



Nordic Council
of Ministers

Policy measures to compensate for increasing costs of energy: **Impacts on equity, climate, and the environment**

Contents

Preface	4
Summary for policy makers	5
Sammanfattning för beslutsfattare	7
Foreword	9
1. Introduction	10
1.1 Background and motivation	10
1.2 Objective of the project	12
1.3 Earlier results and lessons from the international literature	12
1.4 Outline of the report and reader guide	15
2. Overall methodological approach	16
2.1 Theoretical framework	17
2.2 Analytical framework	23
3. Compensation measures and relevant environmental policies	26
4. Assessment of selected Swedish measures	29
4.1 Electricity support for households	29
4.2 Electricity price support for businesses	33
4.3 Relaxed reduction mandate for fuels	34
5. Assessment of selected Danish measures	37
5.1 Electricity tax reduction	37
5.2 One-off payment to disadvantaged households	38
5.3 Increased subsidies for disconnecting from the gas network	39
6. Assessment of selected Norwegian measures	40

6.1 Electricity support for households	40
6.2 Electricity support for businesses	44
7. Assessment of selected Finnish measures	47
7.1 Fixed term tax credit	47
7.2 Extended payment period for electricity bills	50
8. Synthesis and conclusions	53
8.1 Overall evaluation of the measures	53
8.2 Alternative measures	55
8.3 Conclusions	57
References	58
Appendix	64
About this publication	69

Preface

This report has been commissioned by the Nordic Working Group for Environment and Economics (NME). The report has been prepared by a consortium led by Anthesis AB in cooperation with Menon Economics and Copenhagen University. The project team has been led by Stefan Åström from Anthesis AB. The other participants in the project team were Alexander Eriksson, Erik Gråd and Niels Baumert from Anthesis AB, Henrik Lindhjem and Erika Karttinen from Menon Economics and Christian Fromberg and Jette Bredahl from Copenhagen University.

The report presents an overview of different compensation measures which have been implemented in the Nordic countries in order to compensate consumers and other groups in society for higher energy prices in the aftermath of the Covid pandemic and as a consequence of the war in Ukraine. The report evaluates selected compensation measures, with a focus on their effect on income distribution, climate and environment. It also includes a discussion on alternative and likely more appropriate compensation measures that could have been taken. The main constraint of the analysis was data availability and the limited research available on impacts at the time when the report was written.

Members of the Nordic Working Group for Environment and Economy have provided comments and inputs to the report during the work. The authors of the report are responsible for the content as well as the assessments and recommendations, which do not necessarily reflect the views and the positions of the governments in the Nordic countries.

February 2024

Magnus Cederlöf

Chair of the Nordic Working Group for Environment and Economics

Summary for policy makers

The long-term Nordic policy objective of combating climate change has been challenged in recent years by disturbances to the economic system. The effects of the COVID-19 pandemic and Russia's military invasion of Ukraine on trade flows and income distributions contributed to large price increases for electricity, heat, and transport fuels between 2021–2023. The Nordic governments tackled these price increases by introducing numerous measures to economically compensate households and businesses. However, it is unclear if and how these measures affected the Nordic social, climate and environmental policy priorities.

To clarify these issues, this report evaluates selected compensation measures, with a focus on their effect on income distribution, climate, and the environment. The report also presents alternative and likely more appropriate compensation measures that could have been taken. The scope of this project includes the Nordic countries and measures implemented from 2021–2023. The focus is on measures aimed at households and, to a minor extent, businesses. The main constraint of the analysis is data availability and the limited research available on impacts, which is a result of project implementation at the same time that several of the measures were in place. Therefore, the results presented in this report rely on theoretical reasoning and a few Nordic and international studies, but relatively limited empirical evidence.

The main results and conclusions are:

- The design of the compensation measures varied among the Nordic countries.
- All countries acted relatively quickly, but this speed resulted in implementation problems. There have also been occurrences of targeting errors, as well the creation of undesirable incentives.
- Most of the implemented measures did not redistribute funds to low-income households. Rather, high energy consumption often implied high support, which implies that more support was given to high-income households.
- Measures that include redistribution would be possible to implement in Nordic countries, which all have well developed social security systems. This is exemplified through one Danish measure, which supplied a one-off payment to disadvantaged households.
- Most of the implemented measures distorted the price signal for electricity scarcity provided by the market, thus diminishing the opportunity for the market to effectively allocate resources and reduce energy consumption and emissions.

- Most measures missed the opportunity to establish a direct win-win relationship between climate change policies and the desire to alleviate the price shocks. One Danish and one Norwegian measure did, however, give direct support for investments in green technology, with corresponding direct long-term effects on greenhouse gas emissions.
- To reduce the risk of conflict between climate change policy and price shock alleviation, it is important that compensatory measures are generally understood to be temporary measures. Otherwise, businesses and households may come to expect such support in the case of future price increases, with the result that incentives for investment in energy saving measures are dampened.
- Other policy designs for compensation measures are available. Measures that include flat rates or regressive transfers of funds, and include the decoupling of measures from current consumption, are outlined in the literature to be more effective than most of the measures that were implemented. A few of the implemented measures have some of these features, so learning from them may be beneficial.

Sammanfattning för beslutsfattare

De långsiktiga nordiska politiska målen att bekämpa klimatförändringarna har de senaste åren utmanats av störningar i det ekonomiska systemet. Effekterna på handelsflöden och inkomstfördelningar av covid-19-pandemin, och Rysslands militära invasion av Ukraina, bidrog till stora prisökningar på el, värme och transportbränslen under 2021–2023. De nordiska regeringarna engagerade sig i dessa prishöjningar genom att införa ett flertal kompensationsåtgärder för att ekonomiskt kompensera hushåll och företag. Det är dock oklart om och hur dessa åtgärder påverkat de nordiska prioriteringarna för social-, klimat- och miljöpolitik.

För att klargöra dessa frågor, utvärderar denna rapport utvalda kompensationsåtgärder med fokus på deras effekter på inkomstfördelning, klimat och i viss mån miljö. Rapporten presenterar också alternativa och sannolikt mer lämpliga tillvägagångssätt för kompensationsåtgärder som kunde ha vidtagits. Omfattningen av rapporten omfattar de nordiska länderna och de åtgärder som genomförts under 2021–2023. Fokus ligger på åtgärder riktade till hushåll, och i mindre utsträckning till företag. Analysens främsta begränsningar är datatillgänglighet och lite tillgänglig forskning om effekter, vilka är resultat av att projektet genomförs samtidigt som flera av åtgärderna införs. Därför bygger resultaten som presenteras i denna rapport på teoretiska resonemang och ett fåtal nordiska och internationella studier, med relativt begränsad empirisk evidens.

De viktigaste resultaten och slutsatserna är:

- Utformningen av kompensationsåtgärderna varierade mellan de nordiska länderna.
- Alla länder agerade relativt snabbt, men hastigheten innebar implementeringsproblem. Det har också förekommit inriktningsfel och oönskade incitament har ibland skapats.
- De flesta av de genomförda åtgärderna omfördelade inte medel till låginkomsthushåll. Snarare innebar hög energiförbrukning ofta högt stöd, vilket innebär att mer stöd gavs till höginkomsthushåll.
- Åtgärder som inkluderar omfördelning skulle vara möjliga att genomföra i de nordiska länderna, som alla har väl utvecklade sociala trygghetssystem. Att detta var möjligt exemplifieras genom en dansk åtgärd som gav en engångsbetalning till ekonomiskt utsatta hushåll.

- De flesta av de genomförda åtgärderna förvrängde prissignalen om elbrist på marknaden, vilket reducerade möjligheten för marknaden att effektivt allokera resurser och minska energiförbrukningen och utsläppen.
- De flesta åtgärderna missade möjligheten att skapa en direkt "win-win"-situation mellan klimatförändringspolicy och viljan att lindra prischockerna. En dansk och en norsk åtgärd gav dock direkt stöd till investeringar i grön teknik, med motsvarande direkta långsiktiga effekter på utsläppen av växthusgaser.
- För att minska risken för konflikt mellan klimatförändringspolicy och prischockdämpning är det viktigt att kompensationsåtgärderna generellt förstås som tillfälliga åtgärder. Annars kan företag och hushåll komma att förvänta sig ett sådant stöd vid eventuella framtida prisökningar, vilket kan leda till att incitamenten för investeringar i energisparåtgärder dämpas.
- Andra utformningar för kompensationsåtgärder finns tillgängliga. Åtgärder som inkluderar schablonbelopp eller regressiva överföringar av medel, och inkluderar frikoppling av åtgärder från nuvarande konsumtion nämns i litteraturen som mer effektiva än de flesta av de åtgärder som genomfördes. Några av de åtgärder som redan har implementerats har vissa av dessa funktioner, så att lära sig av dessa åtgärder kan vara fördelaktigt.

Foreword

This report constitutes the final deliverable of the project "*Political measures to compensate for increasing costs of energy: Impacts on equity, climate, and the environment.*" (agreement no: EPOELY/391/2023), financed by Nordic Council of Minister and its working group for environment and economy. The project has been led by Stefan Åström, and project collaborators have been Alexander Eriksson, Erik Gråd, and Niels Baumert from Anthesis AB, Henrik Lindhjem and Erika Karttinen from Menon Economics, and Christian Fromberg and Jette Bredahl Jacobsen from Copenhagen University. During the drafting of Chapter 2.1.1.1, as well as the NCM web page and for summaries, we consulted ChatGPT software for support. The contact person for the Nordic Council of Ministers has been Lotta Eklund. The steering group from the working group for environment and economy also included Cecilia Andreasson, Lisa Björk, Magnus Cederlöf, and Tryggve Homme.

We would like to thank Ståle Navrud at Menon Economics for reviewing the report. Thanks also to the project's steering group for active involvement in the project, as well as to the workshop participants: Lars-Erik Borge, Norwegian University of Science and Technology, Daniel Spiro from Uppsala University, Maria Stenström from 2030-sekretariatet, Ulla Blatt Bendtsen from the Danish Council for Climate Change, Julius Andersson from Stockholm Institute of Transition Economics, Lotta Eklund from the Nordic Council of Ministers' working group for environment and economy, and Agneta Persson from Anthesis AB.

With the steering groups approval of this report, the project is considered completed. The conclusions and recommendations presented in this report does not represent the position of the Nordic Council of Ministers or its working group on Environment and Economics. All errors are the authors' own.

1. Introduction

1.1 Background and motivation

Of the current global challenges, combating climate change is a top policy priority. However, the prioritization of climate change has been challenged by recent events such as Russia's war in Ukraine, policies to tackle the COVID-19 pandemic, and growing inflation worldwide. These events have resulted in significant price increases for fuels and electricity, as well as other commodities. Increasing electricity prices garnered intense media attention in 2022, following substantial price increases from average pre-2021 price levels in most Nordic countries (Figure 1). Figure 1 shows daily prices, with the variation in price even larger on an hourly basis (note: for Iceland, price statistics are only available on a bi-annual basis).

To address the challenges posed by high energy and transport costs, governments may implement market interventions (in this report called "compensation measures") to provide support to vulnerable households and companies. Compensation measures have been swiftly implemented to address these events, particularly the substantial increase in energy prices. However, the measures' compatibility with existing climate and environmental policies is unclear. There is also a question as to whether such measures, typically introduced to dampen the impact of energy price increases on households and industries, could have been designed more efficiently and with a better distribution profile.

These questions are not simple to answer, due largely to the complexity and multifaceted nature of the real-world system in which the compensation measures were implemented. For example, deviations from established standards, such as the EU Renewable Energy Directive, have raised concerns about potential impacts on existing climate goals. Furthermore, the impact of the sharp increase in electricity costs on the green transition is an important example. Since such large changes have occurred, both intentionally and unintentionally, it is crucial to thoroughly evaluate the consequences of the rapidly implemented compensation measures and changes in markets, alongside already existing environmental regulations. The need for such an evaluation is further stressed as the long-term climate change and environmental goals themselves impose a change to the system. However, early evaluations of the effect of the implemented measures - such as the one presented in this report - are challenged by the natural lack of comprehensive data and relevant research to build on.

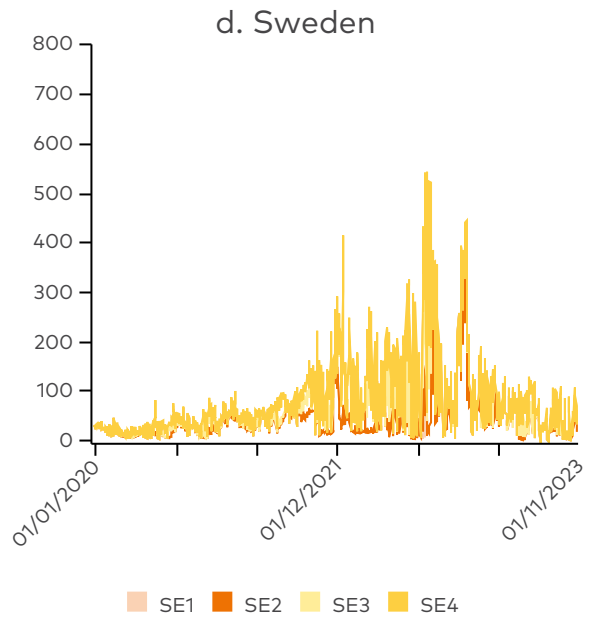
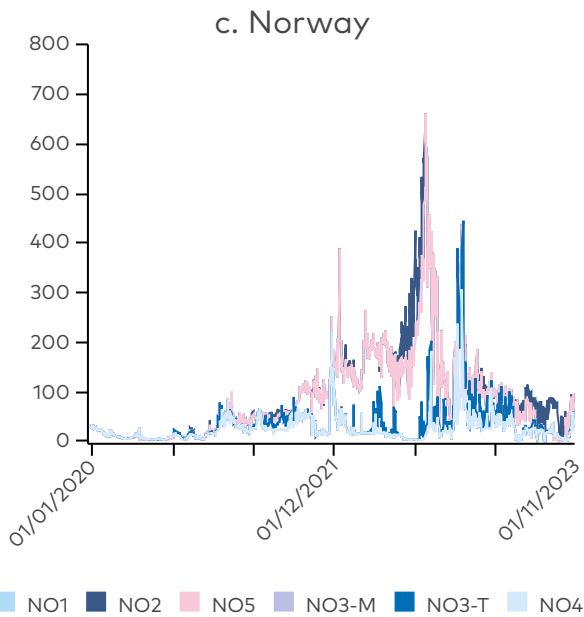
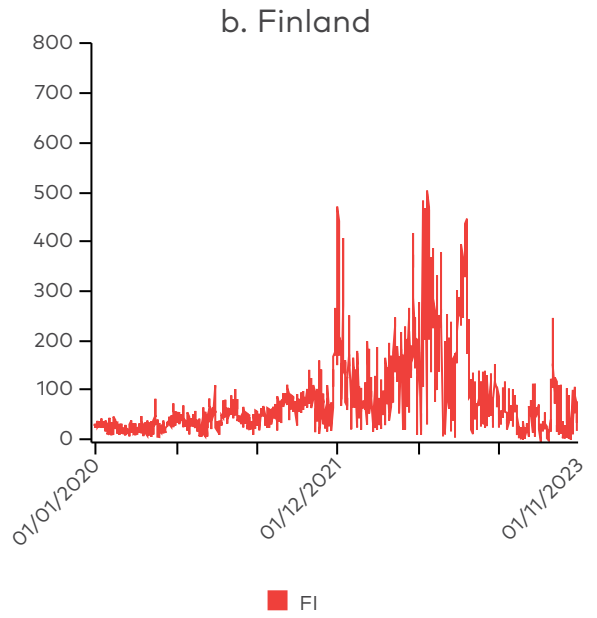
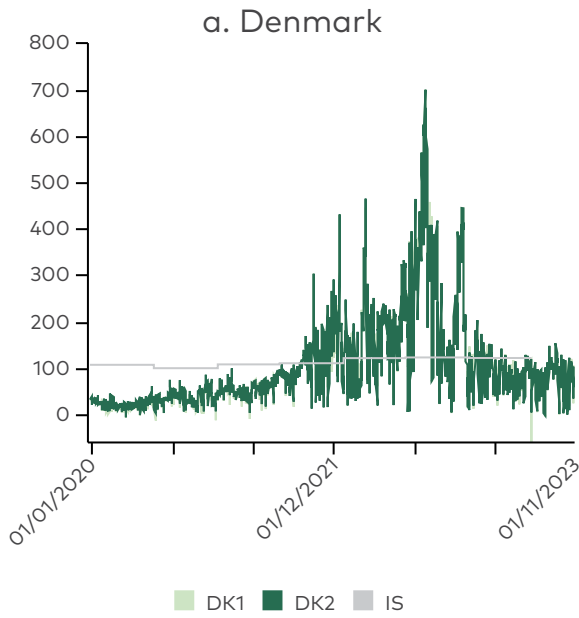


Figure 1 Daily electricity market (Elspot) prices in €/MWh 2020–2023 on the Nordpool electricity market for the price areas in Denmark (a), Finland (b), Norway (c), and Sweden (d), Source: Nordpool (2023). Bi-annual electricity prices to homes and industry in the Iceland 2020–2022, including all taxes and fees, for 5000–15000 kWh/year, half year average (a). Source: Eurostat (2023)

1.2 Objective of the project

The main objective of the work leading to this report was to evaluate a selection of compensation measures introduced to address energy and transport price increases in the Nordic countries between 2021–2023, with a focus on the distributional effects and coherence with existing climate change and environmental policies. The analysis focuses primarily on households, and secondarily on industry.

