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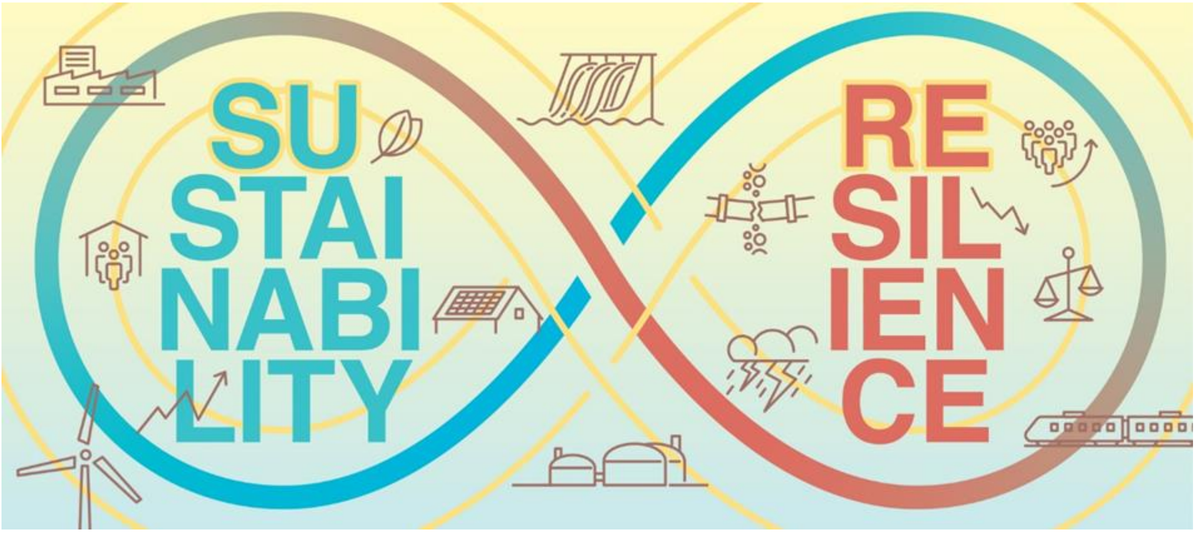
Federal Department of the Environment, Transport,
Energy and Communications DETEC

Swiss Federal Office of Energy SFOE
Energy Research and Cleantech

Report dated: 31.03.2025
Reporting period: 01.03.2024 – 28.02.2025

Annual Report Year 4 – Public Part

SURE



sweet swiss energy research for the energy transition

Date: 31.03.2025

Location: Bern

Publisher:
Swiss Federal Office of Energy SFOE
Energy Research and Cleantech
CH-3003 Bern
www.bfe.admin.ch

SWEET Call: 1-2020
Annual report template: v3.1

Subsidy recipient:
Paul Scherrer Institut (PSI)
Forschungsstrasse 111
CH-5232 Villigen PSI
https://www.psi.ch/de
Consortium website: https://sweet-sure.ch/

Authors:
Coordinator: Peter Burgherr, PSI, peter.burgherr@psi.ch
Evangelos Panos, River Huang, Romain Sacchi, Eleftherios Siskos, Evgenia Tsianou (PSI)
Alexander Fuchs, Turhan Demiray, ETHZ-FEN
Martin Jakob, Marc Melliger, Giacomo Catenazzi Steck (TEP)
Claudia Binder, Ankita Singhvi, Nino Jordan (EPFL)
Jalomi Maayan Tardif, Matteo Palucci, FrancescaCellina (SUPSI)
Rolf Krause, Michael Multerer, Toby Simpson, Ddavide Baroli, Saara. S. Jones (USI)
Isabelle Stadelmann, Gracia Brückmann, Walid El-Ajou (UniBe)
Evelina Trutnevyte, Nik Zielonka, Giacommo Rubino (UniGe)
Andreas Abegg, Reto Müller, Goran Seferovic, Andreas Hirstein (ZHAW)
Leonidas Paroussos, Stelios Tsiaras (E3M)

SFOE project coordination:
SWEET@bfe.admin.ch
Head of the Monitoring Panel: Mirjam Kosch, mirjam-magdalena.kosch@bfe.admin.ch

SFOE contract number: SI/502266-01

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Executive summary

The guiding research question of the SURE consortium is « How can resilience and sustainability criteria be reconciled with the primary goals of the Swiss energy sector transformation? » More specifically, the project investigates four primary objectives:

1. Assessment of the sustainability and resilience of the future renewable-based Swiss energy system.
2. Development of an integrated analytical framework based on modeling tools and indicator databases.
3. Engagement of stakeholders to evaluate indicators for four long-term pathways under five shock scenarios.
4. Application at the national level in Switzerland, as well as for several regional or topic-focused case studies.

