ENABLE DHC

INVESTMENT PLAN

For the District Heating system in Weiz-Gleisdorf

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Dissemination level		
SEN	Sensitive, limited under the conditions of the Grant Agreement	☐
PU	Public, fully open	☒

Nature of the deliverable		
R	Report, document	☒
DEM	Demonstrator, pilot, prototype, plan designs	☐
DEC	Websites, patents filing, press & media actions	☐
DATA	Datasets, microdata, etc.	☐
DMP	Data management plan	☐
ETHICS	Deliverables related to ethic issues	☐
SECURITY	Deliverables related to security issues	☐
OTHER	Software, technical diagram, algorithms, models, etc.	☐

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This template is prepared to support consortia participating in the LIFE Clean Energy Transition subprogramme in developing investment plans for existing or new district heating and/or cooling systems. The goal is to facilitate the preparation of plans that meet the "efficient district heating and cooling" criteria outlined in the Energy Efficiency Directive article 26, which is further explained in Commission Recommendation (EU) 2024/2395 [1].

[1] Commission Recommendation (EU) 2024/2395[1] of 2 September 2024 setting out guidelines for the interpretation of Article 26 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the heating and cooling supply, available at https://eur-lex.europa.eu/eli/reco/2024/2395/oj/eng

1. Case Study Context and Transformation Objective

The Weiz-Gleisdorf case study addresses the long-term transformation of five existing district heating systems located along a regional corridor in Styria, Austria. The systems are currently operated by different local organisations and are not hydraulically interconnected. This multi-operator structure is a defining feature of the case because technical integration has to be accompanied by coordinated planning, clear operational interfaces and cooperation arrangements between the participating organisations.

The regional heat supply already has a strong renewable basis. Biomass forms the main renewable backbone and is complemented by industrial waste heat, solar thermal energy, biogas and heat pumps using wastewater as a low-temperature heat source. Fossil gas and oil are mainly used for peak-load, reserve and operational flexibility. The transformation challenge is therefore to expand an already renewable heat system while making better use of existing resources and progressively reducing the remaining dependence on fossil backup.

Future district-heating demand is expected to increase through network densification, connection of buildings with fossil heating systems and new developments. If the networks continue to expand independently, each system must maintain sufficient local generation and reserve capacity. Regional interconnection offers another option: available heat and generation capacity can be shared, temporal differences between local loads can be balanced and renewable or recovered heat sources can serve a larger operational area.

Planning aspect	Public case-study context
Existing system	Five neighbouring district-heating systems operated separately by local operators
Existing energy basis	High renewable share with biomass as the main backbone, complemented by waste heat, solar thermal, biogas and wastewater heat recovery
Main challenge	Serve growing district-heating demand while limiting fossil peak-load use and avoiding unnecessary duplication of generation capacity
Strategic response	Create an inter-municipal connection that enables regional heat exchange, coordinated operation and integration of additional renewable and recovered heat
Planning horizon	Stepwise transformation towards 2040

Table 1: Public overview of the Weiz-Gleisdorf transformation context.

Transformation objective and heat-source strategy

The investment plan widens the planning perspective from five individual systems to a coordinated regional heat-supply system. The inter-municipal district heating network (IKW) is intended to provide the physical and operational link between the local networks. This can increase the system value of sources whose availability does not always coincide with local demand, including industrial waste heat, solar thermal energy and low-temperature sources upgraded by heat pumps. Thermal storage and coordinated dispatch can provide additional flexibility.

Biomass remains a mature and regionally established option for dispatchable renewable heat and is therefore assessed as an important element of the future generation portfolio. Industrial waste heat can gain value through a larger balancing area, while solar thermal and wastewater heat recovery can contribute to diversification. Deep geothermal energy is regarded as a longer-term option; existing

geological indications justify further investigation, but the exploitable potential is not yet sufficiently confirmed for inclusion as a committed source in the current investment pathway.

