT: SUPPLY-INFRASTRUCTURE-DEMAND INTEGRATION.....	9
6.1. INTEGRATED VALUE CHAIN LOGIC AND SYNCHRONISATION CHALLENGE	9
6.2. HYDROGEN SUPPLY AND INFRASTRUCTURE SEQUENCING.....	10
6.3. DEMAND ANCHORING: INDUSTRY AND MOBILITY.....	11
6.4. CROSS-CUTTING ENABLERS AND OVERALL FEASIBILITY ASSESSMENT	12
7. GOVERNANCE, STAKEHOLDER COORDINATION AND INSTITUTIONAL CAPACITY.....	13
7.1. GOVERNANCE AS AN ENABLING CONDITION FOR HYDROGEN DEPLOYMENT.....	13
7.2. REGIONAL STAKEHOLDER COORDINATION AND THE HYDROGEN PLATFORM	14
7.3. MULTI-LEVEL GOVERNANCE, PERMITTING AND OPERATIONAL CAPACITY	14
7.4. MONITORING, FINANCING AND PUBLIC ACCEPTANCE	14
8. CROSS-BORDER DIMENSION	15
8.1. STRATEGIC RELEVANCE OF CROSS-BORDER CONNECTIVITY	15
8.2. CROSS-BORDER EFFECTS ON DEMAND, INFRASTRUCTURE AND LEARNING.....	15
8.3. FUNCTIONAL COOPERATION, STANDARDS AND CORRIDOR-BASED INTEGRATION	15
9. INTERNATIONAL AND TRANSNATIONAL DIMENSION (EUROPEAN INTEGRATION, CORRIDORS AND MARKET FORMATION)	16
9.1. EUROPEAN REGULATORY AND MARKET FRAMEWORK.....	16
9.2. TRANSNATIONAL INFRASTRUCTURE AND CORRIDOR INTEGRATION	16
9.3. INDUSTRIAL VALUE CHAINS, KNOWLEDGE TRANSFER AND INSTITUTIONAL INTEGRATION	16
9.4. MANAGING UNCERTAINTY AND ENSURING INTEROPERABILITY	17
10. TERRITORIAL RELEVANCE IN CENTRAL EUROPE AND TRANSFERABILITY OF EXPERIENCE	17
10.1. STRUCTURAL POSITIONING OF THE ÚSTÍ REGION IN CENTRAL EUROPE.....	17
10.2. TRANSFERABILITY OF INDUSTRIAL AND TRANSFORMATION PATHWAYS.....	17
10.3. INFRASTRUCTURE CONNECTIVITY AND POLICY COHERENCE.....	18
10.4. INTERREG CENTRAL EUROPE ADDED VALUE AND CAPITALISATION	18
11. STRATEGIC RELEVANCE OF THE ÚSTÍ REGION FOR HYDROGEN VALLEY DEVELOPMENT	18
11.1. STRUCTURAL NECESSITY AND SYSTEMIC PRECONDITIONS	18
11.2. INDUSTRIAL DEMAND ANCHORING AND MARKET FORMATION.....	19
11.3. INFRASTRUCTURE, SPATIAL ASSETS AND COMPETITIVENESS CONSTRAINTS	19
11.4. MACRO-REGIONAL TRANSFORMATION LEVERAGE.....	19
12. SWOT SYNTHESIS (HYDROGEN VALLEY PERSPECTIVE)	19
12.1. STRENGTHS: STRUCTURAL ASSETS AND GOVERNANCE MATURITY.....	19
12.2. WEAKNESSES: STRUCTURAL CONSTRAINTS AND COST EXPOSURE	19



H2CE

12.3. OPPORTUNITIES: EUROPEAN DRIVERS AND MACRO-REGIONAL INTEGRATION	20
12.4. THREATS: FRAGMENTATION AND REGULATORY UNCERTAINTY	20
12.5. INTEGRATED SWOT IMPLICATIONS FOR H2CE.....	20
13. MEASURES, ACTIVITIES AND KPI FRAMEWORK IN THE H2CE CONTEXT (TRANSNATIONAL FOCUS).....	20
13.1. SHORT-TERM MEASURES (2026-2030): DEMAND ANCHORING AND MARKET ACTIVATION.....	20
13.2. LONG-TERM MEASURES (2030-2040): INTEGRATION AND STRUCTURAL SCALING	22
13.3. TRANSNATIONAL ACTIVITIES AND H2CE CAPITALISATION	22
13.4. CORE TECHNICAL AND MARKET KPIs (TRANSNATIONAL DIMENSION).....	22
13.5. GOVERNANCE AND ECOSYSTEM MATURITY KPIs (INTERNATIONAL INTEGRATION).....	23
14. EVALUATION FRAMEWORK IN THE CENTRAL EUROPEAN CONTEXT	23
14.1. CONCEPTUAL SCOPE OF EVALUATION IN H2CE	23
14.2. OPERATIONAL MONITORING AND PERFORMANCE TRACKING	23
14.3. MARKET FORMATION AND VALUE CHAIN COHERENCE	23
14.4. GOVERNANCE PERFORMANCE ASSESSMENT.....	24
14.5. STRATEGIC REVIEW AND REGULATORY ALIGNMENT	24
14.6. IMPACT EVALUATION	24
14.7. ADAPTIVE GOVERNANCE AND CONCLUDING FRAMING	24



1. Introduction

The Regional Strategy for H2-Ready Regions - Ústí Region is positioned as a structured strategic document developed within the H2CE framework to articulate the region's systemic approach toward hydrogen deployment in a Central European transition context. It builds upon existing regional strategic and analytical foundations and reframes them through the lens of integrated Hydrogen Valley development.

This strategy positions the Ústí Region not as an isolated hydrogen deployment territory, but as an integrated node within the emerging Central European hydrogen ecosystem, with a focus on cross-border value chains, infrastructure corridors and transnational market formation.”

The strategy responds to three interlinked imperatives. First, the structural decarbonisation pressure faced by energy-intensive industry under ETS exposure, regulatory tightening and electricity price volatility. Second, the necessity to maintain regional socio-economic stability in a fossil-transition territory. Third, the increasing European emphasis on integrated hydrogen deployment models and corridor-based market formation.

Within this context, the Hydrogen Valley concept serves as the central strategic architecture. It provides a framework for synchronising supply, infrastructure and demand while reducing coordination failure and investment fragmentation. The document therefore adopts a value-chain logic and multi-level governance perspective rather than a project-based or technology-centric approach. (see Section 7)

The strategy is explicitly embedded within the Central European macro-regional dimension. Hydrogen readiness is understood not as an isolated regional status but as a relative positioning within evolving European regulatory frameworks, transnational infrastructure corridors and industrial value chain restructuring. The Ústí Region is analysed as a structurally representative transition territory whose pathway may generate transferable insights for comparable industrial regions. (see Section 9-11)

Methodologically, the document combines structural assessment, value-chain integration analysis, governance evaluation and macro-regional positioning. It emphasises selectivity, sequencing and adaptive governance under uncertainty. Hydrogen deployment is treated as a managed transition process requiring continuous monitoring, strategic recalibration and alignment with European regulatory evolution.

The purpose of this strategy is therefore twofold. Internally, it provides a coherent analytical and strategic basis for coordinated hydrogen deployment within the Ústí Region. Externally, it positions the region within the H2CE cooperation framework as an active contributor to Central European hydrogen market formation and policy learning.

The strategy frames hydrogen not as an end, but as a structured instrument of regional industrial modernisation, energy system integration and macro-regional transformation. Its credibility rests on realism, demand anchoring and governance maturity rather than on aspirational capacity targets.

1.1. Purpose, Scope and Role of the Regional Strategy

This Regional Strategy provides an evidence-based framework for understanding the structural position of the Ústí Region within the emerging hydrogen economy. Rather than serving as a standalone regional plan, the strategy positions the region as an active component of a wider Central European hydrogen system, where deployment is shaped by cross-border value chains, infrastructure corridors and evolving European regulatory frameworks.

The strategy is developed within the framework of the H2CE project, which aims to strengthen hydrogen readiness and coordinated market development across Central Europe. In this context, the document



contributes not only to regional strategic orientation but also to transnational knowledge exchange, policy alignment and the gradual formation of a coherent macro-regional hydrogen ecosystem.

