smartEn
Smart Energy Europe

The smartEn Map

Peak Demand Reduction Measures   **2023**

Reduce national peak consumption by 5%... and more

Demand Response Benefits

- **For participants:** up to 15% energy savings, a free solution reducing bills.

- **For all energy customers:** demand reduction lowers power prices and electric system costs.

- **For power systems:** reliability, CO2 reduction, higher share of renewables in the energy mix.

Voltalis: an energy efficiency and purchasing power solution for all consumers in Europe

- Totally free solution, including hardware and energy management services.

- Over 1.2 million electrical appliances already connected and participating in our daily operations.

- Homes and buildings, in particular all kind of electric heating and cooling (heaters, heat pumps, aircon...).

Voltalis

The Leading Residential Demand Response & Flexibility Agregator

smartEn is the European business association for digital and decentralised energy solutions. Our members include innovators in services and technology for energy and data management, finance, and research. By taking an integrated perspective on the interaction of demand and supply, our mission is to promote system efficiency, encourage innovation and diversity, empower energy consumers, and drive the decarbonisation of the energy sector.

For further information please visit **www.smarten.eu**

About smartEn

We also thank all smartEn Members for their invaluable contributions and feedback.

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smart energy manager for a sustainable future

Energy Pool is a key player in the energy transition, providing **advanced services and software solutions for optimizing distributed energy resources**, including consumers, renewables and electricity storage solutions.

Energy Pool

energy-pool.eu

Michael Villa
Executive Director, smartEn

The European Union has been grappling with a profound shock to the energy system that has affected both its citizens and the economy at large. This disruption has been instigated by several factors, leading to a substantial surge in energy prices. Ensuring affordable and secure energy supply has more than ever become a paramount concern for European policymakers.

In response, the EU adopted the REPowerEU Initiative in spring 2022, and swiftly adopted the emergency Regulation (EU) 2022/1854 to address the high energy prices for the 2022/2023 winter, anticipating further price increases and significant volatility. The Regulation included several measures for Member States, including a mandatory 5% reduction target of electricity consumption during peak hours. Such a target has highlighted the pivotal role of demand-side flexibility as a priority, reliable and immediate response to the crisis, recognising the benefits of engaging consumers and harnessing their flexibility at times where it is most needed. Such benefits were quantified in a *smartEn* publication[1] which found that by fully activating demand-side flexibility, the EU could harvest 300 billion euro in indirect benefits to people, communities, and businesses by 2030. These benefits would result from cheaper energy prices, reduced investment needs for grid infrastructure, and reduced carbon emissions.

This edition of the smartEn Map looks at those measures introduced by European countries to reduce peak demand through explicit demand response over the 2022/2023 winter in order to comply with the emergency mandatory peak demand reduction target. Experiences show that the activation of demand-side flexibility is a cost-effective and environmentally-friendly solution to address high energy prices and support the system in emergency situations.

In spring 2023, the European Commission proposed a revision of the Electricity Market Design to address some of the systemic failures that led to the energy crisis. It notably proposed to transform the 5% reduction in peak electricity demand from an emergency measure to a structural, market-based feature. This would be a crucial evolution as peak fluctuations will increasingly occur in a flexible and renewables-based electricity system. The introduction of a peak reduction product as an additional avenue for demand-side flexibility could provide an opportunity to engage a large sector of consumers and facilitate their access to a wide range of services and markets.

The 2023 smartEn Map illustrates the first attempts made by Member States in introducing such peak demand reduction products. It emphasises the insights gained throughout this process, as well as the barriers that could hinder wide consumer participation. Furthermore, it identifies good practices that involve all types of consumers and technologies, and how they enable them to actively support the European energy system and help overcome the energy crisis. This report offers valuable insights that can inform the development of similar products for the winter 2023/2024 and their introduction as a permanent feature of the electricity market.

Stefan Dörig
Chair, smartEn

[1] "2030 Demand Side Flexibility. Quantification of benefits in the EU", DNV, smartEn, 2022. https://smarten.eu/wp-content/uploads/2022/09/SmartEN-DSF-benefits-2030-Report_DIGITAL.pdf

Mapping the peak demand reduction measures across Europe

OUR SCOPE AND PURPOSE

The *smartEn Map Peak Demand Reduction Measures 2023* provides a detailed picture of the implementation of the Council Regulation 2022/1854 to address high energy prices during the winter 2022/2023. It aims at highlighting the measures introduced by European countries to reduce their electricity consumption during peak-hours. The scope of this report focuses exclusively on dedicated demand reduction programmes. This report seeks to answer the following questions:

1 **In which context was the measure introduced / Which actions were undertaken before its introduction?**

2 **What are the key design features of the measure?**

3 **Was the measure effective to reduce electricity consumption during peak hours?**

4 **Will the measure be extended or improved for the winter 2023/24?**

The objectives of this edition of the *smartEn Map* is to provide an accurate assessment of the variety of measures introduced. We aim to shed light on the best practices on the optimal use of demand-side flexibility to reduce electricity consumption during peak hours. In doing so, we aim to provide guidelines for the introduction on a permanent basis of similar peak shaving products to create favourable conditions for citizens and to drive a cost-effective energy transition and contribute to a reliable, affordable, and efficient energy system for everyone.

The information and grading contained in this report is accurate at the date of publishing (September 2023). This report is not intended as a tool for companies to base their investment decisions on, but as a reference material on which to start and support those decision.

OUR METHODOLOGY AND SCORING SYSTEM

Every year, we review our methodology and approach to the *smartEn Map*. The topics we deal with vary significantly from year to year, and so do our sources and scoring system, to adapt the specificities of each topic.

For the *smartEn Map* Peak *Demand Reduction Measures 2023,* we have collected data from across the industry and from a wide selection of countries. We approached TSOs, National Regulators, Economic and Energy Ministries, independent aggregators, energy service and technology providers, and other associations.

To accompany, verify and complete the primary research conducted through a questionnaire, we complemented each chapter with thorough secondary research. The findings of this report were reviewed internally, with the smartEn membership, and externally with a wide range of actors to ensure the quality and accuracy of the outcomes.

The scoring methodology in this report was designed to give an overview and a basis for comparing differing programmes and measures. For this reason, the grade should not be taken as a final judgment of the country as it is accompanied by a text that describes its strengths and weaknesses.

The grading is performed on a high-level assessment based on the outcomes of our research. Not all categories are graded equally, since their importance varies on the overall goal of this *smartEn Map*. The final objective is to score highly those countries where market-based measures open to all types of consumers were implemented that showed to be efficient in achieving the 5% peak demand reduction targeted.

OUR RANKING

Our ranking is based on four categories: peak demand reductions measure, design features of the measure, effectiveness of the measure, initiatives for the winter 2023/2024. Alongside the aggregated grading of countries, it also allows the mapping of countries per category.

The smartEn Map scoring system

CATEGORY	DESCRIPTION	SCORING SYSTEM
Peak demand reduction measure	■ Type of measure introduced ■ Market-based measure ■ The responsible parties to introduce and execute the measure ■ Resource adequacy assessments performed ■ Communication campaigns ■ National consultation performed	**1 =** No resource adequacy assessment. Mandatory or non-market based measure and/or no remuneration per activation **2 =** Identification of peak hours linked to a resource adequacy assessment. Communication campaign on peak-hours consumption. Market-based measure **3 =** Lauch of a comprehensive communication campaign on the measure **4 =** Organisation of a national consultion prior to the measure introduction
Design features of the measure	■ Type of consumers and technologies that can participate ■ Stackability of products ■ Minimum bid sizes ■ Possibility of aggregation ■ Payment and penalties	**1 =** Communication of an event without remuneration **2 =** Implicit or explicit measure only open to some types of consumers with significant technical and/or administrative barriers **3 =** Implicit or explicit measures open and remunerating with mild technical and/or administrative barriers **4 =** Explicit measures open and remunerating all type of actors with only small/no significant barriers
Effectiveness of the measure	■ Capacity procured and activated by SOs ■ Correlation between the measure and the reduction of demand ■ Difference between the targeted and the activated volume ■ Number of participant and the types of consumers and assets	**1 =** 0-10% of volumes or no correlation with reduction of demand **2 =** 10-50 % of volumes and/or only industrial consumers, and reduction of demand not directly correlated to measure **3 =** 50-75 % of volumes and/or a wide variety of consumer types **4 =** 75-100% of volumes
Initiatives for winter 2023/24 and beyond	■ Post-emergency national assessment performed ■ Introduction of permanent measures ■ Improvement planned on the 2022/23 measure ■ New measure planned	**1 =** No expected extension nor implementation of new measure **2 =** National consultion on-going **3 =** Expected extention and/or expansion of already implemented market-based measure **4 =** Expected extention and/or expansion of already implemented market-based measure coupled with a critial assessment of the winter 2022/23 measure

Overview

In September 2022 the European Union (EU) adopted the Council Regulation 2022/1854[2] to address high energy prices. This proposal included a mandatory national 5% reduction target of electricity consumption during peak hours. Member States, through their transmission system operators (TSOs) were responsible for identifying peak hours corresponding to 10% of the overall hours of the period between 1 December 2022 and 31 March 2023. The demand reduction target was meant to apply to the identified peak hours.

