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INVOLVED PARTNERS

Number	Organisation	Country
1	Landshut University of Applied Sciences	Deutschland (DE)
2	Mazovia Energy Agency	Polska (PL)
3	Regional Development Agency of South Bohemia – RERA	Česko (CZ)
4	Energieinstitut an der Johannes Kepler Universität Linz	Österreich (AT)
6	Energy Institute Hrvoje Požar	Hrvatska (HR)
8	Energy Agency of Savinjska, Šaleška and Koroška Region	Slovenija (SI)
9	South-Transdanubian Regional Innovation Agency	Magyarország (HU)
11	WeEurope Srl SB	Italia (IT)

The following document is developed as a compilation of the policy recommendations prepared by participating countries, which have been made by the respective partners with accompanying support of PP4 EI-JKU in the development of the reports. The EI-JKU assumes no liability for the correctness and completeness of these country-specific recommendations.

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A. Introduction

The transition to a sustainable and resilient energy system in Europe requires the coordinated use of a broad range of energy resources and technologies. A successful energy transition cannot rely solely on the expansion of renewable electricity but must instead be based on an integrated approach that leverages all available potentials. In this context, renewable hydrogen plays a central role—particularly in hard-to-electrify industrial sectors—but its production must also be considered from a systemic efficiency perspective.

The operation of electrolysers for hydrogen production, which requires large volumes of electricity—preferably from renewable sources—also generates amounts of waste heat. This thermal energy, if left unutilised, represents a substantial loss of valuable energy. Integrating the recovery and reuse of this waste heat into the broader energy system offers an important opportunity to increase overall efficiency, reduce primary energy demand, and support EU-decarbonisation targets, especially in the heating and industrial sectors.

As electricity generation from renewable sources often does not align with real-time demand, technologies such as renewable hydrogen and the use of waste heat can help balance the grids. While hydrogen production provides a flexible load that can absorb surplus electricity, the associated waste heat can be fed into local heating networks or used in industrial processes, thereby displacing other, often fossil-based, heat sources.

It is therefore essential to design legal and regulatory frameworks that not only support the deployment of renewable hydrogen technologies but also recognise and promote the use of the associated waste heat. Fully exploiting these synergies is crucial for maximising energy system efficiency and achieving the climate and energy goals of the European Union.

This report presents a set of policy recommendations developed through a collaborative process, aimed at improving national and local framework conditions for renewable hydrogen and the use of waste heat. The report builds on the findings of the Policy Framework Assessment (D.2.1.1), where project partners identified key barriers within existing legal and regulatory frameworks that hinder the deployment of renewable hydrogen and the efficient utilisation of waste heat. These barriers highlighted the areas where policy support is most needed to enable a flexible, efficient, and sustainable energy system.

To address these challenges, each partner country collaborated closely with their Associated Strategic Partners (ASPs) and consulted relevant policy stakeholders in a co-creation process. This joint effort focused on identifying strategic elements that would guide future policy development and serve as the foundation for the recommendations presented here. In addition, insights from previously conducted expert interviews provided further context,

ensuring that the recommendations are grounded in practical realities and aligned with emerging needs.

Through iterative exchanges combining assessment findings, stakeholder input, and expert knowledge, the policy recommendations were formulated to be both feasible and effective. In this report, they are presented as a comprehensive guide to support renewable hydrogen deployment and maximising the use of waste heat, reflecting a balanced integration of strategic considerations, stakeholder perspectives, and expert insights.

B. National Policy Recommendations

This section of the report presents policy recommendations developed by each partner country. The recommendations address both renewable hydrogen and the use of waste heat, with a focus on short- and medium-term targets for 2030 and 2040. For this purpose, the recommendations have been tailored to reflect the specific legal, regulatory, and practical contexts of each country.

The recommendations are presented in alphabetical order of the participating countries. This structure allows for a clear and systematic presentation, providing insights into the strategic direction and policy measures required to support the deployment of hydrogen and the efficient use of waste heat. By integrating the findings from the legal framework assessments, stakeholder consultations, and expert interviews, the report offers a comprehensive set of recommendations designed to facilitate the effective integration of these technologies at the national level.

1. Austria

Topic	Now	2030	2040
Hydrogen	Ensure faster permitting procedures	Ensure long-term funding for projects	
	Clarify definitions (renewable and low-carbon hydrogen) and certification schemes; especially introduce definition for energy storage facilities (a category that includes electrolysers)	Provide financial and legal support for potential consumers of renewable hydrogen to foster hydrogen production	
	Clarifycation on financial incentives, particularly regarding system usage charges for energy storage facilities	Develop hydrogen energy communities and supportive legal and financial schemes	
	Simplify the application for funding for large-scale industrial projects		
Waste heat	Adjust the definition of waste heat suitable for cases if no connection to the district heating network exists and merely exemplary naming of the waste heat source.		
	Provide funding schemes for use of waste heat from electrolysers		
	Consider stipulation of obligatory use of waste heat from electrolysers		

Hydrogen

The development of hydrogen projects is still slowed down by lengthy permitting procedures, which make investments less attractive and often lead to higher costs. To support a sustainable energy transition, permitting processes should be accelerated, and the relevant EU rules should be implemented consistently at the national level.

It is not only lengthy permitting procedures but also the lack of implementation of fundamental provisions—such as the Electricity Directive (EU) 2019/944 and its rules on energy storage facilities, which also encompass electrolysers within the electricity market—that create legal uncertainty for potential operators of electrolysers. Closely linked to this is the design of network charges and possible exemptions, which further contributes to uncertainty regarding the cost structures under which electrolysers can operate. Therefore, it is essential that the national legal framework be adjusted as soon as possible.

Significant challenges continue to arise with regard to conversion processes and sector-coupling elements of renewable energy, particularly in the context of guarantees of origin and RFNBO certification. Although Austria has introduced a national framework for conversion processes such as electrolysis, a harmonised European approach remains highly desirable in the long term to ensure that cross-border energy flows can occur without barriers. Equally important is the preservation of RFNBO certification when hydrogen is injected into the natural gas grid. While this represents a less efficient option compared to direct injection into a dedicated hydrogen network, transitional solutions must realistically be considered, as the development of such hydrogen networks will require several more years. Similarly, a harmonised EU-level framework would be highly beneficial in establishing uniform conditions across Member States and enabling unhindered trade. Equally important is the swift adoption at EU level of the methodology for assessing greenhouse gas emission savings from low-carbon hydrogen. Establishing such a framework would provide the necessary legal basis for low-carbon hydrogen, close existing regulatory gaps, and contribute to accelerating the energy transition.

Given that renewable hydrogen continues to represent a comparatively costly alternative to fossil-based processes, targeted support measures appear both necessary and reasonable. While certain funding instruments already exist, a simplification of procedures – particularly for large-scale industrial projects – could be considered, alongside the establishment of long-term support schemes to ensure investment security. Moreover, as the use of renewable hydrogen itself may pose significant cost-related challenges, providing both regulatory and financial assistance to potential end-users could be an important step to guarantee market uptake and ensure that the hydrogen produced is effectively consumed.

In addition, the promotion of hydrogen energy communities offers significant potential for strengthening local value creation, citizen participation, and regional energy resilience. Therefore, financial and regulatory support mechanisms should be developed to enable such communities to play an active role in the emerging hydrogen economy.