Building on existing research in this field, a novel, quantitative model- and data-based framework will be developed and applied by combining holistic, systemic approaches, comprehensive indicator databases, energy infrastructure, and system modeling while explicitly representing social and policy aspects. Focusing on Swiss national developments as well as selected regional case studies, resilience will be analyzed with a long-term perspective (including 2035 and 2050 as focus years) with a scenario approach that simulates transition pathways as well as future disruptive events (using shock scenarios with disruptions at different scales), related uncertainties and the implications for the energy system and society.

The results inform a stakeholder-informed, multi-objective decision analysis that develops strategies and policy measures to design an energy system more resilient to disruptions and capable of rapid recovery in the event of a disruption. The project's output will be multifaceted, including a web-based platform supported by a comprehensive analytical framework that enables a broad audience to understand the interdependencies of various sustainability and resilience dimensions in a prospective manner and to illustrate the trade-offs between competing objectives related to a sustainable and resilient energy sector transformation.

Ultimately, the project will provide policymakers, technology developers, and businesses with recommendations and guidelines on designing their respective strategies for a more sustainable and resilient energy future.

The major achievements of the project to date, with a focus on the past year, can be summarized as follows. The SURE MCDA framework has been designed and tested at the second stakeholder workshop for evaluating Swiss energy transition pathways, revealing key trade-offs among environmental, economic, socio-political, and resilience indicators. The first version of the SURE Game, «Energy Ensured», was released and integrated into the SURE survey by late 2024. The Adaptation Need Indicator (ANI) was finalized, allowing the evaluation of the legal and political aspects of the SURE pathways. The SURE modeling framework has been further enhanced, and all assumptions, definitions, and protocols have been documented in a publicly accessible repository. The quantification of the four pathway scenarios has been completed, and model interfaces for efficient interaction have been established. For the case studies, a system dynamics model was developed to assess Ticino's energy transition, and an urban district heating planning tool was developed for Zurich. The integration of the SBB model with the SURE analysis framework was completed, with a focus on the connection between SBB and Swissgrid.

Zusammenfassung

Die übergeordnete Forschungsfrage des SURE-Konsortiums lautet: «Wie können Resilienz- und Nachhaltigkeitskriterien mit den primären Zielen der Schweizer Energiewende in Einklang gebracht werden?» Konkret untersucht das Projekt vier Hauptziele:

1. Bewertung der Nachhaltigkeit und Resilienz des zukünftigen Schweizer Energiesystems auf Basis erneuerbarer Energien.
2. Entwicklung eines integrierten analytischen Rahmens auf der Grundlage von Modellierungswerkzeugen und Indikatoren-Datenbanken.
3. Einbeziehung von Interessengruppen zur Bewertung von Indikatoren für vier langfristige Pfade unter fünf Schockszenarien.
4. Anwendung auf nationaler Ebene in der Schweiz sowie für mehrere regionale oder themenbezogene Fallstudien.

Aufbauend auf bestehenden Forschungsarbeiten in diesem Bereich wird ein neuartiger, quantitativer, modell- und datenbasierter Rahmen entwickelt und angewandt, der ganzheitliche, systemische Ansätze, umfassende Indikatoren-Datenbanken, Energieinfrastruktur und Systemmodellierung kombiniert und dabei explizit soziale und politische Aspekte berücksichtigt. Mit dem Fokus auf die nationalen Entwicklungen in der Schweiz sowie auf ausgewählte regionale Fallstudien wird die Resilienz in einer langfristigen Perspektive (einschliesslich 2035 und 2050 als Fokusjahre) mit einem Szenario-Ansatz analysiert, der Übergangspfade sowie zukünftige Störereignisse (unter Verwendung von Schockszenarien mit Störungen auf verschiedenen Ebenen), damit verbundene Unsicherheiten und die Auswirkungen auf das Energiesystem und die Gesellschaft simuliert.