Member States had freedom on how to implement this target, as long as the measures were market-based and their effectiveness measurable and linked to the identified 10% peak hours. smartEn proposed in October 2022 four potential implementation measures including from dedicated TSO and distribution system operator (DSO) products and the opening of wholesale markets to demand-side participation[3]. Over 20 European countries introduced measures addressing consumption during the Winter 2022/23, but only eight (one of them being Great Britain, and not bound to the EU Regulation) countries implemented products that could be considered peak demand reduction products.

For this edition of the smartEn Map we analysed these measures, their effectiveness in reaching the targets set out, and the way they engaged and rewarded consumers for their actions. The objective of this map is to inform the reader on the development of similar products for the winter 2023/24 and/or their introduction as a permanent feature of the electricity markets.

The development of the EU Regulation and introduction of such concrete measures in such a short period of time was a major achievement by the European Commission. Member States were pressed to develop and implement their programmes also within a brief timeframe. This was a significant feat. It shines a light on those countries that succeeded, but also on the dangers that a rushed design can pose on the development of demand-side flexibility (DSF). Maybe one of the important lessons from this process that implementation of the measures at Member State level was rushed, with only two months between the adoption of the Regulation and the beginning of the winter. The second main takeaway is the very diverse nature of the measures implemented, which makes it difficult to compare them (probably more so than any previous smartEn map), but which also speaks to the ingenuity of those that implemented them and the big breadth of roles and services that DSF can fulfil.

The measures that stand out do so due to a combination of factors. They are market-based, involve the activity of suppliers or independent aggregators to contact consumers, provide remuneration for the actions of consumers, and were effective, showing a direct correlation between the requests for activation and the decrease of electricity demand in the selected periods.

NON-EU COUNTRIES:

■ It might surprise the reader to find some non-EU countries within a publication that focuses on the implementation of an EU Council Regulation. These countries (Great Britain, Norway, and Switzerland) were included in this report for two reasons. First, they implemented measures that are comparable to those required by the EU Council Regulation to address the high energy prices that were expected during the 2022/23 winter. Second, these countries find themselves in the orbit of the EU, synchronised with its markets and historically adopting similar decisions as in the EU. This allows us to analyse and learn from the EU's neighbours, trying to improve the measures implemented in the future. Looking further afield, in June 2023, smartEn published a Spotlight examining some programmes outside the continent.

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[2] Council Regulation (EU) 2022/1854 of 6 October 2022 on an emergency intervention to address high energy prices (OJ L 261 I, 7.10.2022, pp. 1–21). [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022PC0473]

[3] https://smarten.eu/guideline-l-5-electricity-peak-demand-reduction-target-how-to-implement-it/

Countries that have performed best include Austria and Ireland and outside of the EU, Great Britain. The main reason for their success can be found in the variety of consumers that their measures were addressed at. This highlights the importance of engaging a combination of industrial, commercial and residential consumers in the success of DSF schemes. In particular residential consumers that represent half of the European winter peak electricity consumption[4]. The Austrian mechanism stands out with low technical and bureaucratic participation requirements. While the Irish mechanism showed how the product design could not only engage the TSO, as most countries did, but also address local congestions through the DSO.

These cases notwithstanding, no country truly excelled in their product design, with room for improvement in all of them. However, as mentioned before, due to the short period of implementation, this can be expected, and the forthcoming measures for the 2023/2024 winter (for those countries implementing them), or the introduction of peak demand measures on a permanent basis, opens up a great opportunity to learn from the experiences reflected in this publication.
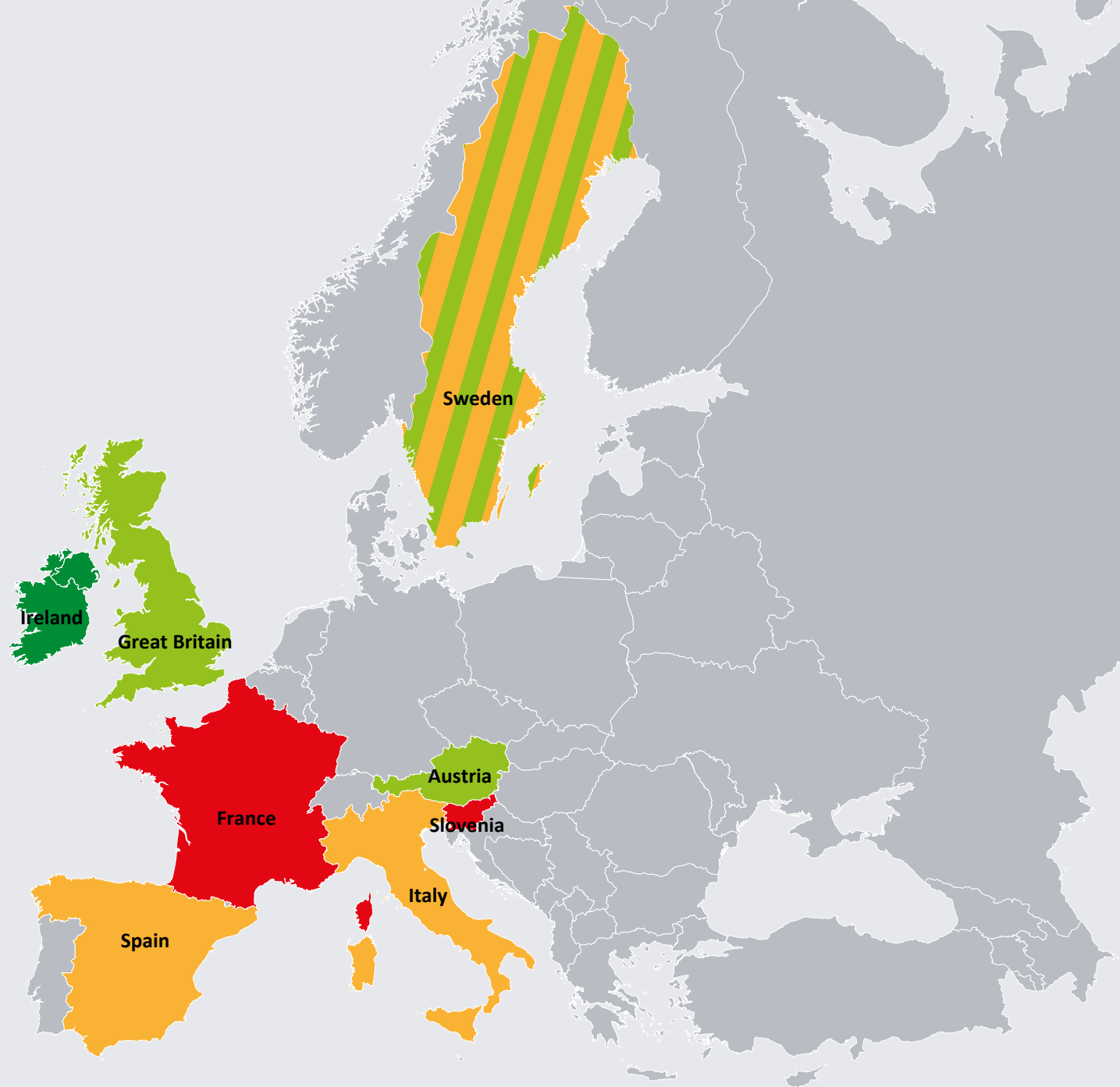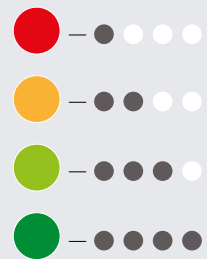
WHAT WE LOOKED AT:

■ Peak demand reduction measures introduced: While most countries introduced some kind of measure to address the energy crisis and the risk of significant price spikes during the winter 2022/2023, in this publication we focused on the countries that introduced a new product to reduce peak demand through explicit demand response (DR).

■ Design features of the measures: We approached the analysis of the measures from two perspectives. First, the measure should ideally comply with the EU Regulation and the 5% reduction target, that is, being market-based and open to all consumers. Second, and since Member States were free to choose the appropriate measure, we analysed the viability for all consumers to participate, including the minimum bid sizes, technology inclusivity, measurement requirements, payments, penalties and other technical or bureaucratic requirements that could encourage or limit participation.

■ Effectiveness of the measure: For the measure to be effective, it had to reduce demand by 5% in the 10% peak hours identified by the TSO. We analysed the correct identification of those hours, the quantities tendered, and the actual participation and activation of the contracted capacities.

