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Executive summary

PATHFNDR is part of the Swiss Federal Office of Energy's SWEET programme and supports Switzerland's goal of reaching net-zero greenhouse gas emissions while maintaining a resilient and reliable energy system by 2050. The consortium addresses one of the central challenges of this energy transition: **how to enable flexibility and sector coupling to allow for a high share of variable electricity integration, including the associated changes needed in infrastructures, markets, regulation, and society.**

To address this challenge, PATHFNDR brings together eight research institutions and more than 25 partners from the private and public sectors. Its objective is to contribute to a future secure and affordable energy system by developing and quantifying flexibility options and sector coupling solutions, while assessing the business models, regulatory frameworks, and social acceptance required for implementation. PATHFNDR follows an inter- and transdisciplinary approach, combining energy system modelling, engineering, economics, and social science, supported by collaboration with stakeholders from industry and policy. This approach allowed the consortium to generate evidence on future energy scenarios and infrastructure planning with a focus on flexibility, assess and quantify the potential of flexibility-enabling technologies such as electric vehicles, heat pumps, thermal storage, and hydrogen-based systems, and explore how these technologies can support both the overall and local energy systems. In parallel, it examined how business and market design, policy and regulation, and public acceptance can enable or hinder implementation. A central feature of the project is the synthesis of results across these areas into clear statements and practical recommendations.

During this reporting period, a key achievement was the production of synthesis reports that consolidated results across the consortium and made them accessible to decision-makers. The published Synthesis Report III presents project results on flexibility from buildings and electromobility, with a focus on heat pumps and electric vehicles. The report showed that the energy transition depends not only on new technologies but also on the coordinated use of flexibility across energy scales, sectors, and actors, supported by suitable infrastructure, market rules, and policy frameworks. For example, the report highlights that dynamic and hybrid electricity tariffs can unlock demand-side flexibility, as explored in the NeDeLa pilot. It also shows that shared heating concepts such as nanoverbund can offer a cost-effective alternative to conventional infrastructure expansion. It attracted strong public and stakeholder interest and helped position PATHFNDR's findings in broader energy discussions, resulting in concrete impact.

PATHFNDR also engaged intensively in knowledge transfer and stakeholder engagement. Through workshops, consultation meetings, public events, lunch talks, newsletters, and media outreach, it shared results with authorities, utilities, industry representatives, cantons, municipalities, and other stakeholder groups. These activities helped validate the findings and their practical relevance, supporting their uptake in decision-making of stakeholders. The project's real-world impact is further evidenced by its pilot and demonstration projects that tested flexibility and sector-coupling solutions in practice, such as dynamic electricity tariffs (NeDeLa), shared heating and flexibility concepts (nanoverbund), and hydrogen-based district energy systems (H₂ districts). These projects provide practical evidence on implementation opportunities and barriers.



Zusammenfassung

PATHFNDR ist Teil des SWEET-Programms des Schweizerischen Bundesamts für Energie und unterstützt das Ziel der Schweiz, bis 2050 Netto-Null-Treibhausgasemissionen zu erreichen und gleichzeitig ein resilientes und zuverlässiges Energiesystem sicherzustellen. Das Konsortium befasst sich mit einer der zentralen Herausforderungen der Energiewende: **Wie Flexibilität und Sektorkopplung gewährleistet werden können, um einen hohen Anteil fluktuierender Stromerzeugung zu integrieren, einschliesslich der damit verbundenen notwendigen Anpassungen von Infrastrukturen, Märkten, Regulierung und Gesellschaft.**