The main distributional effects considered include aspects such as risk of poverty, differences between geographic areas (such as urban and rural areas), and difference between socioeconomic groups. It also considers whether some industries are more likely to benefit from these measures. The main climate and environmental policy impact considered is the effect of the compensation measures on greenhouse gas emissions.

In addition, the report discusses alternative approaches that could have better ensured equitable distribution, while maintaining positive and long-term climate change impacts. The extent to which these alternative approaches have been evaluated, and whether the Nordic countries have worked to coordinate their compensation strategies and explored potential negative impacts (particularly on their common electricity market) is also addressed.

1.3 Earlier results and lessons from the international literature

The recent energy crisis in Europe has resulted in the implementation of a number of policy measures to shield households and firms from increases in energy prices. For some countries, these measures have been costly, while for others, the costs have been moderate. Figure 2 below summarises the size of the support (in billion Euro and percentage of GDP), based on Bruegel.org which has compiled this information.

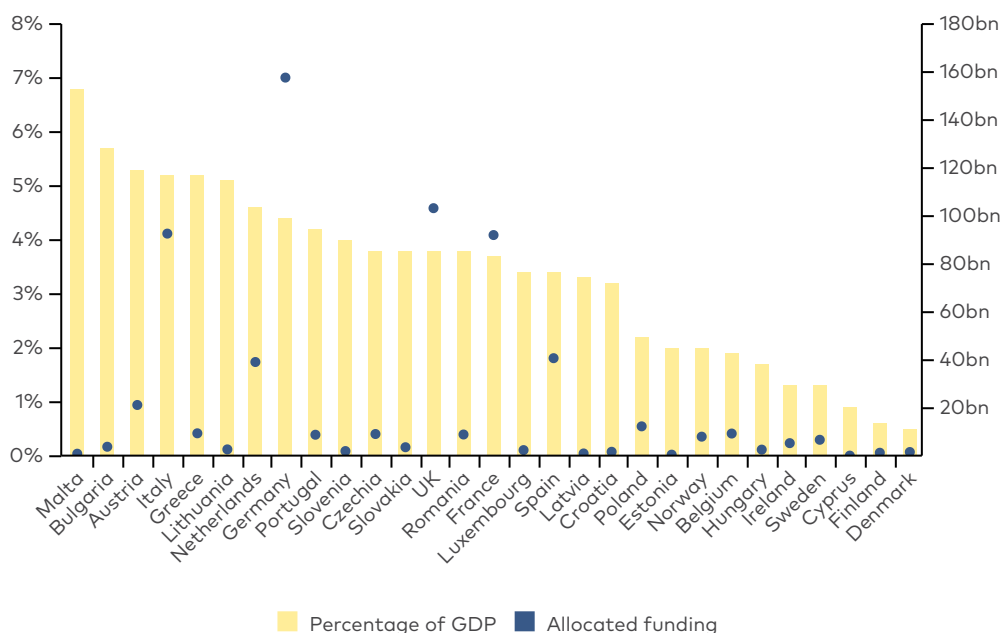


Figure 2 Governments earmarked and allocated funding to shield households and firms from the energy crisis (Sep 2021–Jan 2023), for European countries including the Nordic countries (excluding Iceland where no measures were implemented). Total amount in bn euro (blue dots) and as per cent of GDP (yellow bars) per country. Source: Bruegel (2023). Last updated 26. June 2023

As can be seen from Figure 2, relatively speaking (as percentage of GDP), the Nordic countries are in the lower end, although the amounts spent are still substantial, especially if considered per household, and may therefore have non-negligible distributional and climate/environmental impacts.

Since the compensation measures have very recently been implemented (and many of them also revised over the last two years^[1]) it is methodologically challenging to evaluate their effects. In principle, the effects of the compensation measures are the difference between the effects in the period from introduction of the measure, and the effects in a hypothetical (reference) trajectory without the measure in place. To get a “clean” estimate of these effects, one would need either an experimental (or quasi experimental) situation where e.g., one geographical area has experienced a measure, and another (similar in all other aspects) at one point in time has not. Alternatively, that the same area for some time has experienced a measure and later (and/or before) has not. Under such circumstances it is possible to identify, by use of econometric techniques, the causal effect of the measure on the distributional profile (equity) and on climate policy outcomes. If there are no such experimental conditions, the alternative is macro-economic modelling of the effects through the economy. In such cases, one can study both hypothetical and actual policy measures, but with relatively high uncertainty. We limit ourselves to a

1. It may be such revisions can be used as basis for evaluation at a later stage, though this has not been possible in this project.

few observations from international studies that have attempted to assess the impact of energy prices and compensation measures across several countries^[2] before we proceed to look more specifically at the measures implemented in the Nordic countries. Some of the lessons from the international literature are also relevant in the Nordic context.

The impacts of energy prices and of resulting compensation measures depend on several factors, e.g., for households their share of energy costs compared to other expenditures. They will also depend on the design of the compensation measures. A global study of 116 countries found that the energy price crisis increased energy costs by 63–113 percent on average, resulting in increased household expenditures of 2.7–4.8 percent, and around 78–141 million people potentially pushed into extreme poverty (Guan et al., 2023). In Europe, Steckel et al. (2022) found that the impact of the energy price crisis on households is highly heterogenous. For example, they found that it affects low- and middle-income households more than high-income households, relative to their total expenditures (i.e. regressive impact). Furthermore, results show that the poorest 40 percent of households with high energy costs are particularly affected, and that ca. 11 million inhabitants (2.6 percent of all households) would require at least 50 percent of their current expenditures to compensate for increasing energy prices, while ca. 48 million inhabitants (11.5 percent of all households) would need 25 percent of current expenditures in compensation. A large and more recent assessment based on a microsimulation model of Europe confirms the large, regressive impact of the energy crisis on households in Europe (IEEP, 2023). Menyhert (2022) found that the adverse social effects of inflation are significantly larger in many Central and Eastern European Member States,^[3] and that energy price increases not only potentially increase inequality *within* countries but also *between* EU15 and non-EU15 countries.

The bulk of the resources used for energy price compensation in Figure 2, have been general price-suppressing schemes for everybody, dampening the effect of energy prices.^[4] This is expensive and if not designed in a progressive way, would do little to alleviate the unequal burden of the high energy prices. In addition, such schemes reduce incentives for saving on energy and investing in energy saving measures and, hence, delay the necessary green transition. Therefore, an unequivocal conclusion from the studies referenced above, and other studies (e.g. Ari et al., 2022 and European Scientific Advisory Board on Climate Change, 2023), is to design such schemes so that they target those who need it the most, while generally maintaining price signals for everybody to reduce energy use.

-
2. There are also a number of individual country studies that we do not review here, such as e.g. Department for Business, Energy & Industrial Strategy (2021), (both UK) and Kalkuhl et al. (2022) (Germany)
 3. This is because low-income households and vulnerable groups (such as large households, rural population, children or elderly persons) in these parts of Europe face particularly high risks of financial distress and social exclusion.
 4. Bruegel, (2023). <https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices>

1.4 Outline of the report and reader guide

The report is organised as follows. Chapter 2 explains the overall approach to our assessment of Nordic compensation measures. Chapter 3 provides an overview of the policy measures that have been implemented in the Nordic countries, details in Appendix. Chapters 4–7 assess a selection of measures in each of the Nordic countries. Chapter 8 synthesises the results and lessons from the Nordic countries, to derive some knowledge about how such (future) measures could be better designed to achieve more desirable societal and environmental outcomes.

2. Overall methodological approach

Our approach has been to start by mapping relevant compensation measures in the Nordic countries. This analysis covers the Nordic countries for the implementation period 2021–2023. Subsequently, a selection of measures to analyse was made in consultation with the project's steering group. The selection has been made so as to illustrate different types of measures, within the given project budget. For some countries, similar types of measures are analysed to further compare different measures designs in terms of their environmental impact and distributional effects. Iceland was excluded after an initial screening, concluding that there were no relevant measures implemented in Iceland during the time period of interest. This was also confirmed with a contact at the Ministry of the Environment, Energy and Climate in Iceland.

Alongside the selection of measures, we developed a theoretical and analytical framework for the analysis. We also surveyed economic literature, reports, and other documents to identify experiences and evaluations of past compensation measures (some of which were referenced in Chapter 1 above). The theoretical framework focuses on the economic theory of introducing political measures on energy and climate under existing policy regimes, including perspectives such as first- and second-best policy theory and the incentivisation of energy efficiency. The analytical framework introduced a set of criteria to evaluate distributional effects and impacts on existing climate and environmental policies and targets. These criteria were later used to assess the selected policy measures in each country.

The preliminary results of the analysis were presented and discussed at a digital workshop on September 7th, 2023. The workshop gathered relevant stakeholders and experts in policy development and environmental policy, and included participants from Denmark, Finland, Norway, and Sweden. In the workshop the preliminary results, as well as ideas on alternative policy-designs, were discussed, with special emphasis on distributional impacts and coherence with existing policies. The outcome of the workshop has been integrated into the results and conclusions presented in this report.

The questions addressed in this project and the corresponding analytical approach taken comes with limitations. The most important limitation is the fact that we are still within the implementation regime of the compensation measures. This means that the final effect of the measures is yet to be revealed, and that the project has little to no data to base the analysis on.

2.1 Theoretical framework

The theoretical framework used in this project is built around market imperfections: compensation measures distort the market forces, and there is presence of environmental externalities. Hence, the interesting element is the relationship between these factors. The framework considers compensation measures, distributional effects, climate policies, and policy implementation in real-world situations, as presented below. The framework is based on standard textbook (environmental) economic theory, the theory of 'second-best' (Lipsey & Lancaster, 1956), and is also influenced by theories of innovation systems (Löfgren & Rootzén, 2021).

2.1.1 Compensation measures

Compensation measures aim to alleviate the burden of high energy and transport costs by offering targeted assistance to those in need. For households, this may involve direct financial support, subsidies for energy-efficient upgrades, or reduced rates for essential services. For companies, compensation measures may include direct transfers, tax incentives, grants for energy-saving technologies, or assistance programs to improve energy efficiency. By specifically targeting vulnerable populations or companies, these policies can help ensure that those who are most affected receive the necessary support to cope with high energy costs.

If the goal of a policy is to alleviate the burdens for those most in need, the accuracy of the policy is vital in determining its effectiveness. Policymakers should then design policies to accurately identify and assist the population in greatest need of support. Accurate targeting helps to prevent misallocation or exclusion, ensuring that the resources are effectively used to alleviate the challenges faced by households and companies burdened by high energy costs. Targeted support may in some cases come with relatively high administrative costs (e.g., administrative considerations of who should and should not qualify for a given scheme) and sometimes there is a trade-off between targeted support with high transaction costs, and more general support with lower transaction costs. Politically, it may be easier to implement general schemes since (almost) everybody will benefit, even if the scheme can be considered unfair in some ways (e.g., if it benefits higher income groups more than lower income groups, i.e., a regressive scheme).

In an otherwise perfectly functioning market, compensation measures can hinder effective functioning of the market by disturbing the price mechanism. Energy prices serve the important role of signalling scarcity, which in turn, provides incentives to economise on energy use and to invest in increased supply. Compensation measures that are directly aimed towards consumption will increase the consumer's consumption level, all other things equal. They may thereby inflate demand and subsequently price levels. Even minor changes in consumption are found to potentially have a significant impact on energy prices (Energiforsk, 2022).

2.1.1.1 Types of compensation measures

Compensation measures aimed at addressing high energy and transport prices encompass a range of strategies and interventions designed to mitigate the adverse economic, social, and environmental impacts of rising energy costs. These measures are typically implemented to alleviate the burden on households, industries, and vulnerable groups. Several types of compensation measures can be employed:

1. **Direct financial support or lump-sum payments:** Governments may provide direct financial assistance, such as cash transfers or subsidies, to households and businesses to help offset the increased energy expenses and to provide immediate relief. The support can be targeted towards low-income individuals or specific sectors that are particularly sensitive to energy price fluctuations.
2. **Energy Tax Reductions or Exemptions:** Temporarily reducing or exempting energy-related taxes, such as value-added taxes (VAT) or excise taxes, can lead to lower energy prices for consumers. This approach aims to decrease the overall cost burden on energy consumers and potentially stimulate demand.
3. **Price caps or controls:** Implementing temporary price caps on energy commodities, such as electricity or fuel, can prevent prices from exceeding a certain threshold. This measure seeks to shield consumers from price spikes during periods of volatility.
4. **Energy efficiency incentives:** Promoting energy-efficient practices and technologies through incentives, such as subsidies for energy-efficient appliances or home improvements, can help reduce overall energy consumption and costs. This type of measure is a more long-term investment, and the economic benefits may be seen after some time.
5. **Targeted non-financial assistance programs:** Designing programs specifically targeted at vulnerable or marginalized populations, such as low-income households, elderly individuals, or people with disabilities, can ensure that those most affected by high energy prices receive adequate support. In contrast to the direct financial support, these programs provide only non-financial support to the beneficiaries. One example may be advisory support for financially vulnerable individuals.
6. **Flexible payment plans or deferral schemes:** Energy providers may offer flexible payment plans to consumers, allowing them to spread out their energy costs over a longer period and avoid sudden spikes in monthly bills.
7. **Rationing or quota systems:** In extreme cases, governments may implement rationing or quota systems to limit energy consumption, ensuring that energy resources are allocated fairly and efficiently.

8. **Expansion of social safety nets:** Strengthening social safety net programs, such as unemployment benefits, housing assistance, or food assistance, can indirectly help individuals and families cope with the financial strains of higher energy prices.

It is worth noting that these various measures can be combined, for example providing some of support conditional on investing in certain energy efficiency measures. The selection and design of compensation measures depend on a variety of factors, including the specific energy source affected, the socio-economic context of the region, the policy goals of the government, and the available budget. It's important to note that compensation measures are often temporary and designed to address short-term challenges while maintaining alignment with broader policy objectives, such as sustainability and economic stability.

2.1.2 Distributional effects

The recent increase in energy and transport costs have posed significant challenges for both households and companies (European Scientific Advisory Board on Climate Change, 2023). For households, increased energy expenses can strain budgets, particularly for low-income families, the elderly, and those living in energy-inefficient homes. Rising energy prices can lead to difficulties in meeting basic needs, such as heating, cooling, and lighting. Similarly, for companies, high energy costs can impact profitability, especially for small businesses with limited financial resources. To the degree that increased expenses are local, it may, for energy-intensive industries, also hinder competitiveness in the global market.

Energy inequality has a different effect to that of general inequality, despite being correlated. For example, it is more closely related to connectivity (energy grid, transport distance), and therefore often involves a spatial aspect. Furthermore, it is strongly linked to the ownership of properties, as energy saving investments are made by owners, but the energy use costs paid by renters. Hence, it is common to study measures directed towards alleviating energy poverty (e.g. Lowans et al., 2021; Charlier & Legendre, 2021 for reviews and further description). Energy poverty can be defined with an expenditure approach, i.e. based on the proportion of income spent on energy, or with a consensual approach, e.g. whether a household can keep the home warm and free of rot, damp, etc. (e.g., Halkos & Gkampoura, 2021). Looking across Europe, Scandinavia includes the countries with the lowest energy poverty levels (Halkos & Gkampoura, 2021). While a large share of households own their home in Norway (78%), this is somewhat lower in Sweden (65%), Denmark (59%) and Finland (70%), and in EU as a whole (70%) (EUROSTAT, 2021). This difference in ownership rate can be of importance for compensating measures and their effect on investment incentives in energy renovation, and therefore long-term climate goals.