■ Initiatives for Winter 2023/24 and beyond: Member States understood that the winter 2022/2023 was a sort of trial run for dedicated peak demand reduction mechanisms. The future for these mechanisms can be bright, as some countries have already shown. We tried to understand how the existing mechanisms could be developed further into more technology and consumer inclusive products. Furthermore, with the introduction of a dedicated peak demand reduction product as a permanent feature of EU law in the revision of the Electricity Market Directive and Regulation, we paid special attention to those countries that intend to make the winter 2022/2023 plans a permanent product available for system operators.
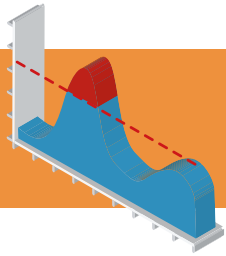
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[4] "Electricity demand reduction: Measures to mobilise consumers", European Commission Smart Grids Task Force Expert Group 3. (2022)

Overview

PEAK DEMAND REDUCTION MEASURES 2023

smartEn
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Sweden

Ireland

Great Britain

France

Slovenia

Austria

Italy

Spain

Peak demand reduction measures

A wide variety of measures have been introduced in Europe in reaction to the energy crisis of 2022 and in particular to implement the emergency Council Regulation 2022/1854. Most of the measures introduced by Member States were of a fiscal nature, like direct subsidies, reduction of energy taxes or value-added tax, direct support to businesses and the regulation of different markets (e.g., a cap on electricity wholesale prices). Those, however, are not the focus of this report.

The measures analysed in this report are focused on reducing peak demand through explicit demand response mechanisms.

A major requirement from the Council Regulation introduced in September 2022 is the identification of 10% peak hours during which the measure would be active. The identification of these peak hours was the Member States' responsibility, usually delegated to their TSOs. Beyond that, countries took different avenues for the development of the programmes. The countries that stood out are those that created dedicated peak shaving products, for TSO or DSO markets, and allowed suppliers or independent aggregators to provide them, by engaging their customers.

A very important aspect of the effort of implementing the Council Regulation was the use of communication campaigns by governments and market parties. Due to the energy crisis, and overall low trust in energy companies, consumers' reticence toward new energy products was high. A clear and easy to understand communication campaign, where the benefits of the programme are apparent, was key. Some countries introduced apps, or dedicated websites to engage directly and bring visibility to the day-to-day variations in energy prices and the possibility to earn money through demand-side flexibility activations.

Finally, even though not specifically required by the regulation, the best performing measures were introduced after a resource adequacy assessment and a stakeholder consultation process to ensure they would be effective in their implementation and engagement with consumers. Following the overview chapter, the countries that best executed the 5% peak demand target were Austria, Ireland and Great Britain, and they did this by creating products that were market-based, clearly identifying the 10% peak hours, engaging independent market parties and clearly communicating about the measure to consumers.

WHAT WE LOOKED AT:

- Type of measure introduced
- The responsible parties to introduce and execute the measure
- Resource adequacy assessments performed
- Identification of the peak hours
- Communication campaigns
- National consultations performed

Peak demand reduction measures

PEAK DEMAND REDUCTION MEASURES 2023

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Spain
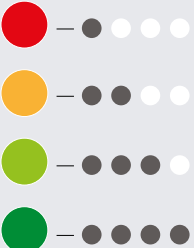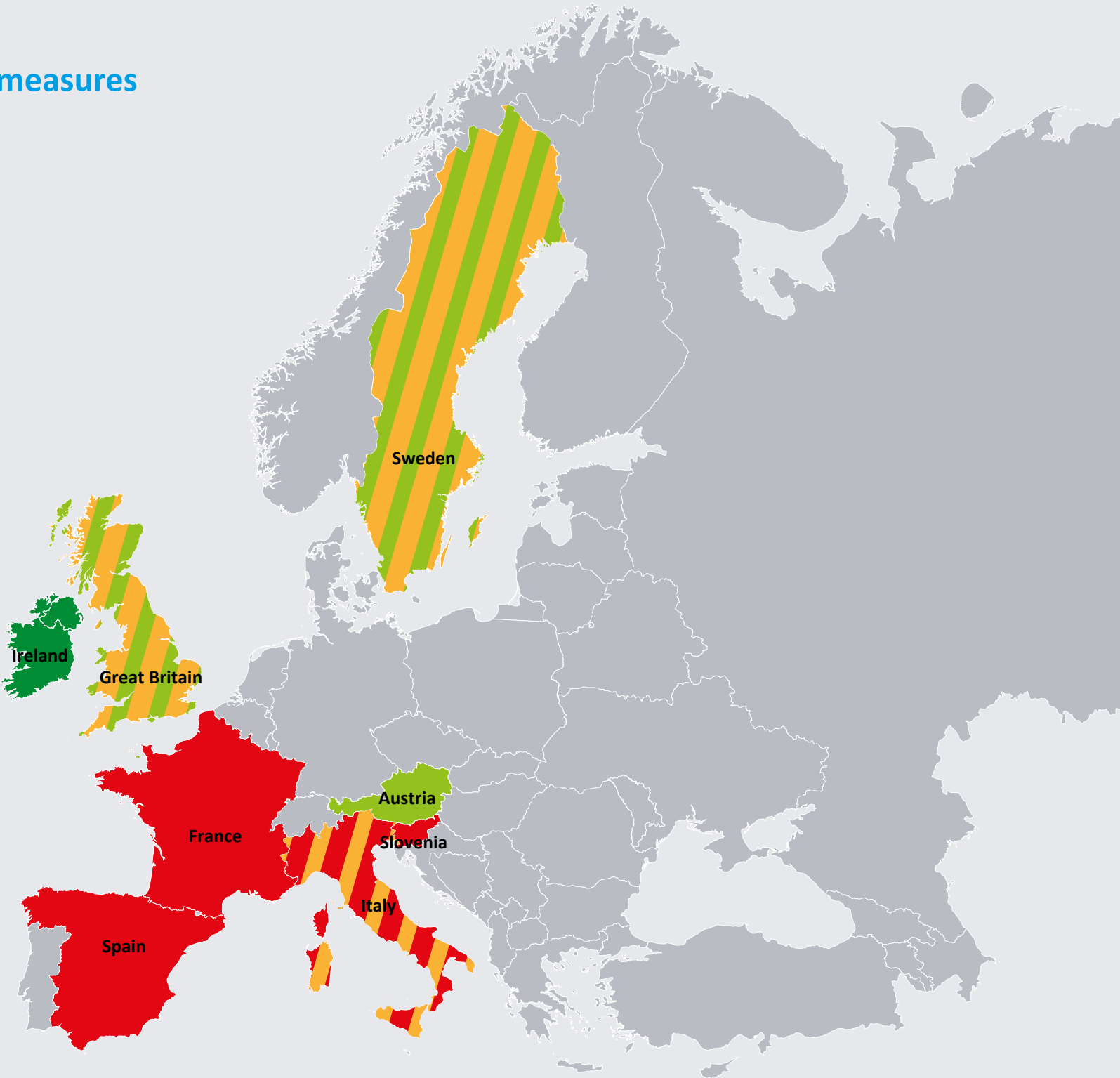
Design features of the measures

How a peak demand reduction measure is designed will dictate the viability for a large array of actors to provide their flexibility. A smart design will ensure that a wide range of consumers, from residential to industrial, will be able to participate and receive a remuneration for their actions. The key features of any product are a procurement on a competitive market, a voluntary participation of consumers, and a financial compensation for an action. In addition, service providers should be able to aggregate different loads to provide their bids, and those should be stackable, i.e., with the same loads, service providers should be able to bid into different markets to find the most valuable use of the flexibility.

Technical participation requirements are key for the participation of demand response in any product, as any requirement can have the potential effect of excluding a whole sector or making the product completely uninteresting for the demand-side. Apart from the need to allow all technologies and consumer types, the possibility to aggregate resources and a low minimum bid size to join the product is of particular importance. Other technical aspects of importance are the measurement and verification of the delivery. We paid special attention to the baseline methodologies used, their suitability for different types of assets, and the possibility of using sub-meters for the measurement.

Finally, we looked at the financial compensation received by consumers and the possibility of penalties for non-delivery. The best performing countries provided a financial reward for the participation in the product that could be passed on to the consumer giving them a concrete incentive for participation. Ideally, availability payments are combined with payments upon activation. In most cases no specific penalties were applied, other than not receiving a payment for non-delivered energy. But some countries, like Spain, introduced stringent financial penalties for non-delivery, which made the participation in the products less attractive.