Um dieser Herausforderung zu begegnen, vereint PATHFNDR acht Forschungsinstitutionen sowie mehr als 25 Partner aus der Privatwirtschaft und dem öffentlichen Sektor. Ziel ist es, zu einem sicheren und bezahlbaren Energiesystem beizutragen, indem Flexibilitätsoptionen und Lösungen zur Sektorkopplung entwickelt und quantifiziert werden. Gleichzeitig werden Geschäftsmodelle, regulatorische Rahmenbedingungen und gesellschaftliche Akzeptanz für deren Umsetzung untersucht. PATHFNDR verfolgt einen inter- und transdisziplinären Ansatz, der Energiesystemmodellierung, Ingenieurwissenschaften, Ökonomie und Sozialwissenschaften kombiniert und durch die Zusammenarbeit mit Akteuren aus Industrie und Politik ergänzt wird. Dieser Ansatz ermöglichte es dem Konsortium, fundierte Erkenntnisse zu zukünftigen Energieszenarien und Infrastrukturplanungen mit Fokus auf Flexibilität zu gewinnen, das Potenzial flexibilitätsfördernder Technologien wie Elektrofahrzeuge, Wärmepumpen, thermische Speicher und wasserstoffbasierte Systeme zu bewerten und zu quantifizieren, sowie deren Beitrag zu übergeordneten und lokalen Energiesystemen zu untersuchen. Parallel dazu wurde analysiert, wie Geschäfts- und Marktdesign, Politik und Regulierung sowie öffentliche Akzeptanz die Umsetzung fördern oder behindern könnten. Ein zentrales Merkmal des Projekts ist die Zusammenführung der Ergebnisse zu klaren Aussagen und praxisnahen Empfehlungen.

Während des Berichtszeitraums stand die Erstellung von Syntheseberichten im Zentrum. In denen die Erkenntnisse des Konsortiums gebündelt und für Entscheidungsträger zugänglich gemacht wurden. Der veröffentlichte Synthesebericht III präsentiert Projektergebnisse zur Flexibilität in Gebäuden und Elektromobilität mit Fokus auf Wärmepumpen und Elektrofahrzeuge. Der Bericht zeigt, dass die Energiewende nicht nur von neuen Technologien abhängt, sondern auch von der koordinierten Nutzung von Flexibilität über verschiedene Energieskalen, Sektoren und Akteure hinweg, unterstützt durch die passenden Infrastrukturen, Marktregelungen und politischen Rahmenbedingungen. So wird beispielsweise aufgezeigt, dass dynamische und hybride Stromtarife die nachfrageseitige Flexibilität erschliessen können, wie aus dem NeDeLa-Pilotprojekt hervorgeht. Zudem wird gezeigt, dass gemeinschaftliche Heizkonzepte, wie der Nanoverbund, eine kosteneffiziente Alternative zum konventionellen Infrastrukturausbau darstellen können. Der Bericht stiess auf grosses Interesse der Öffentlichkeit und der Stakeholder und trug dazu bei, die Ergebnisse von PATHFNDR in energiewirtschaftliche Diskussionen einzubringen.

PATHFNDR engagierte sich zudem intensiv im Wissenstransfer und im Austausch mit Stakeholdern. Durch Workshops, Konsultationstreffen, öffentliche Veranstaltungen, Lunch Talks, Newsletter und Medienarbeit wurden die Ergebnisse mit Behörden, Energieversorgern, Industrievertretern, Kantonen, Gemeinden und weiteren Interessensgruppen geteilt und diskutiert. Diese Aktivitäten trugen dazu bei, die Ergebnisse zu validieren und ihre praktische Relevanz zu stärken sowie deren Einfluss auf Entscheidungsprozesse sicherzustellen. Die reale Wirkung des Projekts zeigt sich auch in Pilot- und Demonstrationsprojekten, in denen Flexibilitäts- und Sektorkopplungslösungen praktisch getestet



wurden, etwa dynamische Stromtarife (NeDeLa), gemeinschaftliche Heiz- und Flexibilitätskonzepte (Nanoverbund) sowie wasserstoffbasierte Quartiersenergiesysteme (H₂-Districts). Diese Projekte wiederum liefern konkrete Erkenntnisse zu Umsetzungsoptionen und bestehenden Hürden.