Waste heat

Definition

The current legal framework for waste heat in the Renewable Energy Directive suffers from significant practical shortcomings. The core issue lies in the requirement that thermal energy must be integrated into a district heating network to qualify as waste heat. This narrow coupling with network integration excludes alternative utilization pathways – such as direct on-site use or bilateral heat supply agreements between neighboring facilities.

A contemporary definitional approach should functionally characterize waste heat as any unavoidable thermal energy that would otherwise remain unutilized – regardless of its specific recovery method. Furthermore, the exhaustive enumeration of potential waste heat sources appears problematic. Instead, an open, illustrative catalog of sources should be adopted that can accommodate technological innovations and emerging application areas – such as hydrogen production facilities, data center operations, or agricultural processes,

Funding Regime

Dedicated funding schemes should be established to support the recovery and utilization of waste heat from electrolysers. Electrolyser projects often generate large amounts of low-temperature waste heat that can contribute significantly to local energy systems, but the necessary infrastructure and integration measures require financial incentives to become economically viable.

Obligatory use of waste heat

The possibility of introducing mandatory requirements for the use of waste heat from electrolysers should be considered. The German Energy Efficiency Act provides a precedent by obliging certain large facilities, including data centers, to make their waste heat available for external use, while allowing exceptions in cases of proven technical impossibility or economic disproportionality. A similar approach for electrolysers at the EU or national level could ensure systematic recovery of valuable energy streams while maintaining flexibility through narrowly defined exemption clauses.

2. Croatia

Topic	Now	2030	2040
Hydrogen	Ensure faster permitting procedures for hydrogen infrastructure and electrolysers	Achieve 510 MW installed electrolyser capacity	Reach 4,693 MW electrolyser capacity
	Promote awareness and education campaigns on hydrogen safety and benefits	Provide incentives for industrial and transport hydrogen use	Enable blending of hydrogen in gas networks
	Define clear national rules aligned with EU legislation (RED III, AFIR, FuelEU, etc.)	Ensure hydrogen infrastructure (e.g., refuelling stations along TEN-T) is in place	Integrate hydrogen fully into the energy and industrial sectors
	Identify priority areas and support pilot projects	Enable regional hydrogen hubs with cross-border transport and storage facilities	
Waste heat	Map the industrial waste heat potential at the regional level	Support investment in heat recovery technologies (e.g. heat exchangers, absorption chillers)	Ensure full valorisation of industrial and urban waste heat sources
	Promote use of waste heat in district heating networks	Integrate waste heat into renewable-based heating systems (e.g. solar district heating with waste heat backup	Combine waste heat with seasonal heat storage and hydrogen production
	Develop a regulatory framework for waste heat recovery and integration	Link waste heat use with hydrogen production via high-temperature systems	

Croatia has adopted the Hydrogen Strategy until 2050 as well as the accompanying Development and Implementation Study, demonstrating strong strategic commitment to developing a national hydrogen economy. However, the regulatory and permitting environment is still fragmented, lacking comprehensive and harmonised procedures that would enable efficient deployment of hydrogen infrastructure. Key gaps remain in defining renewable (green) hydrogen, aligning national rules with RED III, AFIR, and FuelEU, and streamlining permitting for electrolysers, storage facilities, and hydrogen refuelling stations (HRS). Current processes remain slow, unclear, and distributed across multiple institutions.
The Croatian Hydrocarbon Agency (CHA) has been tasked with coordinating hydrogen-related activities under the Renewable Energy Sources and High-Efficiency Cogeneration Act, yet capacity, tools, and legal authority require strengthening. Pilot initiatives such as the North

Adriatic Hydrogen Valley (NAHV) demonstrate strong regional cooperation but progress at project level often exceeds the pace of national policy development.

2030 Outlook

Croatia aims to scale renewable hydrogen production to 510 MW of installed electrolyser capacity, significantly exceeding the original 70 MW target defined in the national hydrogen strategy. Achieving this requires accelerating permitting, identifying priority zones for hydrogen development, and fully transposing RED III, particularly RFNBO rules for transport and industry. AFIR mandates deployment of hydrogen refuelling stations along the TEN-T network, requiring coordinated national planning.

The National Recovery and Resilience Plan (NRRP) supports construction of a 10 MW electrolyser and six HRS by 2026, but additional incentives will be needed to stimulate early market demand. Support for public transport operators, freight companies, and industrial users will be critical to enable domestic hydrogen consumption.

2040 Outlook

By 2040 Croatia aims to reach 4.7 GW of electrolyser capacity, fully integrating hydrogen across industry, energy, and mobility sectors. This requires:

- Conversion of parts of the national gas network for hydrogen transport.
- Establishment of regional hydrogen hubs with cross-border infrastructure.
- Integration with the European Hydrogen Backbone.
- Stable certification systems and mutual recognition of Guarantees of Origin.
- Predictable long-term incentive frameworks for producers and consumers.

A mature regulatory system—supported by technical standards, certification schemes, and streamlined permitting—will be essential to secure investment and ensure system interoperability.

Regulatory Improvement Recommendations (Hydrogen)

1. Streamline and unify permitting procedures
   - Establish a one-stop shop for all hydrogen infrastructure.
   - Set statutory deadlines for issuing permits.
2. Define a complete hydrogen regulatory framework
   - Legally define hydrogen categories (renewable, low-carbon, WtH-based).
   - Align certification with EU Delegated Acts and CertifHy.
3. Integrate hydrogen across sectoral laws
   - Update energy, transport, industrial, and spatial planning rules to include hydrogen.
4. Strengthen institutional governance
   - Expand CHA's mandate to include RFNBO certification and system monitoring.
   - Establish the Regional Hydrogen Centre as a competence hub.
5. Support market creation
   - Introduce CAPEX/OPEX support for hydrogen vehicles and industrial uses.
   - Promote hydrogen offtake agreements and H2-Contracts for Difference.

Waste Heat

Waste heat is recognised within Croatian legislation through the Renewable Energy Sources and High-Efficiency Cogeneration Act, yet no comprehensive regulatory framework exists to ensure systematic recovery, valorisation, and integration of waste heat into energy systems. There are currently no national targets for waste heat utilisation, no standardised methodologies for mapping waste heat potential, and no regulated procedures for connecting waste heat sources to district heating networks.
As a result, large quantities of unavoidable industrial and urban waste heat remain underused, despite their potential to significantly support national decarbonisation goals.

2030 Outlook
By 2030 Croatia aims to significantly expand the use of industrial and urban waste heat through:

- Investments in heat exchangers, absorption chillers, and industrial heat recovery units.
- Integration of waste heat into renewable-based district heating systems.
- National-level mapping of all major waste heat sources.
- Development of cost-benefit analysis tools for evaluating heat recovery.
- Deployment of waste heat in fourth-generation district heating to enhance system flexibility.

Waste heat will also increasingly support hydrogen production, especially through high-temperature electrolysers (SOEC), improving overall system efficiency.

2040 Outlook
By 2040 Croatia is expected to achieve full valorisation of industrial and urban waste heat by linking waste heat with hydrogen production, seasonal thermal storage, and hybrid renewable systems. Achieving this requires:

- A complete regulatory framework for waste heat integration.
- Mandatory reporting of industrial waste heat availability.
- Standardised rules for grid connection, pricing, and data sharing.
- Support mechanisms for district heating operators and industrial producers.