Die Ergebnisse bilden die Grundlage für eine von den Interessengruppen informierte, facettenreiche Entscheidungsanalyse, die Strategien und politische Massnahmen zur Gestaltung eines Energiesystems entwickelt, das widerstandsfähiger gegen Störungen ist und sich im Falle einer Störung schnell erholen kann. Das Projektergebnis wird vielfältig sein, einschliesslich einer webbasierten Plattform, die durch einen umfassenden analytischen Rahmen unterstützt wird, der es einem breiten Publikum ermöglicht, die Interdependenzen verschiedener Nachhaltigkeits- und Resilienz-Dimensionen zu verstehen und die Kompromisse zwischen konkurrierenden Zielen im Zusammenhang mit der Transformation des Energiesektors zu veranschaulichen.

Letztendlich wird das Projekt politischen Entscheidungsträgern, Technologieentwicklern und Unternehmen Empfehlungen und Leitlinien für die Gestaltung ihrer jeweiligen Strategien für eine nachhaltigere und widerstandsfähigere Energiezukunft liefern.

Die wichtigsten Errungenschaften des Projekts lassen sich mit Blick auf das vergangene Jahr wie folgt zusammenfassen. Der SURE MCDA-Rahmen wurde im Rahmen des zweiten Stakeholder-Workshops für die Bewertung von Schweizer Energiewendepfaden entwickelt und getestet, wobei die wichtigsten Kompromisse zwischen ökologischen, wirtschaftlichen, soziopolitischen und resilienten Indikatoren aufgezeigt wurden. Die erste Version des SURE-Spiels, «Energy Ensured», wurde veröffentlicht und bis Ende 2024 in die SURE-Umfrage integriert. Der Anpassungsbedarfsindikator (ANI) wurde fertiggestellt und ermöglicht die Bewertung der rechtlichen und politischen Aspekte der SURE-Pfade. Der SURE-Modellierungsrahmen wurde weiter verbessert, und alle Annahmen, Definitionen und Protokolle wurden in einem öffentlich zugänglichen Repositorium dokumentiert. Die Quantifizierung der vier Pfadszenarien ist abgeschlossen, und es wurden Modellschnittstellen für eine effiziente Interaktion eingerichtet. Für die Fallstudien wurde ein Systemdynamikmodell entwickelt, um die Energiewende im Tessin zu bewerten, und ein städtisches Fernwärmeplanungswerkzeug wurde für Zürich entwickelt. Die Integration des SBB-Modells mit dem SURE-Analyserahmen wurde abgeschlossen, wobei der Schwerpunkt auf der Verbindung zwischen SBB und Swissgrid lag.

Résumé

La question de recherche qui guide le consortium SURE est la suivante : « Comment concilier les critères de résilience et de durabilité avec les objectifs de transformation du secteur énergétique suisse ? » Plus précisément, le projet étudie quatre objectifs principaux :

1. Évaluation de la durabilité et de la résilience du futur système énergétique suisse basé sur les énergies renouvelables.
2. Développement d'un cadre analytique intégré basé sur des outils de modélisation et des bases de données d'indicateurs.
3. Engagement des parties prenantes pour évaluer les indicateurs de quatre voies à long terme soumis à cinq scénarios de choc.
4. Application au niveau national, ainsi que pour plusieurs études de cas régionales ou thématiques.

En s'appuyant sur les recherches existantes dans ce domaine, un nouveau cadre quantitatif basé sur des modèles et des données sera développé et appliqué en combinant des approches holistiques et systémiques, des bases de données d'indicateurs complètes, des infrastructures énergétiques et une modélisation des systèmes, tout en représentant explicitement les aspects sociaux et politiques. En se concentrant sur les développements nationaux suisses ainsi que sur des études de cas régionales sélectionnées, la résilience du système énergétique suisse sera analysée dans une perspective à long terme (avec 2035 et 2050 comme années cibles). Pour cela, une approche par scénario qui simule les voies de transition ainsi que les événements perturbateurs futurs (en utilisant des scénarios de choc avec des perturbations à différentes échelles) sera utilisée, incluant les incertitudes qui y sont liées et les implications pour le système énergétique et la société.

Les résultats alimenteront une analyse décisionnelle multi-objectifs, éclairée par les parties prenantes, qui élabore des stratégies et des mesures politiques pour concevoir un système énergétique plus résistant aux perturbations et capable de se rétablir rapidement en cas de perturbation. Les résultats du projet seront multiples, notamment une plateforme en ligne soutenue par un cadre analytique complet qui permettra à un large public de comprendre les interdépendances des différentes dimensions de la durabilité et de la résilience de manière prospective et d'illustrer les compromis entre des objectifs concurrents liés à une transformation durable et résiliente du secteur de l'énergie.

