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Recommendations for Energy Efficiency Principles in the Green Transition

The Danish Council for Energy-Efficient Transition (REO) is an independent organisation set up by the Minister for Climate, Energy and Utilities to advise the minister on the organisation and implementation of the overall energy-saving efforts.

Members of the organisation are Aalborg University, the Danish Trade Union Federation of Construction Workers, CONCITO, the Danish Association of Architectural Firms, Green Power Denmark, the Danish Chamber of Commerce, the Danish District Heating Association, the Confederation of Danish Industry, De Frie Energiselskaber – Association of Independent Energy Companies, Drivkraft Danmark – Industry Association for Fuel and Charging, the Danish Property Federation, Energy Forum Denmark, the Danish Trade Union Confederation, the Danish Consumer Council THINK, the Danish Association of Consulting Engineers, Local Government Denmark, the Danish Agriculture and Food Council, Roskilde University, Green Transition Denmark, SMEdenmark, SYNERGI, the Danish Mechanical and Electrical Contractors Association, SustainableEnergy and VELTEK.

Summary

The Danish Council for Energy-Efficient Transition has drawn up recommendations for the Minister for Climate, Energy and Utilities in connection with the upcoming IEA global conference on energy efficiency to be held in Sønderborg, Denmark, in early June 2022.

The purpose of these recommendations is to inspire and contribute towards the development of country strategies for energy savings, reduced CO_2 emissions and greater sustainability on a global level.

Moreover, the sudden change to the supply situation for gas, oil and other raw materials in Europe as a result of Russia's invasion of Ukraine has meant the need for energy savings and a restructuring of energy supply imports are issues which have become significantly more acute and increasingly urgent.

The Danish Council for Energy-Efficient Transition recommends the following principles for energy efficiency within the green transition:

1. Action to improve energy efficiency should be part of a holistic sustainability effort in which energy systems, among other things, are considered in their context
2. The potential for energy efficiency improvements should be realised through technical, regulatory and financial instruments so as to create a market-economy foundation for investments in energy-efficient conversions in both homes and businesses of all sizes
3. Digitisation offers potentials which ought to be reaped
4. Financing for energy-efficient conversion activities should be supported while simultaneously avoiding lock-in effects
5. Examples must lead the way – Danish solutions with international potential that have been implemented and operationalised

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Introduction: Basis for an Energy Efficiency Strategy as Part of the Green Transition

REO recommends that a set of principles and concrete recommendations for energy efficiency be developed as an essential component in the green transition, providing inspiration for international actors who will be participating at the IEA conference on energy efficiency in June 2022. The ambition is that these recommendations should be suitable for implementation in a wide range of nations.

They must therefore be broad in scope as not all principles will have equal relevance for all countries.

Overall, the principles should be able to guide all countries towards creating their own strategy for energy efficiency and initiating measures which are relevant to the energy system, economic structure, building stock and population composition that exists in each individual country. The purpose is to encourage and contribute towards energy savings, reduced CO_2 emissions and greater sustainability on a global level. An unshackling from our dependence on gas and oil is also a stand-alone goal whose necessity has been demonstrated by Russia's invasion of Ukraine.

Digitisation is a common and recurring tool across all fields of action while security of supply will be essential for popular support.

Principles for energy efficiency in the green transition

1. Energy efficiency improvements should form part of a holistic sustainability effort in which energy systems are considered in their context

1.1 A coherent sustainability effort should encompass increased energy efficiency, the transition of current supplies to sustainable energy, reduced CO_2 emissions and reduced resource consumption.

1.2 A coherent effort is important in order to ensure that the work done to improve one sustainability parameter does not lead to an impairment of other parameters or to a deterioration in security of supply.

1.3 Energy Efficiency First should serve as a cross-cutting and leading principle which is cost-effective for society. The greenest energy is energy which is never used and this is also the energy with the fewest externalities.

In the short term, this principle is crucial in relation to establishing quick and cost-effective savings which are able to reduce dependence on fossil fuels and help to reduce CO_2 emissions. In the long term, this principle is crucial in relation to the expansion of our energy supply mix through sustainable energy as this becomes more cost effective.

1.4 Resource consumption and whole-life carbon should be involved as part of a holistic effort for sustainable buildings and enterprises. Reduced resource consumption means using fewer resources, using different resources and reusing resources.

1.5 Improving the indoor climate should also be promoted as part of a holistic enhancement of buildings. Much of the energy consumed in the operation of buildings is used to maintain a

satisfactory indoor climate because this is essential in order for a building to serve its purpose. Indoor climate, lighting, noise levels, air quality and other factors are all of significance for both economic and environmental/social sustainability. Positive externalities should be quantified and made visible insofar as possible.

1.6 Sustainable energy and sector coupling should be promoted through objectives to increase the sustainable-energy share of the overall energy supply mix in order to meet energy and climate goals in line with the Paris Agreement. (Sector coupling refers to the interconnecting of, and exchange between, electricity production and heat production as well as the various energy-consuming sectors, as well as collective and individual sources of energy supply including district heating based on different technologies and temperatures).