The overall objective is a highly renewable, resilient and flexible regional district-heating system that can accommodate future demand growth and provide a platform for additional renewable and recovered heat. Implementation is intentionally stepwise: interconnection can be developed as enabling infrastructure, while later generation and storage investments can be confirmed using updated demand data, operational experience and detailed engineering.

Planning and market context

The transformation is embedded in a broader regional energy-transition process. Spatial energy planning, local network-development activities and the regional phase-out of fossil heat all support a stronger role for district heating. The public planning approach therefore links technical system development with market growth: network expansion should focus on areas where heat density, proximity to existing infrastructure and replacement of fossil heating systems create favourable conditions. Industrial and commercial heat demand is also relevant because larger year-round loads can support good utilisation of the regional infrastructure.

The regulatory direction is likewise supportive of renewable heat and efficient district heating. For the case study, the important planning implication is that future infrastructure should remain adaptable: the system has to satisfy efficient-DHC requirements while still allowing operators to respond to changing demand, new renewable sources and evolving policy conditions. This is one reason why the IKW is treated as enabling infrastructure rather than as a single technology investment.

2. Solutions and Investment Scenarios Assessed

Three long-term transformation pathways were assessed as strategic screening cases. The comparison covers the period to 2040 and evaluates annual heat delivery, renewable energy generation, primary-energy performance, installed thermal capacity and regulatory compliance. The scenarios do not represent final engineering designs; detailed hydraulic modelling, route planning and hourly operational simulation remain subsequent tasks.

Scenario 1 - Local expansion without interconnection

The five networks expand within their local service areas and additional renewable generation is installed locally. The networks remain hydraulically independent. This pathway is technically feasible but limits the possibility of sharing generation and reserve capacity between neighbouring systems.

Scenario 2 - Inter-municipal district-heating connection (IKW)

The existing systems are hydraulically connected through the IKW. Heat and available generation capacity can be exchanged regionally, creating a larger balancing area and reducing the need for each network to cover every operating situation independently. The IKW also establishes the infrastructure required for coordinated use of future renewable and recovered heat sources.

Scenario 3 - IKW with central biomass generation

Scenario 3 builds on the interconnected structure and adds central biomass generation as an additional dispatchable renewable source. The scenario tests whether a more centralised generation strategy, combined with regional heat exchange, can reduce the overall installed capacity required while

maintaining high annual heat delivery and renewable generation. The final capacity and location of this unit remain subject to detailed assessment.

Indicator	Sc1 - local expansion	Sc2 - IKW	Sc3 - IKW + central biomass
Network configuration	Independent	Interconnected	Interconnected
Installed capacity in 2040 [MW]	116.14	99.10	91.62
Delivered heat in 2040 [GWh/a]	190.70	186.23	192.85
Renewable energy generation in 2040 [GWh/a]	188.68	186.01	193.27
Primary energy savings in 2040 [GWh/a]	-6.59	-1.63	+2.16
Screening interpretation	Reference pathway	Interconnection pathway	Preferred pathway for detailed assessment

Table 2: Public technical comparison of the three transformation scenarios. Financial indicators are intentionally omitted.