2.1.3 Climate and environmental policies

Climate impacts from human activities presents a classic case of market failure due to negative externalities and common good characteristics. Emissions of greenhouse gases impose costs on society, but these costs are not reflected in the market price of goods and services causing these emissions. Hence, market actors will generally not factor these costs into their decisions, resulting in higher emissions than what is optimal for society. To address this problem, economic policies can align incentives with what is desirable for society. Carbon pricing mechanisms, such as carbon taxes or emissions trading systems, internalize some or all of the external costs of greenhouse gas (GHG) emissions by assigning a monetary value to them. This creates an economic incentive for businesses and individuals to reduce their emissions and transition towards low-carbon technologies (Perman, 2003). The European Emission Trading Scheme (EU ETS) for CO₂ is one such example.

While carbon pricing provides an incentive for innovation and implementation of new technologies to some degree, other economic policies can provide direct incentives for innovation and development of low carbon energy technologies. Dedicated subsidies, grants, and tax incentives are examples of economic instruments that can directly promote the development of clean energy technologies.

Further, direct research and development (R&D) incentives are often prioritized where the potential benefits are far into the future, very uncertain, of public good nature, and where patents are not easily applicable. However, R&D incentives also come with trade-offs – they are in general less cost-effective than incentivising implementation by carbon pricing and may further distort the effect of the carbon pricing market. From a national perspective, policies incentivising R&D can create jobs, improve national competitiveness, and potentially create first-mover advantages. One such example is the recent American Inflation Reduction Act which, among other things, has incentives for green energy innovation and investments.

Another group of instruments are command and control measures, such as targeted regulations and standards, which can be used to ensure a desired change. This group of instruments can require implementation of a specific technology, or prohibition of certain pollutants (Kolstad, 2011). One example is energy efficiency requirements for appliances and buildings. Command and control measures are in general less cost-effective than economic incentives since they often leave little room for corporate-specific solutions to be used. But on the other hand, they can, in some instances be easier to implement. They are typically preferred where damages are severe for even small emissions (e.g., very poisonous chemicals), where implementation barriers depend on collective implementation practices, or where implementation barriers are judged as structural more than economic.

Finally, information policies try to influence behaviour by changing people's attitudes and perceptions, with the hope that such changes will lead to change in behaviour. Well-known examples are water-saving campaigns and turn-off-the-light campaigns. Although popular, the effectiveness of stand-alone information policies has been discussed (e.g. Haug, 2004; Owens & Driffill, 2008) and for climate risk communication it has been questioned whether the effectiveness of information is hampered by psychological biases such as confirmation biases (Nickerson, 1998; Hulme, 2009)

2.1.4 Policy implementation in real-world situations

The real-world environment, in which real-world economic decisions are made, differs from the description of environment and rational decisions in standard economic textbooks. In the textbooks, much of the economic theory is developed upon the framework of the Market under perfect competition, a market rarely found in reality (Samuelson, 2010). Consequently, any discussion on the effects of policy instruments and compensation measures needs to expand from the standard economic textbooks. A prominent expansion is the theory of first- and second best (Lipsey & Lancaster, 1956). First- and second-best theory refers to outcomes that are optimal or close to optimal in a market or policy context (Lipsey & Lancaster, 1956). The first-best represents an ideal scenario where all market conditions are perfect and there are no market failures or distortions, such as the environmental impacts or externalities mentioned above. In this scenario, the allocation of resources is said to be efficient and achieves the maximum possible total welfare or utility for society. The first-best outcome is achieved when competitive markets are fully functional, and there are no externalities, public goods, information asymmetries, or any other sources of market failure. If there is one market failure, it can be addressed by a first-best policy, essentially internalising the problem in the market. Putting a price on carbon emissions corresponding to the social cost of carbon into a perfectly competitive market, is one such example.

The second-best theory acknowledges that many real-world markets suffer from several market failures and imperfections, making the first-best outcome unattainable in practice. When attempting to correct for a distortion, other distortions may be created or worsened, not necessarily providing a welfare-maximizing solution. Whether the aggregated effect is an overall welfare improvement therefore depends on these other effects. For example, if a market has a natural monopoly due to high entry barriers, a straightforward solution might be to introduce competition by lowering the entry barriers. However, in the presence of other distortions such as externalities, enhancing competition may not lead to an optimal outcome. In such cases, policymakers need to consider a combination of interventions to achieve the best possible outcome under the existing constraints.

The European Union Emission Trading System (EU ETS) is a strong market-based policy instrument to adjust for the externalities of greenhouse gas emissions within the EU. At its outset, it is a first-best policy, which accounts for all or some of the external costs by internalizing them into prices. However, there are a number of other sources of industry market failures, such as potential transition barriers. These can be categorised as technical-, regulatory-, market-, and coordination barriers, and will lead to markets not functioning efficiently (Löfgren & Rootzén, 2021).

Furthermore, perspectives such as energy security, equity, and technical innovation are important to consider in the transition towards a low carbon economy. Therefore, several EU-policies are focused on ensuring a just and equitable transition, long term security of energy supply, and stimulating technical innovation (European Commission, n.d.a; European Parliament, 2020; European Commission, n.d.b). The ETS is also subject to several adjustments, such as the market stability reserve and the carbon border adjustment mechanism (yet to be implemented). These are adjustments made to ensure investment stability and therefore incentives, and to consider the global aspect.

It is also important to notice that there can be public and political opposition to efficient environmental regulation, for example as a result of undesirable distributional impacts. Hence, in the pragmatic world of policymaking, it is often better to implement an economically sub-optimal policy to deal with an environmental problem, than no policy at all.

2.1.4.1 Introducing measures within existing policy regimes

If the EU ETS was implemented as a pure first best policy, any subsequent intervention in the market would be without effect in the short run; emissions from energy production are subject to trading and constraints within the EU ETS. Hence any incentives (or removed incentives) for reduced emissions from energy production and consumption will, in the short run, be offset by adjustments in the market for emission allowances. The total amount of allowed annual emissions has already been established, and additional incentives can only influence the distribution of emissions among different sources. Consequently, compensation measures that remove incentives for energy conservation would not impact emissions levels, although they could affect the costs associated with emission reductions.

However, the EU ETS is, with its many revisions and adjustments, like the market-stability-reserve, a complex system of regulations. Neither the EU ETS market or the primary market for products and services in which the EU ETS market operates are "Markets under perfect competition". For example, Silbye & Sørensen (2019) show that subsidising green energy within the ETS will first be neutralized by the end of the century. As climate policy does distinguish between emissions now and later, this is crucial. The analysis by Silbye & Sørensen was made before the latest revision of the ETS system, yet their conclusions still have relevance. In another

study, Kruse-Andersen & Sørensen (2022) analysed optimal national policies within the ETS system if countries want to be frontrunners in dealing with leakage. Both of these studies are examples on how important it is to look at the detail of regulations, as they are normally taking place in a second-best world.

Finally, it is important to note the endogeneity of policy target setting: Ambitious targets depend on political support, and this is more likely to be received if it is not too costly for the industry and households. Correspondingly, the long-term effects of an incentive might be different from the short-term effects. For example, the Swedish government proposed an annulment mechanism for surplus emission allowances within the EU-ETS. This proposal was based on the fact a significant number of emission allowances were being left unused, which gave political room to manoeuvre and propose changes in the legislation. This proposal has been accepted and has become a part of the 4th trading period within the EU ETS (Swedish Environmental Protection Agency, 2023a).

2.1.4.2 Interplay between climate policies and compensation measures

When compensation measures effectively alleviate the financial burden of high energy costs, they can inadvertently reduce the urgency for individuals and companies to actively engage in efforts to reduce climate impacts, such as energy conservation. If the costs of energy consumption are offset or mitigated through compensation measures, the incentive to adopt energy-efficient practices and technologies is reduced.

The introduction of compensation measures to alleviate the immediate financial burden of high energy costs may also create an expectation of sustained support. Hence, when individuals and companies anticipate future compensation, they may delay or forgo proactive investments in energy-saving technologies or practices today. This reliance on compensation measures can therefore hinder the development of a long-term culture of energy efficiency. If the compensation measure is certain to be a one-time event, it is crucial to effectively communicate that. This is even more important in the context of climate change, since climate policies are long-term policies. Hence, clear and transparent communication is necessary to manage expectations and avoid creating a sense of reliance on repeated compensation for price shocks.

2.2 Analytical framework

Based on the theoretical framework presented above, we designed an analytical framework aimed at evaluating the compensation measures assisting households and companies facing high energy and fuel costs. In our analytical framework we chose to focus on criteria that best address the project objectives. Hence, we focused on elements that address distributional impacts and disincentives for climate positive behaviour and investments, with a secondary focus on policy coherence and on other environmental aspects. This framework follows evaluation

criteria inspired by the literature (e.g., Sterner & Coria, 2013, Goulder & Parry, 2008). However, the potential to evaluate a compensation measure across all criteria is dependent on available data and supporting literature, which varies between countries and measures.

By assessing several evaluation criteria, we sought to provide an understanding of the impact of the compensation measures in addressing energy cost challenges while aligning with climate goals and ensuring proper distributional effects. The evaluation criteria assessed were:

- Distributional impacts
- Climate and environmental impacts
- Coherence with existing climate policies

The distributional impacts criterion focuses on how funding was distributed among different socio-economic groups, and whether the support was targeted to alleviate the burden for the individuals most affected by the high energy prices. To the extent feasible, we also analysed regional differences. The climate impact criterion focuses on 1) short-term market effects, 2) short-term emissions, 3) altered incentives for climate-friendly behaviour, 4) altered incentives for climate positive investments, 5) other environmental effects. The coherence criterion comments on factors such as efficiency, transparency, and transaction costs.

2.2.1 Distributional impacts

The distribution criterion evaluates the extent to which policies specifically target and support vulnerable households and companies. It is important to assess whether the policies effectively address energy cost challenges for those who are disproportionately burdened and financially strained. By analysing the policy's design, implementation, and impact, it is possible to determine whether it provides sufficient support and resources to vulnerable groups. An often-discussed aspect of environmental and other policies is whether the impacts are relatively more positive (or less negative) for people with lower incomes (i.e. progressive policy) or if the policy has the opposite effect (i.e., regressive policy). Furthermore, other factors for distributional impacts that may be relevant include geography (e.g., rural vs urban), gender, age, and ethnicity (e.g., if immigrant groups are more vulnerable). In our assessment we will primarily focus on income and vulnerability towards energy price increases.

Compensation measures that effectively target any of these factors include income-based eligibility criteria, subsidies tailored to low-income households, or support programs for energy-intensive industries facing financial difficulties. Ensuring equitable access to monetary assistance and consideration of the unique needs and challenges of vulnerable populations are key considerations in assessing the policy's ability to reduce energy cost disparities and promote equity in energy access and affordability.

2.2.2 Climate impacts

The provision of monetary support for high energy costs may affect incentives for climate-positive behaviours. Depending on the policy design, disincentives for reductions in energy consumption may be created if energy price signals are blunted, reducing the urgency of behaviours to reduce energy usage. Disincentives arise if monetary support is aligned with current energy consumption, as it keeps the cost of energy relatively low. If monetary support is instead based on past consumption or provided as a lump-sum to all consumers regardless of their energy use, incentives for reductions in energy consumption remain effective. By avoiding disincentives for energy reduction, consumers internalise the high costs into their household budgets, which generally should encourage adoption of energy-efficient behaviours like adjusting indoor temperatures or minimizing hot water usage during showers (European Scientific Advisory Board on Climate Change, 2023). Monetary support for high energy costs may also affect investments in climate-positive initiatives such as energy efficient technology and retrofitting.

A critical consideration, for both behaviour and investment, is the influence on beliefs (expectations) regarding future policies and supports, as beliefs significantly impact current behaviour and investment incentives. If compensation policies are believed to be repeated in the future, the urgency to change behaviour or invest in energy-efficient technologies or retrofitting may be diminished in the short term.

Given the importance of whether support is given for past or current energy use, and of beliefs, it is also highly important that the design of the measure and its potential re-occurrence is communicated effectively. Correct communication helps prevent the perceptions of being 'bailed out' and the formation of expectations for repeated support.

2.2.3 Coherence with existing climate policies

The coherence criterion relates to how well the compensation measure aligns with other existing climate policies on energy and transport on both national and transnational level. The assessment analyses whether the measure complements, distort or conflicts with other environmental policies in terms of reaching specific reduction targets, interest conflicts and cost efficiency. Emphasis is placed on the measure's overall objectives in relation to other policy objectives on climate, relating to energy and transport.

3. Compensation measures and relevant environmental policies

The qualitative analysis is structured into five parts. First, in this chapter, we provide an overview of the different types of compensation measures applied to reduce costs for energy and transport. Next, we present a summary of measures that have been implemented in the Nordic countries to compensate for the high prices of energy and transport, together with an assessment of coordination attempts between the Nordic countries. In a third step, we analyse the selected compensation measures according to the criteria of the analytical framework. This part of the analysis is presented in chapters 4–7. The aim is to qualitatively assess the distributional effects, impacts on climate, and to analyse coherence with existing policies on climate, energy, and transport. Finally, in the synthesis (chapter 8), we summarise the overall results and discuss alternative measures and designs to address the equity perspective while maintaining incentives to reduce the environmental impact and to potentially improve coherence with existing policies.

In Table 1, we present an overview of the measures that were implemented in each country. As can be seen, financial support measures were most frequently implemented in all four countries, and especially in Norway, and price support somewhat less. Other measures vary in nature and in frequency of adoption. A full description of the measures can be found in Table A1 for households and Table A2 for businesses.

Table 1 Overview of measures implemented in the Nordic countries.

Note: No measures implemented in Iceland

Country	Type of measure	Number of measures implemented
Sweden	Financial support	4
	Price support	3
	Other	3
Denmark	Financial support	5
	Price support	3
	Other	5
Norway	Financial support	9
	Price support	2
	Other	2
Finland	Financial support	4
	Price support	2
	Other	1

The measures evaluate for each country were selected with respect to budget size, in order to capture the most impactful measures. Measures were also selected to ensure the varied approaches between countries were represented. Table 2 presents the measures selected for the assessments.

Table 2 Selected compensatory measures for analysis.

Country	Selected measures	Type of measure
Sweden	Electricity support for households	Financial support
	Electricity support for businesses	Financial support
	Relaxed reduction mandates for fuels	Price support
Denmark	Electricity tax reduction	Price support
	One-off payment to disadvantaged households	Financial support
	Increased subsidies for disconnecting from the gas network	Other
Norway	Electricity support for households	Financial support
	Electricity support for businesses	Financial support
Finland	Fixed term tax credit	Financial support
	Extended payment period for electricity bills (deferral scheme)	Financial support/other

In the next chapters, selected measures are assessed according to the evaluation criteria presented in the analytical framework.

4. Assessment of selected Swedish measures

4.1 Electricity support for households

Sweden has implemented two different electricity support schemes for households, amounting to a support level of approximately 65 billion SEK. The first support for households included the mid and southern parts of Sweden, covering the electricity areas SE3 and SE4 (Figure 3). Households were compensated for electricity consumption between October 2021–September 2022 by 0.5 SEK/kWh in SE3 and 0.79 SEK/kWh in SE4. The support was designed as a direct money transfer to individuals registered on an electricity distribution agreement and paid out in February 2023.

In the second support scheme, all four electricity areas were included, compensating for 80% of the consumption between November – December 2022. Households in SE1 and SE2 were compensated by 0.9 SEK/kWh, while households in SE3 and SE4 were compensated by 1.26 and 1.29 SEK/kWh respectively. For a majority of the consumers, the payments were administered in June 2023.