Overall, the design features of a measure can be evaluated very easily by looking at the results from the next chapter, "Effectiveness of the measure", as a high participation and consumer engagement usually results from a smart design.
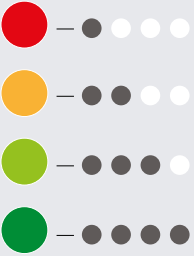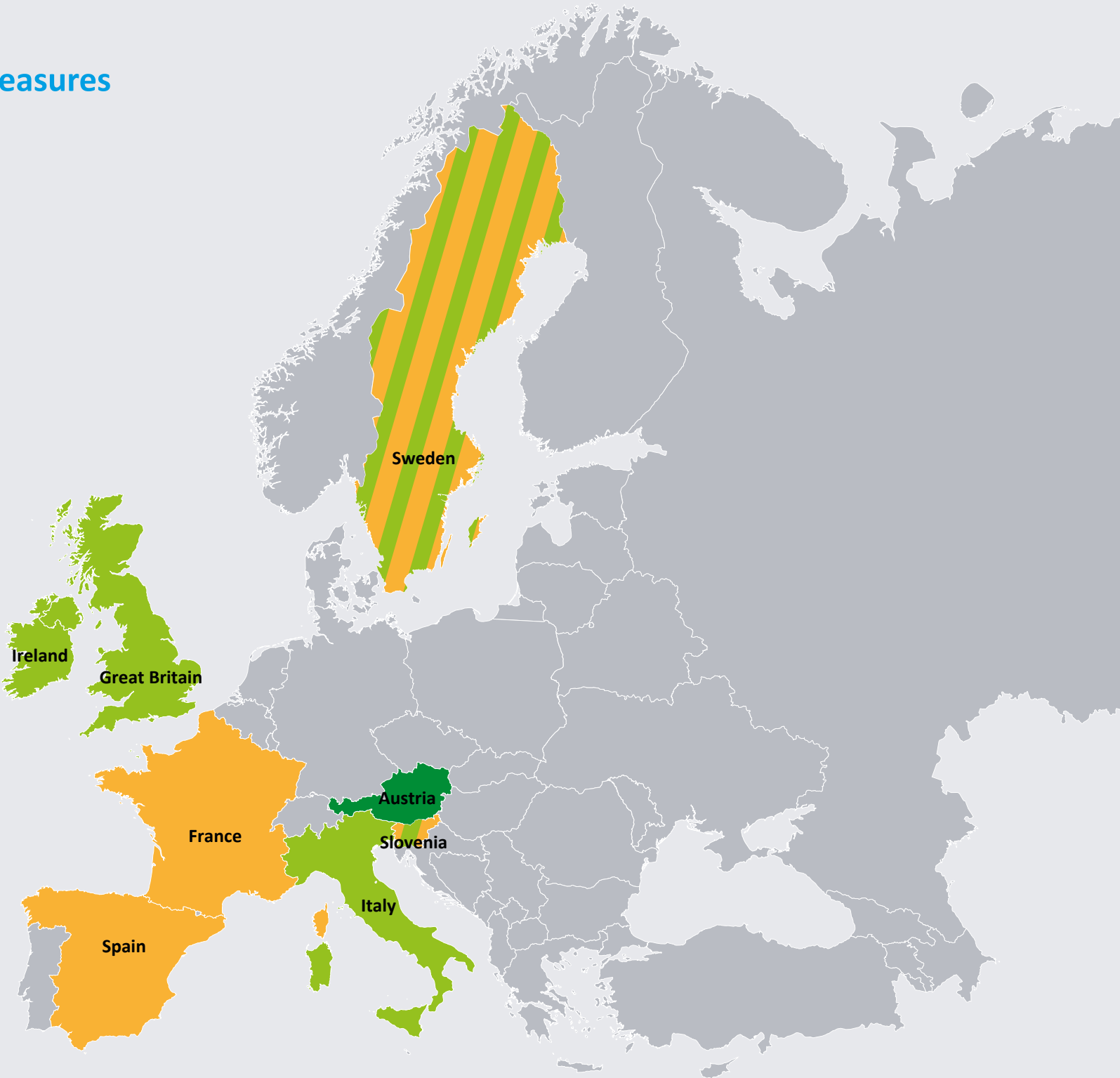
WHAT WE LOOKED AT:

- Types of consumers and technologies that can participate
- Stackability of products
- Minimum bid sizes
- Possibility of aggregation
- Payments and penalties

Design features of the measures

PEAK DEMAND REDUCTION MEASURES 2023

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Italy

Austria

Slovenia

Effectiveness of the measure

The Council Regulation required the 5% in active demand reductions to be performed during the peak hours identified by the Member State. Hence, the effectiveness of the measure is conditioned by the ability to prove causality between the reduction in demand and the activation of consumers' flexibility. This was not always easy in particular due to a long period of sustained high energy prices that made consumers especially wary of their consumption. Any decrease in consumption could also be caused by a more conservative electricity consumption.

Of particular importance for this measure was the engagement of all types of consumers and assets, particularly those that were not active in other ways before its introduction. Some countries, like Great Britain, in order to engage new consumers, did not allow participation by those that were already active in providing explicit demand response. While this had other (significant) negative unintended consequences (i.e., limiting stackability of services), it did encourage

service providers to engage with new types of consumers acting as flexibility evangelists for consumers that were previously unfamiliar with flexibility activities.

The effectiveness of the measure was analysed in different ways. First by procurement and participation metrics like, the overall capacity procured by system operators (SOs), capacity activated during the dedicated peak hours, and the number of consumers that were contracted and activated. And secondly quantitative metrics like the difference between the volumes targeted by SOs during their planning and the effectively activated volumes, and by establishing a correlation between the measure and the reduction of demand.
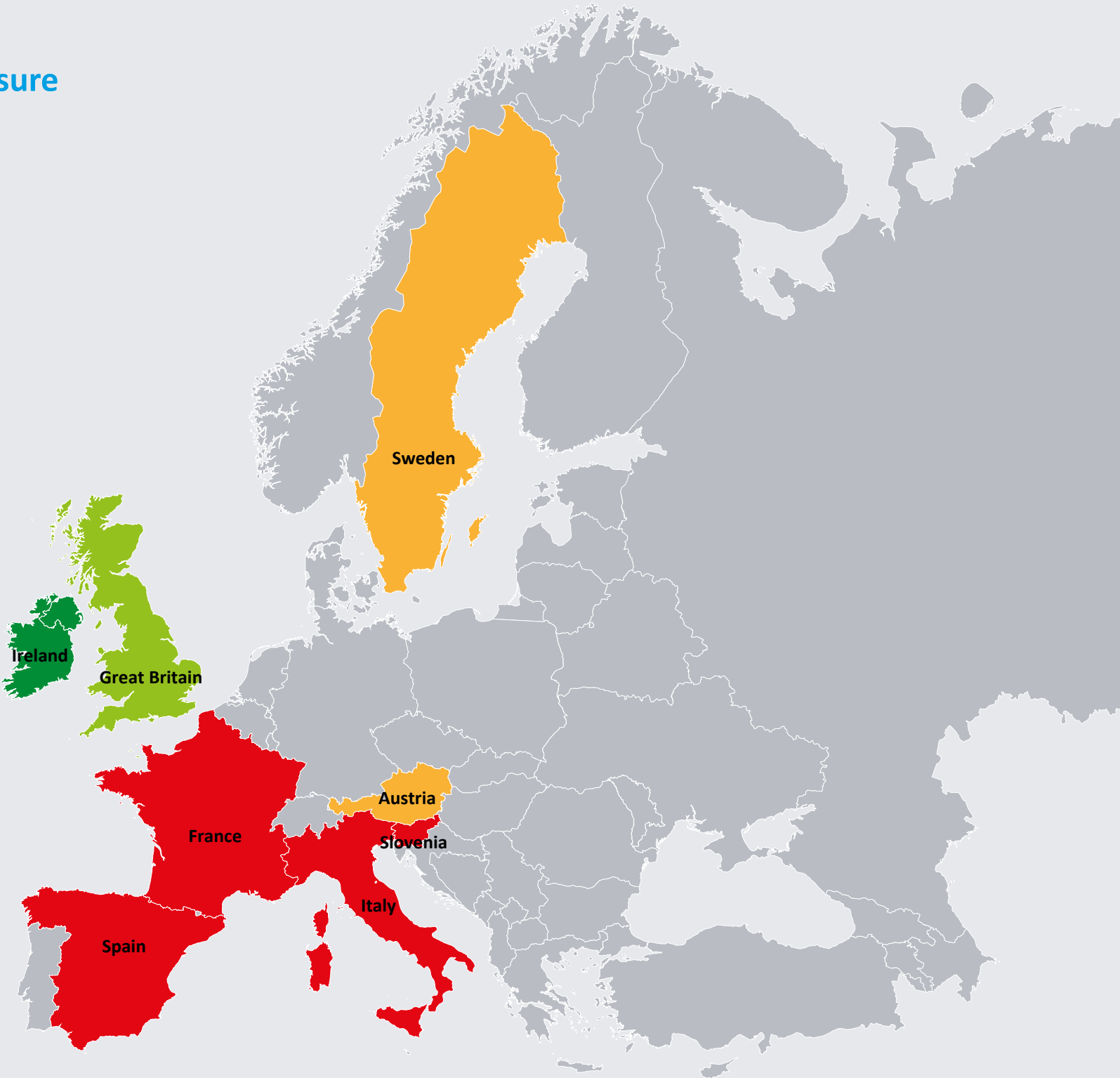
Overall countries that implemented a demand reduction measure were quite successful in the procurement, engagement of consumers and activation of flexibility. This success is testament to the interest of consumers in products that allow them to benefit from their flexibility.