Résumé

PATHFNDR fait partie du programme SWEET de l'Office fédéral de l'énergie et soutient l'objectif de la Suisse d'atteindre la neutralité nette en matière d'émissions de gaz à effet de serre tout en garantissant un système énergétique résilient et fiable d'ici 2050. Le consortium s'attaque à l'un des défis centraux de cette transition énergétique: **permettre la flexibilité et le couplage des secteurs afin d'intégrer une part élevée d'électricité variable, y compris les adaptations nécessaires des infrastructures, des marchés, de la réglementation et de la société.**

Pour relever ce défi, PATHFNDR réunit huit institutions de recherche ainsi que plus de 25 partenaires issus des secteurs public et privé. Son objectif est de contribuer à un système énergétique futur sûr et abordable en développant et en quantifiant des options de flexibilité et des solutions de couplage sectoriel, tout en évaluant les modèles d'affaires, les cadres réglementaires et l'acceptation sociale nécessaires à leur mise en œuvre. PATHFNDR adopte une approche inter- et transdisciplinaire, combinant modélisation des systèmes énergétiques, ingénierie, économie et sciences sociales, soutenue par une collaboration étroite avec des acteurs de l'industrie et des politiques publiques. Cette approche a permis au consortium de produire des analyses fondées sur des scénarios énergétiques futurs et la planification des infrastructures avec un accent particulier sur la flexibilité, d'évaluer et de quantifier le potentiel de technologies favorisant la flexibilité telles que les véhicules électriques, les pompes à chaleur, le stockage thermique et les systèmes à base d'hydrogène, et d'examiner comment ces technologies peuvent soutenir les systèmes énergétiques tant au niveau global que local. Parallèlement, le projet a analysé comment les modèles économiques et la conception des marchés, ainsi que les politiques, la réglementation et l'acceptation publique, peuvent favoriser ou freiner la réalisation de tels scénarios. Une caractéristique centrale du projet est la synthèse des résultats de ces différents domaines en messages clairs et recommandations pratiques.

Au cours de la période de rapportage, une réalisation majeure a été la production de rapports de synthèse consolidant les résultats du consortium et les rendant accessibles aux décideurs. Le Rapport de Synthèse III publié présente les résultats du projet concernant la flexibilité dans les bâtiments et l'électromobilité, en mettant l'accent sur les pompes à chaleur et les véhicules électriques. Il montre que la transition énergétique ne dépend pas uniquement de nouvelles technologies, mais aussi de l'utilisation coordonnée de la flexibilité à travers différentes échelles énergétiques, secteurs et acteurs, soutenue par des infrastructures adaptées, des règles de marché et des cadres politiques appropriés. Par exemple, le rapport souligne que des tarifs d'électricité dynamiques et hybrides peuvent débloquent la flexibilité du côté de la demande, comme l'illustre le projet pilote NeDeLa. Il montre également que des concepts de chauffage partagé tels que le *nanoverbund* peuvent constituer une alternative rentable à l'extension conventionnelle des infrastructures. Le rapport a suscité un vif intérêt du public et des parties prenantes et a contribué à positionner les résultats de PATHFNDR dans des discussions énergétiques plus larges, générant ainsi un impact concret.

PATHFNDR s'est également fortement engagé dans le transfert de connaissances et l'implication des parties prenantes. À travers des ateliers, des réunions de consultation, des événements publics, des conférences, des infolettres et des actions médiatiques, le projet a partagé ses résultats avec les autorités, les services publics, les représentants de l'industrie, les cantons, les communes et d'autres groupes d'acteurs. Ces activités ont permis de valider les résultats et leur pertinence pratique, facilitant leur prise en compte dans les processus décisionnels. L'impact concret du projet est également démontré par ses projets pilotes et de démonstration, qui ont testé en conditions réelles des solutions de flexibilité et de couplage sectoriel, telles que les tarifs d'électricité dynamiques (NeDeLa), les



concepts de chauffage et de flexibilité partagés (nanoverbund) et les systèmes énergétiques de quartier basés sur l'hydrogène (H₂ districts). Ces projets fournissent des preuves concrètes des possibilités de mise en œuvre ainsi que des obstacles existants.