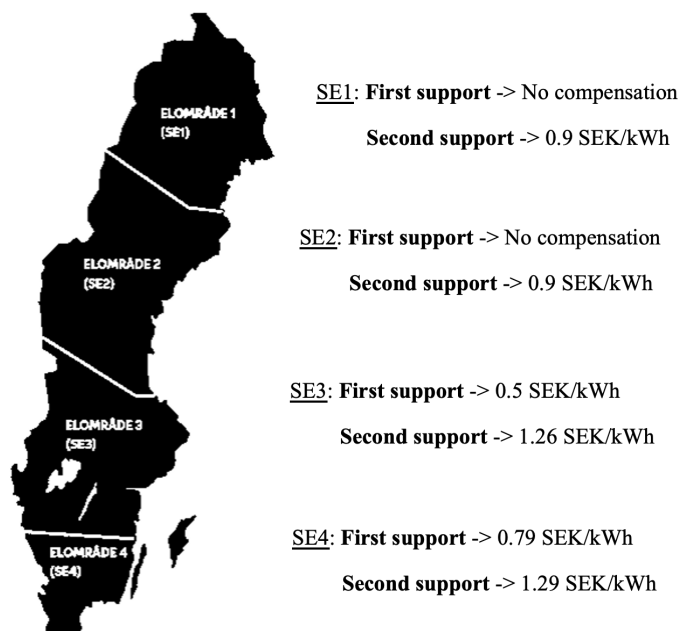


Figure 3 The four electricity areas in Sweden, SE1-SE4. Source: Fortum, 2023.
<https://www.fortum.se/privat/elavtal/elpriser/vara-fyra-elomraden>

The first compensation scheme constituted a geographically targeted scheme design. However, the compensation was not targeted along other dimensions such as income. The support was not focused on targeting a specific group of consumers, and the reason for exclusion of SE1 and SE2 in the first round of support was the generally low electricity price in these areas throughout the first period. Price differences between electricity grid areas arise due to limited transmission capacity, or so called bottlenecks (Svenska Kraftnät, 2023). Compensation for each electricity area was calculated as the difference between a reference price of 0.75 SEK/kWh, and the average electricity price in the electricity grid area. In the first support scheme, the consumers received compensation based on 100% of the consumption, while in the second scheme, the consumers got compensation for 80% of the total electricity consumption (Regeringskansliet, 2023).

4.1.1 Distributional impacts

The two measures were consumption-based in their design, with households receiving a direct money transfer proportionate to the total electricity consumed during each period.

As the compensation was uniform in relation to the consumption, the measure's distributional profile depends on whether specific socio-economic groups were affected differently. Prior to the energy crisis, Menyhert (2022) showed that medium and high-income households in Sweden spend a larger share of their disposable income on energy than the low-income households. A larger support in both absolute and relative terms was thus likely given to medium and high-income households. The recipient of the support varied, depending on the dwelling type. Households with their own electricity agreement (usually single-family houses) received support directly, while some households in owned apartments (housing cooperatives) or rental apartments received support indirectly or not at all. The reason is that, in some cases, the landlord or the housing cooperative were registered for the electricity distribution agreement and received the support. Low-income households live in rental apartments and housing cooperatives more frequently than the mid- and high-income households (Statistiska Centralbyrån, 2017).

Compared to the EU average, Sweden differs in terms of this distribution of energy expenditures between income groups. The EU average data shows a relatively larger share of housing related energy expenditures for low-income households than the high-income households. In terms of both electricity and housing-related energy use, the share of disposable income spent on electricity consumption is slightly larger for medium and high-income households (Figure 4).

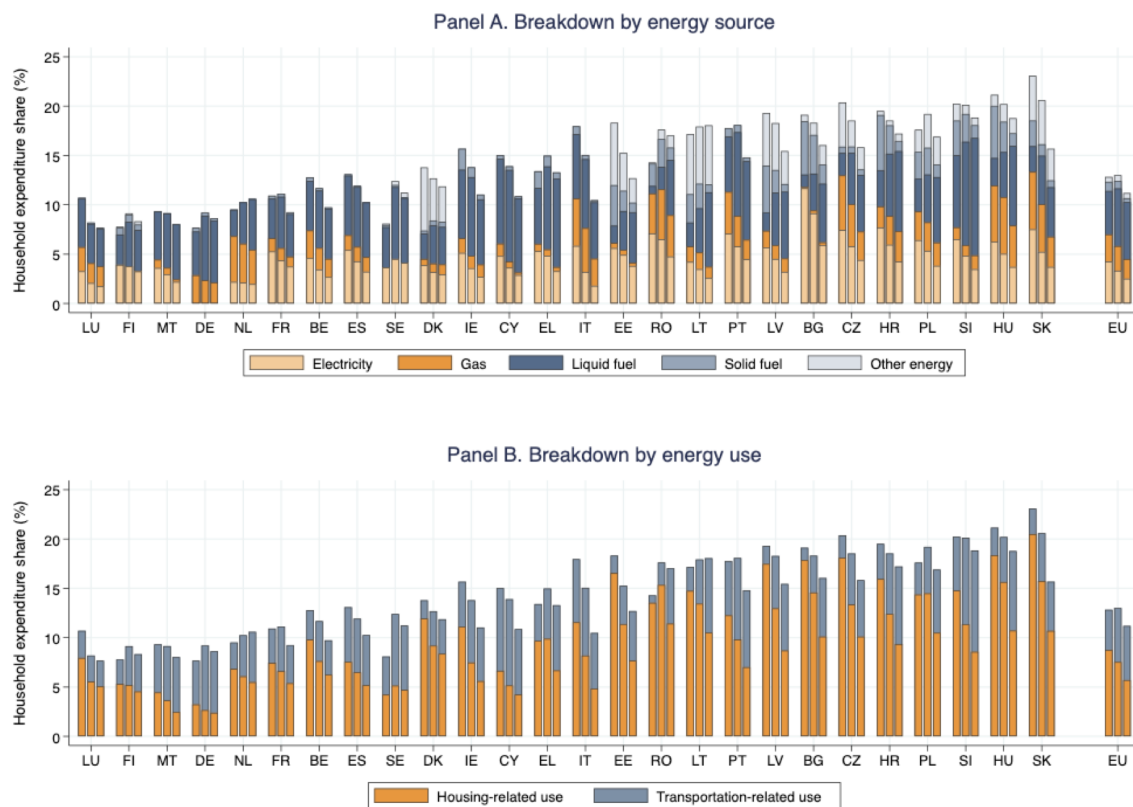


Figure 4 The detailed breakdown of households' 2015 energy expenditures by country and income quintile. The figures present representative country-specific averages of the structure of household expenditures. For each country, the left bar represents the 1st income quintile, the mid bar the 3rd quintile, and the right bar the 5th quintile. Source: (Menyhert, 2022)

Blake and Bulman (2022) showed that the generally increasing energy prices (between March 2021 – March 2022) disproportionately affected high-income households in several European countries, including Sweden. The 'disproportionate' impact refers, in this case, to the percentage increase in energy expenditures in proportion to the disposable income. This means that the compensation schemes for electricity in Sweden are expected to have a slightly regressive distributional profile, since high-income households benefit more from the support relative to their income, than low-income households. In absolute terms, the support favours individuals with high electricity consumption, which are generally high-income households. While the electricity support offers greater benefit to wealthier households which consume more energy, the low-income households are likely those who would need the support more. A recent study on perceived energy poverty shows a clear negative association between household income and whether households have experienced worry or anxiety related to the high energy prices, and whether they have had difficulty paying the energy bills (Holm et al., 2023). Correspondingly, it has been argued that the support should have been directed towards low-income households (Svenska Dagbladet, 2022).

4.1.2 Climate and environmental impacts

The electricity support measures in Sweden were implemented after the corresponding compensation period. But the early implementation process was not completely transparent for consumers, neither in terms of the time frame, targeting, nor the size of the support. The goal of the measure when announced before winter 2022–2023, was to provide support for coming high winter prices, not to compensate for past high prices. But the Swedish government used the past consumption instead of current/future consumption to avoid problems with disincentivising energy savings. The measure can thus be argued to have been well implemented to avoid increases in electricity use, but not well implemented regarding transparency as consumers didn't know whether the measure would reimburse retroactively or prospectively.

Potential confusion around the reimbursement period may have led recipients to believe that they would be compensated for their current consumption, and to thus increase their electricity consumption compared to a 'no-measure' situation. However, factors such as increased energy efficiency, a decreasing share of flat rate monitoring of electricity consumption, and outside temperature all have impacts on the observed electricity consumption, making it difficult to disentangle the effect of the support on consumption levels. If longer-term compensation schemes were to be implemented to compensate for high energy prices, and with a high degree of predictability in receiving the support, demand for electricity may increase, putting strain on energy infrastructure, and increasing greenhouse gas (and other) emissions.

4.1.3 Coherence with existing policies

The electricity support is a part of coordinated EU-measures to lower the energy bills for consumers. A common regulation for tackling the energy crisis was implemented in December 2022 to complement existing EU-initiatives and laws to secure energy provision throughout the union (European Council, 2023). The regulation focused on both measures to reduce the consumption of energy, and measures to decrease the price of electricity.

Financial support targeted towards consumers, counteracting the market price signals from other implemented policies, could be motivated by these parallel perspectives. Ensuring a just transition (see Eurofound, 2023) towards a low carbon economy is challenging, especially in times of external shocks such as post-covid effects and the present situation in Ukraine. Climate policies, such as the EU ETS are long-term policies, and are playing a role in driving up energy prices. We expect the supports to have impacts on the incentives created by other implemented policies at both a national and EU-level, but it can also ensure a just transition. From a just transition perspective, the measure should better focus on targeting economically vulnerable households and businesses in the short-term.

4.2 Electricity price support for businesses

Sweden has also offered support to businesses and legal entities with electricity connections in grid areas SE3 and SE4, with maximum cap of €2 million per entity (equivalent to approximately 22 million SEK). The size of the electricity support, up to the cap, is determined by the consumption between October 2021 and September 2022.

Entities with electricity connections in grid area SE4 were eligible for 0.79 SEK/kWh during the specified period, while those in electricity grid area SE3 qualified for 0.50 SEK/kWh. It's important to note that no electricity support was offered to businesses and legal entities with electricity connections in electricity grid areas SE1 and SE2. To qualify for the support, businesses and legal entities must have held a valid electricity grid agreement in SE3 and SE4 as of November 17, 2022. Any agreements made after this date were not eligible for electricity support for the respective connection point (Sveriges Riksdag, 2023). Additionally, it has been clarified, that the maximum cap of €2 million per company also applies to corporations that may consist of multiple legal entities. The application period for the electricity support opened the 30th of May 2023 with an application deadline on 25th of September 2023. At the time of this analysis, only some of the payments have been administered to the beneficiaries, with no data on actual payments available.

4.2.1 Distributional impacts

The design of the electricity support for businesses, like the support for households, does not consider income levels, size of company, or other socioeconomic aspects. However, the maximum cap of €2 million, and the exclusion of grid areas SE1 and SE2, makes the support more targeted in who it applies to. Large and electricity-intensive corporations will receive support for a smaller share of their total electricity costs. The two northern electricity grid areas were excluded from the compensation as electricity prices were relatively low in these areas during the compensation period.

As the support is currently being administered, we can say little about the actual distribution and distributional effects. We expect the support to benefit organisations that are vulnerable to volatile energy prices. However, for the most vulnerable, it is likely that the periods of high electricity prices have already had impacts (e.g. on liquidity and employment). The retroactive payment is administered almost two years after the beginning of the chosen reference period.

4.2.2 Climate and environmental impacts

In terms of the environmental impacts of the electricity support for businesses, the reasoning does not differ substantially from what has been discussed for the household support. The environmental impact of the support depends on the extent to which the support has been predictable and affected the consumption behaviour of the beneficiaries. Our view is that both the household electricity support and the business electricity support in Sweden were implemented with a low degree of transparency and predictability. Throughout the reference period, the support had not yet been established and the transparency of the planned support was very low. We can say little about consumers' expectations for the support, and to what extent these affected incentives to save energy throughout the reference period. However, the high level of uncertainty and low transparency should have kept expectations down. If that's the case, incentives to save energy in the reference period should not have been affected much. This may have been one underlying purpose of the chosen reference period for compensation, as incentives for energy savings were little affected by eventual expectations. On the other hand, if expectations around additional future compensation schemes are affected by the support, incentives for saving energy may be altered in the wrong direction.

4.2.3 Coherence with existing policies

There is no major difference in the analysis and reasoning around coherence with existing policies between the support provided to households and that provided to businesses. From a second-best perspective, these measures can be motivated by the desire to ensure a just transition, as existing policies such as the ETS, renewable energy targets, etc., are playing a role in the high energy prices. However, if this type of compensation support is to be recurring and with a degree of predictability, we foresee that the incentives for energy savings, through distorted price signals, would impact incentives from other policies aimed at reducing the energy and electricity consumption among businesses.

4.3 Relaxed reduction mandate for fuels

The reduction mandate for fuels in Sweden is a long-term policy tool aimed at promoting the use of biofuels. This policy has multiple objectives, one of which is to help Sweden achieve a 70 percent reduction in greenhouse gas emissions from domestic transportation by 2030, compared to from 2010 levels (Swedish Environmental Protection Agency, 2023b). Those responsible for fuels subject to the reduction obligation must ensure that these fuels contribute to a specific reduction in their climate impact. This is achieved by gradually increasing the inclusion of biofuels.

Regarding the reduction share provided by renewable fuels, as of 1st January 2022, gasoline must have a 6% reduction in GHG-emissions by increased mixing of renewable fuels, while diesel fuel must achieve a 26% reduction. The long-term emission reduction target from gasoline and diesel use is 28% and 66% respectively by 2030. The compensation measure relaxed these targets, and instead keep them unchanged for gasoline and diesel through 2023. Additionally, there is a political agreement to lower the reduction mandates for gasoline and diesel to 6% from 1st January 2024, through 2026. For aviation kerosene, the reduction level is set at 2.6% for the year 2023. To determine compliance with the reduction mandate, the climate impact of a particular fuel is compared to that of a completely fossil-based equivalent. This assessment considers the climate impacts of all components (both fossil and renewable) throughout the fuel's lifecycle, from production to consumption (Swedish Energy Agency, 2023).

4.3.1 Distributional impacts

A reduced reduction mandate is expected to impact the fuel price within transport. Mixing of biofuels is generally more expensive than the fossil-based fuels, and a reduction of the mandates therefore should lower the end-user price. In Sweden, the pausing of the reduction mandates means that the biofuel share is held constant in the mix. The main purpose of the pause has been to avoid further price increases due to reduction mandates throughout 2023. Further, the agreement to reduce mandates from 2024 is expected to lower the price of fuels in the future.

Households with a large consumption of transport fuel benefit most from the avoided further price increases. The average driving distance is significantly higher in rural than urban communities in Sweden (Konjunkturinstitutet, 2023; Gröna Mobilister, 2019). As Figure 4 shows, mid and high-income households spend a larger share of their disposable income on transportation-related energy use, including fuels (Menyhert, 2022). The pausing, and further reduction, of the mandates is expected to have regressive distributional impacts, providing larger benefits to mid- and high-income households.

4.3.2 Climate and environmental impacts

The environmental impact of biofuel mix is debated as there are limits to the global supply of biofuel (due to limitations in land availability, leading to both direct and indirect land use change) (Intergovernmental Panel on Climate Change, 2022). At the same time, we see increasing demand due to the wish to phase out fossil fuels (European Scientific Advisory Board on Climate Change, 2023). Furthermore, most climate change scenarios that reach a 1.5- or 2-degree global warming include an increased use of biofuels, while other studies have shown that increased biofuel demand can lead to higher carbon sequestration in productive forests (Favero et al., 2020). The climate change effect of increased bioenergy use will continue to be

debated and is dependent on the bio-feedstock considered and the alternative replaced. Regardless, pausing the policy might lead to Sweden falling short of its commitments under agreements like the Paris Agreement. In addition, the pausing of the reduction obligation may perpetuate the reliance on fossil fuels for transportation, potentially slowing down the transition to more sustainable and renewable energy sources (Swedish Energy Agency, 2022). A secondary effect is that a decrease in demand for biofuels could lead to reduced incentives for investment in research, development, and implementation of sustainable biofuel technologies, hindering the advancement of alternative fuels.

4.3.3 Coherence with existing policies

With regard to climate policy, the reduction obligation for fuels is an instrument whereby the party targeted for a reduction mandated fuel must ensure to mix a certain share of biofuel into the fuel. The instrument is aimed at increasing the share of biofuels in transport fuels to reduce the environmental impact, and to stimulate the transition away from fossil-based fuels. It is an instrument/policy to help achieve the national reduction targets for transport. The pausing of the reduction mandates will slow down Sweden's transition towards a fossil-free and low-carbon transport sector. We do not expect the pausing of the reduction mandates to directly interfere with existing EU-level or national policies to reduce greenhouse gas emissions. However, it is a reduction in ambition and may affect, among others, the incentive to invest in renewable energy sources and biofuels at a market level. This may also put pressure on the realisation of other policy measures in order to reduce greenhouse gas emissions.