The analytical scope is intentionally focused on structural conditions rather than detailed technical or investment planning. The document does not replace feasibility studies, environmental assessments or project-level documentation. Instead, it identifies the key factors that determine realistic hydrogen deployment pathways, including industrial demand structure, energy system characteristics, infrastructure constraints, governance capacity and investment conditions. It therefore serves as a strategic reference point supporting prioritisation, sequencing and coordinated decision-making among regional stakeholders.

Hydrogen is not approached as an isolated technological solution, but as a systemic transition vector interacting with industrial transformation, energy system decarbonisation, spatial development and labour market dynamics. This reflects the practical reality that hydrogen deployment depends on the alignment of multiple sectors and institutional levels rather than on individual projects or assets. The strategy adopts the Hydrogen Valley concept as its core analytical lens, emphasising the need for integrated development of supply, infrastructure and demand in order to reduce coordination failures and enable viable market formation.

At the same time, the strategy explicitly recognises that hydrogen deployment in the Ústí Region cannot be developed as a closed regional system. Its feasibility and long-term competitiveness depend on integration into transnational networks, particularly within the Central European industrial corridor and in relation to neighbouring regions in Germany and Poland. The region is therefore analysed as a potential node within a broader hydrogen ecosystem, where cross-border connectivity, infrastructure interoperability and coordinated investment play a decisive role.

Given the high level of uncertainty associated with hydrogen development—driven by evolving regulation, volatile energy prices, technological progress and uncertain demand uptake—the strategy emphasises selectivity and adaptability. Hydrogen is treated as a scarce and cost-sensitive decarbonisation option that should be prioritised in applications where it provides clear structural value, particularly in energy-intensive industry. Other applications remain conditional and dependent on technological, economic and regulatory developments.

Finally, the strategy frames hydrogen as part of a broader regional transformation process. In the Ústí Region, hydrogen deployment is closely linked to industrial modernisation, economic restructuring and socio-economic stabilisation in a post-coal transition context. By combining regional analysis with a strong transnational perspective, the strategy establishes a foundation for coordinated development pathways that are both locally relevant and aligned with the wider Central European hydrogen transition.

2. European Context of Energy Transition and Hydrogen Deployment

2.1. Hydrogen as a Strategic Element of the European Energy Transition

Hydrogen has become a structural component of European decarbonisation policy due to its relevance for sectors where direct electrification is constrained. In the European transition, hydrogen is increasingly positioned as a strategic energy carrier for hard-to-abate applications, particularly in energy-intensive industries and heavy transport.

The European policy framing of hydrogen is not limited to climate objectives. It is linked to industrial competitiveness, energy security and resilience of energy systems. Hydrogen is therefore increasingly interpreted as an industrial policy tool enabling value chain restructuring under carbon constraints.



2.2. Integrated Deployment and Regional Hydrogen Readiness

A central European challenge is hydrogen market formation. The EU policy response increasingly favours integrated approaches that reduce coordination failures across supply, infrastructure and demand, which is one reason why Hydrogen Valleys have become a prominent implementation model (see Section 6).

In this context, regional “hydrogen readiness” becomes a decisive analytical concept. Regions differ substantially in their ability to develop hydrogen economies. Readiness is not a binary status, but a maturity trajectory shaped by systemic prerequisites such as industrial demand structure, infrastructure legacy, spatial feasibility, governance capacity and investment conditions.

The Ústí Region should therefore not be interpreted as already hydrogen-ready. It can be assessed as structurally positioned to become hydrogen-ready due to the combination of industrial conversion needs, transformation pressure and existing infrastructure assets. This framing supports realism and avoids overstatement.

2.3. Regulatory, Competitiveness and Sequencing Constraints

European hydrogen deployment is increasingly shaped by regulatory detail rather than by high-level strategy alone. Definitions of renewable and low-carbon hydrogen, sustainability criteria, and certification mechanisms influence technology selection, investment viability and market access. Regional pathways must therefore remain compatible with evolving EU-level requirements. (see Section 7 and 8)

European energy transition also imposes competitiveness constraints. Industrial actors face carbon costs, reporting obligations and supply-chain decarbonisation pressures. Hydrogen deployment is therefore linked to maintaining industrial market access and preventing carbon leakage in energy-intensive sectors.

The European context reinforces the importance of selectivity and sequencing. Hydrogen deployment must be aligned with enabling conditions—regulatory clarity, infrastructure readiness, demand **anchoring and** governance capacity—without which initiatives risk remaining fragmented or limited to small-scale demonstrations. Hydrogen has become an increasingly important component of the European energy transition due to its relevance for sectors where direct electrification is technically or economically constrained. Within the European decarbonisation framework, hydrogen is therefore positioned as a strategic energy carrier for hard-to-abate industrial processes and heavy transport applications.

Beyond its climate policy function, hydrogen is also increasingly interpreted as a tool of industrial policy and economic restructuring. European hydrogen strategies aim not only to reduce emissions but also to strengthen industrial competitiveness, support technological innovation and ensure long-term energy security. These objectives are particularly relevant for industrial transition regions across Central Europe.

Within this broader European context, hydrogen deployment is closely linked to the emergence of integrated hydrogen ecosystems. Policy frameworks increasingly emphasise coordinated development across supply, infrastructure and demand in order to overcome market fragmentation and investment uncertainty. The Hydrogen Valley concept has therefore become an important implementation model for regional hydrogen development.

For regions such as the Ústí Region, these European developments cannot be separated from the wider Central European transformation landscape. Many neighbouring regions across the Czech-German-Polish industrial belt face comparable challenges related to industrial decarbonisation, energy system restructuring and economic transition. Hydrogen deployment in the region must therefore be interpreted within this broader macro-regional context.

The European policy framework thus reinforces the importance of cross-border cooperation, infrastructure connectivity and coordinated hydrogen market formation across Central Europe. These aspects are further explored in the later chapters of this strategy, which examine the cross-border, international and territorial dimensions of hydrogen deployment in the region.



3. Socio-Economic and Industrial Profile of the Ústí Region

The Ústí Region is a structurally industrial territory shaped by a legacy of coal mining, fossil-based power generation and energy-intensive manufacturing. This legacy has historically supported employment and economic activity, but it also creates long-term vulnerability under decarbonization policies and fossil phase-out dynamics.

The socio-economic baseline is analytically relevant because it defines transformation constraints. Regions undergoing structural change face risks of unemployment, skills mismatch and investment outflow if conversion pathways are not available. The region's profile therefore increases the importance of identifying viable industrial transition mechanisms.

Industrial concentration is a key structural feature. From a hydrogen perspective, this matters because hydrogen deployment requires aggregated demand to justify supply and infrastructure investments. Regions without industrial anchors often struggle to develop stable demand profiles. In the Ústí Region, the presence of industrial actors supports anchor demand formation. (see Section 7)

At the same time, the industrial legacy creates lock-in risks. Existing processes and assets are optimised for fossil inputs and may face high conversion costs. Industrial conversion depends on regulatory predictability, investment conditions and access to low-carbon energy. These constraints shape the feasibility of hydrogen uptake.

3.1. Socio-Economic Vulnerability, Human Capital and Acceptance

Socio-economic vulnerability should be interpreted analytically as a structural gap rather than as a descriptive weakness. Transformation pressures can amplify regional disparities unless industrial conversion pathways are accompanied by workforce transition mechanisms and local value creation strategies. This is relevant for assessing long-term feasibility and social stability.

Human capital is both an asset and a constraint. Industrial regions often possess technical skills foundations, but hydrogen deployment requires additional competencies: safety, systems integration, operations and new engineering domains. Skills conversion and training capacity therefore become enabling conditions rather than secondary considerations.

Societal acceptance influences feasibility. Transition regions may exhibit scepticism toward new industrial initiatives if benefits are unclear or risks are perceived as externalised. Transparent communication and stakeholder participation are therefore relevant structural conditions for deployment.

3.2. Territorial Differentiation and Sequencing Implications

Territorial differentiation within the region also matters. The region comprises multiple sub-territories with different industrial structures, logistics connectivity and development constraints. This supports a multi-node interpretation of a Hydrogen Valley, where different value chain segments may develop in different locations.