Riassunto

PATHFNDR fa parte del programma SWEET dell'Ufficio federale dell'energia e sostiene l'obiettivo della Svizzera di raggiungere emissioni nette pari a zero di gas a effetto serra entro il 2050, mantenendo al contempo un sistema energetico resiliente e affidabile. Il consorzio affronta una delle sfide centrali di questa transizione energetica: **come abilitare la flessibilità e integrazione settoriale per consentire un'elevata penetrazione di elettricità variabile, comprese le trasformazioni necessarie nelle infrastrutture, nei mercati, nei quadri regolatori e nella società.**

Per affrontare questa sfida, PATHFNDR riunisce otto istituti di ricerca e oltre 25 partner provenienti dai settori pubblico e privato. Il suo obiettivo è contribuire a un sistema energetico futuro sicuro e accessibile sviluppando e quantificando opzioni di flessibilità e soluzioni di integrazione settoriale, valutando al contempo i modelli di business, i quadri normativi e l'accettazione sociale necessari per la loro implementazione. PATHFNDR adotta un approccio inter- e transdisciplinare, combinando modellazione dei sistemi energetici, ingegneria, economia e scienze sociali, supportato dalla collaborazione con attori industriali e del settore pubblico. Questo approccio ha consentito al consorzio di produrre evidenze su scenari energetici futuri e pianificazione delle infrastrutture con un forte focus sulla flessibilità, di valutare e quantificare il potenziale di tecnologie abilitanti la flessibilità quali veicoli elettrici, pompe di calore, accumuli termici e sistemi basati sull'idrogeno, e di analizzare come queste tecnologie possano supportare sia i sistemi energetici complessivi sia quelli locali. Parallelamente, il progetto ha esaminato come i modelli di business e la progettazione dei mercati, insieme a politiche, regolamentazione e accettazione pubblica, possano favorire o ostacolare l'implementazione. Una caratteristica centrale del progetto è la sintesi dei risultati provenienti da questi ambiti in messaggi chiari e raccomandazioni pratiche.

Durante questo periodo di rendicontazione, un risultato chiave è stata la produzione di rapporti di sintesi che hanno consolidato i risultati del consorzio rendendoli accessibili agli attori decisionali. Il Rapporto di sintesi III presenta i risultati del progetto sulla flessibilità negli edifici e nell'elettromobilità, con particolare attenzione alle pompe di calore e ai veicoli elettrici. Il rapporto evidenzia che la transizione energetica non dipende solo da nuove tecnologie, ma anche dall'uso coordinato della flessibilità attraverso diverse scale energetiche, settori e attori, supportato da infrastrutture adeguate, regole di mercato e quadri politici appropriati. Ad esempio, mostra che tariffe elettriche dinamiche e ibride possono sbloccare la flessibilità dal lato della domanda, come esplorato nel progetto pilota NeDeLa, e che concetti di riscaldamento condiviso come il nanoverbund possono rappresentare un'alternativa economicamente vantaggiosa all'espansione infrastrutturale convenzionale. Il rapporto ha suscitato un forte interesse pubblico e tra vari attori, contribuendo a posizionare i risultati di PATHFNDR in un contesto più ampio di dibattito energetico, generando un impatto concreto.

PATHFNDR si è inoltre impegnato intensamente nel trasferimento di conoscenze e nel coinvolgimento degli attori chiave. Attraverso eventi partecipativi, incontri di consultazione, eventi pubblici, lunch talk, newsletter e attività mediatiche, ha condiviso i risultati con autorità, aziende di servizi pubblici, rappresentanti dell'industria, cantoni, comuni e altri gruppi di interesse. Queste attività hanno contribuito a validare i risultati e la loro rilevanza pratica, favorendone l'integrazione nei processi decisionali degli attori coinvolti. L'impatto reale del progetto è ulteriormente dimostrato dai progetti pilota e dimostrativi che hanno testato in pratica soluzioni di flessibilità ed integrazione settoriale, come le tariffe elettriche dinamiche (NeDeLa), i concetti condivisi di riscaldamento e flessibilità (nanoverbund) e i sistemi energetici di quartiere basati sull'idrogeno (H2 districts). Questi progetti forniscono evidenze concrete sulle opportunità di implementazione e sugli ostacoli esistenti.