Regulatory Improvement Recommendations (Waste Heat)
1. Develop a comprehensive legal framework
   - Establish obligations for mapping, reporting, and disclosing waste heat potential.
   - Create standards for integrating waste heat into district heating networks.
2. Introduce economic incentives
   - Provide grants and fiscal incentives for industrial heat recovery technologies.
   - Support district heating operators in integrating unavoidable heat.
3. Integrate waste heat into national and local planning
   - Include waste heat in NECP revisions and municipal energy plans.
4. Strengthen synergies with hydrogen
   - Support co-location of industrial waste heat sources with hydrogen production.
   - Promote SOEC-based hydrogen pilots.
5. Implement monitoring, reporting, and verification (MRV)
   - Create standardised methodologies for quantity and emissions savings.
   - Establish a national waste heat database.

Conclusion

Croatia has strong strategic foundations for the development of hydrogen and waste heat systems, but requires significant regulatory, institutional, and infrastructural improvements. Enhancing permitting, creating comprehensive legal frameworks, strengthening institutional capacity, and enabling cross-sectoral integration will be essential for achieving national targets for 2030 and 2040. Through alignment with EU directives and coordinated interregional cooperation, Croatia can position itself as a regional leader in renewable gases, waste heat utilisation, and hydrogen technology development.

3. Czech Republic

Topic	Now	2030	2040
Hydrogen	Accelerate permitting and approval procedures, harmonize regulatory frameworks and ensure consistency across regions. Simplify regulations for hydrogen infrastructure development	Support integrated projects for hydrogen production and infrastructure investment	Highly developed hydrogen production and distribution infrastructure enabling significant improvements in hydrogen production, storage, and distribution
	There is a lack of electrolyzer certification and in some cases internationally recognized standards	Clear and achievable hydrogen production targets based on real usage	Fully functional pan-European hydrogen pipeline network (by 2035)
	Eliminate EIA process for electrolyzers (planned in Czech Republic)	Development of a pan-European hydrogen transportation infrastructure	
	Introduce exceptions for hydrogen production via electrolysis under integrated permits	Better manufacturing of electrolyzers aiming to reduce their price while improving their efficiency	Stable market with reduced electrolyzer costs and clearly defined renewable hydrogen pricing
	Strengthen education in hydrogen technologies		
Waste heat	Launch an information campaign on the benefits and applications of waste heat	Include waste heat among supported energy sources in national legislation and energy policy	Fully integrate waste heat into the national energy mix and into city-level infrastructure planning
	Ensure expansion and promotion of funding programs focused on waste heat recovery	Introduce fiscal incentives such as reduced fees or tax exemptions to improve the economic	Make waste heat recovery mandatory in cases where it is technically and economically feasible

		attractiveness of waste heat projects	

Introduce exceptions for hydrogen production via electrolysis under integrated permits:
To support faster deployment of renewable hydrogen, electrolysers with low environmental impact should benefit from exceptions under integrated permitting rules. Simplified or fast-track procedures for example, exemption from full EIA would reduce delays and support early-stage projects powered by clean electricity.

Policy Recommendations for Hydrogen
Short term (now) - To get hydrogen projects off the ground more quickly, it's important to speed up the permitting process and make it easier to build and run electrolysers. This includes creating a single place where companies can get all the necessary approvals and removing unnecessary environmental assessments for small or low-impact projects. It also helps to have the same rules and certificates across EU countries, so everyone is on the same page. Funding should focus on practical, local projects that link hydrogen production with real users: like factories or transport hubs, so we can learn what works and bring costs down. Accelerating early deployment and standardisation will help reduce investment risk and increase investor confidence.
Medium term (≈ 2030) - Countries should set clear targets for how much hydrogen will be used in sectors like industry or heavy transport. These targets should be based on realistic estimates and supported by tools like financial guarantees to make hydrogen competitive. At the same time, we need to start building up the European hydrogen pipeline network, using existing gas lines where possible. Training more people to work in this field is also key, as there will be a high demand for skilled workers. Strengthening infrastructure and building workforce capacity are essential for scaling up production and use.
Long term (≈ 2040) - By this stage, a pan-European hydrogen infrastructure should be fully operational, including interconnected transmission pipelines, large-scale storage facilities, and import terminals. Policy should transition from direct financial support to regulatory instruments that promote long-term market stability and decarbonisation. This includes mandatory quotas for renewable and low-carbon hydrogen in industrial processes and transport, alongside a predictable and sufficiently high carbon price. A stable regulatory environment, underpinned by clear rules and transparent market mechanisms, will foster investor confidence and support the emergence of a mature, competitive hydrogen economy across Europe.

Policy Recommendations for Waste Heat
Short term (now) - Waste heat from factories, data centers or other sources should be officially recognised as a usable energy source. This makes it easier to support it with funding and policies. Governments and the EU should raise awareness about its potential and make it easier for companies and cities to know where waste heat can be recovered. Support should go to local pilot projects, especially in towns with district heating or areas with big industries. Clear definitions and early investments are key to unlocking untapped thermal energy sources.

Medium term (≈ 2030) - We need to make it more attractive to invest in waste heat recovery. That can mean lower taxes or network fees or offering special grants. In some cases, using waste heat should be required by law. Especially for new or upgraded buildings and facilities. Countries should also set up one organisation to keep track of waste heat opportunities and help connect suppliers with users. Local heating systems should be updated so they can use lower-temperature heat sources like waste heat. Making waste heat use a legal requirement in selected cases will help mainstream the practice.

Long term (≈ 2040) - Waste heat should be fully embedded into local and national energy strategies as a standard and reliable energy source. Urban energy planning must systematically include waste heat as a component of low-carbon district heating systems. At the EU level, harmonised monitoring frameworks, certification schemes, and interoperable data platforms will enable benchmarking, transparency, and cross-border comparability. Large-scale deployment of modernised low-temperature district heating networks integrated with industrial waste heat, heat pumps, and seasonal thermal storage, will significantly reduce dependency on fossil fuels in the heating sector. This systemic integration will contribute to improved energy system efficiency, cost-effectiveness, and alignment with the EU's climate neutrality and energy resilience objectives.

4. Germany

Topic	Now	2030	2040
Hydrogen	Ensure faster permitting procedures, e.g. H2 electrolyzer as a legal part of gas stations	Develop more flexible electrolyzers with shorter run-up times	Development and implementation of big and long-term H2 Storage systems
	Companies lack security of investment due to political inconsistencies - another strong signal and reliable roadmap is required. A new round of funding (for Truck companies, Gas stations) is required to start the value creation chain	Develop, extend and strengthen an efficient H2 network in Europe	Develop, extend and strengthen an efficient H2 network in Europe
	Combustion H2 engines should be included as a "green" application	Ensure H2 availability (local production or import) Necessary for local production: security of investment in renewable electricity production (fear of shutdown during overproduction-periods ▫ good opportunity for hydrogen production)	Ensure H2 availability (local production or import) Necessary for local production: security of investment in renewable electricity production (fear of shutdown during overproduction-periods→ good opportunity for hydrogen production)
		Necessary for import: European strategy (import harbors/pipelines and distribution hubs)	Necessary for import: European strategy (import harbors/pipelines and distribution hubs)
Waste heat	Better communication, matching plattform supply / demand	Establish cold Heat-Networks as a best practice	
	Establish Public Institutions as an integral part and intermediary of Waste Heat networks		

	Consider Plan-B in local Waste Heat Networks (when a Waste Heat provider stops producing)		

In order to accelerate Hydrogen Adoption across Germany, in line with the national Nationale Wasserstoffstrategie (National Hydrogen Strategy) and the infrastructure plans of the Bundesnetzagentur, policy makers should establish a streamlined regulatory framework that combines simplified processes for permitting projects with investment security and stable off-take agreements.