The socio-economic baseline implies the need for sequencing. Early hydrogen initiatives are more likely to be viable if linked to sectors that can deliver measurable value and confidence—industrial conversion pilots and fleet-based mobility are typical examples. Such sequencing supports credibility and reduces transformation risk. (see Section 14). The Ústí Region is characterised by a strong industrial legacy shaped by decades of coal mining, fossil-based energy production and energy-intensive manufacturing. This historical development has significantly influenced the region's socio-economic structure, employment patterns and infrastructure configuration.

While this industrial legacy has historically supported regional economic development, it also creates structural vulnerabilities under current decarbonisation policies and fossil fuel phase-out dynamics. The



transition toward a low-carbon economy therefore presents both challenges and opportunities for the region.

From a broader Central European perspective, the socio-economic profile of the Ústí Region is not unique. Several neighbouring regions across Central Europe share similar structural characteristics resulting from comparable historical development paths. Many of these territories are currently undergoing complex industrial transformation processes as a consequence of energy transition policies and changing global industrial dynamics.

The socio-economic analysis presented in this chapter therefore also contributes to understanding how hydrogen deployment may support industrial transition across comparable regions in Central Europe. In this sense, the regional analysis serves not only as a diagnostic exercise for the Ústí Region but also as a reference point for macro-regional policy learning within the H2CE cooperation framework.

4. Energy System Characteristics and Decarbonisation Constraints

The energy system of the Ústí Region has historically been structured around fossil-based generation and high industrial consumption. This configuration has created infrastructure assets but is increasingly constrained by decarbonisation requirements, carbon pricing and the declining viability of coal-based systems.

Decarbonisation constraints are strongly shaped by industrial demand. While some end uses can be electrified, industrial processes often require high-temperature heat and feedstock substitution. Hydrogen is relevant primarily in contexts where electrification is not feasible or where hydrogen provides unique system value.

Energy system characteristics define feasibility boundaries. Hydrogen production requires low-carbon electricity, grid capacity, spatial feasibility and permitting. Hydrogen use requires distribution options and demand stability. Therefore, energy system baseline analysis functions as a constraint map that informs realistic hydrogen deployment pathways. (see Section 7)

4.1. System Integration, Infrastructure and Cost Constraints

System integration is a key analytical dimension. Hydrogen can contribute to renewable integration through sector coupling and storage. However, its value in energy applications depends on relative efficiency and cost compared to alternatives. Hydrogen's role should therefore be assessed pragmatically and selectively.

Infrastructure readiness is central. Hydrogen deployment depends on logistics, storage and distribution capacity. Early markets often rely on mobile distribution, while later stages may require corridor-based infrastructure and pipeline solutions. The sequencing logic is treated in detail in Section 6; here it is relevant primarily as an energy-system constraint.

Cost competitiveness is a major constraint. Hydrogen uptake depends on energy prices, conversion costs, carbon pricing and policy support. The region's industrial competitiveness will be affected by the pace and cost of conversion, making investment conditions and risk mitigation key determinants.

4.2. Energy Security, Spatial and Environmental Constraints

Energy security considerations add complexity. Hydrogen can reduce reliance on fossil fuels but may introduce new dependencies if supply relies on imports. Analytical assessment must therefore consider trade-offs between local production, imports and corridor-based supply options.



Spatial planning interacts with energy system transformation. Hydrogen assets require land, infrastructure corridors and integration into industrial zones. Planning instruments can enable or constrain deployment, making territorial governance a key enabling condition for energy system-based hydrogen pathways.

Environmental constraints and permitting complexity must also be considered. Hydrogen projects can face local concerns regarding water use, land use and safety. These factors influence deployment feasibility and affect timelines, making them structurally relevant for readiness assessment. The energy system of the Ústí Region has historically been structured around fossil-based electricity generation and high levels of industrial energy consumption. This configuration has created important infrastructure assets but is increasingly challenged by decarbonisation policies, carbon pricing mechanisms and the declining economic viability of coal-based energy production.

Energy system transformation in the region is therefore closely linked to broader structural changes in the regional economy. The gradual phase-out of coal and the transition toward low-carbon energy sources require new energy system configurations capable of supporting both industrial competitiveness and climate objectives.

At the same time, energy systems in Central Europe are increasingly interconnected through cross-border electricity markets, transmission networks and emerging hydrogen infrastructure corridors. As a result, regional energy system dynamics cannot be analysed purely within national boundaries.

For the Ústí Region, this implies that hydrogen deployment must be assessed not only in relation to regional electricity supply and demand but also within the wider Central European energy landscape. Infrastructure connectivity, market integration and cross-border regulatory frameworks increasingly influence the feasibility of hydrogen production and utilisation in industrial regions.

5. Hydrogen as a Strategic Instrument for Regional Transition and Competitiveness

5.1. Strategic Role of Hydrogen in Regional Industrial Transition

Hydrogen in the Ústí Region is best interpreted as a strategic instrument embedded in broader industrial and energy transition dynamics. Its relevance is derived from the region's structural need to decarbonise industrial value chains while maintaining competitiveness and socio-economic stability.

The strongest strategic case for hydrogen is industrial decarbonisation. In energy-intensive sectors, hydrogen can substitute fossil feedstocks or fuels and enable emission reductions that are otherwise difficult to achieve. This supports industrial continuity and reduces the risk of economic decline under tightening climate policy constraints.

Hydrogen also has a role in system integration, particularly in relation to renewable energy. It can provide flexibility and sector coupling functions. However, such applications must be assessed carefully, as hydrogen-based energy use is not always cost-effective. Analytical selectivity is therefore required to avoid inefficient allocation.

In transition regions, hydrogen has a broader strategic function: it can act as a conversion vector enabling industrial modernisation while supporting restructuring of regional economic models. This does not imply that hydrogen is a universal solution; rather, it highlights that hydrogen can contribute to maintaining industrial activity under decarbonisation constraints if deployed selectively and credibly.

5.2. Selectivity, System Integration and the Hydrogen Valley Logic

Selectivity is a central analytical principle. Hydrogen should be prioritised where it delivers unique decarbonisation value and where alternative pathways are limited. Broad deployment across all sectors risks



undermining cost-effectiveness and credibility. Hydrogen should therefore be treated as a targeted transition option rather than a universal solution. (see Section 7)

Hydrogen Valleys provide a structural mechanism for this selectivity. By integrating supply, infrastructure and demand, they reduce coordination failures and enable coherent development trajectories. In industrial regions, this integrated model is particularly relevant because industrial demand can anchor the system.

5.3. Investment Mobilisation and Managed Transition under Uncertainty

Hydrogen interacts with investment mobilisation. Large-scale conversion projects can stimulate broader industrial modernisation, including process optimisation and infrastructure upgrades. In transition regions, such investment mobilisation can support restructuring beyond emission reduction alone.

The regional strategy's quantified targets and segmented structure provide a framework for assessing hydrogen's strategic role. Quantification enables monitoring; segmentation supports prioritisation and sequencing. These features strengthen the analytical basis for interpreting hydrogen as a structured transition instrument.

Hydrogen deployment must be understood as a managed transition under uncertainty. Regulatory evolution, technology cost changes and market uptake dynamics require adaptive approaches. Analytical frameworks should therefore emphasise monitoring, learning and recalibration rather than fixed assumptions. (see Section 15). In the context of the Ústí Region, hydrogen should be interpreted primarily as a strategic instrument supporting industrial decarbonisation and economic transformation. Its relevance derives from the region's structural need to reduce emissions while maintaining industrial competitiveness and socio-economic stability.

Hydrogen technologies offer potential pathways for reducing emissions in sectors where electrification alone cannot deliver sufficient decarbonisation. This is particularly relevant for energy-intensive industries that rely on high-temperature processes or fossil-based feedstocks.

Across Central Europe, several industrial transition regions face similar challenges. Hydrogen is therefore increasingly viewed as a strategic transition tool capable of supporting industrial modernisation and economic restructuring in fossil-dependent territories.

In this broader perspective, hydrogen deployment in the Ústí Region forms part of a wider macro-regional transformation process. The development of hydrogen ecosystems across Central Europe is closely linked to shared industrial structures, interconnected energy systems and cross-border supply chains.