À terme, le projet fournira aux décideurs politiques, aux développeurs de technologies et aux entreprises des recommandations et des lignes directrices sur la conception de leurs stratégies respectives pour un avenir énergétique plus durable et plus résilient.

Les principales réalisations du projet à ce jour peuvent être résumées comme suit. L'outil SURE MCDA a été conçu et testé lors du deuxième atelier des parties prenantes pour évaluer les voies de transition énergétique suisses, révélant des compromis clés entre les indicateurs environnementaux, économiques, sociopolitiques et de résilience. La première version du jeu SURE, « Energy Ensured », a été publiée et intégrée à l'enquête SURE fin 2024. L'indicateur des besoins d'adaptation (ANI) a été finalisé, permettant l'évaluation des aspects juridiques et politiques des trajectoires SURE. Le cadre de modélisation SURE a été encore amélioré, et toutes les hypothèses, définitions et protocoles ont été documentés dans un référentiel accessible au public. La quantification des quatre scénarios de trajectoire a été achevée, et des interfaces de modèle pour une interaction efficace ont été établies. Pour les études de cas, un modèle de dynamique des systèmes a été développé pour évaluer la transition énergétique du Tessin, et un outil de planification du chauffage urbain a été développé pour Zurich. L'intégration du modèle SBB dans le cadre d'analyse SURE a été achevée, en mettant l'accent sur la connexion entre SBB et Swissgrid.

Riassunto

La domanda di ricerca principale del consorzio SURE è: «Come possono essere conciliati i criteri di resilienza e sostenibilità con gli obiettivi primari della trasformazione del settore energetico svizzero?». In particolare, il progetto indaga quattro obiettivi principali:

1. Valutazione della sostenibilità e della resilienza del futuro sistema energetico svizzero basato su fonti di energia rinnovabili.
2. Sviluppo di un quadro analitico integrato basato su strumenti di modellizzazione e database di indicatori.
3. Coinvolgimento degli stakeholder per valutare gli indicatori relativi a quattro scenari di transizione a lungo termine e cinque shock.
4. Applicazione a livello nazionale in Svizzera, nonché a studi di caso focalizzati su specifiche regioni o tematiche.

Basandosi su ricerche esistenti in questo campo, il progetto svilupperà e applicherà un quadro innovativo e quantitativo basato su modelli e dati, combinando approcci olistici e sistemici, database completi di indicatori, infrastrutture energetiche e modellizzazione dei sistemi, con una rappresentazione esplicita degli aspetti sociali e politici. Concentrandosi sugli sviluppi nazionali svizzeri e su casi di studio regionali selezionati, la resilienza sarà analizzata con una prospettiva di lungo termine (includendo gli anni 2035 e 2050 come focus) attraverso un approccio che simula scenari di transizione, eventi inaspettati futuri (con impatto di shock di diverse scale), le incertezze correlate e le implicazioni per il sistema energetico e la società.

I risultati informeranno un'analisi decisionale multi-obiettivo basata sul coinvolgimento degli stakeholder, sviluppando strategie e misure politiche per progettare un sistema energetico più resiliente alle interruzioni e capace di un rapido recupero in caso di crisi. L'output del progetto sarà multidimensionale e includerà una piattaforma web supportata da un quadro analitico completo, che consentirà a un pubblico ampio di comprendere le interdipendenze tra diverse dimensioni della sostenibilità e della resilienza in modo prospettico e di illustrare i compromessi tra obiettivi contrastanti nella trasformazione sostenibile e resiliente del settore energetico.

In ultima analisi, il progetto fornirà a responsabili politici, sviluppatori tecnologici e aziende raccomandazioni e linee guida per definire le proprie strategie verso un futuro energetico più sostenibile e resiliente.