- In the short-term, adopt a **fast-track permitting** regime that explicitly recognizes electrolysers and H_2 storage (as ancillary equipment at filling stations or other refuelling sites): i.e. enable one-stop authorisation at the appropriate district or municipal authority, apply a standard safety checklist (e.g., ATEX / Seveso compliance), zoning pre-clearance, and **statutory decision deadlines** (e.g. 90 days, "silence-is-consent"). This would allow small/medium electrolysers to co-locate with refuelling or storage facilities without needing a full green-field approval process.

- Provide **investment security** via a national H_2 roadmap (or regional roadmaps, Länder-level), supported by public utilities / regional energy providers — aligned with the hydrogen strategy and national infrastructure plans (milestones e.g. 2025–2040). Support should be technology-neutral, pegged to verified GHG-intensity or sustainability criteria. Prioritize grid-connection for electrolysers, and where renewable electricity may be curtailed, offer compensation or incentives. On the demand side, establish bankable **demand signals**: public H_2 procurement quotas for buses, municipal fleets and other public sector users; long-term H_2 supply agreements (10–12 year PPAs / off-take MoUs), and, where economically required, price-stabilizing mechanisms (e.g., contract-for-difference) to bridge early cost gaps.

- Kick-start the value chain with a synchronized "fleet-and-station" funding round: provide CAPEX grants for open-access refuelling infrastructure and the first heavy-duty H_2 vehicles (e.g. trucks, municipal/waste fleets), complemented by time-limited OPEX support per kg of renewable H_2 (with degression over time) and risk-sharing loans.

- Allow that during the market ramp-up, **hydrogen combustion engines** are eligible under "green vehicle" definitions for subsidies, toll / low-emission zone benefits, and public procurement, provided they run on 100 % renewable H_2, adhere to strict NO_x and emissions limits, and meet minimum efficiency thresholds. This gives more flexibility during earlier years, especially for heavy-duty or municipal fleets, while fuel-cell technology scales up.

- Require that **all new or renewed gas network assets** (on both transmission and distribution side) be built "H_2-ready." Prioritize the **repurposing of decommissioned natural-**

gas pipelines for hydrogen transport rather than building new pipelines, to minimize environmental and community impact and avoid redundant infrastructure. In parallel, seek recognition under EU-level instruments (e.g., PCI / CEF) for cross-border hydrogen links, so Germany can integrate with broader European hydrogen corridors and benefit from European funding.

Looking ahead (2030–2040), Germany should strive to become a leading European hydrogen hub, aiming to deliver several hundred TWh of green hydrogen annually, meet projected domestic demand of 360–500 TWh by 2045, and serve as a major transit corridor in the emerging pan-European hydrogen market. Germany would integrate into the ~ 53,000 km European Hydrogen Backbone (EHB), enabling cross-border hydrogen flows via dedicated pipelines linking industrial centres, import terminals and neighbouring countries.

Waste-Heat Utilization Policy Recommendations

In parallel to H_2 adoption, national policy should promote systematic waste-heat utilisation to maximize efficiency and decarbonisation of the heating sector across municipalities and industrial regions:

Make **municipal heat planning mandatory and actionable**: comprehensive mapping of sources/sinks, a public register of "abwärme" potentials, and standard **data-sharing platforms** and duties for large energy users and data centres. Create a Regional Waste-heat Office or a specialized organism to run a local "heat exchange platform", standardise contracts/connection charges, and de-risk projects.

Embed a "priority use" rule, where technically/economically feasible, significant waste heat must be offered to a district-heating networks with regulated third-party access; complement with connection obligations or connect-or-pay for new public buildings in designated zones. **Fast-track permitting for cold-heat networks as a best practice** (pre-approved corridors, simplified wayleaves) and align tariffs to reward flexible, low-carbon heat.

Launch **blended-finance package** (guarantees for load risk, CAPEX co-funding for pipes/heat pumps, temporary OPEX top-ups for a first-of-a-kind links) tied to open access and transparent metering.

Finally, formalise cross-border cooperation (Austria for example) for **surplus-heat trade and interoperable technical standards**. Together, these measures can build bankable pipelines of projects ensure early anchor demand, and scale renewable heat **system without disrupting the existing infrastructure**.

5. Hungary

Topic	Now	2030	2040
Hydrogen	Simplification (one-stop) of hydrogen project permitting – less paperwork and less authorities take part in the permitting process	New standards for hydrogen public road delivery	Mandate blending targets or offtake quotas for green hydrogen in industrial sectors
	Define missing regulatory institutions in the green hydrogen vale chain: underground energy storage as part of the energy system	Shortening the permitting process for green hydrogen infrastructure	
	Establish clear and unified safety and technical standards for green hydrogen production	Introduce corporate tax deduction possibility for green hydrogen projects to kick-start market adoption	
		Implement guarantees of origin (GoO) certification frameworks for renewable hydrogen to ensure transparency and traceability	
Waste heat	Favorize waste heat application in the district heating system in state grants	Feed-in tariffs system for waste heat recovery projects	
	Regulate waste heat from waste electricity (aFRR-, mFRR-, negative balancing) sources	Mandate waste-heat recovery system in high level waste-heat generation applications	
		Reduce DSO tariffs for waste-heat applications	

Green hydrogen policy recommendations

A supportive public policy environment is very important to foster the hydrogen economy that is in its infancy. To accelerate the development of a competitive hydrogen economy, national policy must begin with an updated National Hydrogen Strategy that incorporates sector-specific

roadmaps and realistic deployment trajectories. As market data now shows slower-than-expected infrastructure expansion, **2030 objectives should be recalibrated** to ensure feasibility while maintaining ambition.

Introducing hydrogen blending standards for gas networks, supported by regional pilots, would provide practical experience and enable early-stage system integration. Expanding **hydrogen refuelling infrastructure** is essential for enabling sector coupling across mobility, logistics, and industrial applications. This should be combined with strong financial incentives—including CAPEX and OPEX subsidies, tax credits, and state-backed guarantees—to reduce investment risk and attract private capital. **Demand creation remains equally important**: green public procurement, hydrogen bus deployment, municipal fleet transformation, and lower electricity tariffs for renewable hydrogen producers would all strengthen market uptake.

Over the longer term, clear regulatory frameworks, **streamlined permitting for electrolysers** and pipelines, and alignment with EU Hydrogen Backbone principles will be vital for integrating hydrogen into the national energy system. These steps collectively position hydrogen as a cornerstone of a diversified, decarbonized energy portfolio.

Waste heat policy recommendations

Industrial waste heat represents one of the most underutilised energy resources, and unlocking its potential requires a structured national approach and supportive policies. The first priority is **to help mapping and quantifying waste heat availability** across major industrial sectors, providing a data-driven basis for investment decisions.