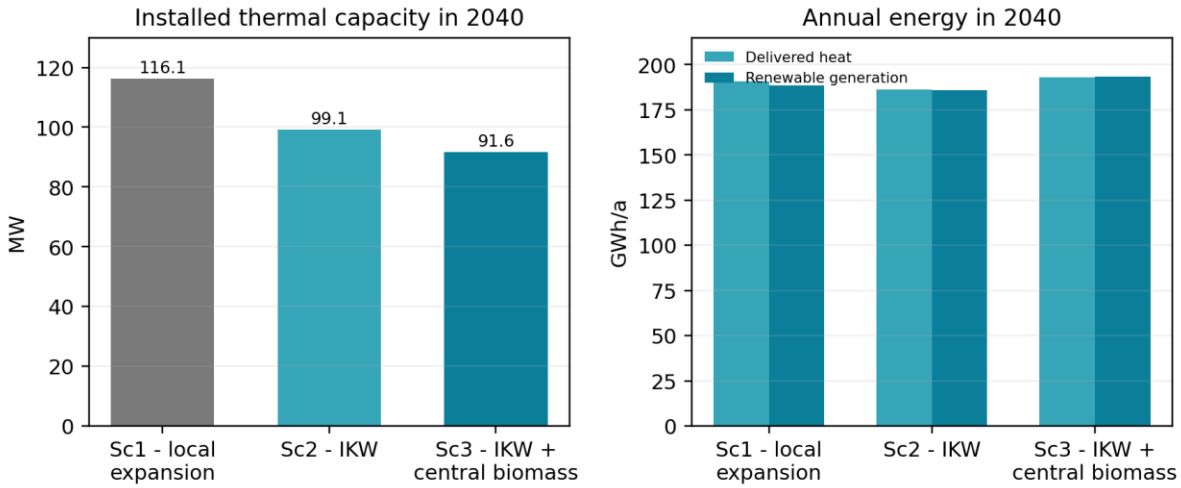


Figure 1: Public comparison of installed capacity, delivered heat and renewable energy generation in 2040.

The comparison shows that regional integration can reduce the amount of installed thermal capacity required. Scenario 1 needs the highest capacity because the local systems remain independent. Scenario 2 lowers the requirement by sharing generation assets across the interconnected system. Scenario 3 reduces the installed capacity further while providing the highest annual delivered heat and renewable energy generation of the investigated pathways.

Primary-energy performance provides an additional distinction. Scenario 3 is the only investigated pathway with positive primary energy savings throughout the assessed periods. Scenario 1 shows the weakest primary-energy result, while Scenario 2 remains close to the reference but slightly negative in

the final assessment period. These results are screening indicators based on annual energy balances and predefined technology configurations, not on detailed hourly dispatch optimisation.

Efficient-DHC compliance and preferred pathway

All three scenarios fulfil the assessed efficient district heating and cooling requirements over the planning horizon. Regulatory compliance therefore acts as an eligibility condition rather than the factor that selects the preferred pathway. Once the alternatives meet the relevant requirements, the comparison has to consider wider system performance, including installed capacity, renewable generation, primary-energy performance, operational flexibility and the ability to integrate future heat sources.

Scenario 3 provides the strongest overall technical performance in the screening and is recommended for further detailed development. The IKW remains the structural backbone of this pathway. Detailed planning must still verify transfer capacities, pressure levels, operating temperatures, pumping requirements, storage needs, route constraints and the location and capacity of additional generation. The recommendation is therefore a prioritisation result, not a final construction specification.

3. Investment and Implementation Outlook

3.1. Expected Impact

The preferred pathway creates system-level benefits that cannot be achieved through isolated network expansion alone. The most direct technical effect is improved utilisation of generation assets: under the screening assumptions, the interconnected Scenario 3 supplies a high level of annual heat with substantially less installed capacity than the decentralised reference case. This indicates that interconnection can reduce duplicated local capacity and create a more flexible regional system.

A second effect is improved integration of renewable and recovered heat. A larger balancing area allows generation and demand to be coordinated across network boundaries and supports sources whose availability varies over time or is linked to industrial operation. Storage and coordinated control can add further flexibility. The regional system also creates a platform for additional renewable technologies without requiring every local network to develop a complete generation portfolio independently.

Impact dimension	Expected public outcome
Technical	Shared generation resources, lower required installed capacity and improved operational flexibility
Energy and climate	High renewable heat production, positive primary-energy performance in the preferred scenario and progressive reduction of fossil peak-load use
Resource integration	Better regional use of biomass, industrial waste heat, solar thermal and low-temperature sources, with future geothermal integration remaining possible
Market development	Capacity to support district-heating expansion and densification while retaining a highly renewable supply structure
Governance and resilience	Coordinated operation across several systems, diversified heat sources and clearer regional cooperation structures

Table 3: Expected impacts of the preferred regional transformation pathway.