6. Hydrogen Value Chain Assessment: Supply-Infrastructure-Demand Integration

6.1. Integrated Value Chain Logic and Synchronisation Challenge

Hydrogen deployment in the Ústí Region must be understood as a system-level challenge requiring coordinated development across supply, infrastructure and demand. The Hydrogen Valley concept provides a relevant analytical framework, as it explicitly addresses coordination failures between these segments and promotes integrated deployment within a defined territory.

In the Ústí Region, this coordination challenge is particularly pronounced due to the scale and structure of industrial demand, the ongoing transformation of the regional energy system and the absence of a fully developed hydrogen infrastructure. The region is characterised by a strong concentration of energy-intensive industry, existing large-scale energy assets and emerging renewable energy capacity, all of which create favourable but interdependent conditions for hydrogen deployment.



The key structural barrier is synchronisation. Hydrogen production projects depend on credible long-term offtake, while industrial users require reliable and competitively priced supply before committing to conversion investments. Infrastructure development—whether based on repurposed gas networks, dedicated pipelines or logistics solutions—requires both supply and demand signals. Without coordinated sequencing, there is a high risk of fragmented pilot projects without systemic impact.

This challenge is further amplified by the fact that hydrogen value chains are not confined to the regional level. The Ústí Region is part of a broader Central European industrial corridor, and its hydrogen ecosystem will depend on cross-border integration, particularly with neighbouring German regions and emerging European hydrogen transport networks.

6.2. Hydrogen Supply and Infrastructure Sequencing

Supply-side actors and production potential

The Ústí Region has structural preconditions for hydrogen production, primarily linked to its energy system and industrial base.

Key supply-side actors include:

- ORLEN Unipetrol - the dominant industrial hydrogen producer and consumer in the region, currently using fossil-based hydrogen with clear decarbonisation ambitions
- Regional energy companies and utilities, particularly ČEZ Group, which are involved in renewable energy development and potential electrolysis projects
- Emerging technology providers and engineering companies active in hydrogen-related technologies, including electrolyser development and integration
- Public and semi-public entities such as Energetické centrum Ústeckého kraje, supporting project preparation and coordination

From a resource perspective, the hydrogen production potential in the Ústí Region is closely linked to several structural factors within the regional energy system. These include the increasing deployment of photovoltaic installations, particularly on post-mining and reclaimed areas, as well as the region's position as a net exporter of electricity. This existing surplus creates a relevant precondition for future hydrogen production, especially when combined with the anticipated growth of renewable energy sources and the gradual integration of flexibility solutions within the energy system.

At the same time, the development of large-scale renewable hydrogen production remains subject to several critical constraints. The availability of low-cost renewable electricity is a decisive factor for economic viability, while grid capacity and connection conditions represent a practical limitation for the deployment of electrolysers. In addition, regulatory requirements related to renewable fuels of non-biological origin (RFNBO) introduce further complexity, particularly in terms of compliance, certification and temporal correlation of electricity supply.

Hydrogen infrastructure in the region is currently underdeveloped and constitutes one of the main bottlenecks for system-wide deployment. The development of infrastructure depends on several key actors. The national gas transmission system operator NET4GAS plays a central role in planning future hydrogen transport options, including potential integration into European hydrogen corridors. At the same time, the electricity transmission system operator ČEPS influences the feasibility of hydrogen production through grid capacity, connection processes and system balancing conditions. Gas distribution companies are also relevant, particularly in the context of potential future adaptation of distribution networks for hydrogen transport or blending.

A critical enabling factor for long-term deployment is the expected integration of the region into the emerging European hydrogen backbone, particularly through north-south corridor routes. This transnational



connectivity is essential for scaling hydrogen production and enabling access to broader markets beyond the regional level.

The development of hydrogen infrastructure is expected to follow a phased and demand-driven trajectory. In the initial phase, hydrogen deployment is likely to rely on decentralised production linked to local consumption, with distribution ensured primarily through mobile solutions such as compressed or liquefied hydrogen trailers. This stage allows for early project implementation while limiting infrastructure risk.

In the intermediate phase, development is expected to shift towards cluster-based solutions, where production, storage and consumption are more closely integrated within industrial hubs. This may include the development of shared storage facilities, local distribution networks and partial utilisation or adaptation of existing gas infrastructure.

In the long term, the system is expected to evolve towards full integration into transnational hydrogen corridors, with pipeline-based transport and connection to the wider European hydrogen market. This stage would enable scaling of both production and consumption and support the region's role within the Central European hydrogen ecosystem.

Across all phases, the sequencing of infrastructure development must remain closely aligned with the evolution of industrial demand. Infrastructure investments without secured demand risk becoming stranded assets, while delayed infrastructure may constrain otherwise viable industrial transition pathways. Coordinated planning across supply, infrastructure and demand is therefore a fundamental condition for efficient and credible hydrogen deployment in the region.

6.3. Demand Anchoring: Industry and Mobility

Industrial demand as the primary anchor

Demand formation represents the decisive condition for hydrogen deployment in the Ústí Region. The region is characterised by a high concentration of energy-intensive industries, which creates a structurally strong basis for hydrogen demand, particularly in applications where direct electrification is limited or not feasible.

Key industrial actors include:

- ORLEN Unipetrol - the dominant industrial hydrogen producer and consumer in the region, with significant existing hydrogen use in refining processes and clear decarbonisation ambitions
- AGC Flat Glass Czech - representing high-temperature industrial processes with potential for hydrogen-based fuel substitution
- Chemical production facilities concentrated in the Litvínov-Záluží industrial cluster, forming one of the largest industrial hubs in the Czech Republic
- Other energy-intensive manufacturing sectors with demand for process heat and feedstock substitution

These industries already operate with high and stable energy demand and, in some cases, existing hydrogen consumption. This creates favourable conditions for demand anchoring, as the transition to low-carbon hydrogen can build on established industrial processes and infrastructure. In particular, refinery and chemical applications represent immediate opportunities for substituting fossil-based hydrogen with low-carbon or renewable alternatives.

Hydrogen can also play a role in providing high-temperature heat and supporting process decarbonisation in sectors where alternative solutions are limited. As a result, industrial demand is expected to form the



backbone of the regional hydrogen economy and provide the necessary scale and predictability for investment in production and infrastructure.

At the same time, industrial conversion is subject to several constraints, including the cost of hydrogen, regulatory requirements and the availability of reliable supply. Investment decisions by industrial actors will depend on long-term price visibility, access to infrastructure and alignment with European decarbonisation policies. This reinforces the importance of demand anchoring as a prerequisite for the development of the entire hydrogen value chain.

Mobility demand as a complementary segment

Hydrogen use in mobility represents a complementary demand segment, which can support early market development but is not expected to serve as the primary driver of hydrogen deployment in the region.

Relevant actors include regional public transport operators such as Dopravní společnost Ústeckého kraje, as well as logistics companies and other fleet operators with potential interest in low-emission transport solutions.

Potential applications include hydrogen-powered buses, heavy-duty vehicles and, in the longer term, rail transport in non-electrified sections. These use cases are particularly relevant in contexts where battery-electric solutions face operational limitations, such as long-distance transport, high utilisation rates or specific operational constraints.

Mobility demand can contribute to the development of local hydrogen ecosystems by creating visible pilot projects and structured, fleet-based demand. Public procurement and targeted support schemes can play an important role in enabling these early applications. However, the economic viability of hydrogen in transport remains highly dependent on fuel costs, infrastructure availability and regulatory incentives.

Given current conditions, mobility alone is unlikely to generate sufficient demand to justify large-scale hydrogen production or infrastructure investments. Its role should therefore be understood as complementary, supporting diversification of demand and contributing to market visibility and technological validation.

Integrated demand perspective

The development of a viable hydrogen market in the Ústí Region depends on the combination of industrial and mobility demand, with a clear prioritisation of industrial applications. Industrial demand provides the scale, stability and economic justification required for investment, while mobility can support early deployment and contribute to public visibility and acceptance.