Financial incentives—such as feed-in tariffs, preferential grants, or reduced network tariffs—should be introduced to encourage deployment of waste heat recovery projects, especially those capable of integration with district heating systems. Modernising Hungary's district heating infrastructure is crucial, shifting towards **low-temperature networks** that can accommodate waste heat and other renewable heat sources. Regulatory reforms are also needed: building codes, energy regulations, and urban development plans **should explicitly support waste heat integration and regeneration.**

By 2030, municipalities should **incorporate waste heat into smart-city planning and prioritise power-to-heat applications**. Looking ahead to 2040, mandatory waste heat recovery for high-output industrial facilities and reduction of distribution system operator tariffs for waste-heat injection would significantly increase adoption. These policy measures collectively create a stable framework that recognises waste heat as a strategic energy asset, supporting decarbonisation, energy efficiency, and reduced reliance on fossil-based heating.

6. Poland

Topic	Now	2030	2040
Hydrogen	Final approval of the newest version of Poland's National Energy and Climate Plan (NECP). The hydrogen strategy cannot be separated from the key Polish climate and energy policy and strategic documents	Introduction of quantitative targets for hydrogen use in the long term (2040 and 2050), making the Strategy a long-term guide for the development of this market	
	Planning of new electrolyser capacity and demand for hydrogen in various sectors should not discriminate against domestic sources over imports	The Polish hydrogen strategy should encourage the participation of Polish companies in hydrogen production projects outside Poland, as the domestic supply of green hydrogen may not be sufficient to cover the full demand for hydrogen in the future	
	Complementing the Polish Hydrogen Strategy with a broader catalogue of specific indicators	Include more widely in the Strategy information on the Carbon Contracts for Difference (CfD) support scheme as a key argument for industry purchase of green hydrogen, while encouraging investment in its production. The Strategy lacks a definition of this support system, the scope of application and the implementation pathway in Polish legislation	
	Adoption by the Polish Ministry of Climate and Environment of the final version of the 'Heat	Transformation towards RES-based district heating systems that are more resilient to price fluctuations in	Changing the business model of the district heating industry currently based on selling as much heat and

Waste heat	Transformation Strategy to 2040'	international markets, resulting in greater cost predictability for consumers, while better management of energy consumption and the development of local heat sources increase the country's energy independence and the energy security of the population	ordered power as possible. District heating companies have no incentive to reduce energy consumption as this works counterproductive to the core business. The aim of the changes is to base the system on subscription and modernisation charges that will bring buildings up to a set energy standard, while ensuring that the building is ready to receive low-temperature heat
	Final approval of the newest version of Poland's National Energy and Climate Plan (NECP)	Integration of the energy and district heating sectors so that surplus electricity from RES is used for heat production	
	Regulatory changes to modify the tariff model, which has been in place for more than 25 years and has resulted in heat suppliers and producers being left on the brink of profitability	Using district heating companies to close the existing gap in professional energy efficiency services in Poland, leading to a leap in energy efficiency and a sustainable reduction in energy demand by generating economies of scale	

Policy recommendations for hydrogen in Poland

The updated Energy Law (2025) and the Polish Hydrogen Strategy until 2030 provide a clear legal framework defining renewable and low-carbon hydrogen and setting up infrastructure and market regulations. To be effective, these policies need better coordination and funding, including linking national programs to EU support for projects like Polish hydrogen valleys and IPCEI initiatives. Priorities include supporting industrial sectors such as steel and chemicals where hydrogen can cut emissions and integrating hydrogen storage and power-to-gas technologies into the energy system.

Legislation should be continuously refined to simplify licensing, environmental permits, and investment approval. The system of guarantees of origin must be fully operational by 2026 to ensure hydrogen's carbon footprint is transparent. Investing in workforce training and R&D will strengthen Poland's hydrogen technologies implementation capacity. Institutional support, including assigning responsibility for the hydrogen economy to selected one ministry, is essential for maintaining momentum and ensuring effective implementation of hydrogen technologies as an intrinsic part of Polish decarbonisation policy.

Policy recommendations for waste heat

Poland's waste heat policy requires urgent legislative and institutional consolidation. Despite a legal definition introduced in 2023, there are no binding regulations to promote waste heat use in district heating or industry. The upcoming Heat Strategy until 2030 should be adopted soon to incorporate waste heat use within broader decarbonisation efforts and define clear efficiency criteria for heating systems aligned with EU directives.

Policy must incentivize industries to recover and supply waste heat, expanding support programs like the Kogeneracja dla Energetyki i Przemysłu programme. Binding requirements for waste heat assessment during environmental permitting for large emitters would link energy and climate goals. Addressing fragmented financing and coordination issues between municipalities, utilities, and industry is critical. Poland should establish a national waste heat register to map and promote project development. Strengthening financial incentives, such as reforming the white certificate system, will encourage investments. Long-term, embedding circular energy concepts into urban and industrial planning can turn waste heat into a significant low-carbon energy source, supporting Poland's climate objectives.

7. Slovenia

Topic	Now	2030	2040
Hydrogen	Ensure faster permitting procedures	Unify opposing and contradictory laws	Ensure enough production capacity to follow the national demand, to ensure that as much H2 as needed is produced nationwide.
	Develop and enforce the National Hydrogen Strategy of the Republic of Slovenia	Secure strategic locations for brownfield investments and hydrogen production plants	Develop and publish a strategic national list of public urban H2 nodes
	Harmonise H2-related laws across energy/transport/building codes	Ensure market regulation to monitor the prices, supply, and demand, in order to prevent monopolies	Integrate 20-30-year H2 plan with power/gas network plans
Waste heat	Establish legal framework recognising waste heat as a resource	Conduct an analysis of the entire national industry to capture waste energy potential	Codify enduring tariffs and verification protocols
	Unify the strategic documents and enforce laws between themselves	Launch state subsidies for waste-heat produmers and DHS injection	Integrate waste heat into DHS planning for peak-shaving/storage.
	Conduct an analysis of the entire national industry to capture waste energy potential	Standardise waste-heat pricing	Align with EU guidance on accounting and state-aid compliance

Slovenian policy recommendations – hydrogen

Slovenia should prioritize an enabling framework that accelerates green hydrogen deployment while safeguarding market integrity and infrastructure coherence across planning horizons. In the short term, the priority is to streamline permitting, finalize and operationalize the National Hydrogen Strategy, and align sectoral legislation that currently creates contradictions for project developers. Faster permitting can be achieved by setting statutory time limits, instituting one stop shop procedures, and standardizing environmental and safety documentation requirements for electrolysers, storage, and refuelling infrastructure. Concurrently, the National Hydrogen Strategy should be translated into executable measures with clear KPIs, including definitions of priority use cases (industry feedstock, heavy mobility,

balancing/ancillary services) and siting guidelines tied to grid and renewable resource maps. Legal harmonization should cover energy, environmental, industrial, transport, and construction codes so that approvals for integrated H2 RES storage systems follow a coherent path rather than parallel, conflicting regimes.

By 2030, policy should shift from basic enablement to market structuring and spatial certainty. First, unify opposing and contradictory laws with a consolidated hydrogen act or coordinated amendments that explicitly define roles for TSOs/DSOs, responsibilities for safety inspections, and thresholds for permitting categories (pilot, demo, commercial). Second, secure strategic locations for brownfield hydrogen production to minimize land use conflicts and leverage existing grid, water, and industrial interfaces; this requires national and municipal spatial plans to reserve zones for electrolysers, compression, storage, and potential co location with waste heat or oxygen valorisation. Third, introduce proportionate market regulation that monitors prices, supply, and demand to prevent monopolistic behaviour, information asymmetries, and discriminatory access to infrastructure; soft regulation can begin with transparency obligations and evolve into access rules for shared pipelines, storages, and refuelling depots if bottlenecks appear. Finally, publish a strategic list of public H2 urban nodes where mobility and municipal services are expected to adopt hydrogen, guiding concession tenders and public procurement toward bankable aggregation of demand.