5. Assessment of selected Danish measures

5.1 Electricity tax reduction

In Denmark, two measures have been aimed at directly lowering electricity prices: (1) A temporary relaxation of the general electricity tax for the first half of 2023 to EU's minimum rate of 0.8 øre per kWh (from 69.7 øre per kWh), as well as a lowering of the electricity tax in the final quarter of 2022; (2) A cancellation of announced increases in electricity tariffs in 2023, amounting to a 3.1 øre/kWh. The reduced revenue from the relaxation of the general electricity tax amounts to DKK 3.5 billion in 2023, and the costs of the reduced tariffs amount to DKK 1 billion. Moreover, Energinet expects to repay bottleneck revenues of additional DKK 1.9 in 2022, and 3.8 billion in 2023, to consumers (Forsyningstilsynet, 2023).

It is estimated that the reduction of energy taxes can explain a 20% reduction in electricity prices: From Q3 2022 to Q1 2023 consumer electricity prices fell by 21.6%, according to data from The Danish Utility Regulator (Forsyningstilsynet, 2023). They also estimated that if the general electricity tax and tariff had not been reduced, the electricity prices would only have fallen by 2.2%.

5.1.1 Distributional impacts

Low-income households use a larger share of their disposable income on electricity (Skatteministeriet, 2020), hence they receive a larger relative benefit from these measures, but not in absolute benefits.

5.1.2 Climate and environmental impacts

Lowering the electricity price, all other things equal, disincentivizes energy saving activities, hence there can be a negative effect on GHG emissions (European Scientific Advisory Board on Climate Change, 2023; Amaglobeli et al., 2022), the effect-size dependent on the energy source used for producing electricity.

Using a short-run price elasticity of -0.35 (following Espey & Espey, 2004), the effect of the price drop caused by a reduction of electricity taxes amounts to 7% increase in electricity use, compared to a scenario without reduced tariffs and taxes on electricity.

5.1.3 Coherence with existing policies

The policies with which there is most coherence are the current redistribution measures. The effect is small as it is only a temporary measure.

5.2 One-off payment to disadvantaged households

Eight compensation measures have been made in the form of direct money transfers to targeted specific, disadvantaged groups. The most prominent of these measures are: (1) a DKK 1 billion programme of 'targeted heat cheques', which delivers a cheque to households with a gross annual income below a fixed threshold, and which have heating sources exposed to price hikes, (i.e., gas and oil. Note: unrelated to actual consumption) (2) DKK 1.1 billion to a tax-free lump sum transfer to recipients of the elderly cheque (around 290,000 public pensioners), amounting to a total of DKK 5,000 per recipient in 2022 and 2023; (3) DKK 1 billion to a temporary relaxation of the maximum employment deduction in 2022 and 2023; (4) a DKK 600 million fund, delivering a one-off increase in the child and youth allowance in January 2023 by DKK 660 per child.

5.2.1 Distributional impacts

These four one-off payments have been directly targeting exposed groups, as also recommended by several experts (references in Chapter 1 recommending the same. In addition, direct money transfers are supported by more efficient use of public resources (European Scientific Advisory Board on Climate Change, 2023).

The measures were based on ex-ante income and installation measures. Therefore, it creates no incentives to act for inclusion. If there are expectations for similar measures in the future, this could disincentivise actions, such as converting heating sources. The other measures are purely income related.

5.2.2 Climate and environmental impacts

As energy prices are only affected indirectly, a pass-through of increased international energy prices to consumers and businesses encourages demand response. Hence, the only environmental effect comes from implicitly increased income leading to increased consumption in general. Furthermore, as low-income households generally have lower emissions of greenhouse gases, this effect should be relatively small.

The only one of these four measures directly related to energy is the heating cheque, which is contingent upon the existing heating source. As it is a one-time payment, it should not create a disincentive to invest in greener heating. However, if there are expectations that similar schemes will be applied in the future if gas

prices are high, it could create speculation. Nevertheless, with no clear precedent for such schemes, it seems a minor issue.

5.2.3 Coherence with existing policies

As the measure is not targeting environmental aspects it is not working against, nor in favour of these.

5.3 Increased subsidies for disconnecting from the gas network

Denmark has as a long-term goal of eliminating natural gas for heating, and to use electricity and district heating to a larger extent. For several years, it has been possible for private households with gas to apply for a subsidy for heat pumps. The fund was distributed according to a first-apply-first-served principle and typically depleted very quickly. As a part of the approach to the energy crisis, the allocated fund for the scheme was increased by 35 million DKK in 2023 (but no adjustment per household) (Finansministeriet, 2022). As a consequence of this and the increase in gas prices, a bottleneck for the delivery and installation of heat pumps arose, and at the point of writing this report, there was still a wait-time of a year for these heat pumps.

5.3.1 Distributional impacts

The measure targets households with natural gas directly, which includes both lower and higher income households. The subsidy is likely to drive up prices, with some of the economic gain harvested by plumbers and heat pump producers.

5.3.2 Climate and environmental impacts

Heat pumps are more energy effective than natural gas, and to the degree that the electricity is green, it is also CO₂ neutral. Hence, it is a core component in Denmark's long term climate plan, where district heating is not an option/is too expensive. The policy has mainly helped to speed up an already ongoing transition.

5.3.3 Coherence with existing policies

The subsidy is part of an existing policy for converting heating systems based on natural gas (and oil) into energy systems based on renewable energy and can be considered coherent with existing environmental policies.

6. Assessment of selected Norwegian measures

6.1 Electricity support for households

By far, the largest support scheme in Norway is the electricity price support to all households.^[5] This was introduced in December 2021^[6] in response to what was, in some areas, a four-fold increase in electricity prices for households, compared to a relatively stable price interval over the last 10 years (Figure 1). Almost all of the large price increase happened in Southern Norway (price zones NO1, 2 and 5), while Mid- and Northern Norway (zones NO3 and NO4) experienced relatively modest increases. In 2022, 32.6 billion NOK was paid out. The support scheme is administered by the grid operators, and the support is automatically deducted from the electricity (grid) bill.

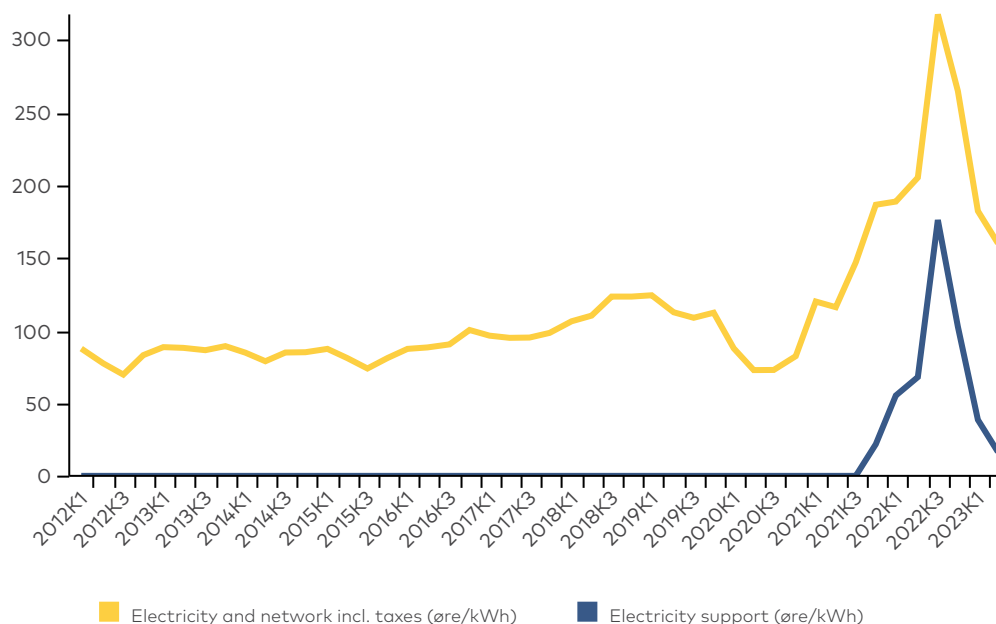


Figure 5 Electricity prices (øre /kWh) in Norway last 10+ years (quarterly) and electricity support. Note: Weighted average prices across different price zones. Source: NVE/SSB^[7]

5. Note that there was also an electricity cost support component for households eligible for receiving housing support. This also depend on electricity prices. We do not analyse that scheme here (see e.g., Dalen and Halvorsen 2022, chapter 7)
 6. <https://www.regjeringen.no/no/tema/energi/regjeringens-stromtiltak/id2900232/>
 7. <https://www.ssb.no/statbank/table/09387/>

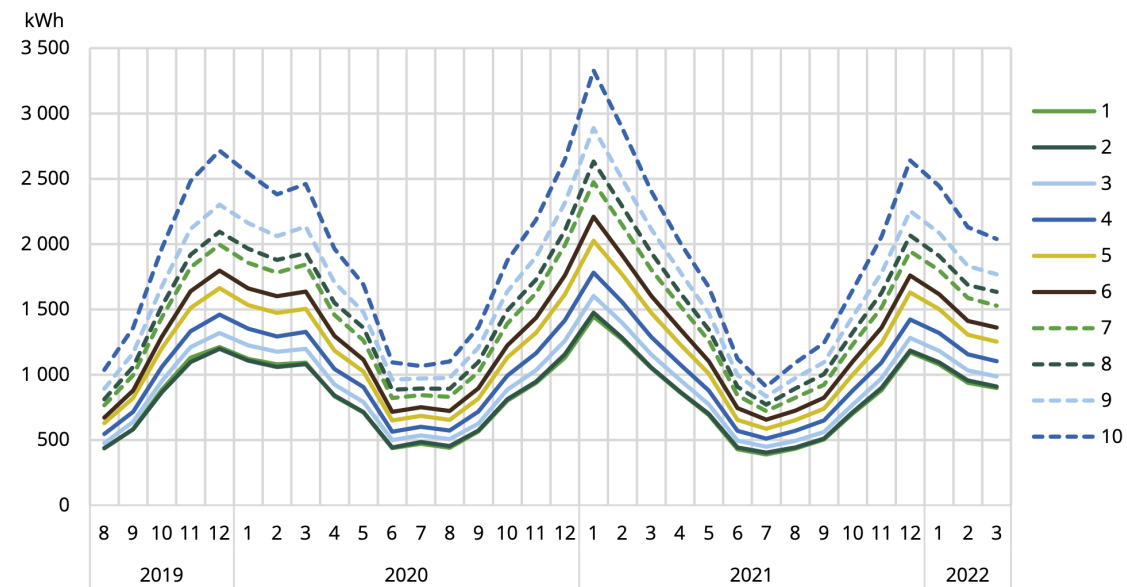
The support scheme has undergone several changes, but the initial version provided an ex-post monthly support of 55 percent of the electricity costs of households (not recreational homes/cabins) when the market price was on average 70 øre/kWh or more (exclusive of VAT) per month. A ceiling was also adopted, set to 5000 kWh per household per month. In January 2022 the compensation level was increased from 55 to 80 percent. In March 2022, it was announced that the scheme would be extended for a year to March 2023. In September 2022 the compensation level was increased again to 90 percent.

In November 2022, it was decided to extend the support scheme to the end of 2023, where the 90 percent support level would start from October until December 2023, and 80 percent from April until September. Finally, in May 2023 a larger revision was announced. Instead of providing support based on the average monthly electricity price, the support would now be based on the spot price, hour by hour. Hence, for every hour the spot price is higher than 70 øre/kWh in the price zone of the household, 90 percent would be compensated (all year). In addition, the scheme was extended through 2024, with price ceiling increased to 73 øre/kWh, and the consumption ceiling of 5000 kWh left unchanged. For 2023, it was estimated that the scheme would pay out around 18 billion NOK,^[8] much less than in 2022 due to lower prices. 9.75 billion NOK has been set aside in the budget for 2024.^[9]

6.1.1 Distributional impacts

The scheme is general, rather than targeted at specific groups, providing support to all households based on the price in their area of the country. Electricity consumption is highly correlated with household income and (even more so) with house size (Dalen & Halvorsen, 2022), as electricity is the main source of heating. The absolute size of the electricity support increases with income. For example, in December 2021 it was more than twice as high on average for households in the highest income decile, compared to the lowest (Dalen & Halvorsen, 2022). The figure below shows how electricity costs vary predictably between different deciles of household income in Southern Norway, the highest decile consuming 2–2.5 MWh more than the lowest decile per month.

8. <https://www.regjeringen.no/no/aktuelt/mer-treffer-sikker-stromstonsordning-til-husholdningene/id2976901/>
9. <https://www.regjeringen.no/no/aktuelt/Forlenger-stromstonsaden-ut-hele-neste-ar/id2996990/>



Kilde: Boforholdsregisteret, Elhub og Nord Pool

Figure 6 Average electricity consumption per household by disposable income decile (marked from lowest, 1, to highest, 10, decile) August 2019 – March 2022, Southern Norway, kWh. Source: (Dalen & Halvorsen, 2022)

As analysed by Dalen & Halvorsen (2022), the budget shares for electricity costs varied from 2–3 percent for the highest income decile, to 11 percent for the lowest decile, during the winter months of the 2021/22 period. The corresponding shares during the 2019/20 and 2020/21 periods were well below 0.5 percent for the highest decile, and 2–3 percent for the lowest. This indicates that the spread of income shares across income groups has increased substantially during the electricity crisis, and that the price increases in the last period were a particularly heavy burden for the lowest income households. The electricity support did, during the winter of 2021/22, move the budget shares spent on electricity from around 11 percent to 7.7 percent in the lowest income decile. For the highest income decile, the budget share decreased from between 2–3 percent to below 2 percent. Note that Dalen and Halvorsen (2022) end their analysis in the third month of 2022, so it does not capture later changes in the scheme or its effect. However, the most pronounced effects were the highest the first winter, where prices were at their highest compared to previous years.

The numbers above illustrate the immediate effect of the electricity support among income groups but does not give a complete picture. This is because we have not factored in how households can change their behaviour and reduce electricity costs, e.g., by saving electricity in response to high prices. Such an analysis requires, as noted in Chapter 2, some view of the counterfactual without electricity support. Dalen & Halvorsen (2022) make a rough assessment and find that households across all income groups likely conduct some electricity savings in response to the

price increases, which is likely dampened somewhat due to the support. They also find that households tend to reduce consumption of other goods and services more to account for increases in electricity prices, since electricity is a necessary good, and hence costs are difficult to reduce in the short run. The support is relatively more important for the lower income groups.

6.1.2 Climate and environmental impacts

As noted previously, it is a highly complex task to assess the impacts of the support scheme on electricity consumption, and ultimately emissions. This is further complicated by all the adjustments made in the scheme. Theoretically, a price support scheme like the one implemented will disincentivize energy savings, all other things equal. Since the support scheme was announced in a staggered way, paid out ex-post, relatively complicated and not fully transparent for everybody, it is likely that the behavioural response was far from what could be expected by fully rational economic agents. However, it is also likely that once the scheme had been communicated and experienced by consumers, they would gradually learn and adjust their behaviour more according to standard demand models when prices change. Unfortunately, none of the studies we have found have tried to estimate the likely effect.

Based on theory and anecdotal evidence, the measure, especially in its initial phase when support was based on an average monthly electricity price, had some clear boosting effects on electricity consumption. For example, the initial design had the perverse effect that households could gain increased support by consuming more electricity during low price periods during the month, especially if they had a fixed price agreement. There were high profile media cases showing people inviting neighbours around for free electric vehicle charging, and examples of wasting electricity (e.g., keeping hot tubs on max temperature etc). For this reason, a later change to the measure linked the support to spot prices. All in all, it is likely that the support increased electricity consumption compared to a situation without the support, but the size of this increase is uncertain. How this change has, in turn, impacted emissions is even more uncertain. Electricity production is part of the EU ETS, so emissions are capped through that system. However, this CAP allows for some temporal storage, weakening such direct effects.

As electricity is important for heating in Norway, the electricity price increase resulted in hoarding and increased use of firewood, an important substitute for heating purposes. The burning of firewood is not covered by the EU ETS, but changes in the carbon stock in forests due to potentially reduced stock captured in the LULUCF accounting. Furthermore, as mentioned in Chapter 4.3.2, the net climate change effect of increased biofuel use is debated, and small-scale household use of biofuels is associated with relatively large emissions of fine particulate matter with associated health impacts (Gustafsson et al., 2022 and Savolahti et al., 2019).