WHAT WE LOOKED AT:

■ Capacity procured and activated by SOs

■ Correlation between the measure and the observed reduction of demand

■ Difference between the targeted and activated volumes

■ Number of participants and the types of consumers and assets

Effectiveness of the measure

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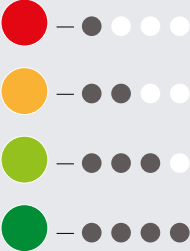
Initiatives for Winter 2023/24 and beyond

The Council Regulation introduced an emergency measure applicable from December 2022 to March 2023 and the EU co-legislators are currently defining the feature of a peak shaving product in the context of the Electricity Market Design revision. Some countries that introduced measures did so with the goal to have them go beyond this four-month period (e.g., Spain) and others have already started planning the introduction of a similar, and evolved measure in the winter 2023/2024. To properly assess the effectiveness of the measures, we expect Member States to have done a thorough analysis of the outcomes after March 2023. This will allow them to understand the effects these measures had both on system management and price formation and will allow stakeholders to provide feedback on where to improve the measure.

smartEn considers that measures implementing the 5% peak demand reduction target should not be envisioned as an emergency programme, ending in March 2023, but an equivalent product serving similar purposes (if with different targets) to become long-term solutions that address sustained peaks or high prices. The revision of the Electricity Market Design introduced a peak shaving product and, in its proposal, the Commission made such a product structural, not limited to emergency situations. We analysed those countries that have the intention of expanding and introducing these measures on a permanent basis.

Most countries, like Austria, Ireland Spain and Great Britain that successfully implemented a peak demand reduction measure have the intention to continue to use it the next winter or are currently still using it on an emergency basis. This is testament to the success of these measures, and the service they provide for an efficient electricity system management.

WHAT WE LOOKED AT:

- Post-emergency national assessment performed

- Introduction of permanent measures

- Improvements planned on the 2022/23 measures

- New measures planned

Initiatives for winter 2023/24 and beyond

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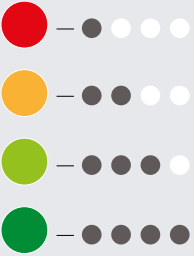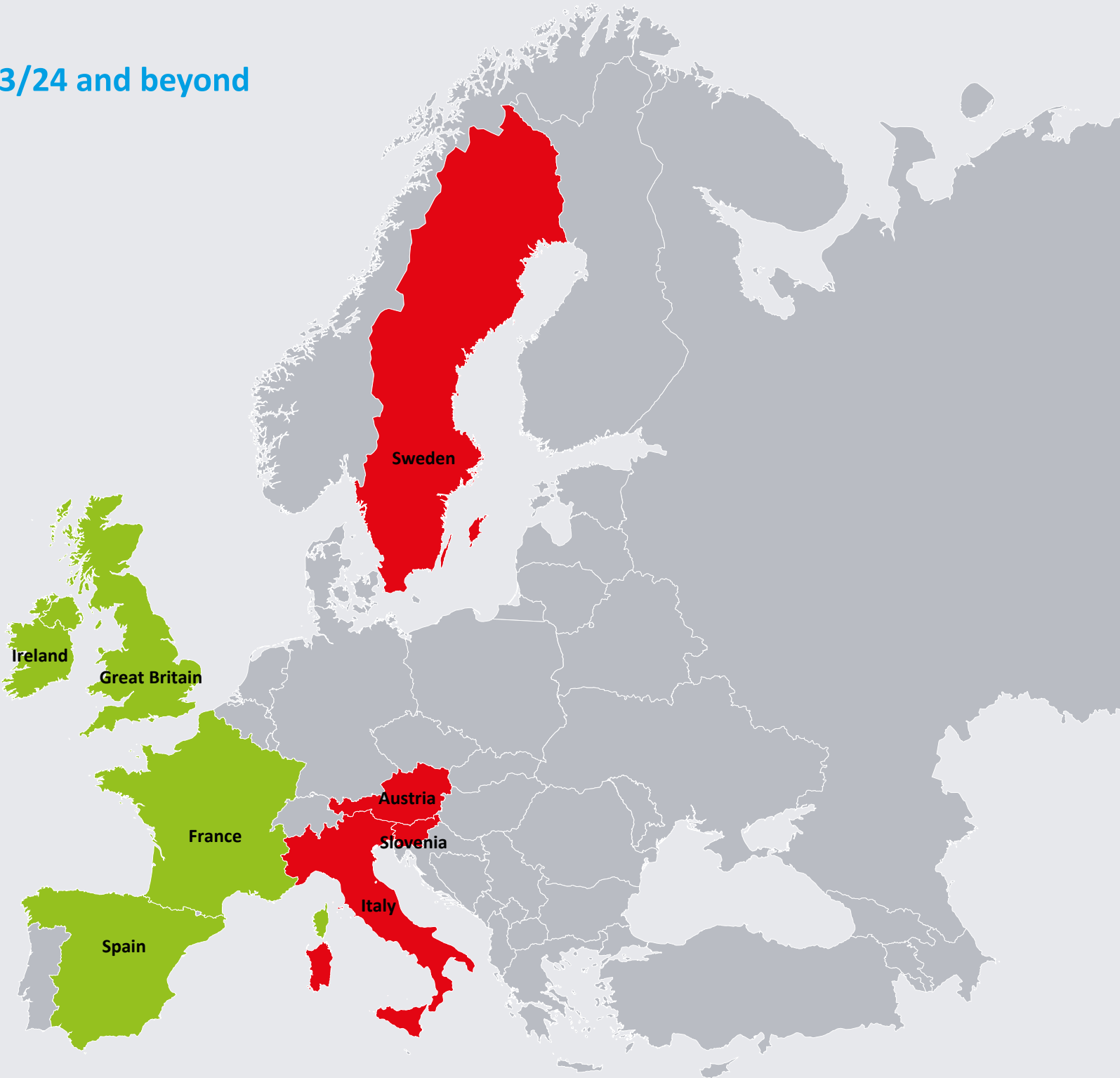
AUSTRIA

The Austrian government introduced a new peak demand reduction product and nominated the TSO for its execution. APG, as implementing body. This mechanism had one of the better designs from the countries that adhered to the Council regulation. It clearly identified peak hours, remunerated participants, had reasonable technical requirements and was open to all kinds of technologies. However, the short implementation time after the introduction of the Council regulation, and the time it took to develop the programme made it so that it was only active throughout the month of March. Nevertheless, it showed a reasonable amount of activity, and promising results if this kind of product were to be introduced on a permanent basis.

PEAK DEMAND REDUCTION MEASURES
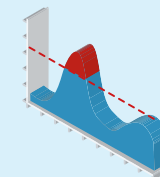
The measure introduced by the Austrian TSO adheres perfectly to the requirements and targets of the Council Regulation. The measure was a new product, that did not fit within any other markets or procedures. For the selection of the peak hours, the TSO studied historical data from 2017-2021, and identified two peak periods between 8:00 - 12:00 and 17:00- 19:00 on weekdays. In addition, if the forecasted renewable electricity generation for a particular hour in those periods was below a threshold, that hour was also selected as a peak hour for the programme. The peak hours selected were published on the TSOs website[5].

The product was open for all types of consumers, from industrial to commercial, and engaged energy suppliers, aggregators, and large energy consumers. Residential consumers were able to participate via aggregators. All of them were invited to explanatory webinars, and a consultation process was held before the adoption of the national law that introduced the programme (SVRG).

DESIGN FEATURES OF THE MEASURE

The Austrian product shows a smart design, with low participation thresholds (technical and bureaucratic), that does not limit participation in other mechanisms. With small adjustments other types of consumers, beyond industry, could be allowed to participate. The new product was procured through weekly tenders open to all types of consumers and flexibility providers. Direct participation was for large energy consumers, aggregators, and suppliers and consumers through aggregators. The minimum bid size to join was 1 MW, with pooling of resources allowed. Flexibility providers had to offer a reduction in electricity consumption in one (or more) of the 2-hour time slots identified as peak-hours. The bids would also indicate the reduction amount, that was at least 2 MWh as well as the price (that was subject to a variable cap).

[5] https://www.apg.at/powermonitor/

Bids were awarded after the TSO calculated the variable cap and excluded all the bids going above the limit. The cap was calculated on a weekly basis by creating the volume weighted average price of the cheapest 90% of the placed bids for the whole week. In case there were less than three bidders, no bids were awarded. In case the offered volume exceeded the volume to be procured, the cheapest combination of the placed bids meeting at least the tender volume were chosen through an optimisation.

Flexibility providers had to submit to the TSO a forecast schedule for the whole day of the awarded bid, three days before delivery. This design excludes customers not able to provide an accurate 3-days-ahead schedule which is very limiting for consumers not wanting to commit so strictly so much in advance. A change from forecasted schedules to another type of baseline methodology approved by the TSO, could improve the measure's inclusivity to a wider scope of consumers. The activation information was provided by APG two days prior to delivery and early enough to trade these volumes at the day-ahead market. The measurements at the metering point(s) were transmitted by the connecting DSO to APG for the validation. Catch-up effects were allowed to extend outside of the potential peak periods. Additional RES generation can be used during activation as outlined by Article 15 (1) 1 of the *Electricity Consumption Reduction Act*[6].