Looking to 2040, the emphasis should be system adequacy, domestic value creation, and long term governance. Ensure sufficient domestic production capacity to meet national demand profiles identified in decarbonisation pathways, with flexible electrolyser fleets able to provide grid services and absorb surplus renewable generation. Prepare a 20–30 year national plan for hydrogen that integrates with electricity and gas network development plans, industrial policy (e.g., green steel, chemicals), and resilience measures for cross border supply shocks. This plan should set technology neutral targets for carbon intensity, reliability, and interoperability, while enabling local manufacturing, workforce development, and R&D. To underpin fair markets, adopt an adaptive regulatory model: light touch oversight in early stages, moving toward codified third party access and tariff methodologies for shared H2 networks if natural monopoly characteristics emerge. At EU level, Slovenia should support a common methodology for assessing GHG savings for low carbon hydrogen that is consistent with renewable fuels of non biological origin (RFNBO) rules, ensuring cross border recognition and robust, auditable guarantees of origin.

Slovenian policy recommendations – waste heat

Waste heat recovery is an immediate, low regret lever for decarbonisation and energy efficiency, but Slovenia requires foundational policies before scaled deployment can occur. In the short term, establish a clear legislative framework that recognizes waste heat as an energy resource, defines data sharing obligations for industrial emitters and data centers, and clarifies liability and metering standards when injecting heat into district heating systems (DHS).

Harmonize existing strategic documents—energy efficiency, renewable heat, industrial policy, and urban planning—so incentives and obligations are mutually reinforcing rather than fragmented. Begin a nationwide assessment of waste energy potential across industries and municipal infrastructures (including wastewater), creating a geospatial registry of sources, temperature levels, seasonality, and proximity to DHS or large consumers. This baseline enables targeted support and helps DSOs plan network upgrades, thermal storage siting, and low temperature loop expansions.

By 2030, move from mapping to monetisation and scale. Introduce state level subsidies or performance based incentives that reward producers who become "produmers" by supplying waste heat to DHS or onsite communal networks, with grants tied to verified delivered MWh and measured temperature/quality parameters. Complement this with standardized connection agreements and technical codes for interconnection (hydraulics, quality bands, metering, data exchange), reducing transaction costs. Conduct the full national industry analysis to quantify technical and economic potential, prioritizing projects with high social welfare (e.g., where DHS can switch from fossil boilers to recovered heat plus heat pumps). Enact pricing regulations that steadily standardize how waste heat is valued: for instance, reference pricing linked to avoided fuel costs, carbon costs, and network losses, while preserving room for bilateral negotiation to reflect local conditions. Transparent, predictable pricing will de risk both industrial and DHS investments and enable third party finance.

For the long term to 2040, when the sector matures, Slovenia should codify stable market arrangements and integrate waste heat into regional energy planning as a conventional resource. While current readiness may not support detailed 2040 measures today, the policy direction is clear: define enduring tariff frameworks, data governance, and performance verification protocols so that waste heat reliably contributes to peak shaving, seasonal storage strategies, and electrified heat pump backbones in DHS. Where feasible, align with EU level guidance on waste heat accounting, interoperability, and state aid compatibility to ensure cross border comparability and financing eligibility. This long term view will ensure that early pilots evolve into a sustained, investable market segment that complements hydrogen, heat pumps, and thermal storage in a coherent decarbonised heat system

8. Italy

Topic	Now	2030	2040
Hydrogen	**Support for scale-up:** promote both public and private investments to increase green hydrogen production, which is still limited and costly	**Functioning hydrogen market:** establish a European framework for cross-border hydrogen trade, with transparent market rules	**Advanced decarbonisation:** complete switch to green hydrogen in energy-intensive sectors
	Infrastructure planning: launch concrete planning for dedicated pipelines, storage, and interconnections between industrial hubs	**Common certification:** introduce a European system for tracking and certifying renewable hydrogen	**Grid integration: achieve interoperability between electricity and gas grids, using hydrogen as a storage vector**
	Clear and harmonised regulations: simplify permitting procedures and harmonise definitions of "green," "blue," and other hydrogen types, as recommended by several interviewed stakeholders	**Support for integrated projects:** promote industrial clusters that combine hydrogen production and consumption	**Global competitiveness:** position the EU as a leader in exporting hydrogen technologies
	Demand stimulation: provide incentives for use in hard-to-abate sectors, such as steelmaking and refining	**Capacity building:** strengthen training for operators, technicians, and policymakers	
Waste heat	**Mapping and awareness:** systematically collect data on waste heat sources, which are still largely underestimated according to stakeholders	**Incentives or mandates for recovery:** introduce energy efficiency criteria that make heat recovery cost-effective or mandatory in certain cases	**Systematic recovery:** waste heat recovery becomes standard practice in all industrial and urban sectors.
	Local recovery policies: encourage municipalities and industrial districts to launch waste heat recovery projects	**Integration with district heating:** support the use of waste heat in both existing and new district heating networks	**Digitalisation and monitoring:** employ smart technologies to optimise heat collection and distribution

	Public-private partnerships: promote agreements between utilities and industries for pilot projects	**Reform of local energy markets:** enable the competitive valorisation of this energy source	

Hydrogen Policy Recommendations

Italy's hydrogen strategy builds on EU climate targets and aims to decarbonize hard-to-electrify sectors through a robust hydrogen economy. Infrastructure planning is a top priority: Italian energy operators are mapping dedicated hydrogen pipelines, storage sites, and industrial hub interconnections to create a hydrogen transport backbone. Snam, the national gas TSO, is repurposing parts of its gas network to be "hydrogen-ready" and participating in the SoutH2 Corridor linking North Africa to Europe, positioning Italy as a key hydrogen import/export hub. This forward-looking infrastructure planning is coupled with efforts to integrate hydrogen into existing energy systems (e.g. blending up to 10% hydrogen into gas grids) while developing new pipelines and storage for 100% hydrogen in the long term.

A common certification system is being advanced to guarantee hydrogen's renewable origin and sustainability. Italy supports the introduction of an EU-wide scheme to track and certify green hydrogen, ensuring that "renewable" or low-carbon hydrogen is clearly defined and tradable across borders. Establishing Guarantees of Origin for hydrogen will increase market transparency and investor confidence, complementing Italy's alignment with emerging EU standards on what constitutes green or blue hydrogen. In parallel, Italy is laying out market development measures: regulators are preparing the legal framework for a competitive hydrogen market, including rules for open access to hydrogen pipelines and terminals once they are built. The government is exploring market-based instruments such as contracts for difference or double-sided auctions to jump-start hydrogen trading and balance the price gap between green hydrogen and fossil alternatives. Simplified authorization procedures and harmonized regulations are also being pursued to accelerate project development – for example, streamlining permits for electrolysers and clarifying definitions of hydrogen types to remove regulatory ambiguity.

