Contribution ID: **104** Type: **Talk (15min + 5min)**

Towards Guidelines for Engineering of Energy Research Software

Wednesday 26 February 2025 15:00 (20 minutes)

Energy research software (ERS) plays a vital role because it enables and supports numerous tasks in energy research. The complexity of ERS ranges from simple scripts and libraries, e.g., for Python, to full software solutions. [1]
ERS is often developed by energy researchers with diverse backgrounds (e.g., physics, mechanical engineering, electrical engineering, computer science, social science) who are mostly not trained in software engineering. This leads to various approaches to creating ERS often with limited focus on testing and maintenance.
To enhance the re-usability of research software, in line with the FAIR principles for research software [2], code quality and overall software management are essential. Since research software differs from industrial applications, not all software engineering methods apply to research software engineering. Collections of best practices of research software engineering can guide researchers to improve their software engineering and, consequently, the overall research process. Such collections already exist for other domains, e.g., [3], [4]. Since research software and especially its development process differs between domains, we argue that an energy-specific preparation of best practices of software engineering can support energy researchers. These best practices should cover areas like the conceptualization, development, maintenance, and publication of ERS, serving as structured processes within the ERS life-cycle.
To collect best practices for ERS, we invited energy researchers with experience in engineering ERS to two on-site workshops in August and November 2024. The first workshop was held internally with 8 researchers from different groups of our research institution. The second workshop was open and attracted around 20 researchers from 12 different institutions across Germany. During these workshops, we collected relevant aspects and practical solutions for software engineering in energy research. Based on the workshop results, we will formulate around 10 ERS-specific guidelines for energy researchers to improve their software engineering. This collection will serve as a common starting guide for early-career researchers when they start to develop ERS. Additionally, this collection will improve the awareness of research software engineering in the energy domain.
In our talk, we will present the results of the two workshops and the first version of the guidelines for energy research software engineering.

References

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Session Classification: Communities around Research Software

Track Classification: Education: best practices for research software development