Energy Dynamics Awareness (EDA)

- In resource dependent systems (house, electric vehicle, ships) users’ behavior is an important factor for actual energy efficiency (1).
- Energy Efficiency = Technical Potential x User Behavior
- Even energy-literate [9] people show inefficient behavior in dynamic energy situations [3]. Here, individual predispositions alone are insufficient to explain energy efficient behavior.
- Situation awareness (SA) [6] could help to better understand user-energy interactions – more precisely, a context specific SA we call energy dynamics awareness (EDA).
- User-centered HMI's providing energy feedback can support EDA [4].

EDA Scale

Developed by a focus group consisting of 4 researchers (including 2 of the authors) with a psychological background following this procedure:

1. Introduction to SA, energy efficient behavior and energy feedback HMI's.
2. Brainwriting task to generate possible items.
3. Editing, selection and exclusion of items (e.g. redundancy, precision).

First Scale Evaluation

- Procedure:
  1. Thematic Introduction
  2. 1st HMI presentation and EDA Scale questionnaire (among others)
  3. 2nd HMI presentation and EDA Scale questionnaire (among others)
  4. General Questions and Demographics
- The study was conducted in German.

Scale Analysis

Descriptive Statistics

Traffic Lights HMI: M = 4.33, SD = 1.11
Range Race HMI: M = 4.00, SD = 1.21

Mean difference not significant: t(39) = 1.55, p = .129, d = 0.25

Exploratory Factor Analysis

Both parallel analyses [7] and scree-plots indicated a single factor structure.

Conclusions + Next Steps

- Based on these preliminary results, the energy dynamics awareness (EDA) scale can be expected to be a reliable method to assess the EDA support of energy feedback HMI’s.
- This study suggests a single-factor structure. A two-factor structure with a comprehension and a control aspect might be possible and should be further examined.
- In this study, the two HMI's where rather similar and did not include a systematic variation to manipulate EDA. In future studies, explicit manipulation of EDA should be tested in order to examine how well the scale discriminates between interface variants.
- Further examinations of the criterion and construct validity are necessary.