I principali risultati ottenuti fino ad oggi, con particolare attenzione all'ultimo anno, possono essere riassunti come segue: il framework SURE MCDA è stato progettato e testato nel secondo workshop con gli stakeholder per la valutazione dei percorsi di transizione energetica in Svizzera, rivelando compromessi chiave tra indicatori ambientali, economici, socio-politici e di resilienza. La prima versione del SURE Game, «Energy Ensured», è stata rilasciata e integrata nel sondaggio SURE entro la fine del 2024. L'Indicatore di Necessità di Adattamento (ANI) è stato finalizzato, consentendo la valutazione degli aspetti legali e politici dei percorsi SURE. Il quadro di modellizzazione SURE è stato ulteriormente migliorato, e tutte le ipotesi, definizioni e protocolli sono stati documentati in una repository pubblica accessibile. La quantificazione dei quattro scenari è stata completata e sono state stabilite interfacce di modello per un'interazione efficiente. Per gli case study, è stato sviluppato un modello di dinamica dei sistemi per valutare la transizione energetica del Ticino, e uno strumento di pianificazione del teleriscaldamento urbano è stato realizzato per Zurigo. L'integrazione del modello SBB con il quadro di analisi SURE è stata completata, con particolare attenzione al collegamento tra SBB e Swissgrid.

1 Work programme overview

The overarching research question of the SURE consortium is how resilience and sustainability criteria can be reconciled with the primary goals of the Swiss energy sector transformation. Specifically, it aims to (1) assess the sustainability and resilience of the future renewable-based Swiss energy system, (2) develop an integrated analytical framework based on modeling tools and indicator databases, (3) engage stakeholders to evaluate indicators for long-term pathways under shock scenarios, and (4) apply the framework at the Swiss national level and for several regional or topic-focused case studies.

The research is organized along five main clusters. Cluster 1 evaluates the sustainability and resilience of the four long-term SURE pathways under five shock scenarios. It develops a Multi-Criteria Decision Analysis (MCDA) framework that incorporates stakeholder interaction throughout the entire process. This approach fosters transparency, reproducibility, and an in-depth understanding of trade-offs, ultimately leading to acceptance of consensus solutions across diverse stakeholder groups. Furthermore, the environmental impacts of Swiss production and consumption are spread throughout the global supply chain and analyzed using Life Cycle Assessment and Circular Economy methods. Finally, a reconciled uncertainty quantification approach is developed based on surrogate modeling.

Cluster 2 aims to investigate the social, legal, and political framework of the SURE pathways and shocks. Central objectives include the development of indicators on the legal and political adaptation needs, as well as on the social acceptance of pathways, to inform and/or integrate SURE modeling. Moreover, the cluster activities include the development of a serious game to a) gather data on how the population perceives and potentially behaves in different future energy systems and therewith contributes or challenges resilience and sustainability and b) evaluate how the SURE game can increase players' sensitization for the energy transition and change attitudes and behavioral intentions.

Cluster 3 refined the assumptions of the SURE pathways and shock scenarios to reflect policies introduced into Swiss legislation as of Jan 1, 2024, and to account for the most recent developments in energy supply and demand in Switzerland and abroad. At the same time, it redefined three shocks, financial, societal, and political, either by changing their scope to maximize their impacts (e.g., the financial shock was repurposed from an exchange rate to an interest rate shock) or by clarifying their assumptions and storylines for implementation into the SURE models (e.g., the societal and nuclear shocks). Based on the updated definitions, the quantification of the four pathways of SURE SPS1-SPS4 was completed, while the quantification of the financial and societal shocks is in progress. Lastly, the SURE models underwent several improvements during the last year.

Cluster 5 comprises three case studies that assess resilience within the SURE framework in regional and topical investigations through collaboration with industry partners. The cantonal case study focuses on sustainable and resilient energy pathways for Ticino. In collaboration with interdisciplinary stakeholders from the energy sector, a simulation model based on System Dynamics approach is developed to test relevant policies and reflect on differences and similarities between the transition at the cantonal and federal levels. A regional case study at the urban and sub-urban scale investigates the role of district heating in urban energy system resilience. In collaboration with the city of Zurich, the heat grid planning is analyzed on a technical, socio-economic, and legal level, with a focus on clear and interactive communication of the results. Two thematic case studies explore sustainability and resilience in different contexts. The first, in collaboration with IWB, examines policy and economic challenges in reducing heat-related CO_2 emissions in industries using surveys, interviews, and legal analyses. The second, with SBB, analyzes the resilience of the electric power grid in public transport. After a comprehensive review, the quantitative investigation integrates the case study with the SURE resilience assessment.