6.1.3 Coherence with existing policies

The support measure is coherent with other distributional policies, except that it, in an absolute sense, benefits higher income groups more than lower income groups. The measure is not explicitly designed to impact people's energy consumption behaviour, so in this sense it is not coherent with the aims of saving energy and the need to speed up the green transition.

6.2 Electricity support for businesses

The Norwegian government introduced an energy support measure ("Energitilskuddsordningen") as a temporary arrangement to help companies with extraordinary electricity costs.^[10] The arrangement was designed, in cooperation with various employee and employer organisations, to help around 20 000 electricity intensive companies. Companies with at least 3 percent electricity intensity could apply for support (grant) to pay electricity bills and to invest in energy saving measures. "Electricity intensity" was defined as the share of electricity costs as a proportion of the company's ordinary turnover for the first half of 2022. The scheme was administered through ENOVA, the Norwegian government owned institution to support a green energy transition. Companies that underwent energy use mapping could get 25 percent of the electricity price above 70 NOK øre/kWh for the months from October to December 2022. Companies that also invest in energy saving measures could get 45 percent covered, and up to 50 percent of the investment in energy savings. District heating would also be covered by the scheme. The deadline for proposals was 11 November 2022 and around 2.8 billion NOK was paid out in 2022 to ca. 3200 companies. This measure was one of four measures designed to support business. The three others were better fixed price agreements, a loan guarantee arrangement, and commitment to the faster development of green energy production.

6.2.1 Distributional impacts

According to ENOVA's own statistics,^[11] around 16.5 percent of the support went to covering a share of electricity bills, and 83.1 percent to investment in energy saving measures. Less than half a percent of spend was on admin costs (e.g., auditing). This demonstrates that an overwhelming majority have utilised the scheme to invest in energy saving. Furthermore, out of the 2.8 NOK billion, 933 million was paid to companies renting out properties, 237 million to hotels and restaurants, 93 million to companies developing and selling property, and 63 million each to running of sports facilities and property management. Almost all of the support was paid to companies in South-Eastern Norway (Figure 7).

10. Regjeringen, 2022. <https://www.regjeringen.no/no/aktuelt/stromtiltak-for-naringslivet-vilkar-og-avgrensninger/id2930025/>

11. Energitilskuddsordningen, 2023. <https://www.energitilskuddsordningen.no/statistikk-for-energitilskuddsordningen>



Figure 7 Overview of areas of Norway where companies received electricity support (darker colour, more companies). Source: (Energitilskuddsordningen, 2023)

6.2.2 Climate and environmental impacts

As with other support measures, it is hard to estimate the environmental impact of the measure. For this measure it is relevant both to consider whether the support itself increased energy consumption through dampening of the price signal to save on electricity use (as for the household support measure above), and whether the energy saving solutions would have been installed regardless of the measure or not. For the price effect, the same arguments as made above for households are, in principle, valid here. However, in this case the support measure was announced in September 2022, with the calculation basis for refund being the first six months. So, unless companies had some clear expectation early in the first half of 2022 that they would receive electricity support, they are unlikely to have increased their electricity consumption. For the majority of companies this is likely the case, though we have found no studies analysing this question. Hence, this support measure likely did not impact companies' electricity consumption or behaviour more generally (e.g., substituting electricity with other energy sources for heating etc.). To our knowledge, as the measure is temporary and not in operation in 2023, there are only small effects on expectations for future support.

In terms of support for investments in energy saving solutions, this is trickier to assess. According to ENOVA, 8081 energy saving investments received support, which as noted above, constituted around 83 percent of the total support. Out of the 8081 solutions, the top five types of solutions (number of solutions in brackets) were energy efficient lighting (LED) (1328), solar panels (1006), heat pumps (air to air) (936), changing windows (705) and energy management systems etc (674). Considered in isolation, such investments are of course positive in that they reduce energy consumption. The question is how many of the solutions would have been implemented anyway, given the high electricity prices. In practice, some probably would have been, but far from all, so the net effect is positive.

6.2.3 Coherence with existing policies

It is less common to provide support to disadvantaged companies than to households, though there are of course a number of subsidy schemes available for individual sectors and to stimulate rural settlements, etc. (e.g., in agriculture). In this sense, the measure is similar to and coherent with other support schemes for companies. Since the measure was unlikely to dampen the price signals for saving energy, and in addition, offered support for investments in energy saving solutions, the support measure is coherent with other environmental and climate policies trying to reduce electricity consumption.

7. Assessment of selected Finnish measures

7.1 Fixed term tax credit

Finland introduced a time-limited tax credit to offset electricity expenses incurred from January to April 2023. To be eligible for this credit, individuals must have had electricity costs exceeding €2,000 for their primary residence during the four-month period. The credit covered 60% of costs exceeding this threshold, up to a maximum of €2,400 per primary residence (not per person), and it applied to only one primary residence. Hence, holiday homes were not eligible for the tax credit. To receive the full €2,400 credit, electricity expenses for the four-month period had to reach €6,000 (The Finnish Tax Administration, 2023).

Furthermore, there was a €100 threshold that was applied to both the electricity tax credit and other tax credits for household expenses. If a consumer did not claim any other household expense credits, this €100 was deducted from the eligible electricity tax credit amount (The Finnish Tax Administration, 2023). In October 2022, the Finnish government projected that the overall expenses for the temporary fixed-term tax credit would amount to 265 million euros. The breakdown of these costs by contributor is provided in Table 3. The government's proposal to the parliament emphasized significant uncertainties linked to these estimated effects, primarily because future consumption patterns, price levels, and, consequently, the tax credit per household, were uncertain. Nevertheless, by April, only 1800 people had applied for credit from the scheme for a total of 2.5 million euros (Yle, 2023).

Table 3 Projected costs of the Finnish fixed term tax credit measure. Source: (Finnish Parliament, 2022)

Payer	Amount (million euros)
State	245
Municipalities	16
Congregations	2
Kela (the Social Insurance Institution of Finland)	2
Total	265

7.1.1 Distributional impacts

In October 2022, the Finnish government estimated that around 252,000 households would be affected by the fixed-term tax credit. The credit was anticipated to have a significant impact on households that rely on electricity for heating, with approximately 96 percent of the credit expected to benefit those households (Finnish Parliament, 2022).

The Finnish tax credit measure favours households with high electricity consumption, which can primarily be expected to be individuals with larger homes and higher incomes. Hence, we can expect it to be regressive, providing greater benefits to high-income groups. Before its implementation, the Finnish government also anticipated that the majority of the tax credit would be claimed by individuals in the highest income brackets, see Table 4 and Figure 8.

Table 4 Expected distribution of tax credit by income decile. Source: (Finnish Parliament, 2022)

Income decile	Number of households	Total credit, mill. euros	Change in income for the average household in the decile, euros
1	3 600	2,3	630
2	3 100	1,8	590
3	14 100	10,3	730
4	21 400	18,8	880
5	26 400	29,0	1 100
6	26 100	25,7	990
7	34 300	33,7	980
8	33 500	33,5	1 000
9	41 300	47,4	1 150
10	47 700	62,5	1 310

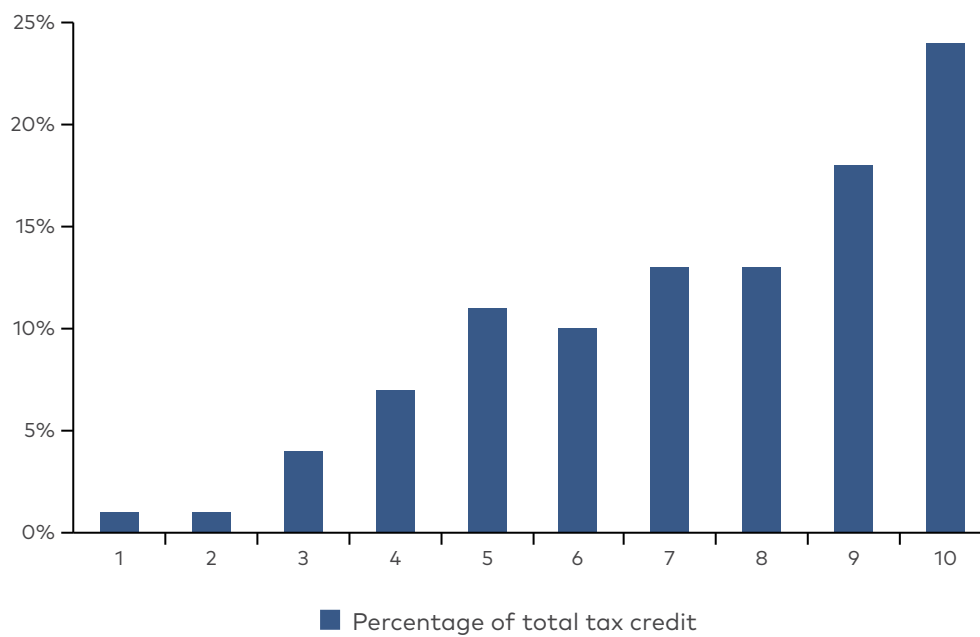


Figure 8 Share of expected tax credit by income decile. Source: (Finnish Parliament, 2022)

The fixed-term tax credit has most likely primarily helped high-income households. The government commented this in the proposal by stating that it was challenging to quickly implement an income-based system. Hence, they connected the measure to an existing tax credit for household expenses (Finnish Parliament, 2022).

Additional support measures were implemented to mitigate income distribution disparities. Given that this is a tax credit program, households must have sufficiently high incomes to benefit from it. To ensure all eligible individuals receive their full entitlement, the government introduced a parallel compensation measure through Kela (the Social Insurance Institution of Finland) for those with lower incomes who could not fully utilize the tax credit (Finnish Government, 2022). In April 2023, 1400 people had applied and received support through Kela for a total amount of 0.3 million euros. Originally, the government prepared for 120 million through the Kela compensation scheme (Yle, 2023). Another step taken to assist all households was reducing the VAT for electricity from 24 percent to 10 percent during January to April 2023. This measure also benefitted high-income households.

7.1.2 Climate and environmental impacts

Any effort to offset high electricity usage may encourage increased consumption, potentially leading to adverse environmental effects. However, since the tax credit measure was in place for only four months, it's unlikely to have a significant long-term impact on electricity consumption. There was also a ceiling put on the sum which could be received as tax credit, to limit the perverse effects of the measure. Further, it appears that the compensation measure will be used to a much lower extent than what was originally projected by the Finnish government.

7.1.3 Coherence with existing policies

In general, this measure doesn't appear to pose a substantial conflict with existing environmental policies. However, the measure is incorporated into an existing program designed for tax credits related to household expenses, typically claimed for work carried out within consumers' homes, like cleaning, childcare, or renovations. Adapting this measure which covers monthly recurring expenses, as in the case of electricity, is not in line with the measure's original intent and principles.

7.2 Extended payment period for electricity bills

Finland introduced a deferral measure to extend the payment period for electricity bills from January–April 2023 to assist both households and businesses in managing their winter electricity bills. Customers could request an extension, but only for consumption-related electricity bills between January 1st to April 30th, 2023. Transmission costs were not included in this extension (Finnish Government, 2023).

For households:

Consumers had the option to extend their payment period for up to 120 days from the original bill payment due date. The request for the extension had to be submitted before the initial bill payment due date. No additional costs or interest will be imposed for this extended payment period.

For Businesses:

Businesses could also apply for an extended payment period, with a maximum of 60 days. In addition, businesses were subject to an annual interest rate of 1.53%, imposed by the electricity company during the extended payment period. It's worth noting that credit institutions and financial institutions were not eligible for an extended payment period, as specified in the Parliament's proposal.

Extending the payment periods does have an impact on retail sellers of electricity. It may result in delayed receivables for these sellers, which could potentially lead to liquidity shortages. To address this issue, central government guarantees may be provided for the bank loans or pension insurance company loans taken by retail sellers to support their liquidity (Finnish Government, 2023).

7.2.1 Distributional impacts

For households, the deferral measure targeted all consumers, providing the possibility to delay payments of electricity bills without incurring additional costs. As to what extent the deferral measure was used by the consumers in Finland, we have found no data. Without further data, we can say little about the actual distributional effects of the deferral measure. It is likely that the option to delay electricity bill payments was used by vulnerable consumers to relieve the financial burden from high energy prices, but also for less affected consumers that could leverage of the additional liquidity and gain low risk interest on capital.

For businesses, the imposed 1.53% interest rate is likely to have increased the threshold for requesting postponement of payment. With such a short postponement period, it is unlikely that companies that were not in need of immediate liquidity could leverage the 60 days extension period offered. Also, financial and credit institutions were not eligible for the support. For companies in need of immediate liquidity to pay electricity bills, we expect the deferral measure to have had a positive impact, offering a short but relatively cheap indirect loan.

7.2.2 Climate and environmental impacts

Delaying electricity payments to increase liquidity and offer short term financial relief is determined to have had a low environmental impact. Due to the short-term nature of the relief and the delay in compensation support, the measure should have had little to no effect on consumers actual electricity consumption. The support has rather worked to smoothen the financial burden while the price signals

of electricity remained strong. Even with a higher degree of predictability in the measure, we expect a low impact on consumption and thus also a low environmental impact.

7.2.3 Coherence with existing policies

The deferral measure was implemented mainly to reduce the financial burden of high electricity prices. As we expect the measure to have a very low impact on electricity consumption, and no direct effect on prices or incentives for energy saving measures, there is no friction between the temporary deferral measure and other environmental policies on national or EU-level. The measure may have impacts on other non-environmental legislation and policies at the national level. However, it is outside of the scope of this study. This type of measure supports some of the objectives of EU policy in relation to ensuring a just and equitable transition, as it helps to alleviate financial burden from high energy prices and provides some temporary support to vulnerable consumers.

8. Synthesis and conclusions

Research for this report involved the gathering of information on compensation measures implemented in the Nordic countries as a response to sharp energy and transport price increases from 2021–2023. We also compiled theoretical and analytical frameworks to enable evaluation of a selection of these compensation measures, and to identify alternative measures. These frameworks were especially important for the evaluation since the work was completed during 2023, prior to the availability of any definitive data or research studies. The evaluation focused on distributional effects, climate, and environmental impacts, as well as coherence with existing policies. Out of a large set of compensation measures (presented in Appendix A1 & A2), we selected three Swedish, three Danish, two Norwegian, and two Finnish measures for evaluation.

8.1 Overall evaluation of the measures

Jointly, the evaluation of the selected measures revealed some similarities as well as disparities between the countries. All countries acted relatively quickly (considering the amount of money redistributed). However, the speed led to implementation problems and targeting errors. Undesirable (dis)incentives also occurred.

Furthermore, almost all measures aimed at electricity bills were set up so that those with high electricity consumption received the most compensation. But since low-income and high-income households in the Nordic countries differ with respect to whether electricity/energy costs constitute a high share of the disposable income, there is no consistent result on distributional effects of these measures. The electricity bill measures also differed as to whether they were implemented as payback measures (retrospective subsidies), tax reductions, or deferral measures. Among the selected measures, only one Danish and one Norwegian measure targeted vulnerable low-income groups. These were also the only ones that implemented an increase in investment subsidies for green technology solutions (i.e., with potentially positive long-term effects on emissions of greenhouse gases). But, as shown in Appendix Table A1 and Table A2, there were more measures introduced that targeted low-income groups. Most of the measures set up also directly affected the electricity price. The literature does, in general, propose that measures directly targeting the price are the least efficient and have the largest conflicts with green transition goals. The Finnish deferral measure for households and businesses is one example of a measure to alleviate the financial burden of the high electricity bills without distorting the price signal or incentives to save energy.

Given the limited data and studies available, the only distributional effect on businesses we can identify is a difference between businesses in different regions. Both Sweden and Norway had a structure that gave explicit or implicit support to certain regions. For Sweden, businesses situated in electricity price zones 3 and 4 were given electricity cost support, whilst northern businesses received nothing in the first round. One consequence of the support ceiling was that large and electricity-intensive businesses received support for a lower share of their total electricity consumption, compared to those who consumed within the ceiling. For Norway, the outcome was that mainly companies in the Southwestern part of Norway received support.