To stimulate demand, Italy is targeting support to sectors that can most benefit from hydrogen. Incentives and pilot programs focus on heavy industry (steel, chemicals, refining) and heavy-duty transport, where hydrogen can replace coal, gas, or oil-based fuels. Italy's draft National Hydrogen Strategy set an initial goal of 5 GW of electrolyser capacity by 2030 and projected hydrogen could supply 2% of final energy demand by that date. Achieving this will require financial support mechanisms – for instance, Italy is channeling EU recovery funds and domestic resources into hydrogen research and deployment, subsidizing early adoption in industrial clusters and co-funding hydrogen refueling infrastructure for freight transport. Public procurement and offtake agreements are being considered to assure hydrogen producers of

future demand. Meanwhile, industrial cluster support is fostering "Hydrogen Valleys" – localized hubs where hydrogen production and consumption are co-located for efficiency. These clusters benefit from shared infrastructure and create synergies between producers and multiple end-users, driving down unit costs. Support for such integrated projects includes grants and regulatory facilitation, aligning with EU initiatives to promote hydrogen hubs. Italy is also investing in capacity-building through training programs and R&D support, recognizing that skilled operators and technological innovation are critical to sustaining long-term growth in the hydrogen sector.

Waste Heat Recovery Policy

In Italy, waste heat recovery is an emerging policy focus within the broader energy efficiency framework. Historically, the potential of industrial waste heat – from factories, power plants, data centers, and other facilities – has been underutilized, and stakeholders note that these sources remain largely underestimated in national energy planning. There were until recently no dedicated government incentives for waste heat recovery in district heating networks, meaning the concept of using excess heat faced low awareness and regulatory support. This is beginning to change: under the National Recovery and Resilience Plan (PNRR), Italy earmarked €200 million to promote efficient district heating infrastructure, including the construction of 330 km of new networks and 360 MW of waste heat recovery capacity. This investment, initiated in 2022, aims to tap into waste heat from industrial processes and other sources, potentially saving around 20,000 tons of oil equivalent in fossil energy each year through recovered heat use. It signifies a first national-level step to capture waste heat at scale and improve energy security by reducing reliance on imported fuels.

A key recommendation for Italy is to strengthen local policy engagement in waste heat recovery. Municipalities and industrial districts are encouraged to identify and implement projects that utilize local waste heat sources. For example, city authorities can work with nearby industries to channel excess industrial heat into municipal district heating systems, supplying residential or commercial buildings. Integrating waste heat with district heating networks is a priority: Italy is supporting the expansion of both existing and new district heating systems that can absorb waste heat inputs. This integration is aligned with Italy's climate goals, as district heating fed by renewable or recovered heat can sharply cut urban emissions. Some Italian cities in the north have begun pilot projects (e.g. using data center or industrial heat for district heating), showcasing the viability of these approaches. To facilitate broader uptake, the government and energy agencies are improving data mapping and awareness: a systematic mapping of waste heat sources nationwide is being developed, so that policymakers and investors know where significant recoverable heat exists. Improved data and transparency will help local authorities incorporate waste heat options into their energy plans. Additionally, the use of digitalisation and monitoring technologies is promoted to optimize heat recovery – smart sensors and

control systems can match heat supply with demand in real time, reducing losses and ensuring efficient distribution of recovered heat.

To overcome economic barriers, Italy is looking at incentives and regulatory measures that make waste heat recovery more attractive. One proposal is to introduce or strengthen energy efficiency criteria that effectively encourage heat recovery, or even make it mandatory in certain cases where feasible. Industries could be required to assess waste heat reuse options when installing large combustion plants, in line with EU Energy Efficiency Directive provisions. Financial incentives are also pivotal: companies investing in waste heat recovery equipment might receive support through Italy's White Certificates (energy efficiency credit) scheme or targeted tax credits, improving the business case for these projects. The PNRR funding mentioned above is distributed in part via grants managed by GSE (the Energy Services Manager) for both small and large district heating projects, with higher scores given to projects that maximize waste heat utilization. On the regulatory side, reforms are being considered to enable the competitive valorisation of waste heat. This means creating a framework where excess heat can be sold or exchanged on fair terms: for instance, enabling third-party access to district heating networks so that an industrial plant can supply heat to the grid, or setting tariffs for waste heat contributions. At present, the lack of a clear market mechanism means many potential heat suppliers have little incentive to invest; Italy aims to address this by clarifying ownership and pricing rules for recovered heat. Public-private partnerships (PPPs) are likewise encouraged to jump-start projects. The government is facilitating agreements between industrial companies (as heat providers) and utilities or local authorities (as heat users) to share costs and benefits of pilot installations. Such partnerships can help navigate initial hurdles by pooling technical expertise, investment, and risk, thereby demonstrating models that can be replicated elsewhere.

Despite these initiatives, several barriers persist. Technically, retrofitting existing plants with heat recovery systems or extending pipelines to connect heat sources with users can be complex and costly. Economically, low awareness and split incentives slow adoption. There is also a need for coordinated planning – aligning industrial sites with residential or commercial heat demand centers is an urban planning challenge that requires collaboration across government levels. However, the opportunities for Italy are substantial. Experts suggest that by 2040 waste heat recovery could become standard practice in all major industrial and urban sectors, contributing significantly to energy saving and emissions reduction. Capturing waste heat aligns with Italy's commitments under the EU Green Deal and Fit-for-55 package, improving overall energy efficiency. It also has co-benefits: reduced air pollution and improved competitiveness as industries lower their energy costs. Going forward, Italy's policy framework is moving toward integrating waste heat in its National Energy and Climate Plan and ensuring that new urban developments consider district heating options. In summary, Italy's waste heat policy recommendations call for a mix of local initiative, supportive regulation, and smart

incentives. By building comprehensive data on heat sources, incentivizing recovery technologies, and enabling markets for waste heat exchange, Italy can turn an often-overlooked energy stream into a valuable resource, strengthening its energy efficiency drive and urban sustainability goals.

C. Recommendations for the Central Europe

The Central European region faces unique opportunities and challenges in the deployment of renewable hydrogen and the utilisation of associated waste heat. National energy systems, regulatory frameworks, and market conditions vary across countries, yet many common challenges have been identified across the region. This chapter presents policy recommendations for Central Europe, developed through stakeholder consultation, expert input, and the analysis of existing legal and regulatory frameworks. Based on these shared challenges, the recommendations are designed to be applicable across the entire region while also addressing specific national contexts where relevant. By highlighting strategic priorities and practical measures, the chapter provides guidance to policymakers on how to strengthen regional cooperation and create an enabling environment for a sustainable energy transition.

Hydrogen Policy recommendations

Streamlined Permitting & Regulatory Clarity

- Accelerate permitting procedures for hydrogen projects.
- Introduce one-stop shops and statutory deadlines to reduce bureaucratic delays.
- Harmonize national laws and sectoral regulations (energy, transport, industrial, construction) with EU directives (RED III, AFIR, FuelEU).
- Provide exemptions for low-impact or integrated hydrogen projects (e.g., EIA exemptions for electrolysers).

Clear Definition & Certification

- Develop certification schemes, including Guarantees of Origin (GoO) or RFNBO recognition.
- Align national definitions with EU standards to ensure cross-border trade and market transparency.

Infrastructure Development

- Build national and regional hydrogen production, storage, and distribution infrastructure.
- Plan hydrogen hubs and TEN-T aligned refuelling networks.
- Integrate with the European Hydrogen Backbone.