2 Progress of activities

In Cluster 1, one central activity during the reporting period was the second stakeholder workshop, which played a critical role in refining the SURE Multi-Criteria Decision Analysis (MCDA) framework and evaluating Swiss energy transition pathways. During this workshop, stakeholders engaged in a comprehensive evaluation process by comparing environmental indicators with economic, socio-political, and resilience indicators. Through interactive discussions and collaborative exercises, participants were able to prioritize these indicators and uncover key trade-offs (across and within the dimensions of sustainability and resilience), thereby providing valuable insights into how different dimensions of sustainability interrelate. The outcomes of this workshop are set to enhance the SURE database and further inform the MCDA framework, ensuring that the analysis of future energy pathways is balanced across environmental, economic, and socio-political considerations.

In Cluster 2, central activities have been completed during the reporting period. On the one hand, this concerns the **SURE Game Energy Ensured**, for which a first version has been released and integrated as “a sophisticated information treatment” into the SURE survey. The latter has been developed over the past year and was successfully completed by the end of 2024. On the other hand, the Adaptation Need Indicator (ANI) has been finalized, which assesses the different SURE pathways from a legal and political perspective and serves as an indicator to be used in the SURE database and MCDA.

In Cluster 3, all the assumptions of the SURE scenarios were documented in a publicly accessible repository (**Report “Revised scenario protocol capturing new energy sector developments translating into re-defined pathway and shock scenarios**”). The updated scenario definitions and the protocol developed for model linking in SURE were also extensively described (Deliverable D2.2). These two documents served as the basis for completing, according to the SURE time plan, the quantification of the four pathway scenarios and further improving the models of SURE and their interfaces to maximize efficiency in their interactions during the quantification of the scenarios. Two additional deliverables were produced by Cluster 3, **addressing analyses of current legal requirements** (Deliverable D2.3) and the political acceptance of a sustainable energy system (Deliverable D2.4). Major model developments include: a) the integration of building construction material flows into BSM; b) modifications in STEM to account also for non-CO2 GHG emissions trajectories in its carbon constraint; c) benchmarking and alignment of GEM-E3-CH with the emissions trajectories of WWB and Zero Basis scenarios of ES2050, as well as the Swiss agricultural policy, while GEM-E3-CH also completed the **Reference Economic Outlook for Switzerland** (Deliverable D8.2); d) development of stress tests of the Swiss energy system with high renewable shares under different weather conditions (25 historical years), documented in **Deliverable D5.2** that was produced within the current reporting period, and which was performed with an improved version of EXPANSE that considers the electricity system development both for 2035 and 2050; and e) improved computation of grid security indicators and finalization of the SURE grid gas network module of the FlexECO model.

Progress in Cluster 5 comprised several concrete results and quantitative outputs, which are now complete following previous preliminary investigations. First, the cantonal case study continued to advance the development of the System Dynamics model for assessing Ticino’s energy transition. This tool enables policymakers to evaluate the impacts of policies, external shocks, and assumptions on the regional energy system. During the reporting year, the first version of the model was completed and documented in this **conference proceedings** expanding beyond the residential sector to include transport, centralized electricity production, and the energy demands of the tertiary and industrial sectors. Secondly, the case study on urban district heating has converged to several concrete results.

For the analysis of the current and future heat grid infrastructure of the city of Zurich, a new district heating planning tool has been developed that comprises cost-efficient grid planning at regional and neighborhood levels, the impact of demand uncertainty due to the willingness to connect, resilience to pipe outages, and weather-related impacts. To facilitate understanding of the results, an interactive web tool has been developed. The results are disseminated with the case study partners, and have initiated several follow-up collaborations within SURE, other SWEET consortia, and beyond. Third, the industry sector case study investigated industrial heat process decarbonization through surveys and expert interviews. A survey concept was developed, followed by interviews with experts from the chemical, pharma, and food industries, which were analyzed using content analysis. The survey was then launched, with two reminders sent before evaluation. The findings assessed the current status of heat process decarbonization, identified key challenges and barriers, and explored industry-specific needs in various contexts. The analysis is based on response occurrences and qualitative insights from open-ended answers, providing a comprehensive understanding of sectoral challenges and opportunities for decarbonization.

The transport sector case study has completed the SBB model integration with the SURE analysis framework, focusing on the connection between SBB and Swissgrid. The ongoing quantitative analysis directly leverages and complements the technical resilience indicators of the SURE framework, by determining the potential mutual benefit of an enhanced coordination of the power exchange between the Swissgrid and SBB electricity grids (i.e., reducing the number of congestions and redispatch requirements).