Billing and monitoring were carried out ex-post on a monthly basis. To avoid gaming, the quality of the forecast schedule was assessed by comparing the provider's forecasted and actual consumption during the time periods where it was awarded, but not activated. The provider's forecast was then adjusted according to its forecast quality factor (over a whole month), before the actually delivered amounts for each validity period were calculated. The aggregator having to provide such an accurate forecast is a significant barrier for the provision of DSF. Customers required to pre-schedule or have to forecast in advance how much they are going to consume as a participation requirement, limits the customer's freedom in consuming, giving them less flexibility and therefore discouraging them from participating. Ideally an objective baseline, data-driven methodology for baseline calculation would have been used, that would allow the task of forecasting and responding to remain separate. No monetary penalties were included in the programme, but there were payment deductions for under-delivery and unallowed catch-up effects in place.

EFFECTIVENESS OF THE MEASURE

While Austria significantly reduced its electricity consumption during the Winter 2022/2023, the reduction was mainly achieved by voluntary reductions by consumers and high energy prices. At the end of the period from 01.12.2022 to 31.03.3023, a consumption reduction of 4.88% was achieved compared to the reference consumption (a temperature adjusted average consumption between 2017-2021). The new DSR-product was activated during the month of March and managed to save a total of 242 MWh during the selected peak hours[7]. Its impact on the overall electricity consumption reduction was therefore marginal.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

At the time of writing, no assessment of the programme was performed by the TSO or the Energy Ministry, and no plans were made to extend the programme for the 2023/24 winter.

[6] Budesgesetzblatt für die Republik Österreich. 235. Bundesgesetz über Maßnahmen zur Stromverbrauchsreduktion in Spitzenzeiten (OJ L 235, 30.12.2022, pp. 1-6). https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2022_I_235/BGBLA_2022_I_235.pdfsig
[7] https://www.apg.at/news-presse/apg-stromversorgung-weiterhin-herausfordernd/
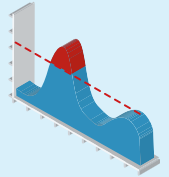
FRANCE

France is at the forefront of DR activation in the EU, with a variety of offerings in the market. In particular, measures like the Ecowatt initiative, while they do have an effect on consumption, they do not comply with all requirements set by the Council Regulation, notably because it is not market-based and does not foresee any remuneration for participating consumers. Other programmes like the NEBEF mechanism, have benefited from the favourable market context which resulted in 520GWh of activated load shedding on the wholesale (spot) market in 2022. However, for the winter 2022/2023 no specific, market-based, remunerated peak demand reduction measure was introduced to follow the Council Regulation. Instead, an amendment to the programme curtailing electric water heaters was introduced. While the effectiveness of this action is not in question, and is testament to the potential of DR, its implementation could have been significantly more positive for consumers if an actual remuneration and aggregation would have been involved.

PEAK DEMAND REDUCTION MEASURES

Among measures to address the Council regulation, France introduced an expansion of their already existing residential hot water tank curtailment programme during peak hours. This programme was directly controlled by the TSO, leaving out the direct participation of flexibility service providers and the requirement for a market-based mechanism.

The peak demand reduction measure introduced by a ministerial decree in France was executed by the DSO and targeted the usage of hot water heaters by residential customers. Remote activation of hot water heaters associated with the Time-of-Use (ToU) "Peak/Off-Peak" tariff was inhibited during the height of peak hours, shifting the consumption of most of these heaters to the night. This did not involve market parties, in particular flexibility service providers like aggregators. The peak hours identified by the French authorities were between 8h-13h and 18h-20h during weekdays from 1 December 2022 to 31 March 2023. The methodology used to identify peak hours is based on both consumption and wholesale electricity prices. As both prices can vary widely depending on the time of day, and the type of day, an analysis of price levels was carried out by hour, day and month over the five years of the reference period (between 1 November and 31 March for winters between 2017/2018 and 2021/2022).

France introduced other measures to support the peak demand reduction, but they were more related to communication awareness campaigns, the development of an app that encouraged voluntary action (Ecowatt) and mandatory switching off of illuminated advertising during peak hours.

DESIGN FEATURES OF THE MEASURE
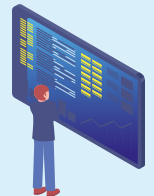
The main design feature of the measure was an expansion of the already existing remote-control mechanism of hot water heaters, whereby the DSO prevented the automatic switching on of water heaters during the peak hours. Under normal circumstances, all hot water heaters fitted with a "*Linky*" meter and that are part of the ToU tariff can be

remotely controlled by the DSO to heat water during off-peak hours of the regulated tariff. Off-peak hours of contracts are usually positioned at night from 10pm but some customers also have a 2-hour off-peak range between 11am and 3:30pm. The measure consisted in stopping the automatic switching on of the water heaters of these customers during this time slot. Consumers could at any moment manually switch their water heaters on, and benefit from their regular off-peak tariff. This mechanism, by design, did not require a prequalification process, as all hot water tanks, with a measurement device, were able to be controlled directly by the DSO. Since the mechanism circumvented market parties, there was no possibility for aggregators to participate. Furthermore, the participation of consumers in this mechanism was not explicitly remunerated, with the main benefit being a lower energy bill (from less consumption) through the ToU tariff. Consumers were however warned by their suppliers of this programme and could always override it (which in practice did not happen, as there was no reduction of comfort).

EFFECTIVENESS OF THE MEASURE

While the measure had an obvious impact on consumption (due to its mandatory nature), it is unclear how much it contributed to the overall peak demand reduction target, and furthermore it is difficult to assess how successful this measure would have been if it had been voluntary, remunerated and on market-based.

The measure, together with other mechanisms used by France, contributed to the achievement of the 5% peak demand reduction, but to what extent is difficult to calculate. The peak hours identified for this measure only covered two hours of the seven hours identified by the TSO to be peak hours. Throughout each activation, the measure shifted consumption by 2.5 GW on a daily basis at 12:30 in the afternoon. System operators and suppliers affirm that the measure had no discernible negative effect on consumers' wellbeing, as the two-hour period of activation was not sufficient to have an impact on the water heaters, and thus rate the success of this measure as very high.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

The same measure will be implemented for the 2023/24 winter, with some notable changes being discussed in the identification of peak-hours. These changes will redefine the identification of peak hours to be more representative of the national balance between production and consumption and not only linked to local grid constraints. These hours could be defined in a more dynamic way, taking into consideration that off-peak hours can vary between seasons depending on the PV production level. A consultation is on-going to change the peak/off-peak hours.

In addition to this specific measure, France has a wide range of options for the activation of DR, one of them being the dedicated DR auction, Appel d'Offres Effacement, that activated around 800 MW simultaneously in 2022. This programme will be expanded starting in Q4 2023, called the AOE 2024, including enhanced access to wholesale markets and incorporating dedicated measures from the 2022/23 emergency measures. AOE 2024 will act as contract for difference with the French Capacity Mechanism. AOE contract holder will reduce its consumption during days flagged by RTE if spot prices overpass their strike price. The revision of the AOE is expected to provide volume required to lean toward 5% electricity peak demand reduction for the Winter 2023/2024.

GREAT BRITAIN

Great Britain does not follow the requirements stemming from an EU Regulation, however their national TSO, without obligation, introduced a demand reduction measure that boasts amongst the best designs and consumer engagement in this report. The Demand Flexibility Service introduced initially during the winter months, allowed a wide range of previously non-active consumers to provide their flexibility to the grid

PEAK DEMAND REDUCTION MEASURES
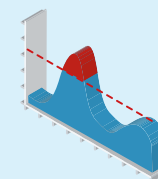
The British TSO, National Grid ESO, with the approval of the NRA, Ofgem, introduced the Demand Flexibility Service (DFS), a peak-demand reduction programme that was intended to be open to all types of consumers, but through some limiting design choices was almost exclusively used by residential consumers. This programme came from an initiative by the TSO rather than being mandated by the NRA or government, and it did not follow a formal process to identify the peak hours on it would be active. The DFS programme was introduced after a short and informal consultation process with the industry, that improved the baseline methodology for non-residential consumers and increased the "Guaranteed Acceptance Price"[8] from £500/MWh to £3,000/MWh.

The measure was generally well received by the public and had a significant media coverage due to the novelty factor of consumers being paid for their actions. The promotion and communication campaigns were led by the participating suppliers and aggregators, with no direct involvement from the government (who did not champion this measure) and the TSO.

DESIGN FEATURES OF THE MEASURE

The British measure had by design easy to achieve participation requirements to engage as many consumers as possible. However, the programme had significant shortcomings that would make it non-viable on a permanent basis. While the measure was intended to be accessible to a wide range of consumers, with no technology restrictions, and particularly geared to engage consumers not yet active, the participation requirements excluded the participation of industrial and commercial consumers by preventing participation during the period covered by the DFS programme by any consumer already participating in other explicit flexibility products.

[8] The "Guaranteed Acceptance Price" is the remuneration consumers receive for performing a series of 12 test dispatches. These tests were not necessary to participate in the DFS programme.

The payments were done on a pay-as-bid basis, so price signals were not relevant at the moment of activation. Most of the payments came through a series of tests performed. Since any offers up to the "Guaranteed Acceptance Price" would be accepted, the payments for the tests acted as capacity payments. No penalties or commitment requirements were introduced, which resulted in an unpredictable product for the TSO.

Aggregation was allowed, and the minimum bid size was 1 MW. However, calculations had to be broken down to the 14 "GSP Zones", which increased the amount of data to be handled.

