ENERGY EVALUATION EUROPE
25 SEP - 26 SEP 2025
frizzforum BERLIN
ENERGY EVALUATION EUROPE CONFERENCE 2025
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Accelerating Transition by Energy Efficiency and Climate Protection Networks

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EXTENDED ABSTRACT

Motivation

Energy efficiency networks operated in a defined format – and since 2016 broadened to climate protection) networks - have been successfully implemented in different settings (Eberle et al. 2024; Jochem/Gruber 2007; Park et al. 2023):

- as centrally organized instrument with an operating standard set by governments (Switzerland, or Sweden for Small and Medium Sized Companies),
- with an open standard with a minimum specification (Germany, Austria) or an open standard set by the state utility (China).

There is no country where participation of companies is obligatory; but it is encouraged by incentives offered by national governments, communes (e.g. in Sweden: Paramonova/ Thollander 2016) or by industrial associations (Jensterle et al. 2024) and large utilities (Jochem et al. 2025).

On average, participants of energy efficiency and climate protection networks with a rather strict setting double their efficiency progress and CO_2 mitigation compared to individually acting companies (Durand et al. 2018). This success is linked to the organisational setting and mainly caused by informational and psychological reasons (Eberle et al. 2023; Dütschke et al. 2016; Aggarwal et al. 2019; Woolley et al. 2015).

The present research focusses on the various organizational settings that may influence the successes observed of regional and branch-specific climate protection networks of companies. The successes of group-internal energy efficiency and climate protection networks (EECP) cannot be analysed due to unpublished performance data of those networks.

Theoretical lens and empirical setting

A strict setting developed in 100 pilot networks ("Learning Energy Efficiency Networks LEEN") between 2008 and 2014 is characterized by the following mayor elements (Durant et al 2018):

- Participating energy managers of production sites of a region or of an industrial branch meet regularly four times per year for at least 4 hours and for at least three years.
- The meetings are prepared by a network team (manager, moderator, and consulting engineer).
- The participants report on their actual activities and investment plans; new technical topics, new regulations or new policies to be treated in a meeting have been decided by the participants in the preceding meeting. Information about new organisational measures, and financing options is added continuously.
- The meeting is hosted by one participant including a site visit which is highly estimated by the participants.

- In the first year, audits (meanwhile including scope 3) are performed to decide on a three- or four-years efficiency and CO_2-mitigation target of each participant. A joint target is decided upon which gets yearly measured.
- The initial energy audit has been expanded to include demand-side management analysis, the flexibility potentials of production processes and on-site electricity generators, investments in renewables or contracts in PPA, the greenhouse gas emissions from scope 3 actors (upstream and downstream), and GHG compensation options.

Methods

The attempt to explain the doubling of efficiency progress and CO2 mitigation on average of participating companies with non-participating by analytical statistics failed due to insufficient data sets of companies participating in the climate protection networks. There are many influences that contribute to the success of participants or non-participants (Stede, 2019). Statistical experience suggests that about 1000 data sets of companies would be needed to expect significant results.

However, several surveys – mostly written questionnaires - have been performed during the last 10 years that allow to reflect the opinions of the participating companies (Chassein et al. 2019; Dütschke et al. 2016; Jalo et al. 2021).

In some cases, companies stayed for more than 10 years in a regional network, realizing between 50 to 60 % efficiency improvement on their site. The long-term performance was compared to 3 or 4 years network operation. However, these few observations are statistically irrelevant. They hint to the fact that also the personal engagement of the energy managers can have a substantial impact on the energy performance of individual production sites.

Findings and original contributions

The success of energy efficiency and climate protection networks depends on strict organisational conditions (see above) and on informational and psychological reasons. These organisational features support the benefits of collective intelligence (Woolley et al. 2015) and offer many occasions of mutual acknowledgment of the participating energy managers, and friendly competition among the energy managers and their companies (Aggarwal et al. 2019).

The strict setting was also quite successful for SMCs compared to individual consultation of the companies (Jalo et al. 2021). So, the question arises what element of the setting seems to be very important für the network's success. One finding was the substantial reduction of transactions cost before the decision is taken (Mai et al. 2014).

Participating companies have taken their own initiatives to improve their products' energy efficiency und CO_2 neutrality (recently triggered by marketing aspects regarding final consumers). Innovative energy managers start asking their plant and machinery suppliers to improve the energy performance and search for CO_2-free solutions, speeding up innovation in the field of efficient and climate neutral solutions.

The results of the EECP networks are only published as gross savings or gross mitigated emissions of the participating companies (Barckhausen et al. 2024; Durand et al. 2018). They do not consider the autonomous technical progress which may be embedded in almost each re-investment. The gross effect may also include new national or international standards (e. g. electrical motors, ecodesign) or additional use of financial incentives for consultation or for investments.

As critical remark, the paper also questions the impact of well-trained and highly motivated moderators and consulting engineers of the network teams compared to non-specifically trained network team members. It seems that the active life of EECP networks – some of them last longer than 12 years- may substantially depend on the professional training of the two roles in the network team.

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