3 Highlights of outputs

A serious game as sophisticated information treatment

In November and December 2024, the SURE population survey was conducted. The most innovative element of this survey project was the integration of the SURE Game *Ensured Energy* as a sophisticated information treatment. As Figure 1 illustrates, we conceptualized the SURE survey in 2 parts. The first part included the pre-treatment variables, most importantly central attitudinal questions as well as initial perceived efficacy and policy support. Afterward, we used block randomization to define a treatment and a control group. Whereas the control group was directly forwarded to the second survey part (and had the opportunity to play the game afterward), the treatment group was sent to the Serious Game. After having played the game (respondents could choose not to play), these respondents were sent back to the second part of the survey. More detailed information on the survey design can be found in the preregistration (https://osf.io/s53q4).

The design was very much "high risk" because the treatment was demanding (going to the game and playing and then finding the way back to the survey) and was likely to deter some respondents. Against this background, the response rate of >20% (1285 full responses out of 6000 invites persons, control group > 800, treatment group > 400) can be seen as a success. In the next reporting period, the data will now be analyzed to test in how far playing the game is an effective "information treatment".

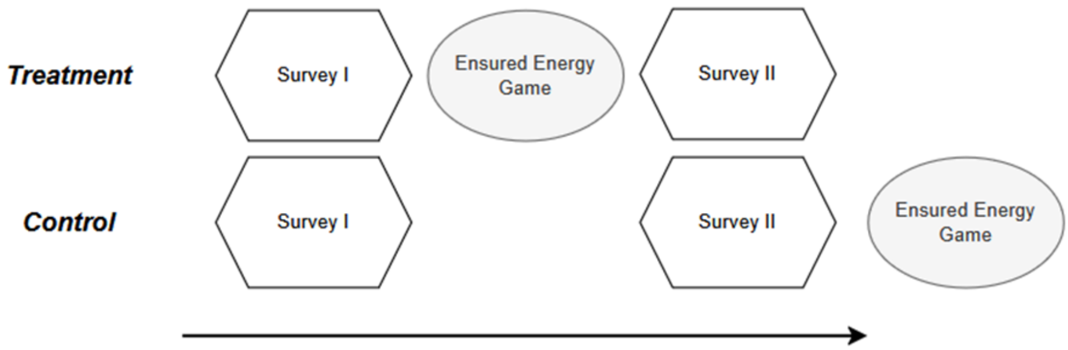

Figure 1 Experimental set-up of the SURE survey integrating Ensured Energy.

An interactive heat grid and multi-energy grid planning tool

The quantitative tools and results completed in the case study on urban heat grid planning and resilience have spurred multiple dissemination activities, collaborations, and follow-up investigations.

An interactive web tool has been created (**https://fenwebtools.ethz.ch/SURE_heatgrid/**) to display selected outputs of the heat grid planning tool GridPLAN, part of the SURE case study. Users can select key parameters like heat demand, pipeline costs, and temperature spread to visualize grid costs and topology. The tool helps communicate planning results effectively to customers, residents, stakeholders, and decision-makers, enhancing transparency and acceptability of the planning process. It also facilitates the communication of research challenges associated with heat grid planning.

A more advanced version of the tool was demonstrated at the SURE General Assembly 2024, using a gaming approach between two participants to explain N-1 security in heat supply. Given the positive reaction, it is planned to incorporate gaming elements into the web tool for future dissemination events.

The heat grid visualization has been compared with other visualizations used in the industry based on GIS software. The tool and results have also been shared with the project stakeholders (ewz, City of

Zurich), identifying the potential for a resiliency increase and issues surrounding non-technical constraints for heat grid planning.

The results have led to follow-up investigations, including a collaboration with the SURE Ticino case study, to expand insights from urban to cantonal settings. There is interest in examining the role of heat grids vs. decentralized heat sources in rural and suburban areas. A new partnership with the SWEET consortium PATHFNDR applies the tool in the rural municipality of Losone, along with enhancements to the heat grid planning tool for optimal neighbourhood sizing and heat source location.

The heat grid planning tool is currently extended to other energy carriers (electricity, gas), enabling analysis of grid transformations due to changing use cases, such as the discontinuation of the gas grid, conversion to hydrogen pipelines, or the co-planning of grids for different energy carriers. Overall, the study’s outputs and impact extend well beyond the original study scope.