1.7 In order to enable better sector coupling and systemic energy efficiency improvements, the placement of large sources for surplus heat (e.g. from industry, data centres and PtX plants) should be included as a part of energy planning with a view to using the surplus heat in the district heating network. These plants should use water cooling as the cooling water has a high temperature and thus improves heat transfer to the district heating network in contrast to air cooling.

2. The potential for energy efficiency improvements must be realised through technical, regulatory and financial instruments to create a market-economy foundation for investments in energy-efficient conversions in both homes and businesses of all sizes

2.1 It is important that the principle of profitability for both private actors and wider society is respected with a view to securing the contribution from energy efficiency improvements in the pressing green transition. Initiatives and regulation should take account of the real lifetimes of the initiatives being undertaken.

2.2 Best Available Technology (BAT) should be a ubiquitous consideration when implementing conversion projects.

2.3 BAT as a decision-making parameter on individual projects should be assessed in relation to other initiatives so that the overall effort is optimised.

2.4 There exist a number of options for both energy efficiency and reduced CO_2 emissions which are technically possible but do not make financial sense for private actors within an acceptable time horizon for the owner. This applies to both buildings and enterprises alike. In the case of projects which are essential from a climate perspective and profitable for wider society but not private actors, instruments should be developed that stimulate implementation.

2.5 The development of new solutions requires demand volume. Building owners which have this volume – public, general and private – should be encouraged both through requirements and positive incentives to take the lead in developing products and processes for energy-efficient conversion projects.

2.6 Interest rate levels are crucial for investments and there should be no policy difference between the discount rate for investment in EE initiatives and investments in other sectors. Regulation, subsidies and knowledge sharing should contribute to boosting the demand volume for energy efficiency progress.

2.7 Initiatives and regulation should take account of the fact that there are differences between the abilities of large and small enterprises to implement concrete initiatives.

2.8 Building engineering regulation should be open to new and innovative solutions which can reduce both CO_2 emissions and material consumption.

3. Digitisation offers potentials which ought to be reaped

3.1 Digitisation is a crucial and cross-cutting factor for energy efficiency improvements and reduced consumption. A barrier for energy efficiency improvements – both in relation to the energy supply mix and consumption – is access to data. It is not enough for data simply to be made available. What matters is how data are made available and that definitions are consistent internationally.

Digital data collection and the dissemination of information and data synchronously with consumption are crucial to the optimisation of both the operation and maintenance of buildings and production processes.

3.2 Knowledge of current energy consumption in a building and the state of the surrounding energy systems is important in order to reduce consumption efficiently. The availability of data on both consumption and other measurement data such as temperature is therefore a crucial prerequisite for action on the part of the owners and users of the building and their partners. Such availability should therefore be promoted insofar as possible.

3.3 Data must be transferable and easily accessible in open formats for both building owners and their partners – for example through API.

3.4 Regulatory restrictions on data collection should be removed.

3.5 When buildings are screened for their potentials to be made more energy efficient, these potentiality reports should be made available as digital energy labels. Once improvements have been made, the label should then be updated so that it is kept up to date on a continuous basis.

3.6 Buildings should be intelligent and their readiness for the digital optimisation of operations both internally and in relation to surrounding energy systems should be made visible through the use of the Smart Readiness Indicator (SRI). The SRI should be a part of energy labelling.

3.7 Intelligent management and monitoring of machine, building and other consumption unit levels should support sector coupling and energy efficiency improvements.

3.8 Digitisation should support the dissemination of knowledge and the development of skills and competencies for activities to boost efficiency undertaken by building owners, advisors and trades people.

3.9 Uniform standards should be used across sectors and in regulations and all (upcoming) regulations should be designed so that it is possible to digitise the requirements. This is cost optimal and will generate increased momentum in solutions within energy efficiency improvements.

4. The financing of energy-efficient conversion activities should be supported

4.1 According to the IEA's report entitled *Energy Efficiency 2021*, the total annual investment in energy efficiency must be tripled worldwide before 2030 if we are to reach the goal of net-zero emissions in 2050 as set out in the IEA's *Roadmap to Net Zero by 2050* [1]. This means that an increase in investments from private actors (such as pension funds, capital funds and similar) is crucial.

4.2 Buildings, production processes and supply systems have long lifetimes. Predictability and stability must be created within the regulations to provide reassurance for long-term investments.

4.3 The planning of energy and heating supply should be long term, stable and communicated to decision makers. Long-term planning should not create lock-in effects which mean that temporary needs end up leading to unsuitable solutions becoming permanent.

4.4 Energy Performance Contracting (EPC) – e.g. in the form of ESCOs and other forms of service contacts whereby improvements to the indoor climate, building quality, sustainability and energy usage – should be promoted. In practice this typically requires large portfolios of buildings – e.g. all the schools in a municipality – to be pooled together.

4.5 REO recommends that state risk hedging is enabled through investments in energy efficiency improvement projects. The state guaranteeing a part of the borrowing risk makes it easier for actors such as pension companies with low business requirements to invest in long-term EE investments.