A demand-driven approach is essential for reducing investment risk and ensuring cost-effective deployment. Hydrogen supply and infrastructure should be developed in alignment with clearly identified demand segments, particularly in industrial clusters where aggregation effects can be achieved. This integrated perspective supports a phased and realistic transition pathway, consistent with both regional conditions and broader Central European hydrogen market development.

6.4. Cross-Cutting Enablers and Overall Feasibility Assessment

Innovation, skills and institutional ecosystem

The development of hydrogen in the Ústí Region depends on a supporting ecosystem of innovation, skills and institutional capacity. Key actors include UJEP, ICUK and Energetické centrum Ústeckého kraje, which contribute to education, research, innovation and coordination.

The region benefits from a strong industrial skills base, particularly in energy and chemistry. However, hydrogen deployment requires new competencies in system integration, operation and safety. Targeted reskilling and education are therefore necessary, especially in the context of coal phase-out. Without



strengthening local capacities, there is a risk of technological dependency and limited regional value capture.

Regulatory, financial and data conditions

Hydrogen deployment is strongly conditioned by regulatory and economic factors. Key constraints include evolving certification requirements, the absence of stable operational support mechanisms and the significant cost gap between renewable hydrogen and fossil alternatives.

Investment decisions remain highly sensitive to price uncertainty and policy support. At the same time, fragmented data on projects, demand and infrastructure limits coordination and increases the risk of inefficient investments. Strengthening financial frameworks and improving data availability are therefore critical enabling conditions.

Public acceptance, safety and governance

Hydrogen deployment requires robust safety standards, effective governance and public acceptance. Key stakeholders include Hasičský záchranný sbor České republiky, regional authorities and the regional hydrogen platform.

Public acceptance depends on clear communication of economic and environmental benefits, particularly in a region undergoing structural transformation. Governance capacity—especially in coordination and permitting—directly affects implementation speed and investment confidence.

Overall feasibility and system perspective

The Ústí Region has strong structural potential for hydrogen deployment based on its industrial demand, energy system and available transformation areas. However, feasibility remains conditional on demand anchoring, infrastructure development, cost competitiveness and supportive policy frameworks.

Long-term viability depends on integration into the wider Central European hydrogen system, including cross-border infrastructure and market development. Hydrogen deployment should therefore follow a coordinated, demand-driven and phased approach aligned with both regional conditions and transnational dynamics.

7. Governance, Stakeholder Coordination and Institutional Capacity

7.1. Governance as an Enabling Condition for Hydrogen Deployment

Governance is a structural enabling condition for hydrogen deployment. Hydrogen Valleys require coordination across sectors, institutions and governance levels. This includes planning, permitting, infrastructure sequencing, stakeholder alignment and monitoring. Without institutional capacity, deployment remains fragmented. (see Section 7)

Stakeholder ecosystems in hydrogen are inherently complex. Producers, consumers, infrastructure operators, public authorities, research institutions and civil society have different incentives and constraints. Governance must therefore provide coordination mechanisms enabling alignment and reducing conflict.



7.2. Regional Stakeholder Coordination and the Hydrogen Platform

In the Ústí Region, stakeholder coordination is supported by the existence of the Hydrogen Platform of the Ústí Region, which functions as an institutional coordination interface across relevant actors of the emerging hydrogen ecosystem. The platform provides a structured environment for information exchange, alignment of priorities and identification of shared constraints across public authorities, industrial stakeholders, infrastructure actors and knowledge institutions. From a readiness perspective, the platform is analytically relevant not as a symbolic initiative, but as an enabling governance mechanism that can reduce fragmentation, support continuity in strategic planning and facilitate the transition from strategic orientation toward coordinated implementation trajectories.

Institutional mobilisation in the region is reflected in strategic planning and platform-based coordination. This indicates readiness maturity. However, governance capacity must be evaluated through operational performance: the ability to translate strategic priorities into coordinated trajectories and to reduce implementation friction.

7.3. Multi-Level Governance, Permitting and Operational Capacity

Multi-level governance is critical. Hydrogen regulation and financing frameworks are largely national and European, while permitting and spatial planning occur regionally and locally. Effective deployment requires alignment across these levels and the ability to navigate regulatory complexity.

Permitting capacity is a key bottleneck. Many hydrogen projects are delayed by unclear responsibilities and long administrative processes. Governance readiness therefore includes streamlining procedures, clarifying institutional roles and building administrative competence for hydrogen-specific permitting.

7.4. Monitoring, Financing and Public Acceptance

Data and monitoring are governance functions. Hydrogen deployment requires transparent tracking of progress across production, infrastructure and demand. Monitoring supports adaptive management and builds trust among stakeholders. It also enables evidence-based recalibration under uncertainty.

Financing coordination is another institutional task. Hydrogen projects often require blended finance and risk-sharing mechanisms. Institutional capacity to prepare projects, coordinate partners and structure investment conditions influences feasibility.

Public communication and acceptance are governance issues. Hydrogen infrastructure and industrial conversion can raise local concerns. Transparent participation mechanisms and evidence-based communication reduce resistance and improve legitimacy, particularly in transition regions.

Governance should be treated as delivery infrastructure. In Hydrogen Valleys, institutional capacity is as important as physical infrastructure. Regions that can coordinate stakeholders and manage implementation complexity are more likely to achieve coherent deployment trajectories. (see Section 15). Governance structures play a critical role in enabling hydrogen deployment. Hydrogen Valleys require coordination across multiple sectors, institutional levels and stakeholder groups. This includes industrial actors, infrastructure operators, public authorities, research institutions and civil society organisations.

Effective governance therefore involves not only regional coordination but also alignment with national and European regulatory frameworks. Permitting procedures, funding mechanisms and infrastructure planning are often distributed across different governance levels, making institutional coordination a key enabling condition.

In addition, hydrogen deployment increasingly requires cross-border governance cooperation. Infrastructure corridors, energy markets and industrial value chains frequently extend beyond national borders, requiring coordination between neighbouring regions and countries.



For the Ústí Region, governance capacity must therefore be interpreted both in regional and transnational terms. Participation in macro-regional cooperation frameworks such as H2CE strengthens the institutional capacity of the region to engage in cross-border hydrogen planning and contributes to the development of coordinated hydrogen ecosystems across Central Europe.

8. Cross-Border Dimension

8.1. Strategic Relevance of Cross-Border Connectivity

Hydrogen transition dynamics in the Ústí Region are shaped by cross-border infrastructure, industrial linkages and policy developments, especially in relation to Germany. The region's location near Saxony gives it strategic relevance within the emerging Czech-German hydrogen interface, where future hydrogen flows, industrial offtake and infrastructure investment are increasingly being planned in corridor logic rather than within national borders alone. This is particularly important because the future Czech hydrogen system is being designed to connect to the German hydrogen core network through projects led by NET4GAS and its German partners.

A concrete example is the **Czech Hydrogen Backbone WEST**, which is planned to connect the Czech hydrogen transmission network with the German core network and to transport hydrogen from northern Germany, Scandinavia and the Baltic area towards Czechia and further south. NET4GAS identifies Northern Bohemia as an expected hydrogen demand cluster along this route. The project is part of the **Czech-German Hydrogen Interconnector (CGHI)** and is included in the first hydrogen PCI/PMI list adopted in 2023, which gives the cross-border dimension a clear strategic and investment relevance.

8.2. Cross-Border Effects on Demand, Infrastructure and Learning

Cross-border connectivity affects all three core parts of the hydrogen value chain. On the demand side, industrial actors in the Ústí Region operate within international supply chains and are increasingly exposed to decarbonisation requirements from European customers and regulation. For firms such as ORLEN Unipetrol and other industrial players in Northern Bohemia, access to future cross-border hydrogen infrastructure may directly influence the feasibility and timing of conversion decisions.

On the infrastructure side, cooperation reduces fragmentation and improves the business case for large-scale investment. The **CGHI** initiative brings together **GASCADE, NET4GAS, OGE and naTran Deutschland** with the explicit aim of linking high-potential hydrogen supply areas in northern Germany and the Baltics with expected demand clusters in South Germany and Northern Bohemia. In parallel, the **Central European Hydrogen Corridor (CEHC)** connects the Czech discussion to a wider route from Ukraine via Slovakia and Czechia to Germany. These initiatives show that the regional hydrogen future is tied to cross-border corridor development rather than isolated local build-out.