1 Work programme overview

Switzerland's energy transition envisions a net-zero greenhouse gas emissions target and a resilient, reliable energy system by 2050. Reaching this goal requires changes across the energy system, including the electrification of heating and transport, the addition and integration of renewable energy sources, and demand-side flexibility across all parts of the system.

The PATHFNDR consortium supports this transition by pursuing an energy system that is efficient, flexible, resilient, cost-competitive, and sustainable by 2050. Its main objective is to support the integration of renewable energy by identifying flexibility options and sector coupling solutions, as well as assessing supportive business models, regulatory frameworks, and social acceptance strategies. To achieve this, PATHFNDR is organized as an integrated “PATHFNDR machine” (Figure 1) – a system of interconnected workstreams, where domain-specific activities are linked through a central synthesis process that ensures the consistent exchange, alignment, and integration of results.

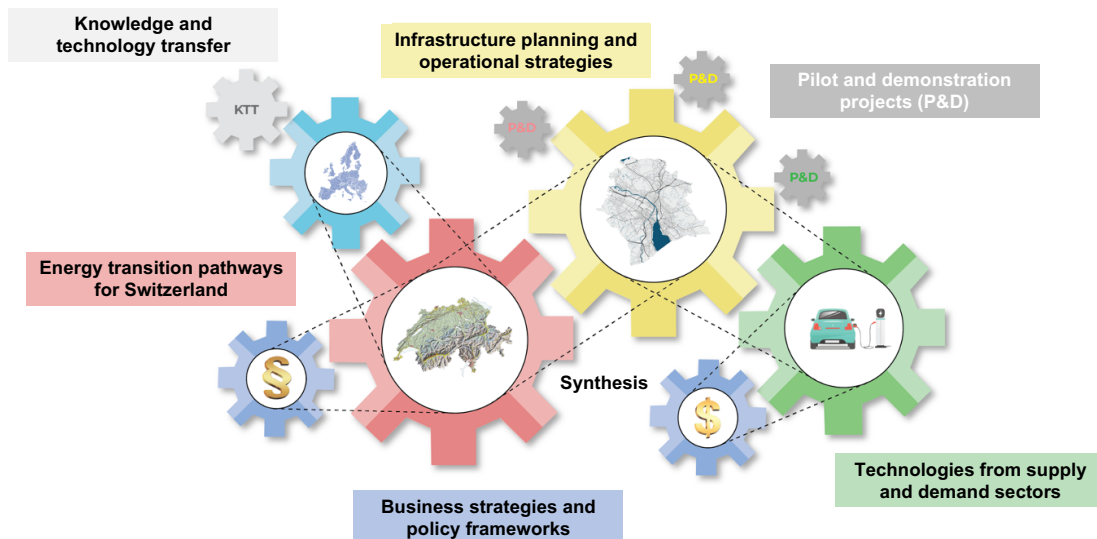


Figure 1: The “PATHFNDR machine” with the focus areas

The work programme is structured around the following focus areas: (i) development of multi-scale energy transition scenarios and pathways for Switzerland, (ii) infrastructure planning and operational strategies for distributed multi-energy systems, (iii) assessment of key flexibility-enabling technologies, (iv) exploration of business models and innovation strategies, (v) evaluation of policy and regulatory frameworks, (vi) a synthesis stream to integrate findings into practical recommendations for stakeholders, and (vii) pilot and demonstration projects to test flexibility and sector coupling solutions.

The consortium is composed of eight leading research institutions – ETH Zurich, Empa, PSI, ZHAW, HSLU, UNIGE, EPFL, and TU Delft – and is supported by more than 25 cooperation partners from Swiss industry and associations. This inter- and transdisciplinary partnership bridges science and practice across the energy sector. Through pilot and demonstration projects, and targeted consultations, the consortium tests solutions in real-world contexts while ensuring that the perspectives of policymakers, industry, and citizens are incorporated into the research.



2 Progress of activities

PATHFNDR progressed across its focus areas (described in Chapter 1), with most activities now shifting toward consolidation of results as several workstreams approach completion.