The transformation also supports regional value creation by building on established district-heating operation, biomass supply chains and links to industrial and municipal heat sources. This public deliverable does not disclose project-specific financial assumptions; detailed business cases and financing arrangements remain part of the implementation process.

3.2. Implementation Roadmap

Implementation is designed as a staged process so that technical, organisational and regulatory experience can be incorporated before the full regional system is developed. The key principle is to establish the interconnection and operating framework first, then progressively develop the generation portfolio and additional flexibility options.

Phase	Main actions	Main outcome
Short term - planning and preparation (to approx. 2028)	Detailed route and hydraulic planning; permits and rights-of-way; operator cooperation agreements; metering, data exchange and control principles; preparation of funding and procurement processes.	Technical and organisational basis for interconnected operation
Medium term - construction and integration (approx. 2028-2032)	Construction and commissioning of main interconnection infrastructure and transfer stations; progressive regional operation; network densification; integration of storage and coordinated control where appropriate.	Transition from separate systems towards coordinated regional operation
Long term - renewable expansion and further decarbonisation (approx. 2032-2040)	Detailed assessment and, subject to confirmation, implementation of central biomass generation; integration of further renewable and recovered heat; storage expansion and continued reduction of fossil peak-load use.	Highly renewable, flexible and regionally integrated heat-supply system

Table 4: Indicative implementation roadmap for the Weiz-Gleisdorf transformation pathway.

Key actions along the implementation pathway

In the short term, detailed engineering has to turn the screening concept into an implementable regional project. Hydraulic calculations are required to determine transfer capacities, pressure levels, pumping requirements and interfaces between existing networks. Route planning must be coordinated with roads, other utility infrastructure, land ownership and permitting authorities. In parallel, the participating operators need common rules for metering, data exchange, heat accounting, maintenance and emergency operation.

The medium-term phase focuses on construction and progressive commissioning of the IKW. A staged build-out allows operating experience to be gained before the complete corridor is interconnected. Monitoring and control should be designed to support transparent heat accounting and coordinated dispatch. Network densification should proceed in parallel so that the new regional infrastructure is matched by sufficient heat demand and good utilisation of generation assets.

In the long term, the preferred Scenario 3 pathway can be consolidated. The central biomass option should be assessed in detail with regard to siting, sustainable fuel supply, logistics and integration into the regional hydraulic concept. At the same time, the system should remain open to additional technologies such as geothermal energy, large heat pumps, further industrial waste heat and thermal storage. The long-term objective is a robust regional infrastructure rather than a fixed technology mix.

3.3. Key Risks and Enabling Conditions

The main implementation risks are not limited to technology. The multi-operator structure means that governance, permitting, infrastructure coordination, long-term resource availability and market development are equally important. A staged implementation approach allows these uncertainties to be addressed progressively.

Risk / challenge	Key enabling condition or mitigation
Planning and construction uncertainty	Early route coordination, detailed engineering, permit screening and phased construction planning
Multi-operator governance	Formal cooperation framework, clear responsibilities and transparent operating rules
Technical integration	Hydraulic modelling, interface design, coordinated control and progressive commissioning
Renewable resource availability	Sustainable biomass assessment, efficient resource use and diversification of the heat-source portfolio
Demand development	Spatial heat planning, targeted network expansion and continued customer engagement
Financing and public support	Staged investment planning, early funding preparation and diversified financing sources
Regulatory development	Regular review of efficient-DHC requirements and adaptable technical planning

Table 5: Main public implementation risks and enabling conditions.

The preferred scenario should therefore be treated as a planning priority rather than a fixed construction specification. Detailed design and procurement should be preceded by updated demand projections, site-specific engineering, renewable resource assessment and operational modelling. The screening uses annual energy flows and does not simulate every condition that will occur in a real interconnected system.