Knowledge transfer is a further cross-border benefit. In Saxony, the **Hydrogen Land Saxony** cluster led by **Energy Saxony** and **HZwo e.V.** and the **Hydrogen Innovation Center (HIC) in Chemnitz** are building practical capacity in hydrogen technologies, testing and industrial application. For the Ústí Region, cooperation with neighbouring German actors is therefore relevant not only for infrastructure, but also for innovation, skills and governance learning. The **H2CE project** strengthens exactly this dimension by supporting hydrogen-ready regional planning, practical tools for public authorities and a wider Central European network for exchange beyond the lifetime of the project.

8.3. Functional Cooperation, Standards and Corridor-Based Integration

For cross-border relevance to translate into real readiness, cooperation must be functional rather than declaratory. In practice, this means alignment of infrastructure planning, data exchange, corridor participation and coordination between transmission system operators, regional authorities and industrial stakeholders. The Czech-German interface is already moving in this direction through NET4GAS corridor



projects and the wider CGHI framework, which explicitly includes bi-directional cross-border connection points and the possibility to connect local producers and consumers along the route.

Cross-border integration also depends on interoperability. Technical compatibility, safety standards and hydrogen certification will shape whether infrastructure investments can support real market coupling. This is especially relevant because Germany's hydrogen core network is already proceeding in phased build-out to 2037, meaning Czech regions close to the border must plan with future German network development in mind. In this context, the H2CE framework adds value by linking regional strategy development with transnational planning practice and by supporting a more coordinated regional response to Central European hydrogen market formation.

9. International and Transnational Dimension (European Integration, Corridors and Market Formation)

9.1. European Regulatory and Market Framework

Hydrogen deployment in the Ústí Region is structurally shaped by European regulation and market design. Even where hydrogen is produced or used locally, project feasibility depends on EU definitions of renewable and low-carbon hydrogen, certification rules, infrastructure eligibility and access to support instruments. This means that regional readiness cannot be assessed independently of the wider European framework. At the same time, the H2CE project is explicitly built around helping Central European regions integrate hydrogen into regional and local energy planning, which gives the strategy a direct link to transnational governance practice rather than only local ambition.

The wider market context is increasingly corridor-based. Czechia's transmission position in Central Europe is seen by NET4GAS as strategically important because the country can connect to several major European import routes. For the Ústí Region, this is particularly relevant because the Czech backbone projects are designed not only for transit, but also to serve expected hydrogen demand clusters in Northern Bohemia. This shifts the region from being a peripheral industrial territory to being a potential node within the emerging Central European hydrogen market.

9.2. Transnational Infrastructure and Corridor Integration

Transnational infrastructure planning is one of the clearest expressions of the international dimension. The **Czech Hydrogen Backbone WEST** is planned to use about **163 km** of repurposed pipeline in Czech territory to connect with the German core network, while the **Czech Hydrogen Backbone NORTH** foresees modification of about **381 km** of pipeline between the German and Slovak directions. Together, these projects place the Ústí Region within a wider cross-border transmission architecture rather than a standalone regional system.

These projects also sit within broader initiatives. The WEST route is part of the **CGHI**, while the NORTH route is linked to the **CEHC**, **SEEHyC** and **SunsHyne** corridor concepts. Their common logic is to connect supply sources from northern Germany, the Baltics, Ukraine, the Balkans or North Africa with industrial demand in Central Europe and Germany. For the Ústí Region, the implication is clear: long-term hydrogen feasibility depends on successful integration into transnational corridors and not only on local production potential.

9.3. Industrial Value Chains, Knowledge Transfer and Institutional Integration

International integration matters equally on the demand side. Industrial decarbonisation is increasingly driven by European value-chain pressures, customer requirements and carbon constraints. For industrial actors in the Ústí Region, hydrogen is therefore not only an energy issue but also a competitiveness issue.



Access to hydrogen infrastructure and compliance with European low-carbon requirements will influence whether regional industry can maintain its position in integrated European markets.

The transnational dimension also includes institutional and knowledge integration. In neighbouring Saxony, **Hydrogen Land Saxony** brings together industry and research actors around hydrogen deployment, while the **HIC Chemnitz** is being developed as a major hydrogen innovation and testing centre with public funding of about **EUR 84.4 million**. These initiatives create a nearby ecosystem for applied learning, demonstration and industrial cooperation. The H2CE project complements this by building a network of hydrogen-ready regions, testing planning tools for public authorities and supporting strategic coordination across Central Europe.

9.4. Managing Uncertainty and Ensuring Interoperability

International integration also brings uncertainty. Corridor timing, future hydrogen prices, import availability and regulatory evolution will all influence the speed of deployment in the Ústí Region. A credible regional strategy should therefore remain flexible and avoid dependence on a single supply scenario or one narrowly defined market pathway. This is particularly relevant in a context where both the German core network and Czech hydrogen backbone are being rolled out in phases over time.

At the same time, interoperability becomes a strategic requirement. Technical compatibility, recognition of certification and alignment of operational standards determine whether the region can participate in wider hydrogen trade and infrastructure use. In this respect, the role of H2CE is not symbolic: it helps regional authorities build strategic capacity and common planning approaches so that local hydrogen strategies are compatible with broader Central European market formation. In conclusion, the international and transnational dimension is not an external add-on, but a structural condition for hydrogen readiness in the Ústí Region.

10. Territorial Relevance in Central Europe and Transferability of Experience

10.1. Structural Positioning of the Ústí Region in Central Europe

Hydrogen transition in Central Europe is shaped by a specific structural configuration: a concentration of industrial transition regions with fossil-based energy legacies, energy-intensive production structures and socio-economic exposure to decarbonisation pressures. The Ústí Region represents a typological case of such a transition territory, combining high decarbonisation necessity with industrial demand potential and infrastructure legacy. Within the H2CE framework, this positioning is not merely regional; it is macro-regional. The relevance of the region derives from its structural comparability with other Central European territories facing similar transformation challenges.

The updated strategic framing of hydrogen in the Ústí Region, as reflected in the regional analytical and strategic documentation, emphasises the interdependence between industrial competitiveness, energy price volatility, ETS exposure and infrastructure readiness. These factors are not unique to the region; they characterise a broader Central European industrial belt extending across Czechia, Germany, Poland and Austria. In this sense, the territorial relevance of the Ústí Region lies in its function as a structurally representative laboratory for hydrogen integration in fossil-transition economies.

10.2. Transferability of Industrial and Transformation Pathways

The region's experience in linking hydrogen deployment to industrial conversion pathways, ammonia substitution obligations, RFNBO compliance and infrastructure sequencing provides transferable insights for the H2CE macro-region. Lessons concerning demand anchoring, price sensitivity of energy-intensive sectors,



interaction between regulatory pressure and investment behaviour, and the economic viability of electrolysis under Central European electricity price conditions are directly relevant for cross-border knowledge exchange. Within H2CE, the Ústí Region contributes not only pilot activities but also systemic learning regarding how hydrogen can be embedded into broader transformation strategies without undermining economic resilience. (see Section 7)

10.3. Infrastructure Connectivity and Policy Coherence

Beyond industrial conversion, the territorial relevance of the Ústí Region also derives from its position within emerging Central European infrastructure and logistics networks. Hydrogen deployment in this macro-region is increasingly shaped by corridor-based planning, cross-border grid constraints and the spatial distribution of industrial clusters. The region's proximity to Germany and its integration into transnational transport and energy corridors provide a functional interface between national hydrogen strategies. This enhances its role not merely as a participant in hydrogen market formation, but as a potential connector territory capable of aligning local deployment with macro-regional infrastructure dynamics.

Furthermore, the Ústí Region's approach demonstrates how hydrogen strategies in transition territories can be embedded within broader socio-economic restructuring frameworks. In Central Europe, decarbonisation cannot be treated as a purely technological process; it must be synchronised with labour market adaptation, investment mobilisation and territorial governance reform. The integration of hydrogen into regional transformation policy illustrates a model of policy coherence that is highly relevant for H2CE partners. The transferability of this experience lies not only in technical deployment choices, but in the strategic coordination between energy policy, industrial restructuring and regional development instruments, which together determine the long-term feasibility of Hydrogen Valley formation in Central Europe.