2.1 Synthesising research across the consortium

During the reporting period, PATHFNDR focused on integrating research findings across the consortium. A central activity was the preparation of the synthesis reports, which bring together insights from different disciplines and institutions and present them in a clear and accessible format for non-academic audiences. The process included internal quality checks and external expert review to enhance the clarity, relevance, and practical value of the reports (Figure 2). As a result, Synthesis Report III on the flexibility provision from electromobility and buildings (PATHFNDR Consortium, 2025) was completed and published (details are provided in Chapter 3).

In parallel, PATHFNDR consolidated results from research activities and pilot projects, bringing together evidence from technical, economic, regulatory, and societal perspectives. Although time- and coordination-intensive, this effort is essential to translate a broad range of research results into key messages and recommendations that support decision-making beyond academia. It will result in two further synthesis reports: one on key technologies enabling flexibility and sector coupling, and one presenting ten guiding statements for the path to net zero.



Figure 2: Writeathon for the development of Synthesis Reports.

2.2 Engaging stakeholders and gathering feedback

Stakeholder engagement was aligned with PATHFNDR outputs. PATHFNDR organised topic-specific workshops and consultations linked to the synthesis reports and the pilot and demonstration projects. These activities supported both the dissemination and dialogue across stakeholder groups and allowed the consortium to test the relevance, communication, and applicability of the key messages and recommendations presented in the synthesis reports. Participants included public authorities, regulators, cantons, cities and municipalities, energy utilities, engineering firms, and industry associations. These workshops also led to individual consultation meetings with the SFOE, EnDK/EnFK, and energy utilities.



2.3 Dissemination and public communication

Dissemination focused on implementing the knowledge and technology transfer strategy for the synthesis reports, linking research findings with practical recommendations for policymakers, industry stakeholders, and researchers.



Figure 3: (left) Presentation of Prof. André Bardow (ETH Zurich) and Dominik Born (IWB) at SWEET Conference 2025; (right) Presentation of Prof. André Bardow (ETH Zurich) at Energy Week 2025.

Synthesis Report III followed a structured process of review, publication, and outreach. After publication, the report was shared via press releases, academic news channels, media, social media, and presentations at major events such as the [SWEET conference](#) and [Energy Week @ ETH](#) (Figure 3). A dedicated online lunch talk series (August 2025 to May 2026) presented related research to researchers, industry representatives, and policymakers. All talks were recorded and made available on the PATHFNDR [website](#) and [YouTube](#). Website, newsletters, and social media further increased the visibility and accessibility of PATHFNDR insights.

2.4 Advancing pilot and demonstration activities

Work on the pilot and demonstration projects focused on finalising research activities, analysing results, preparing publications, and linking pilot findings to the broader synthesis work. Results from NeDeLa and nanoverbund were incorporated in Synthesis Report III (PATHFNDR Consortium, 2025), while findings from all three projects will feed into the upcoming synthesis reports.

In NeDeLa, field studies, conducting customer surveys, and simulations were completed to compare different tariff designs and their implications for energy and grid costs, and user behaviour (Winzer, et al., 2026). In nanoverbund, the project was finalized, including an assessment of the Swiss-wide scalability of the nanoverbund concept, its potential as a cost-effective infrastructure alternative, and further testing of the control framework (Cai et al., 2025). In H2 districts, final experiments, model predictive control tests, and techno-economic simulations were completed despite installation delays and a shortened testing window (Wister et al., 2025).



3 Highlights of outputs

A key highlight of this reporting period is the synthesis of research on flexibility provision from buildings and electromobility. This process demonstrated that PATHFNDR is moving beyond individual research results towards integrated messages, practical recommendations, and tested implementation approaches. Across synthesis reports, stakeholder activities, and pilot and demonstration projects, a central takeaway emerges: a flexible, resilient, and renewable Swiss energy system requires not only technological innovation, but also coordination across sectors and stakeholder groups.