5. Examples lead the way: Danish solutions with international potential

A catalogue has been developed containing Danish experiences from concrete projects which can be shared internationally. The catalogue consists of cases within different sectors and means. The catalogue of cases A to J is enclosed in Annex 1.

a. **Implementation of climate plans at the local level:** Ninety-five out of 98 Danish municipalities are a part of the DK2020 programme which aims to help Danish municipalities to develop climate action plans and initiatives in line with the Paris Agreement. DK2020 uses C40's

[1] IEA Press Release, 17 November 2021: Global energy efficiency progress is recovering – but not quickly enough to meet international climate goals

standard for climate action planning and today includes almost all Danish municipalities. The DK2020 program includes a number of concrete energy efficiency products which are conducted at the local level.

b. **District heating in densely populated areas and the opportunities this yields for sector coupling:** Systemic energy efficiency improvements are achieved when energy planning allows for sources of surplus heat to be established in places where it can be used for district heating.

c. **Intelligent data-led energy management:** Experience from Aarhus on data-led energy management. The project focused on three areas: the benchmarking of building energy consumption, the reduction of water usage and the improvement of cooling in district heating systems.

d. **Nudging of private homeowners:** ProjectZero in Sønderborg where individual guidance and inspiration for homeowners are combined with energy supervisor training for local trades people and collaboration with local monetary institutions around targeted ZERObolig lån products (loans for energy efficiency improvement).

e. **Energy renovation of older apartment blocks:** AL2bolig was to undertake the renovation of the Langkærparken complex of housing blocks in Tilst, near Aarhus, and wanted to do something about the poor energy economics that characterise many public-housing buildings from the 60s and 70s. A single block was offered up as a trial block so that AL2bolig could use its experience from this project to decide how to proceed with the remaining 34 blogs in the complex. The 860 apartments which are home to approx. 2,000 residents were given new kitchens and bathrooms. Their basements, roofs and gable walls were reinsulated while the old courtyard facades were replaced with highly insulated facade elements. Langkærparken now meets the requirements for low energy class 2015.

f. **Cost-neutral renovation of municipal buildings:** ESCO project in Guldborgsund Municipality which resulted in the cost-neutral renovation of 54 municipal buildings. Ventilation and heating systems, as well as lighting installations, were replaced as part of a project with a simple payback period of 12 years with loan repayment covered by the savings.

g. **Climate adaptation yields climate gains:** Local-rainwater-harvesting solutions in the town of Låsby have resulted in rainwater being used in a recreational area rather than being directed to the sewers, thus boosting the recreational qualities of the area while also saving energy.

h. **Wastewater as a valuable resource:** Wastewater is usually energy-intensive to treat, but in 2019 the Marselisborg treatment plant was able to produce 50 percent more energy than it used to treat wastewater. At the same time, the plant also produced phosphorus fertilizers from the wastewater reaching up to 600 kg per day in 2019. That makes the Marselisborg treatment plant one of the absolute most sustainable treatment plants in the world.

i. **Energy optimisation of building operations based on detailed data collection**: Energy optimisation of the Nordisk Fjer building in Copenhagen was achieved through an IoT set-up collecting data on consumption, indoor climate and user behaviour and then presenting

these data in user-friendly dashboards. Simply put, this makes it possible for operational staff in the building to identify and stop or curtail the inexpedient consumption of electricity, water and heat and thus easily reduce CO_2emissions and bring down costs.

j. **Green Reporting delivers competitive advantages:** SIF Gruppen A/S – a major electricity installer – has developed a reporting system which uses consumption data for documentation. This is a process which at present is undertaken manually and so the unleashing of consumption data digitally will therefore provide new and better opportunities.

In addition to Annex 1, Green Transition Denmark (RGO) has also gathered together eight concrete examples in the project: "Grøn succes – lokal omstilling der rykker". These projects comprise changes of energy supply, energy efficiency improvements, behavioural changes, common ownership of sustainable-energy facilities and much more. This booklet has been drawn up as inspiration for the many different actors in the local community who wish to implement a green conversion project. The booklet contains knowledge from RGO, the Danish Technological Institute and the Samsø Energy Academy, supplemented with an analysis of eight examples of well-implemented local green conversion projects. Despite the highly diverse nature of the eight projects, they are in fact characterised by rather uniform courses of progression. A typical project course is therefore divided into twelve characteristic elements which are described in the following. All twelve elements are of great significance for a successful course of this green conversion project.

The eight documented projects are:

1. ZERObutik — Climate label in Sønderborg
2. Hylke – European heat pump city 2016
3. Samsø — Denmark's energy island
4. Energy Council – Ringkøbing-Skjern Municipality
5. Føns – Citizen-led district heating
6. A/B Elleparken – Efficient energy savings
7. Pilehusene — Energy-saving reinsulation
8. ZEROsport – Climate label in Sønderborg.

These examples can be accessed through the following link: https://rgo.dk/projekt/gron-succes-lokal-omstilling-der-rykker/.