10.4. Interreg Central Europe Added Value and Capitalisation

In the Interreg Central Europe perspective, the added value of this territorial positioning lies in structured capitalisation and policy learning. The Ústí Region provides a replicable governance and sequencing model that can be adapted by other transition regions facing similar structural conditions. Through H2CE, regional experience is not treated as an isolated best practice, but as part of a coordinated macro-regional experimentation framework. This enables partners to benchmark readiness levels, compare infrastructure sequencing approaches, exchange regulatory interpretation practices and jointly address bottlenecks such as permitting complexity and demand uncertainty. (see Section 5)

Interreg CE logic emphasises transnational cooperation as a mechanism for reducing fragmentation and accelerating implementation maturity. In this context, the Ústí Region contributes to the creation of a shared Central European hydrogen knowledge base. The territorial relevance of the region is therefore reinforced by its capacity to participate in structured peer learning, to align regional strategies with macro-regional corridor dynamics and to co-develop governance solutions that extend beyond national boundaries. This positions the region not only as a hydrogen deployment territory, but as an active contributor to Central European policy integration and coordinated Hydrogen Valley development.

11. Strategic Relevance of the Ústí Region for Hydrogen Valley Development

11.1. Structural Necessity and Systemic Preconditions

The strategic relevance of the Ústí Region for Hydrogen Valley development within H2CE is grounded in structural necessity combined with systemic prerequisites. The regional economy remains heavily influenced by energy-intensive industry, high exposure to ETS1 and upcoming ETS2 mechanisms, and electricity price volatility. These pressures create a tangible decarbonisation imperative. At the same time, the region hosts the largest hydrogen-producing industrial actors in Czechia, existing hydrogen handling experience,



brownfield capacities and proximity to German industrial corridors. This combination generates a higher structural potential for integrated Hydrogen Valley development than in less industrialised territories.

11.2. Industrial Demand Anchoring and Market Formation

Industrial demand anchoring is central. The presence of chemical production, refinery operations and ammonia-related processes creates concrete and measurable hydrogen substitution potential. In the Central European context, such demand clusters are critical for corridor-based hydrogen market formation. Without industrial anchors, hydrogen deployment risks remaining pilot-based and fragmented. The strategic relevance of the Ústí Region therefore lies in its ability to connect compliance-driven industrial demand (e.g., RED III obligations) with emerging RFNBO production projects supported by European and national funding instruments.

11.3. Infrastructure, Spatial Assets and Competitiveness Constraints

Infrastructure and spatial assets further strengthen this relevance. Brownfields, industrial zones and energy infrastructure legacy reduce land-use conflict risks and accelerate project feasibility. In Central Europe, where permitting and spatial planning represent major bottlenecks, such structural readiness constitutes a comparative advantage. However, strategic relevance must remain realistic. Hydrogen competitiveness remains highly sensitive to electricity pricing, regulated energy components and capital expenditure intensity. Therefore, within H2CE, the region's role should be framed as a structured and selective integrator rather than as an overextended hydrogen hub.

11.4. Macro-Regional Transformation Leverage

The broader macro-regional importance lies in transformation leverage. In transition regions across Central Europe, hydrogen can serve as a bridge between decarbonisation requirements and industrial continuity. The Ústí Region's pathway demonstrates how hydrogen can be embedded into industrial restructuring logic, rather than treated as a standalone technology deployment initiative.

12. SWOT Synthesis (Hydrogen Valley Perspective)

12.1. Strengths: Structural Assets and Governance Maturity

The strengths of the Ústí Region within the H2CE macro-region derive primarily from industrial demand concentration, hydrogen handling experience and institutional mobilisation. The presence of major hydrogen producers and consumers, including chemical and refinery operations, provides structural preconditions for value chain integration. The region's strategic documentation and stakeholder coordination mechanisms reflect governance maturity. These strengths position the region as a viable anchor node within a broader Central European hydrogen ecosystem.

12.2. Weaknesses: Structural Constraints and Cost Exposure

Weaknesses are closely linked to fossil dependency, high exposure to ETS-related costs and vulnerability to electricity price volatility. The cost structure of electrolysis, as demonstrated in regional analyses of hydrogen production economics, highlights the dominant role of electricity pricing and utilisation rates. Under Central European energy market conditions, hydrogen cost competitiveness remains uncertain without supportive frameworks or high utilisation anchored by real demand. Administrative capacity and permitting complexity further constrain deployment speed.



12.3. Opportunities: European Drivers and Macro-Regional Integration

Opportunities emerge from European regulatory drivers, corridor development and macro-regional integration. RED III obligations, AFIR implementation and corridor planning across Germany-Czechia-Poland create structural demand signals. The region's cross-border positioning enables integration into emerging hydrogen transport corridors. Innovation and skills development represent an additional opportunity to strengthen long-term competitiveness within the Central European cleantech ecosystem.

12.4. Threats: Fragmentation and Regulatory Uncertainty

Threats include regulatory volatility, delayed infrastructure development and fragmented implementation. If hydrogen demand remains hypothetical or dependent on unstable legislative assumptions, planned production capacities may face underutilisation risk. Fragmentation across supply, infrastructure and demand would undermine scalability. In the Central European context, coordination failure represents a structural threat equal in magnitude to cost competitiveness.

12.5. Integrated SWOT Implications for H2CE

Overall, the SWOT synthesis confirms that the Hydrogen Valley concept remains analytically appropriate precisely because it addresses integration challenges in a structured manner. Within H2CE, the region's potential must be leveraged through coordinated, cross-border and demand-driven deployment pathways. (see Section 14)

13. Measures, Activities and KPI Framework in the H2CE Context (Transnational Focus)

13.1. Short-Term Measures (2026-2030): Demand Anchoring and Market Activation

In the short-term horizon, the priority is to establish the Ústí Region as an active node within the emerging Central European hydrogen system, rather than a standalone market. Measures should focus on demand anchoring, cross-border alignment and early integration into corridor logic, while reflecting cost sensitivity, regulatory uncertainty and infrastructure constraints.

A. Industrial demand anchoring with cross-border relevance

The primary intervention area is industrial demand activation linked to transnational value chains.

Key measures include:

- Support conversion of existing hydrogen consumers, particularly ORLEN Unipetrol, ensuring alignment with EU certification (RFNBO) and access to cross-border hydrogen supply
- Facilitate long-term cross-border offtake agreements, including potential supply from German or future corridor-based hydrogen sources
- Develop regional demand aggregation mechanisms in industrial clusters (Litvínov-Záluží) with potential to act as anchor demand nodes within Czech-German corridors
- Align industrial projects with CBAM exposure and EU industrial decarbonisation requirements, strengthening export competitiveness



Expected outcome:

→ creation of bankable, internationally connected demand nodes capable of attracting corridor-based supply

B. Pilot deployment with interoperability focus (mobility and public sector)

Mobility pilots should serve as interoperability and infrastructure testing environments, not only local demonstrations.

Key measures include:

- Deployment of hydrogen fleets (buses, logistics) via Dopravní společnost Ústeckého kraje, ensuring compatibility with AFIR and TEN-T corridor requirements
- Development of refuelling infrastructure aligned with cross-border transport routes (Czech-German logistics corridors)
- Testing interoperability of refuelling standards, safety procedures and operational models with neighbouring regions (e.g. Saxony)

Expected outcome:

→ validation of hydrogen use cases in cross-border transport and logistics systems

C. Infrastructure readiness and corridor alignment

Infrastructure preparation must be explicitly aligned with transnational corridor development.

Key measures include:

- Coordination with NET4GAS on integration into Czech Hydrogen Backbone (WEST/NORTH) and Czech-German interconnection (CGHI)
- Alignment with European initiatives such as the European Hydrogen Backbone and Central European corridors (e.g. CEHC)
- Identification of regional connection points, industrial hubs and storage potential linked to future pipeline infrastructure
- Cooperation with ČEPS to ensure electricity system readiness for electrolysis

Expected outcome:

→ positioning of the region as a corridor-connected hydrogen node, not an isolated system

D. Governance, coordination and H2CE integration

Short-term governance measures must ensure alignment with transnational planning frameworks.