Financial Incentives & Investment Security

- CAPEX/OPEX grants, tax incentives, subsidies, or Contracts for Difference (CfD) to reduce investment risk.
- Long-term funding schemes to ensure sustainable development and market uptake.
- Support for end-users to stimulate demand (industry, transport, municipalities).

Market Development & Demand Creation

- Promote hydrogen use in hard-to-abate sectors (steel, chemicals, refining, transport).
- Encourage public procurement, fleet transformation, and regional “Hydrogen Valleys”/clusters.

- Introduce blending quotas in gas networks or mandates for industrial use.

Capacity Building & R&D

- Develop training programs and workforce for hydrogen technologies.
- Support integrated projects linking hydrogen production with real users.
- Promote local manufacturing of electrolysers and efficiency improvements.

Long-Term Strategic Planning

- Publish 20–30 year plans linking hydrogen production to electricity/gas networks.
- Ensure domestic production capacity meets national demand.
- Foster cross-border cooperation and regional market integration.

Waste heat policy recommendations

Legal Recognition & Framework

- Recognize waste heat as a usable energy resource.
- Establish comprehensive national laws and regulations for mapping, reporting, and integration.

Mapping & Assessment

- Conduct national/industry-wide surveys to quantify technical and economic potential of waste heat.
- Create databases for sources, temperature, seasonality, and proximity to consumers or district heating networks.

Economic Incentives & Market Support

- Provide grants, subsidies, feed-in tariffs, tax reductions, or fiscal incentives for recovery projects.
- Encourage co-location of industrial waste heat with hydrogen production or district heating.
- Facilitate public-private partnerships to kick-start pilot projects.

Integration with District Heating & Energy Systems

- Promote use of waste heat in district heating networks, renewable-based heating systems, or seasonal storage.
- Encourage hybrid solutions combining heat pumps, thermal storage, and renewable energy.
- Introduce priority use rules or mandatory recovery where technically feasible.

Monitoring, Reporting & Verification

- Implement standard methodologies to track recovery, efficiency, and emissions savings.
- Establish public registries for industrial and urban waste heat availability.
- Integrate waste heat metrics into national energy plans and climate targets.

D. EU level recommendations

In recent years, the European Union has actively advanced the development of renewable energy and climate policies, creating a dynamic legislative environment aimed at supporting the energy transition. The growing integration of renewable hydrogen and the utilisation of associated waste heat into the energy system requires targeted legal and regulatory measures to overcome existing barriers. EU-level policies play a crucial role in providing guidance, harmonising standards, and creating incentives that enable member states to implement these technologies effectively. This chapter presents policy recommendations at the EU level, designed to support the deployment of renewable hydrogen and the efficient use of waste heat, and to ensure that legal and regulatory frameworks are aligned with both short-term (2030) and long-term (2040) climate and energy objectives. By identifying key measures and strategic priorities, these recommendations aim to facilitate a coordinated and efficient European approach to energy system decarbonisation.

Topic	Now	2030	2040
Hydrogen	Harmonize certification standards for green hydrogen	Define a pan-European hydrogen import and transportation strategy	Establish a fully functional pan-European hydrogen pipeline network
	Establish methodology for assessing greenhouse gas emission savings for low-carbon hydrogen	Continuously update realistic hydrogen production targets based on actual projects and production utilization	
	Establish methodology for assessing greenhouse gas emission savings for low-carbon hydrogen	Harmonize regulations across EU member states to enable cross-border hydrogen trade	
	Fund pilot project for a portfolio of business cases transferable to all over Europe	Build hydrogen production, transport and storage infrastructure	
	Further develop hydrogen valleys and local hydrogen projects to foster and replicate developments to other regions		

	Harmonise methodology for assessing GHG savings from renewable and low-carbon hydrogen		
	Accelerate trans-European hydrogen infrastructure rollout (Hydrogen Backbone)		
	Facilitate access to EU funds with simplified criteria		
	Promote mutual recognition of Guarantees of Origin		
Waste heat	Officially recognize waste heat as a renewable or secondary energy source under RED III and other relevant frameworks	Mandate the integration of waste heat into urban planning and energy infrastructure	Require mandatory waste heat recovery in new industrial installations
	Launch EU-wide awareness campaigns and publish guidelines for best practises in waste heat recovery	Harmonize certification and monitoring systems for waste heat across the EU to enable cross-border use and benchmarking	Integrate waste heat metrics into the EU's energy efficiency and carbon neutrality targets
	Recognise waste heat as a renewable source in EU statistics		
	Standardise technical criteria and incentives for integrating waste heat into district heating		
	Promote cross-border cooperation for waste heat utilisation		
	Support R&D linking waste heat with hydrogen (SOEC)		
	Fund pilot project for a portfolio of business cases transferable to all over Europe		

Hydrogen

A harmonised EU framework for conversion processes and sector-coupling elements is urgently needed to ensure barrier-free cross-border energy flows and consistent implementation of guarantees of origin and RFNBO certification. Such harmonisation would prevent different national approaches and provide a coherent foundation for the internal energy market. Equally important is the preservation of RFNBO certification when hydrogen is injected into the natural gas grid. Although this represents a transitional and less efficient solution compared to dedicated hydrogen networks, it remains a pragmatic interim measure until the latter are fully developed.

A uniform European approach would prevent market fragmentation and facilitate unhindered hydrogen trade between Member States. Furthermore, the swift adoption of a common EU methodology for assessing greenhouse gas emission savings from low-carbon hydrogen is essential. This would establish a clear legal basis for recognising low-carbon hydrogen, close existing regulatory gaps, and accelerate the European energy transition by providing greater legal certainty for investors and industry alike.

In the long term, however, the development of a comprehensive hydrogen infrastructure encompassing production, transport, and storage will be indispensable to enable an integrated and resilient European hydrogen economy. At the same time, it will be crucial to further develop hydrogen valleys and local hydrogen projects in order to foster innovation, strengthen regional value chains, and replicate successful developments across other regions of the EU.

Policymakers should invest in pilot initiatives that reflect the broad spectrum of hydrogen use cases — spanning production, transport, storage, and various end-use applications. The focus should go beyond proving technical viability at isolated sites and instead aim to create replicable and scalable concepts that can be implemented across Europe. By pursuing such a diversified and practice-oriented strategy, policymakers can provide concrete models for different industries and regions, accelerate the market uptake of hydrogen technologies, and lay the groundwork for a robust and interconnected European hydrogen economy.

Waste Heat

The legal definition of waste heat in the Renewable Energy Directive should be revised in order to better reflect practical realities. Currently, the definition links the qualification of waste heat to its integration into a district heating network, which excludes on-site or bilateral forms of utilization. A more functional definition would recognize waste heat as any unavoidable and otherwise unused thermal energy, irrespective of whether it is fed into a district heating system. In addition, the catalogue of sources should not be exhaustive but merely exemplary, so that future developments – for instance in hydrogen production, data centers, or agriculture – are automatically covered.

Policymakers should fund pilot projects that cover a portfolio of different business cases for waste heat utilization. The aim is not only to demonstrate technical feasibility at single sites but to generate transferable and scalable models that can be replicated across Europe. Such a portfolio approach would provide practical blueprints for diverse sectors and regions, thereby accelerating the uptake of waste heat recovery on a continental scale.