Electricity savings due to price increases, have a positive environmental effect. However, the producers are constrained by emission caps under the EU ETS. Hence, it can be argued that the electricity saving measures (or as here price increase) have little to no effect on climate and environment. In the long term, it is feasible that consumption measures taken today can affect future cap levels through political derogations, and several studies advocate using both demand and supply side measures for the green transition (e.g., ESABCC, 2023b). Of the measures evaluated, the Danish increase in subsidies for disconnecting gas-powered heating, and the Norwegian electricity support for energy savings in businesses, both have the direct potential for long-term reductions in greenhouse gas emissions. As for distributional effects, the literature proposes that adverse effects on climate and environment are best avoided if the price signal remains undisturbed.

None of the evaluations identified had any significant incoherencies with existing policies, but a number of other aspects should be highlighted. Firstly, an important factor for long term effects is whether households and businesses will anticipate similar compensation measures if future price shocks occur. If so, it is perceived that the actors will fail to take action to reduce their vulnerability. At the time of writing, we have not identified any clear signal from the Nordic governments on whether the market interventions taken during 2021–2023 were one-time events, or if they will re-occur, so there is a risk that households and businesses will, anticipate compensation from future price shocks (which has more or less been expressed). As a consequence, households may not be eager to change their behaviour. For Norway, the electricity support to households has been extended through 2024, possibly already creating expectations of a more permanent arrangement.

Furthermore, the analysis is hampered by the politicisation of the measures. For example, the Swedish measure to pause the increased ambition of the fuel reduction mandate was announced as politically desirable by the parties currently governing Sweden long before the 2021–2023 price hike (Kinnunen et.al., 2020). It is therefore possible that the implementation of this measure was only secondarily a crisis handling measure. In addition, the interest in actively reducing income disparities between low- and high-income households is a traditional difference between left/right political parties. The political inclination of the currently

governing party could correspondingly affect how compensation measures are redistributing incomes. This may also be part of the explanation for the degree to which redistribution was made, and how targeted it was towards low-income households.

One interesting aspect that had to be omitted from this analysis was the impact of the compensation measures on national debt. Some of the Nordic countries already had high national debt. With further borrowing comes an increased cost of repayment for the national debt, with potential negative down-stream effects on both income redistribution efforts and environmental efforts. Part of the Swedish support was, however, financed by congestion-based income resulting from high demand and restricted opportunities to transport electricity between geographical areas. This support has no impact the national debt. This aspect would be interesting to investigate further but is beyond the scope of the current report.

Another omitted aspect, which was outside of scope this project, is the effect of the 'do-nothing' option. What would have happened if governments did not engage in any compensation measures at all? One can only speculate, but since governmental bailouts have been hypothesised to have contributed to post-covid inflation in some countries,^[12] it can be suspected that the 'do-nothing' option would have contributed to lower inflation in the Nordic countries and lower governmental debt. From lower inflation, one can speculate a slower speed of central bank interest rate hikes, with lower pressure on heavily mortgaged (Swedish) homeowners. On the flip side, the 'do-nothing' option, could also have contributed to a hike in unemployment rates.

8.2 Alternative measures

From the literature it is possible to identify a number of alternative ways to implement price spike compensation measures, primarily to compensate for household electricity bills. One option is that each household get the same flat support rate, i.e., that each household is paid the same amount regardless of their electricity consumption. This measure can be seen as a support measure that only redistributes the extra earnings from the power companies to the people. Such a measure has been recommended by a number of Norwegian economists (e.g., Skonhoft, 2022), and may be considered more fair as most power companies are government-owned (municipalities, counties and the state). Households that have a lower-than-average electricity consumption would gain more from this measure than from the current measure, which is advantageous in terms of the distributional profile of the measure (progressive). At the same time, this electricity subsidy also provides a better incentive to save on electricity, since consumption is

12. Smialek & Zhang, 2023. <https://www.nytimes.com/2023/04/27/business/economy/what-causes-inflation.html>
The Economist, 2022. <https://www.economist.com/finance-and-economics/2022/12/21/2022-has-been-a-year-of-brutal-inflation>

independent of support and the price signal for electricity scarcity is maintained through the market price. There is a small positive income effect, but increased income will be spent on many things, not just electricity.

Depending on political orientation, such a measure can be modified to become more or less progressive, e.g., such that lower income households are paid more. Some of the applied Danish measures had such characteristics – in being decoupled from energy consumption, but typically targeting specific user groups (e.g., people with children), rather than income based. Both of these approaches are, as such, recommendable as they redistribute according to political orientation, but maintain the price signal fully, and thereby allow for a more efficient market and, if otherwise addressed sufficiently, the long-term societal goals of a green transition.

The challenge of ensuring that compensation measures target the vulnerable population has been highlighted by several other evaluations, for example the international literature cited in section 1.3. If a flat rate support measure is not possible to implement (for whatever reason), an alternative is to amend the current measure so that the support is decoupled from current electricity consumption. This has for example been suggested by Hoel & Golombek (2022). They suggest that the electricity subsidy should be linked to historical electricity consumption, not to current electricity consumption. Their proposal suggests that the sum of the electricity subsidy for all relevant subscribers be calculated as it is currently, monthly. However, instead of distributing the subsidy to the subscribers according to their actual consumption for the month, the amount should be distributed according to the subscribers' consumption for the corresponding calendar month for the previous year. For the vast majority, this will give approximately the same amount of support as the current measure. If, for example, all subscribers in October 2022 use 10 percent less electricity than in October 2021, each subscriber will receive exactly the same amount of support with the revised measure as with the current measure. With this proposal, it will be more profitable to reduce electricity use, since the subscriber will now save the full market price for every kWh that is not used. In practice, there will be a few electricity customers who have very different consumption in 2021 and 2022 (among other factors, due to new subscribers), but it should be possible to create special rules for this group. A requirement for such a measure to work is that it is a one-time event. If it is recurring, it will negatively affect households' incentives to invest in otherwise profitable energy saving measures, cf. the discussion above.

8.3 Conclusions

The compensation measures applied in the Nordic countries differed between countries. Most of the measures did not have positive distributional effects in absolute terms, i.e., effectively redistributing funds to low-income households. Secondly, all the Nordic countries have well developed social security networks and data on vulnerable groups is not difficult to gather for authorities. So, it could have been feasible to target the most vulnerable groups with the supports, but only a few of the measures did. A consideration often levied against such targeted programs is the administrative burden and potential disincentives on the margins of such measures (e.g., where the lines are drawn for who gains and how much). However, such disadvantages must be weighed against the costs of alternatives. Thirdly, most measures diluted the important scarcity message as communicated via the price signal. Fourthly, most measures missed the opportunity for a direct win-win between climate change and price shock alleviation. Only one measure in Denmark and one in Norway expanded on subsidies in green technology solutions, and the risk of Nordic households and businesses anticipating a bail-out from high energy bills in the future is higher now in 2023 than before 2021, implying a risk of higher energy use. Fifth, while some of the measures are to be considered as crisis management measures, and as such are meant only to be temporary, others seem to have gained a more permanent character. For the latter, it is urgent that governments consider the purpose of keeping them and redesign them accordingly, to avoid negatively affecting incentives for increased energy efficiency and reduced energy use. Sixth, looking at alternative designs for possible future crisis compensation measures, flat rate transfer-, and price- and consumption-decoupled measures are considered more effective than most of the implemented measures thus far.

References

- Amaglobeli, D., Hanedar, E., Hee Hong, G., & Thevenot, C. (2022). *Fiscal Policy for Mitigating the Social Impact of High Energy and Food Prices*. IMF. <https://www.imf.org/en/Publications/IMF-Notes/Issues/2022/06/07/Fiscal-Policy-for-Mitigating-the-Social-Impact-of-High-Energy-and-Food-Prices-519013>
- Ari, M. A., Arregui, M. N., Black, M. S., Celasun, O., Iakova, M. D. M., Mineshima, M. A., Mylonas, M. V., Parry, I. W., Teodoru, I., & Zhunussova, K. (2022). *Surging energy prices in Europe in the aftermath of the war: How to support the vulnerable and speed up the transition away from fossil fuels*. International Monetary Fund.
- Blake, H., & Bulman, T. (2022). *Surging energy prices are hitting everyone, but which households are more exposed?* ECOSCOPE. <https://oecd ecoscope.blog/2022/05/10/surging-energy-prices-are-hitting-everyone-but-which-households-are-more-exposed/>
- Bruegel. (2023). *National fiscal policy responses to the energy crisis*. Bruegel | The Brussels-Based Economic Think Tank. <https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices>
- Charlier, D., & Legendre, B. (2021). Fuel poverty in industrialized countries: Definition, measures and policy implications a review. *Energy*, 236, 121557. <https://doi.org/10.1016/j.energy.2021.121557>
- Dalen, H. M., & Halvorsen, B. (2022). Økonomiske konsekvenser av høye kraftpriser og strømstønad: En empirisk studie av stønadsberettigede husholdninger, jordbruks- og veksthusforetak. In *Økonomiske konsekvenser av høye kraftpriser og strømstønad: En empirisk studie av stønadsberettigede husholdninger, jordbruks- og veksthusforetak: Dalen, Hanne Marit/ uHalvorsen, Bente*. [Oslo]: Statistisk sentralbyrå.
- Department for Business, Energy & Industrial Strategy. (2021). *Review of the schemes to compensate energy intensive industries for indirect emission costs in electricity prices*. GOV.UK. <https://www.gov.uk/government/consultations/review-of-the-schemes-to-compensate-energy-intensive-industries-for-indirect-emission-costs-in-electricity-prices>
- Energiforsk. (2022). *Lowering prices in a hurry – Electricity prices in the wake of Russia's invasion of Ukraine*. <https://energiforsk.se/program/nordeuropeiska-energiperspektiv-nepp/rapporter/electricity-savings-will-prevail-lowering-electricity-prices-in-the-wake-of-russias-invasion-of-ukraine/>
- Energitilskuddsordningen. (2023). *Statistikk for Energitilskuddsordningen*. <https://www.energitilskuddsordningen.no/statistikk-for-energitilskuddsordningen>

- Espey, J. A., & Espey, M. (2004). Turning on the Lights: A Meta-Analysis of Residential Electricity Demand Elasticities. *Journal of Agricultural and Applied Economics*, 36(1). <https://econpapers.repec.org/article/agsjoaaec/42897.htm>
- Eurofound. (2023). *Just transition | European Foundation for the Improvement of Living and Working Conditions*. <https://www.eurofound.europa.eu/en/topic/just-transition>
- European Commission. (n.d.a). *Just Transition Fund*. https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/just-transition-fund_en
- European Commission. (n.d.b). *What is the Innovation Fund?* https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund/what-innovation-fund_en
- European Council. (2023). *Energikrisen: Samordnade EU-åtgärder för lägre energiräkningar*. <https://www.consilium.europa.eu/sv/infographics/eu-measures-to-cut-down-energy-bills/>
- European Parliament. (2020). *Energy security in the EU's external policy: In depth analysis*. Publications Office. <https://data.europa.eu/doi/10.2861/10775>
- European Scientific Advisory Board on Climate Change. (2023). *Addressing the energy crisis while delivering on EU's climate objectives: Recommendations to policy makers*. <https://climate-advisory-board.europa.eu/reports-and-publications/addressing-the-energy-crisis-while-delivering-on-eus-climate-objectives-recommendations-to-policy-makers>
- EUROSTAT. (2021). *Owning or renting? What is the EU's housing situation?* <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/wdn-20211230-1>
- Favero, A., Daigneault, A., & Sohngen, B. (2020). Forests: Carbon sequestration, biomass energy, or both? *Science Advances*, 6(13), eaay6792. <https://doi.org/10.1126/sciadv.aay6792>
- Finansministeriet. (2022). *Aftale om vinterhjælp*. Regeringen.dk. <https://www.regeringen.dk/aktuelt/tidligere-publikationer/aftale-om-vinterhjælp/>
- Finnish Government. (2022). *Kotitalouksille tukea suuriin sähkölaskuihin*. Valtioneuvosto. <https://valtioneuvosto.fi/-/10623/kotitalouksille-tukea-suuriin-sahkolaskuihin>
- Finnish Government. (2023). *Acts on retroactive reimbursement for electricity costs and extended payment periods of electricity bills enter into force next week*. Valtioneuvosto. <https://valtioneuvosto.fi/en/-/1410877/acts-on-retroactive-reimbursement-for-electricity-costs-and-extended-payment-periods-of-electricity-bills-enter-into-force-next-week>

- Finnish Parliament. (2022). *HE 204/2022 vp*.
https://www.eduskunta.fi:443/FI/vaski/HallituksenEsitys/Sivut/HE_204+2022.aspx
- Fortum. (2023). *Våra fyra elområden*. Fortum.
<https://www.fortum.se/privat/elavtal/elpriser/vara-fyra-elomraden>
- Goulder, L. H., & Parry, I. W. H. (2008). Instrument Choice in Environmental Policy. *Review of Environmental Economics and Policy*, 2(2), 152–174.
<https://doi.org/10.1093/reep/ren005>
- Gröna Mobilister. (2019). *Bilkörandet minskar i storstaden men ökar på landsbygden*. Mynewsdesk.
https://www.mynewsdesk.com/se/grona_bilister/pressreleases/bilkoerandet-minskar-i-storstaden-men-oekar-paa-landsbygden-2892319
- Guan, Y., Yan, J., Shan, Y., Zhou, Y., Hang, Y., Li, R., Liu, Y., Liu, B., Nie, Q., Bruckner, B., Feng, K., & Hubacek, K. (2023). Burden of the global energy price crisis on households. *Nature Energy*, 8(3), 304–316. <https://doi.org/10.1038/s41560-023-01209-8>
- Gustafsson, M., Lindén, J., Forsberg, B., Åström, S., & MM Johansson, E. (2022). *Quantification of population exposure to NO₂, PM₁₀ and PM_{2.5}, and estimated health impacts 2019*. IVL Svenska Miljöinstitutet.
- Halkos, G. E., & Gkampoura, E.-C. (2021). Evaluating the effect of economic crisis on energy poverty in Europe. *Renewable and Sustainable Energy Reviews*, 144, 110981. <https://doi.org/10.1016/j.rser.2021.110981>
- Haug, M. (2004). Do Campaigns Really Change Behavior? *Nordicom Review*, 25(1–2), 277–290. <https://doi.org/10.1515/nor-2017-0286>
- Hoel, M., & Golombek, R. (2022). *Strømstøtten bør knyttes til historisk strømforbruk*.
<https://www.aftenposten.no/meninger/kronikk/i/V9Kqp3/stroemstoetten-boer-knyttes-til-historisk-stroemforbruk>
- Holm, F., Wahlström, Å., Persson, A., Gråd, E., Andersson, P., Malinen, F., Engdahl, N., Gräas, C., Sharifi, M., & Guldbrand, M. (2023). *El och energi—Vad har svenska folket egentligen koll på?*
- Hulme, M. (2009). *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press.
<https://doi.org/10.1017/CBO9780511841200>
- IEEP. (2023). *Who took the burden of the energy crisis?*
<https://ieep.eu/publications/who-took-the-burden-of-the-energy-crisis/>
- Intergovernmental Panel on Climate Change. (2022). *Climate Change 2022: Mitigation of Climate Change. Chapter 3: Mitigation pathways compatible with long-term goals*. <https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-3/>

Kalkuhl, M., Flachsland, C., Knopf, B., Amberg, M., Bergmann, T., Kellner, M., Stüber, S., Haywood, L., Roolfs, C., & Edenhofer, O. (2022). *Effects of the Energy Price Crisis on Households in Germany*. MCC.

Kinnunen et.al. (2020). *Med anledning av prop. 2020/21:180 Reduktionsplikt för bensin och diesel – kontrollstation 2019 (Motion 2020/21:4043 av Martin Kinnunen m.fl. (SD))*. https://www.riksdagen.se/sv/dokument-och-lagar/dokument/motion/med-anledning-av-prop.-202021180-reduktionsplikt_h8024043/

Kolstad, C. (2011). *Intermediate environmental economics: International edition*. Oxford university press.