Key measures include:

- Active participation in H2CE project, including use of planning tools, benchmarking and joint methodologies
- Establishment of a regional hydrogen coordination platform with cross-border interface, involving German partners (e.g. Hydrogen Land Saxony, HZwo)
- Alignment of project pipelines with EU funding instruments (Hydrogen Bank, Innovation Fund, IPCEI Hydrogen)
- Development of shared data frameworks for demand, infrastructure and project tracking across borders

Expected outcome:

→ improved strategic coordination and reduced fragmentation at Central European level



13.2. Long-Term Measures (2030-2040): Integration and Structural Scaling

In the long-term horizon, the focus shifts to full integration into the Central European hydrogen market, including infrastructure, industrial systems and governance.

A. Corridor-based infrastructure and market integration

- Deployment of pipeline-based hydrogen transport connected to Czech-German and wider European corridors
- Integration into European Hydrogen Backbone network, enabling cross-border hydrogen flows
- Development of regional hydrogen hubs linked to industrial clusters and corridor infrastructure

B. Industrial transformation within European value chains

- Scaling hydrogen use in refining, chemicals and high-temperature industry, aligned with EU decarbonisation pathways
- Integration into European low-carbon value chains, ensuring compliance with CBAM and sustainability requirements
- Development of hydrogen-based industrial ecosystems, including CCU/CCS and circular carbon processes

C. Institutional integration and long-term governance

- Integration of hydrogen into regional, national and EU-level strategic planning frameworks
- Strengthening participation in transnational platforms (H2CE, Hydrogen Europe, corridor initiatives)
- Establishment of permanent cross-border governance mechanisms for infrastructure and market coordination

Expected outcome:

→ transition to a fully integrated, cross-border hydrogen ecosystem

13.3. Transnational Activities and H2CE Capitalisation

The H2CE project provides a structured platform for operationalising the transnational dimension of the strategy.

Key activities include:

- Joint development of hydrogen valley planning methodologies adapted to Central European conditions
- Cross-border benchmarking of infrastructure sequencing, permitting models and industrial deployment strategies
- Exchange of experience with regions such as Saxony and other coal-transition regions
- Development of joint pilot concepts and coordinated project pipelines across partner regions
- Capacity building through skills development, training programmes and institutional learning

Expected outcome:

→ creation of a coherent Central European hydrogen ecosystem with aligned regional strategies

13.4. Core Technical and Market KPIs (Transnational Dimension)

The KPI framework should reflect both regional deployment and integration into transnational systems.

- Production and infrastructure KPIs



- Installed electrolysis capacity (MW)
- Annual renewable hydrogen production (kt/year)
- Number of hydrogen production facilities connected to corridor infrastructure
- Connection to transnational hydrogen networks (capacity, interconnection points)
- Demand and market KPIs
- Contracted industrial hydrogen demand (kt/year), including cross-border supply contracts
- Number of industrial conversion projects aligned with EU frameworks
- Hydrogen consumption in export-oriented sectors
- Number of refuelling stations located on TEN-T / cross-border corridors

13.5. Governance and Ecosystem Maturity KPIs (International Integration)

Governance KPIs should explicitly capture transnational integration and ecosystem development.

Key indicators include:

- Number of cross-border hydrogen projects and cooperation agreements
- Participation in EU and Central European initiatives (including H2CE outputs implemented)
- Volume of private and public investment mobilised (€), including EU funds
- Average permitting duration and alignment with EU standards
- Number of SMEs integrated into hydrogen value chains across borders
- Volume of coordinated hydrogen-related activities within the regional ecosystem

A key indicator should track the intensity of cross-border integration, measured through participation in corridor projects, joint initiatives and shared infrastructure planning processes.

14. Evaluation Framework in the Central European Context

14.1. Conceptual Scope of Evaluation in H2CE

Evaluation of hydrogen deployment in the Ústí Region must reflect the structural complexity of Central European transition regions and the evolving regulatory and market environment in which hydrogen markets are forming. In the context of H2CE, evaluation cannot be limited to capacity tracking or project implementation control. It must assess systemic integration, demand anchoring, governance performance and macro-regional alignment. Hydrogen deployment is not a static infrastructure rollout but a dynamic transformation process influenced by electricity prices, ETS exposure, regulatory developments, industrial competitiveness and cross-border corridor formation. (see Sections 7, 8 and 14)

14.2. Operational Monitoring and Performance Tracking

The evaluation framework therefore combines performance monitoring, strategic review and adaptive recalibration. At the operational level, annual monitoring should assess installed production capacity, actual hydrogen output, utilisation rates of electrolysers, contracted industrial demand and infrastructure development progress. Special attention must be given to utilisation levels, as economic feasibility in Central European energy market conditions is highly sensitive to capacity factors and electricity pricing. Monitoring should also evaluate whether hydrogen production is effectively aligned with real demand anchors or whether underutilisation risk emerges.

14.3. Market Formation and Value Chain Coherence

From a market formation perspective, evaluation must assess whether hydrogen deployment contributes to coherent value chain integration. This includes verification that supply expansion corresponds to stable



offtake agreements, that infrastructure sequencing follows demand formation logic and that projects are not implemented in isolation. Within H2CE, cross-border coordination indicators should be integrated into evaluation, measuring participation in corridor initiatives, interoperability progress and alignment with European certification frameworks. Regional deployment must be assessed not only on internal coherence but also on its integration into Central European hydrogen market architectures.

14.4. Governance Performance Assessment

Governance performance constitutes a core evaluation dimension. The effectiveness of stakeholder coordination mechanisms, including the Hydrogen Platform and regional institutional structures, should be assessed through measurable criteria such as permitting duration, project preparation timeframes, cross-sector coordination quality and transparency of monitoring. Evaluation should determine whether institutional arrangements reduce fragmentation and enable strategic continuity beyond individual funding cycles. In transition regions, governance capacity is functionally equivalent to infrastructure readiness; without effective coordination, physical assets alone do not produce systemic outcomes.

14.5. Strategic Review and Regulatory Alignment

Strategic review cycles should occur at defined intervals, ideally every three to four years, to reassess the alignment of the regional hydrogen pathway with European regulatory evolution, including RED implementation, ETS developments, AFIR requirements and certification schemes for renewable and low-carbon hydrogen. Given the volatility of hydrogen cost assumptions and evolving geopolitical supply dynamics, scenario-based reassessment is essential. The evaluation process should test whether strategic assumptions remain valid under updated electricity price trajectories, carbon pricing mechanisms and industrial competitiveness constraints.

14.6. Impact Evaluation

Impact evaluation must extend beyond capacity metrics and include broader transformation outcomes. These include measurable decarbonisation impact in industry and transport, preservation or strengthening of industrial competitiveness, investment mobilisation within the hydrogen ecosystem and reinforcement of regional economic resilience. In the Central European context, where industrial decline risk remains tangible in fossil-transition territories, evaluation must explicitly assess whether hydrogen deployment contributes to economic stabilisation rather than imposing additional cost burdens.

An additional dimension of evaluation concerns knowledge transfer and macro-regional learning within H2CE. The Ústí Region's experience should be systematically documented and benchmarked against comparable Central European regions. Evaluation should identify replicable governance models, effective sequencing approaches and successful demand anchoring mechanisms. Conversely, it should also capture bottlenecks and implementation risks to inform macro-regional coordination. In this sense, evaluation serves not only regional accountability but also Central European policy learning.

14.7. Adaptive Governance and Concluding Framing

The evaluation framework must remain adaptive. Hydrogen markets are characterised by regulatory uncertainty, evolving cost structures and technological learning curves. Therefore, evaluation outcomes should not simply confirm target achievement but enable strategic adjustment. If demand formation lags, infrastructure sequencing must be recalibrated. If cost competitiveness deteriorates, prioritisation must shift toward segments with structural advantage. If corridor integration accelerates, regional positioning should adapt accordingly.

In conclusion, evaluation within the H2CE framework is conceived as an instrument of adaptive governance and macro-regional alignment. It links performance monitoring, strategic reassessment and impact analysis into a continuous learning cycle. For the Ústí Region, this ensures that Hydrogen Valley development remains selective, demand-driven and economically grounded, while contributing coherently to Central European hydrogen market formation.