3.4. Stakeholder Engagement & Endorsement

The regional IKW requires continuous cooperation between district-heating operators, municipalities, heat suppliers, infrastructure owners, industrial and commercial actors, customers and public authorities. Stakeholder involvement is part of implementation because critical decisions concern shared infrastructure, construction coordination, long-term operating rules and the integration of new heat sources.

Stakeholder group	Main role
District-heating operators	Technical planning, investment decisions, heat exchange, operation, maintenance, metering and coordinated dispatch
Municipalities	Spatial planning, infrastructure coordination, communication and support for district-heating expansion
Heat suppliers and large consumers	Potential renewable or recovered heat supply, stable demand and participation in regional heat-exchange arrangements
Infrastructure owners and authorities	Coordination of routes, crossings, permits and construction activities
Customers and local population	Future heat demand, acceptance of construction activities and long-term connection decisions
Regional initiatives and research partners	Technical support, monitoring, innovation and transfer of lessons to other district-heating systems

Table 6: Main stakeholder groups and their roles in implementation.

Earlier ENABLE DHC stakeholder mapping provides the basis for continued engagement during detailed planning. The stakeholder structure should be updated as new heat suppliers, customers or infrastructure partners become relevant. Formal endorsement of individual investments remains the responsibility of the participating district-heating operators and relevant decision-making bodies; the public investment plan documents the shared strategic direction.

Engagement approach during implementation

During detailed planning, the district-heating operators should form the core technical working structure for the regional system. This group needs to coordinate hydraulic interfaces, operating temperatures, metering standards, data exchange, maintenance responsibilities and the principles for regional dispatch. Establishing these interfaces early is important because the value of interconnection depends not only on physical pipelines but also on the ability of the participating systems to operate transparently and predictably together.

Municipalities and infrastructure authorities have a complementary role. Their early involvement can reduce implementation delays related to road works, crossings, land-use questions and coordination with other utilities. Public communication should accompany this process, especially where construction affects streets or where district-heating expansion creates new connection opportunities. Clear information on the purpose of the regional network, the role of renewable heat and the staged nature of the project can support local acceptance.

Stakeholder engagement should therefore be treated as an iterative process rather than a one-time consultation. As the project moves from screening to design and construction, the relevant actors and their interests will change. Regular updates of the stakeholder map, targeted technical workshops and transparent documentation of agreed interfaces can help maintain a common regional direction while leaving formal investment decisions with the responsible operators and public bodies.

4. Conclusions and Key Lessons

The Weiz-Gleisdorf case demonstrates the value of assessing district-heating transformation at regional rather than individual-network level. The existing systems already provide a strong renewable starting point, but future expansion creates a need for additional generation, greater flexibility and more coordinated use of regional resources. Interconnection enables these challenges to be addressed jointly.

The screening identifies the inter-municipal network combined with central biomass generation as the most promising pathway for further detailed development. The IKW itself remains the enabling infrastructure: it creates the platform on which future generation, storage and recovered-heat options can be developed more flexibly. The preferred pathway combines high renewable generation with lower installed thermal capacity than the decentralised reference case.

Several transferable lessons emerge from the case study:

- Network integration and generation expansion should be assessed together because infrastructure decisions directly influence the amount and utilisation of generation capacity.
- Efficient-DHC compliance is an essential regulatory condition, but several technically different pathways can comply; broader system performance is therefore needed to identify a preferred option.
- Screening-level analysis is useful for prioritising transformation pathways, but detailed hydraulic design, hourly operational analysis, resource assessment and site-specific planning remain necessary before implementation.
- Stepwise implementation reduces risk and allows experience from early interconnections to inform later development stages.
- Multi-operator governance, transparent operating rules, reliable data exchange and sustained stakeholder engagement are essential elements of regional district-heating transformation.

For other regions with several neighbouring district-heating networks, the Weiz-Gleisdorf approach provides a transferable model: establish a common regional perspective, compare alternative transformation pathways, develop interconnection as enabling infrastructure and retain flexibility for the renewable technologies that prove most suitable during detailed planning.

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GET IN TOUCH

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