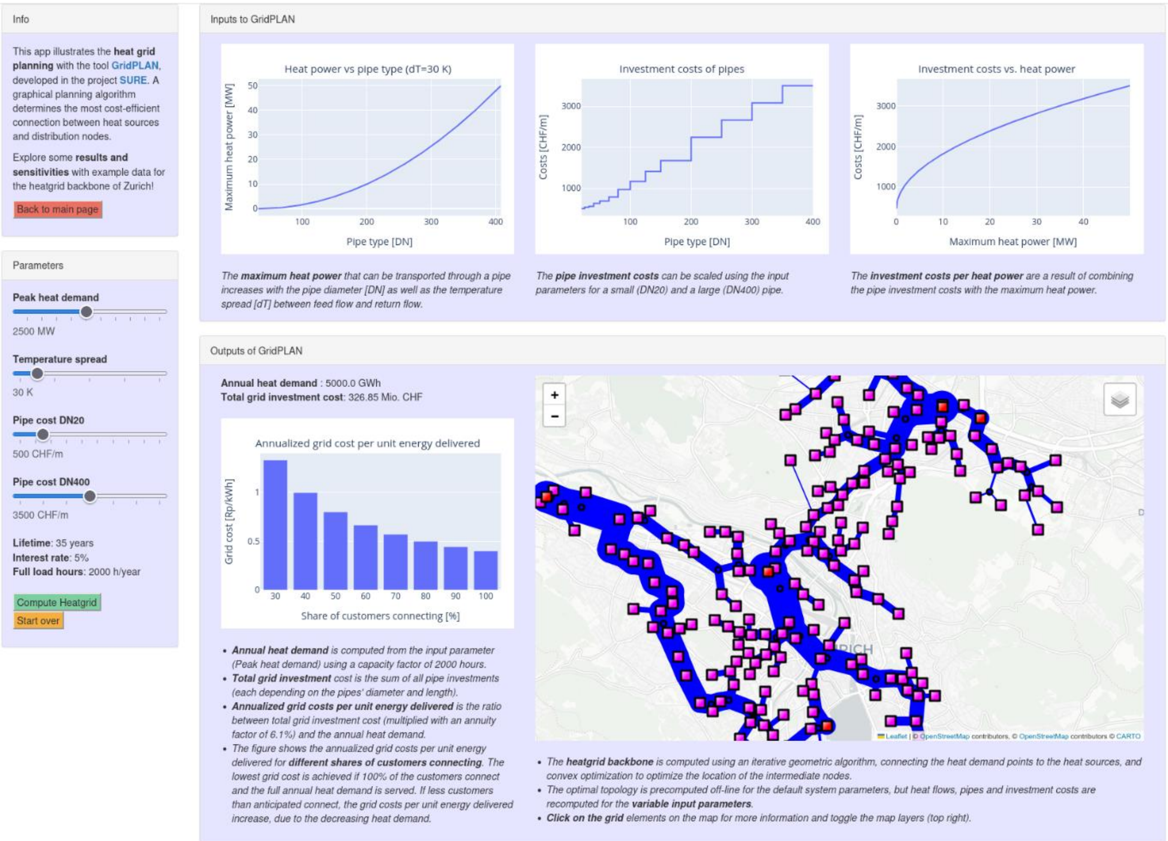

Figure 2: Overview of the interactive web tool for heat grid visualization, including controls (left), input parameters (top), uncertainty impact from customers’ willingness to connect (bottom left), and the topology of the resulting heat grid backbone. The user can adjust parameters, zoom in, or explore the sensitivity of the results.

Besides the heat grid planning tool GridPLAN, developed by ETHZ-FEN, two other tools with different scopes complete the toolbox. The "Decentralized Clustering" tool for the early planning stage allows the identification of clusters of buildings that are suitable for a heat grid connection. The advantage of this approach is that it allows for an analysis before a heat source is planned or defined. The Street Routing tool, on the other hand, like the tool described above, is useful for planning at a later stage when the heat source has already been defined. The difference of the Street Routing tool is that it follows the streets for the grid routes. Those tools are not released directly as webversion, but features (like the street routing) are continuously incorporated in GridPLAN and eventually also released in the webversion. Additionally, new application and projects combining the holistic heat supply planning of TEP with the ETHZ network planning tool are actively sought, fostering a continuous coordination between the tools.

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