Designing EnergySHR: A platform for energy dataset sharing and communications

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Abstract

The UN developed 17 sustainable development goals to get us to climate neutrality by 2030. In part, those goals focus on changing the ways we produce and consume energy, often called the energy transition. The energy transition is reliant on data, software, algorithms, and people. In order to address the growing reliance on data, increase transparency, and reduce redundancy in project development, the Center for Energy System Intelligence (CESI), a Convergence collaboration between TU Delft and Erasmus University Rotterdam, has developed EnergySHR, a platform where researchers on the energy transition can share, publish, and/or find energy-related datasets and algorithms and develop partnerships with other researchers. EnergySHR, was designed and deployed using sustainable software engineering and FAIR principles of open data with the aim of facilitating connection, building networks, and developing new, innovative projects while reducing redundancy.

CCS Concepts

• **Human-centered computing** → **Collaborative and social computing**; **Computer supported cooperative work**; • **Information systems** → **Data management systems**.

Keywords

EnergySHR, data sharing, energy transition, energy datasets, platformization, sustainable software engineering, software engineering education

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1 Introduction

Technology and data are center stage as the world transitions from fossil fuels to renewable energy [7, 11], and data is necessary for innovation and decision-making in the energy sector [6]. Energy data is a vast landscape that is growing with increased reliance on generative AI and LLMs adapted for other uses. Finding relevant data can be challenging because it is scattered across various repositories and formats [12]. Even when data is found, access may be a barrier because data may be protected, necessitating extra care and compliance [9]. To maximize the value of data in the energy transition, we developed EnergySHR as a platform for data sharing designed with the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles [3] as a tool to facilitate project development and collaboration for the energy transition.

2 Background

The energy transition is global, complex, and multi-faceted, so to work on the transition, computer science students should have access to the most current knowledge across multiple sectors in the field. Chen [2] points out that the energy transition requires interdisciplinary knowledge concerning advanced technologies that drive the transition. This is echoed in Betz and Penzendstadler [1], where they state that sustainability, responsibility, inclusion, and ethics must be incorporated into the classroom. In addition, adequate cooperative education and training shaped by energy transition challenges are necessary to achieve European Union's climate goals [8]. The transition, and therefore education, should be mindful of inclusion, energy justice, energy poverty, and other social aspects and stakeholder groups [5, 10].

3 Platform Development

The Center for Energy System Intelligence (CESI), a Convergence collaboration between TU Delft and Erasmus University Rotterdam, has developed EnergySHR[1], a unique platform that combines social aspects from Web 2.0 with repositories specifically for data about the energy transition. Using a community informatics approach [4], the platform was designed to meet the needs of the computing energy community. We operationalized a list of desired features into social and data storage requirements. The features were further divided into functional and non-functional requirements. Focused on the energy transition, EnergySHR differs from other repositories because it allows versioning and archiving, can connect datasets to existing projects, and follows the FAIR principles for public data. In addition, EnergySHR also accelerates energy transition research using intelligent, data-driven algorithms. Some social features include highlighting profile creation, uploading and following datasets, integrating datasets into projects, and archiving data. EnergySHR was designed with Django and Python. The platform also incorporates Keycloak, OpenID Connect, and PostgreSQL private and public profiles, create dataset categories, and classify datasets. Metadata is constructed using Croissant, a metadata format exclusively for machine-learning datasets. Storage is S3 compliant.

On EnergySHR, every dataset has a Digital Object Identifier (DOI). This stability supports citation integrity, data traceability, and interoperability across digital infrastructures. Moreover, this platform is purpose-built to support the sharing, discovery, and management of datasets and code within the research community. The platform emphasizes collaboration, data integrity, and robust access control, offering a comprehensive suite of functionalities designed to streamline open and reproducible science. EnergySHR also applies the FAIR principles through features like User Authentication and Access Control, Dataset and Code Publication, Search and Discovery, Version Control, Collaboration Features, and the Notification System. Through these features, EnergySHR provides an integrated environment for open, trustworthy, and efficient data and code sharing across platformization and energy research.

4 Next steps

Continuing using a community informatics approach and participatory design principles, we will survey members of the computing energy transition community at the 2025 ACM e-Energy conference in Rotterdam, Netherlands (June 17-20 2025) to determine features and uses that are most beneficial to the community. We will also identify ways in which EnergySHR can be used as an educational tool for computer science students and professionals. We will use this data to identify computer science and software engineering educational opportunities. In Fall 2025, we will survey Masters and Doctoral students across disciplines to determine the usefulness and application of the tool in project development.

5 Conclusion and Future Work

EnergySHR offers a flexible and user-centric access control model **??** for dataset sharing, enabling researchers to manage visibility according to their collaboration needs and data sensitivity. Users can assign one of several predefined access levels to their datasets: Restricted, Public, Follower, Friend, and Colleague. Additionally, users retain complete control over their network by having the ability to block specific individuals from accessing their content. This nuanced permission system promotes both openness and security, aligning with FAIR principles while respecting ethical and legal requirements for data sharing.

Finally, the EnergySHR platform will researchers and educators to share, discover, and manage data and design curricula about the energy transition aligned with FAIR principles. This will advance computer science education and sustainable software engineering education by providing a platform where researchers can work collaboratively and design projects specifically about the energy transition. The modular architecture and open-source technologies ensure flexibility, security, and scalability as well as evaluate the platformization of data for empirical research.

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