3.1 Synthesis report on flexibility provision from electromobility and buildings

Synthesis Report III (PATHFNDR Consortium, 2025) focuses on the flexibility potential of electric vehicles and heat pumps in Switzerland. The report highlights that Switzerland's energy transition depends not only on new technologies, but also on the coordinated use of flexibility across sectors, supported by appropriate infrastructure, market design, and policy frameworks. The report was downloaded approximately 750 times from the ETH collection shortly after release and was covered by media outlets including NZZ, energate messenger, and Der Solarserver.

Key messages of the report are:

- **EV and heat pump flexibility creates system value:** shift demand to better align with renewable generation, thereby increasing renewable integration, lowering system costs and imports, reducing wholesale prices, and limiting the need for additional gas and battery capacity.
- **Substantial flexibility exists across system and grid levels:** heat pumps can use thermal inertia and hot water storage, EVs can shift charging in time and location, and flexibility-aware planning can use these resources to reduce peaks, relieve grid stress, and defer distribution-grid upgrades.
- **Unlocking flexibility at scale requires enabling market and policy conditions:** dynamic and hybrid tariffs, interoperable and automated controls, opt-out participation models, and flexibility-ready regulation are key to increasing participation and realising flexibility in practice.

Further messages are presented in Synthesis Report III (PATHFNDR Consortium, 2025).

Synthesis Report IV is being prepared to present technologies and infrastructures that enable flexibility and sector coupling, while Synthesis Report V will consolidate statements and recommendations from the consortium. Together, the synthesis reports translate a large body of research into insights that are more directly useful for real-world decision-making.

3.2 Stakeholder workshops and consultation activities

Stakeholder exchange focused on the findings of Synthesis Report III. At the Energy Week @ ETH 2025, PATHFNDR organised an industry and policy workshop on “The future energy system through flexibility” (Figure 4), where 32 stakeholders discussed barriers, responsibilities, and short- to long-term actions from the perspectives of the energy system, the distribution grid, and end consumers. The results inform implementation pathways for flexibility through electric vehicles and heat pumps, to be validated in a follow-up stakeholder workshop in May 2026.

Follow-up consultations were held with the SFOE (December 2025) and EnDK/EnFK (February 2026) on implications of the findings for federal and cantonal policy processes. At the VSE electromobility



conference, PATHFNDR presented vehicle-to-grid research and the regulatory measures needed to support small-scale V2G aggregators including tariff design, compensation schemes, and infrastructure support. The lunch talks attracted 30-40 participants each and more than 4,000 post-event video views.



Figure 4: Stakeholder workshop during the Energy Week 2025.

3.3 Pilot and demonstration projects

As each pilot and demonstration project reports separately, only the key takeaways are summarised.

3.3.1 NeDeLa

NeDeLa produced outputs on the design and effects of dynamic electricity tariffs. The project combined field studies, customer surveys, and simulations. The main takeaway is that dynamic tariffs can support demand-side flexibility, but their effectiveness depends strongly on the tariff design. Energy-based tariffs mainly reduce energy costs, capacity-based tariffs mainly reduce grid costs, and combined structures offer the most balanced outcome. Further details are provided in the final report (Winzer et al., 2026).

3.3.2 nanoverbund

Nanoverbund produced outputs on shared heating and flexibility solutions for residential buildings. The project combined national-scale analysis, ecosystem-based assessment, and experimental control tests. The main takeaway is that local heat sharing between buildings is technically feasible, applicable in many building clusters across Switzerland, and is a cost-effective alternative to new infrastructure such as district heating extensions. Implementation depends on suitable market and governance structures and control strategies. Further details are provided in the final report (Cai et al., 2025).

3.3.3 H2 districts

H2 districts produced outputs on the use of hydrogen-based fuel cell combined heat and power systems in district-scale energy applications. The work focused on experimental analysis and testing model predictive control. The main takeaway is that hydrogen-based district solutions can provide flexibility and peak shaving under specific conditions. Performance and viability depend strongly on system design, operating conditions, data availability, and whether advanced control is feasible in practice. Further details are provided in the final report (Wister et al., 2025).



4 References

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