Measurement was performed with just the interval (30-min) meter at the connection point. Sub-metering was not allowed. The baseline and settlement calculations were done by the service providers that participated, who uploaded the results to the TSO weekly. The baseline methodology was based on the one used in the balancing mechanism. However, this methodology includes a day-of adjustment that is not suitable for a product that has day-ahead dispatch, as this makes it trivial to game. The day-ahead adjustment was removed for commercial and industrial customers, but left in place for residential customers. This led to numerous instances of gaming, where residential consumers would deliberately increase their consumption before the activation event.

The TSO communicated to suppliers and aggregators day-ahead whether they intended to run a tender, an, if so, the volumes required, giving a few hours to submit offers before the tender cleared. Communication with the consumer by the aggregator or supplier for an activation was done in different ways, mostly through SMS or an app the day before the event.

EFFECTIVENESS OF THE MEASURE
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The overall effectiveness of the measure, based on the activated volumes was satisfactory considering the quick turn-around and it being the first run of the programme. However, this measure was not linked to any specific target or peak hours, like the 5% peak demand reduction plan in the EU, hence it is not fully comparable with the EU requirement.

During the activity of the programme, the maximum capacity reached during a single test was 294 MW, and the highest activated capacity during a single live event was 269 MW. The energy delivered was 2 641 MWh in tests (at £3 000/MWh) and 679 MWh in live events (at an average price of £4 503/MWh). It is worth mentioning, that this programme was created by National Grid ESO to have additional capacity available when needed, rather than reducing electricity consumption during peak-hours, which explains lower activated volumes than in other countries.

The TSO considers that the measure was effective, as it reached consistently the target volumes identified at day-ahead. Comparing the total delivered MWh to the day-ahead target MWh, the programme delivered 37% in tests, and 85% in the live events.

As the measure engaged customers of different profiles. Out of 31 service providers engaged in DFS, 14 contracted only residential customers, 7 engaged residential, commercial, and industrial customers, and 10 engaged commercial and industrial customers. For residential profiles, most of the assets participating were behind-the-meter assets like storage and controllable loads.

INITIATIVES FOR WINTER 2023/24 AND BEYOND
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The overall positive experience of the DFS programme, bringing DSF to the forefront and into the public's eyes, has encouraged National Grid to further develop the programme. After launching a public consultation until June 2023, National Grid ESO announced the extension of a reviewed DFS programme. Changes occurred regarding the baselining methodology, where in-day adjustment isn't allowed any more for domestic customers and a "Good faith warranty" is introduced to deter against gaming. Moreover, to improve the accuracy of baselining and settlement, National Grid ESO accepts the data coming from a certified sub-meter. An assessment of the measure was performed by the TSO and a roadmap is planned with consultations that will inform the evolution of the DFS programme. A final programme is expected to be presented during the end of Q3 or early Q4 2023.
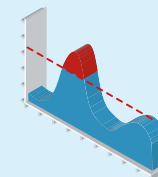
IRELAND

Ireland was one of the first European countries to implement a peak-shaving product to address the 2022 energy crisis. The mechanism was introduced within an umbrella Programme called 'Beat the Peak'. Contrary to other EU countries where the TSO took the initiative, in Ireland the programme was developed by the DSO ESB Networks (ESB-N) during the first half of 2022. Following the adoption of Regulation 2022/1854, the country adopted a comprehensive strategy to reduce electricity consumption during peak-hours with the creation of a peak tariff to foster implicit flexibility, and an energy saving scheme and communication campaign on how to effectively reduce electricity consumption during peak-hours. With this comprehensive strategy, Ireland is one of the country leading in the best practices for the implementation of the EU Regulation. However, improvements can be made regarding the remuneration of commercial and residential loads as part of the Beat the Peak initiative.

PEAK DEMAND REDUCTION MEASURES

Ireland introduced a dedicated peak-shaving reduction measure addressed at commercial and residential users within a framework called 'Beat the Peak'. Its preparation and consultations were performed even before the adoption of the EU Regulation. In July 2022, the Irish regulator, Commission for Regulation of Utilities (CRU), launched in July 2022 a public consultation that helped to identify measures for peak-shaving. Actions taken included the promotion of the peak-shaving programme, 'Beat the Peak', developed by the DSO ESB-N, the development of a network tariff with peak-pricing for small and large-scale consumers, and a call to suppliers for the development of demand reduction mechanisms. Moreover, the government launched a comprehensive communication campaign called "Reduce your use" targeting all types of consumers (residential, commercial, and industrial) through a broad range of media (television, radio and cinema spots, street panels, radio spots, social media campaign).

To adapt the 'Beat the Peak' programme to the EU Regulation once it came into force, the Irish TSO, EirGrid, identified the required 10% peak-hours based on the resource adequacy assessment study 'Ireland Capacity Outlook 2022-2031' (2022). The identified hours range from 4pm to 7pm during weekdays and weekends.

DESIGN FEATURES OF THE MEASURE

Ireland expected grid stability issues for the winter 2022/2023 and developed the Beat the Peak measure before the Council Regulation was introduced. However, the transposition of the regulation in Ireland led to the evolution and creation of several mechanisms fostering both explicit and implicit flexibility, each of them addressed at different types of consumers, with different levels of engagement and rewards. During 2022, the DSO ESB-N developed a DR scheme called `Beat the Peak' (BTP) as an umbrella of products and pilots targeting different types of consumers for peak shaving.

It included:

■ **BTP Domestic:** This pilot targeted households. It gave a warning to the consumer to reduce their consumption in case of stress of supply. This pilot was voluntary and had no remuneration associated with a reduction of the electricity consumption by households.

■ **BTP Commercial Pledge:** Like BTP Domestic but targeting small, medium, and large commercial, semi-state & public sector entities willing reduce electricity demand at peak hours. No remuneration was associated with an activation.

■ **BTP Commercial Active:** The programme incentivised large electricity consumers to reduce their consumption during peak-hours. The service was open to customers connected to the ESB-N distribution grid at a voltage level between 10kV and 110kV, and with a connection capacity equal or higher than 250 kVA. Stacking of different services was not permitted, as sites participating in BTP cannot be already engaged in other DR schemes. The remuneration was based on a fixed tariff of 0,444 €/kWh. BTP Commercial Active did not provide availability remuneration. Flexibility service providers received an additional payment up to 5 000 €/MW if more than two sites were engaged in the programme. Activation was measured by comparing the actual consumption with a baseline using historical data. No penalties were applied in case of non-activation.

Ireland developed other measures including specific ToU tariffs to incentivise large energy users, commercial and domestic customers to consume electricity outside of peak hours. These tariffs charge a peak rate increased by 10% between 5pm and 7pm. The 10% increase is then offset by a corresponding decrease during an off-peak period. The only requirement for commercial and residential customers is to have a smart meter at the connection point. The choice of the peak tariff is voluntary and it is administered by the supplier (but is not part of a new retail tariff). Sites already engaged in DR schemes (e.g. the Capacity Market) cannot engage in peak-rate tariff. Moreover, the CRU allowed electricity suppliers to create specific offers targeting demand reduction during peak hours.

EFFECTIVENESS OF THE MEASURE
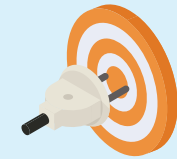
The varied set of initiatives led to significant results as the electrical consumption during peak-hours (from 4 to 9pm) was reduced by 7% compared to the TSO forecasts. While efforts were made to quantify the effectiveness of each measure (e.g., monthly reports from ESB-N to the government), the range of initiatives made it difficult to accurately assess the quantity of energy consumption reduced by each one. Hence the measures can only be assessed in a holistic way. The DSO estimated the savings brought on by all the mechanisms combined at 30 700 MWh. In a similar fashion, since measures targeted all types of consumers, it was challenging to analyse which type of load contributed the most to the overall electricity consumption reduction.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

Ireland already launched several initiatives to prepare the Winter 2023/2024 and improve current measures. Critical assessment of the different measures implemented is undergoing. While originally considered as pilot projects, the BTP schemes should be improved and extended for the winter 2023/2024. Moreover, the Irish government requested CRU to develop an Energy Demand Strategy. Among other elements, this strategy aims at increasing the rollout of smart meters and smart ToU tariffs, and achieving between 15% and 20% of flexible system demand. This programme also aims at fostering the smart connection agreement for large energy consumers[9]. This feature could have negative impact on a market-based participation of assets, as per the current proposal, new large loads such as data centres would have to make their backup generators available for dispatch in an entirely non-market way.

9 https://www.cru.ie/about-us/news/cru-publishes-a-new-energy-demand-strategy/

ITALY

The Italian TSO, Terna, developed a peak shaving mechanism called *'Servizio di riduzione dei consumi elettrici'* that in its design and by the participating consumers, resembles significantly an interruptibility scheme. Based on a yearly auction, the mechanism offers consumers a capacity payment in exchange of curtailment throughout the year. Participation in the service was low due to technical constraints in the participation requirements and the reduced time available to engage consumers before the launch of the first auction. Throughout the measure, Terna removed stringent requirements on the minimum bid size of single assets within an aggregator portfolio, allowing non-industrial customers to participate in the auction. However, limited participation and contracted volumes hampered the ability of the mechanism to achieve the targeted 5% of electricity consumption reduction during peak hours.