Konjunkturinstitutet. (2023). *Fördelningseffekter av klimatpolitiken hanteras bäst med annan politik—Konjunkturinstitutet* [Text]. <https://www.konj.se/publikationer/miljoekonomisk-rapport/miljoekonomisk-rapport/2023-12-06-fordelningseffekter-av-klimatpolitiken-hanteras-bast-med-annan-politik.html>

Kruse-Andersen, P. K., & Sørensen, P. B. (2022). Optimal carbon taxation in EU frontrunner countries: Coordinating with the EU ETS and addressing leakage. *Climate Policy*, 0(0), 1–13. <https://doi.org/10.1080/14693062.2022.2145259>

Lipsey, R. G., & Lancaster, K. (1956). The General Theory of Second Best 1. *The Review of Economic Studies*, 24(1), 11–32. <https://doi.org/10.2307/2296233>

Löfgren, Å., & Rootzén, J. (2021). Brick by brick: Governing industry decarbonization in the face of uncertainty and risk. *Environmental Innovation and Societal Transitions*, 40, 189–202. <https://doi.org/10.1016/j.eist.2021.07.002>

Lowans, C., Furszyfer Del Rio, D., Sovacool, B. K., Rooney, D., & Foley, A. M. (2021). What is the state of the art in energy and transport poverty metrics? A critical and comprehensive review. *Energy Economics*, 101, 105360. <https://doi.org/10.1016/j.eneco.2021.105360>

Menyhert, B. (2022). *The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU*. JRC Publications Repository. <https://doi.org/10.2760/418422>

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, 2(2), 175–220. <https://doi.org/10.1037/1089-2680.2.2.175>

Owens, S., & Driffill, L. (2008). How to change attitudes and behaviours in the context of energy. *Energy Policy*, 36(12), 4412–4418. <https://doi.org/10.1016/j.enpol.2008.09.031>

Perman, R. (2003). *Natural resource and environmental economics*. Pearson Education.

- Regeringskansliet. (2023). *Frågor och svar om elstöd till hushåll* [Text]. Regeringskansliet; Regeringen och Regeringskansliet. <https://www.regeringen.se/regeringens-politik/energikrisen/elstod-hushall/>
- Regjeringen. (2022). *Nå kommer hjelpen til de mest strømutsatte bedriftene* [Pressemelding]. <https://www.regjeringen.no/no/aktuelt/stromtiltak-for-naringslivet-vilkar-og-avgrensninger/id2930025/>
- Samuelson, P. A. (Paul A. (2010). *Economics* (19. ed.). Boston: McGraw-Hill Irwin.
- Savolahti, M., Lehtomäki, H., Karvosenoja, N., Paunu, V.-V., Korhonen, A., Kukkonen, J., Kupiainen, K., Kangas, L., Karppinen, A., & Hänninen, O. (2019). Residential Wood Combustion in Finland: PM2.5 Emissions and Health Impacts with and without Abatement Measures. *International Journal of Environmental Research and Public Health*, 16(16). <https://doi.org/10.3390/ijerph16162920>
- Silbye, F., & Sørensen, P. B. (2019). National climate policies and the European emissions trading system. *Climate Policies in the Nordics. Nordic Economic Policy Review*, 2019, 63–111.
- Skatteministeriet. (2020). *Skatteøkonomisk Redegørelse 2019—Skatteministeriet*. <https://skm.dk/aktuelt/publikationer/rapporter/skatteoekonomisk-redegoerelse-2019>
- Skonhoft, A. (2022). *Flat strømstøtte er best! | Samfunnsøkonomen*. https://www.samfunnsokonomen.no/journal/2022/6/m-303/Flat_str%C3%B8mst%C3%B8tte_er_best!
- Smialek, J., & Zhang, C. (2023). Inflation Is Still High. What's Driving It Has Changed. *The New York Times*. <https://www.nytimes.com/2023/04/27/business/economy/what-causes-inflation.html>
- Statistiska Centralbyrån. (2017). *Låginkomsttagare bor ofta i hyresrätt*. Statistiska Centralbyrån. <https://www.scb.se/hitta-statistik/artiklar/2017/Laginkomsttagare-bor-ofta-i-hyresratt/>
- Steckel, J. C., Missbach, L., Ohlendorf, N., Feindt, S., & Kalkuhl, M. (2022). *Effects of the Energy Price Crisis on European Households*. Mercator Research Institute on Global Commons and Climate Change, Berlin.
- Sterner, T., & Coria, J. (2013). *Policy instruments for environmental and natural resource management*. Routledge.
- Svenska Dagbladet. (2022). Ekonomer: Villor behöver inget elstöd. *Svenska Dagbladet*. <https://www.svd.se/a/JQr91P/tunga-ekonomer-villaagare-behover-ingen-elstod>

Svenska Kraftnät. (2023). *Höga och varierande elpriser – vad påverkar och varför?*
<https://www.svk.se/press-och-nyheter/temasidor/tema-elmarknad-och-elpriser/hoga-och-varierande-elpriser--vad-paverkar-och-varfor/>

Sveriges Riksdag. (2023). *Förordning (2023:233) om elstöd till företag.*
https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/forordning-2023233-om-elstod-till-foretag_sfs-2023-233/

Swedish Energy Agency. (2022). *Reduktionsplikten är avgörande för att nå Sveriges energi- och klimatmål.*
<https://www.energimyndigheten.se/nyhetsarkiv/2022/reduktionsplikten-ar-avgorande-for-att-na-sveriges-energi--och-klimatmal/>

Swedish Energy Agency. (2023). *Reduktionsplikt.* Energimyndigheten.
<https://www.energimyndigheten.se/fornybart/hallbarhetskriterier/reduktionsplikt/>

Swedish Environmental Protection Agency. (2023a). *Marknadsstabilitetsreserv.*
<https://www.naturvardsverket.se/amnesomraden/utslappshandel/marknadsstabilitetsreserv/>

Swedish Environmental Protection Agency. (2023b). *Sveriges klimatmål och klimatpolitiska ramverk.*
<https://www.naturvardsverket.se/amnesomraden/klimatomställningen/sveriges-klimatarbete/sveriges-klimatmal-och-klimatpolitiska-ramverk/>

The Economist. (2022). 2022 has been a year of brutal inflation. *The Economist.*
<https://www.economist.com/finance-and-economics/2022/12/21/2022-has-been-a-year-of-brutal-inflation>

The Finnish Tax Administration. (2023). *Tax credit for electricity.* Vero.Fi.
<https://www.vero.fi/en/individuals/tax-cards-and-tax-returns/deductions/tax-credit-for-electricity/>

Yle. (2023). *Valtiolle satojen miljoonien "säästö": Sähkötukien piti olla yli miljardin euron potti, mutta kokonaissumma jääkin alle puoleen.* Yle Uutiset.
<https://yle.fi/a/74-20028246>

Appendix

Table A1 Implemented compensation measures for households in Denmark, Sweden, Norway, and Finland.

Measure type	Denmark	Sweden	Norway	Finland
Subsidy/Grant/Cheque	Temporary increase in child and youth benefit: A one-off increase in the child and youth allowance in 2023 by DKK 660 per child. A total of DKK 600 million is set aside for the initiative. The full amount was paid in January 2023.		Support for students: Stream grant of NOK 1500 for students in addition to ordinary electricity subsidy	-
	Temporary relaxation of the maximum employment deduction: The maximum employment deduction is increased in 2022 and 2023.	Gas-price support: Gas-price support for households connected to the West-Swedish gas network. A compensation of 79 öre/kWh in the period between October 2021–September 2022 is paid out.	Support for energy efficiency: The government has increased the allocation to Enova by NOK 750 million to benefit both business and private individuals.	-
	Increased earning thresholds for receivers of student grants: An advancement of the increase of the earning thresholds for receivers of student grants by DKK 4,000 per month.	Electricity support: 80% of the average electricity cost that was above the reference price of 75 öre/kWh is compensated. The support in the first round was limited to 18.000 kWh and unlimited in the second round. The support is equal within each of the four electricity areas. With this reference price, the first electricity support affected areas 3 & 4, while the second electricity support supported all four areas.	Electricity support: When the average market price exceeds 70 øre per kilowatt hour (kWh), the state will pay 90 per cent of the power price above this level from September 2022 to March 2023, as well as a benefit rate of 80 per cent from and with April up to and including September 2023 and a benefit rate of 90 per cent from and including October up to and including December 2023.	Retroactive reimbursement: Consumers whose electricity contract exceeds 10 cents/kWh as well as end consumers that have an electricity contract based on spot prices are compensated. The reimbursement is paid over four winter months for 50 per cent of the part of consumers' electricity bills that exceeds the threshold of EUR 90/month. The maximum reimbursement is EUR 700 per month.

Tax reduction	Electricity tax reduction: In the first half of 2023, the general electricity tax of 69.7 øre per kWh was temporarily reduced to the EU's minimum rate of 0.8 øre per kWh.	-	Electricity tax reduction: For 2022, the general rate electricity tax was reduced by 8 øre per kWh for the months January to March and by 1.5 øre per kWh for the months April to December, compared with price-adjusted 2021 rates. This was a real fee reduction of 47 per cent for the winter months and 9 per cent for the rest of the year respectively. The rates have stayed unchanged in 2023.	Lowering VAT: Lowering of the value-added electricity tax from 24% to 10%
Support for disadvantaged/low-income households	Targeted heat check: The check is given to households with heating sources which is particularly exposed to price hikes. Only households with a yearly income of maximum DKK 598.000 are qualified for the heat check, to target households with a need.	-	Increased housing benefit: Increased income limit to be eligible for receiving the benefit until June 2023. Also, an additional 1.500 NOK is paid out January–April 2023.	Fixed term tax credit: If you do not qualify for the tax credit from the Tax Administration, you can apply for assistance with electricity costs from Kela. The amount of the assistance is 60% of the amount of the electricity bill, excluding the cost of electricity transmission and the own liability of EUR 400. The maximum support is 660 € per month.
	Funds for vulnerable citizens: The municipalities are given the possibility to increase the financial assistance for example to pensioners and services to cash assistance receivers, to compensate these citizens.	-	Support for energy efficiency: The government has allocated NOK 260 million in grants for energy measures through the Housing Bank in 2023. The grant will go to measures that reduce energy needs in municipally owned rental housing, care homes and nursing homes. The investment will, among other things, benefit disadvantaged people on the housing market.	-
	Temporary increase in financial support for elderly: Recipients of the elderly check receive a tax-free lump sum of DKK 2,500 in both 2022 and 2023.	-	-	-

	Lump sum to certain transfer recipients: A tax-free lump sum of DKK 2,000 to several transfer recipients who have withdrawn from the labour market.	-	-	-
	Lump sum for receivers of student grants with disabilities or single parents: A tax-free lump sum of DKK 2,000 in 2022 to SU recipients who receive student disability allowance or student allowance as a single parent.	-	-	-
Deferral schemes	Freezing scheme for households: Households are offered a temporary and voluntary freezing scheme for electricity costs, gas, and district heating above a ceiling. The households repay the frozen amount to the energy company over a period of 4 years, when a freezing period of 12 months has expired.	-	-	Extending the payment period for electricity bills: Customers are granted an extended payment period of up to 120 days from the original payment date of the bill.
Other	Relaxed reduction mandates for fuels: The long-term emission reduction target from fuel gasoline and diesel use is 28% and 66% respectively by 2030. The compensation measure was to relax these targets, and instead keep them unchanged for gasoline and diesel through 2023. Additionally, there is a political agreement to lower the reduction mandates for gasoline and diesel to 6% from January 1, 2024, through 2026. For aviation kerosene, the reduction level is set at 2.6% for the year 2023			

Table A3 Implemented compensation measures for businesses in Denmark, Sweden, Norway, and Finland.

Measure type	Denmark	Sweden	Norway	Finland
Subsidy/Grant/Cheque	Increase in subsidies for decoupling the gas network: An additional DKK 139 million is set aside with the agreement. DKK for subsidies for decoupling the gas network in 2023. The decoupling scheme allows private residences to cover the fee that Evida (Danish Gas Distribution Operator) charges for removing the gas meter and disconnecting a household that is heated with a gas boiler from the gas system, if the customer wishes to replace their gas boiler with an alternative heat source.	Electricity support for electricity-intensive companies: Electricity-intensive companies receive support for the part of the electricity costs during the period October–December 2022 that exceeds one and a half times the company's average price in 2021. The electricity cost support is aimed at companies throughout Sweden that had an electricity consumption of at least 0.015 kWh per turnover SEK in 2021 (excluding heating). In addition, the company's estimated support must amount to at least SEK 50,000.	Grant-support for businesses: Businesses with at least 3 percent electricity intensity can apply for grants to pay the electricity bill and to invest in energy measures.	-
	-	Electricity support for companies: Companies with an outlet point in electricity area 3/4 can receive 50/79 öre up to a maximum of 20 MSEK. The size of the support depends on the consumption in the period 1. October 2021–30. September 2022.	Electricity support-scheme: Agricultural enterprises, greenhouses and irrigation teams receive a compensation of 80% of the electricity price above 70 øre per kWh up to 60.000 kWh per month. The support will last until 2024.	-
Tax reduction	-	Temporary tax reduction on agricultural diesel: 0% until the end of 2023	Electricity tax reduction: For 2022, the general rate electricity tax was reduced by 8 øre per kWh for the months January to March and by 1.5 øre per kWh for the months April to December, compared with price-adjusted 2021 rates. This was a real fee reduction of 47 per cent for the winter months and 9 per cent for the rest of the year respectively. The rates have stayed unchanged in 2023.	Lowering the value-added tax on electricity to 10 per cent: The value-added tax on electricity has been lowered from 24 to 10 per cent between 1 December 2022 and 30 April 2023.

Deferral schemes	Freezing scheme for companies: Companies and associations are offered a temporary and voluntary freezing scheme for energy companies. The scheme offers the possibility to freeze energy bills over an established ceiling, for a period of 12 months, followed by a payback period of four years. In contrast with the schemes for households, the companies themselves pay the financing costs of the scheme through an interest rate on the loan.	-	Loan guarantee: The guarantee applies to loans granted by the end of March 2023, with a duration of up to 6 years. The upper limit for the loan amount is NOK 50 million per company/group.	Extending the payment period for electricity bills: Businesses may be granted an extended payment period of up to 60 days. The electricity company may charge an annual interest rate of 1.53 per cent from a business for the extended payment period.
Other	Relaxed reduction mandates for fuels: The long-term emission reduction target from fuel gasoline and diesel use is 28% and 66% respectively by 2030. The compensation measure was to relax these targets, and instead keep them unchanged for gasoline and diesel through 2023. Additionally, there is a political agreement to lower the reduction mandates for gasoline and diesel to 6% from January 1, 2024, through 2026. For aviation kerosene, the reduction level is set at 2.6% for the year 2023			

About this publication

Policy measures to compensate for increasing costs of energy: Impacts on equity, climate, and the environment

Erik Gråd, Henrik Lindhjem, Jette Bredahl Jacobsen, Alexander Eriksson, Stefan Åström, Erika Karttinen, Niels Baumert, Christian Fromberg

TemaNord 2024:527

ISBN 978-92-893-7817-8 (PDF)

ISBN 978-92-893-7818-5 (ONLINE)

<http://dx.doi.org/10.6027/temanord2024-517>

© Nordic Council of Ministers 2024

Cover photo: Aleksi Partanen/Unsplash

Published: 15/3/2024

Disclaimer

This publication was funded by the Nordic Council of Ministers. However, the content does not necessarily reflect the Nordic Council of Ministers' views, opinions, attitudes or recommendations.

Rights and permissions

This work is made available under the Creative Commons Attribution 4.0 International license (CC BY 4.0) <https://creativecommons.org/licenses/by/4.0>.

Translations: If you translate this work, please include the following disclaimer: This translation was not produced by the Nordic Council of Ministers and should not be construed as official. The Nordic Council of Ministers cannot be held responsible for the translation or any errors in it.

Adaptations: If you adapt this work, please include the following disclaimer along with the attribution: This is an adaptation of an original work by the Nordic Council of Ministers. Responsibility for the views and opinions expressed in the adaptation rests solely with its author(s). The views and opinions in this adaptation have not been approved by the Nordic Council of Ministers.

Third-party content: The Nordic Council of Ministers does not necessarily own every single part of this work. The Nordic Council of Ministers cannot, therefore, guarantee that the reuse of third-party content does not infringe the copyright of the third party. If you wish to reuse any third-party content, you bear the risks associated with any such rights violations. You are responsible for determining

whether there is a need to obtain permission for the use of third-party content, and if so, for obtaining the relevant permission from the copyright holder. Examples of third-party content may include, but are not limited to, tables, figures or images.

Photo rights (further permission required for reuse):

Any queries regarding rights and licences should be addressed to:
Nordic Council of Ministers/Publication Unit
Ved Stranden 18
DK-1061 Copenhagen
Denmark
pub@norden.org

Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

The Nordic Council of Ministers
Nordens Hus
Ved Stranden 18
DK-1061 Copenhagen
pub@norden.org

Read more Nordic publications on www.norden.org/publications