PEAK DEMAND REDUCTION MEASURES
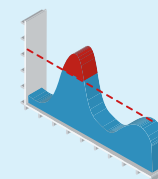
The Italian energy regulator, ARERA, requested Terna to identify electrical consumption peak-hours and implement a mechanism that would reduce electricity consumption during these hours. The identification of peak-hour was linked to a resource adequacy assessment performed by the TSO. The whole design of the mechanism was carried out by Terna, without input from stakeholders through public consultations. Terna prioritised a market design to enable the reduction of electricity consumption during peak-hours until March 2023 (as mentioned in the Regulation 2022/1854), and to improve system adequacy up to December 2023. The mechanism developed was originally expected to reach a total of 2 500 MW of contracted flexibility. However, due to the limited time between the announcement of the measure and the first auction, aggregators were not fully able to reach and contract enough customers. Moreover, demanding technical requirements also made the programme unattractive to customer. Out of the 2 500 MW auctioned, only 258 MW were awarded. No public communication campaign on the measure was launched by the TSO or any government agency.

DESIGN FEATURES OF THE MEASURE

The mechanism had a number of positive design features that makes it stand out compared to other mechanisms in Italy, and it should allow the participation of numerous demand-side assets. However some technical requirements, prevented the access to many aggregators and consumers. The procurement process for the mechanism was based on auctions. The first round was organised for a monthly procurement (January 2023) while the second round was for a yearly procurement (from February to December 2023). The mechanism was open to two types of customers. The first type are customers equipped with an UPDC (*Unità periferica distacco carico* - Load Disconnection Peripheral Unit) and with a minimum available power of 1 MW. The UPDC is a hardware that costs up to 50 000€ and allows Terna to unilaterally curtail the consumption of a given site. Sites equipped with UPDC

were granted a priority in the auction. The second type are customers equipped with an hourly meter. These customers can engage in the mechanism through aggregation. Terna significantly improved the design features of the measure between its two service windows (the first in January and the second from February to December). The threshold of 1 MW for every delivery unit was removed. This change allowed different type of profiles, such as commercial and residential customers, to engage through aggregation in the measure. Delivery points active in the mechanism are also allowed to participate in other DR scheme as the *Unità Virtuali Abilitate Miste* (UVAM) or *Servizio di Interrompibilità* (Interruptible Service). While this is a positive design feature of the mechanism, sites already engaged in the interruptibility mechanism were prevented from entering the peak demand reduction mechanism through an aggregator and had to participate in the mechanism individually as a stand-alone site. This limited the ability of aggregators to effectively balance their portfolio and contract new loads. Minimum bid size during auctions were at 1MW. The yearly auctions settled at a price of 59 200 €/MW per year.

A maximum number of activations was fixed at 459 hours per year (with 111 hours already settled between the 10th February and 31st March to answer the requirement of the Regulation). Aggregators and other market participants receive from Terna an activation notice two days before the delivery. On the same day before 7pm, market parties must send a baseline. The baselining requirements introduced by Terna acted as a barrier for market parties, requiring accurate forecasts of consumption days in advance is difficult and constrains the activity of consumers while disincentivising participation (similar to the Austrian baseline methodology). The methodology used was a forecast of consumption sent in by the service provider. Terna performs on a monthly test comparing the provided forecast to the actual consumption. A monthly delta higher that 15% is interpreted as inaccurate (and a possible sign of gaming) leading to the exclusion of that customer from the mechanism. The activation is performed by an aggregator or directly by Terna if the site is equipped with an UPDC. The settlement is based on a comparison of the consumption data with the provided baseline. The payment is based on the energy delivered. However, non-activation or deviation higher than 30% of contracted volume led to an exclusion from the mechanism and its related payment.

EFFECTIVENESS OF THE MEASURE
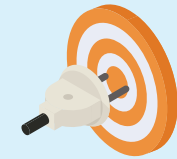
At the time of writing, Terna did not communicate on the total activated volumes. However, the limited contracted volume compared to that initially considered by Terna will hamper the ability of the mechanism to achieve the targeted 5% of electricity consumption reduction during peak hours. Out of the 2 500 MW auctioned, only 258 MW were awarded. The mechanism engaged almost exclusively industrial customers, using the flexibility of their industrial processes.

Commercial consumers also participated to the measure through an aggregator, marking a positive development for Demand Response in Italy. No residential customer engaged in the mechanism.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

Neither Terna nor ARERA have yet communicated whether the programme will be extended for the 2023/2024 period. However, it is of note, that by design this programme did have yearly auctions that went beyond the December 2022 – March 2023 period envisioned by the Council Regulation. No clear actions, either a critical assessment of the measure or a public consultation for its improvement has been done or are currently planned to take place. If the mechanism was to be extended, and by improving some of its design features, in particular, to change the consumption forecast for a clear baselining methodology approved by the TSO, to remove the UPDC requirement and direct activation by Terna that act as a deterrent for flexibility providers, and to increase available time to engage with potential participants, the programme could be more successful.
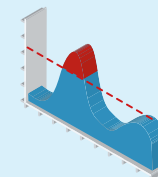
SLOVENIA

To implement the EU Regulation 2022/1854 Slovenia introduced a peak shaving product by creating the *Storitev zmanjšanja bruto porabe,* the "gross consumption reduction service". While the effectiveness of the measure remains unclear, it had some design features that made it unique compared to other European mechanisms, like the price formation in the bidding process. The measure is based on monthly auctions for the provision of flexibility. With the remuneration being solely based on energy delivered, and linked to Day-Ahead price, with no availability payments, price variability can create uncertainties and complicate the recruitment process of consumers by aggregators. However, restricted available information on the measure limits our qualitative assessment of the mechanism.

PEAK DEMAND REDUCTION MEASURES

The introduction of the service came on the 19 December 2022 when the Slovenian Parliament approved the Act on Emergency Intervention to Address high Energy Price as a transposition of the Council Regulation 2022/1854. This act allowed the Slovenian TSO, ELES, to organise tenders for the provision of flexibility to reduce electricity consumption during peak hours from 1 January to the 31 March. The service developed targeted industrial consumer to achieve the consumption reduction targets. The TSO oversaw the identification of the peak hours for the period of activity and selected two periods, one in the morning between 7am and 9am and one in the evening between 6pm and 8pm.

DESIGN FEATURES OF THE MEASURE

To expedite participation to the auctions, these were open to electricity suppliers, aggregators and individual end-consumers if they were already engaged in the balancing market. This however limited access for new entrants. In addition of being already active, their total contracted flexibility had to be at least 1 MW. For verification purposes, the service provider could either use the boundary meter or its own certified submeter with an accuracy class of at least 0.5 (IEC) or C (MID) for measuring points with a connected power greater than or equal to 1 MW, accuracy class of at least 1 (IEC) or B (MID) for measuring points with connected power greater than 43 kW and less than 1 MW and accuracy class of at least 2 (IEC) or A (MID) for measuring points with a connection power less than or equal to 43 kW. If the flexibility provider decides to use the boundary meter, they had to collect 15-minutes measurement data from the connected DSO and send it to ELES.

The auction process was first performed on a monthly basis but then changed to weekly auctions by the end of the programme. The remuneration was on pay-as-bid basis. In its bid during the peak hours, the flexibility provider adds a surcharge as a percentage of the Day-Ahead price in the Slovenian power

exchange operator SIPX. The markup is capped to a maximum of 75% of the Day-Ahead price. Moreover, the absolute value of the markup is limited to 750 €/MWh. The minimum bid size to join the product is 1 MW. Flexibility providers were able to introduce an offer for each peak-hour period.

The process of flexibility activation is fully managed by the service provider as the volume of flexibility and the activation hours were contractually settled between the service provider and the TSO. One day before the delivery, the service provider sends a consumption forecast for its entire portfolio and individually by unit in a 15-minutes template for each hour of the delivery day to ELES. This data was used by ELES for the calculation of the gross consumption reduction service by comparing the forecast to the actual consumption data. Failure to comply with the provision of the service with the requested volume led to an exclusion from the mechanism.

EFFECTIVENESS OF THE MEASURE

The gross consumption reduction service managed to contract up to 89 MW of flexibility. No official communication was made on the activated volumes.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

No critical assessment or communication regarding the potential extension of the mechanism for the Winter 2023/2024 has been released by ELES at the time of writing. There is also no clarity yet as to whether this mechanism could be introduced on a permanent basis in the product catalogue available for the TSO.

SPAIN

Spain developed an explicit DR programme in the context of the winter 2022/23 crisis. However, it is not comparable to other EU programmes, and does not follow all the requirements in the Council Regulation. The programme developed, "Servicio de Respuesta Activa de la Demanda" (SRAD), is designed as a system reserve in case of insufficient tertiary frequency regulation reserves. While this initiative provides some opportunities for flexibility providers (that were exclusively industrial consumers), it does not fit the requirements of the EU Regulation for a dedicated peak shaving product. Furthermore, no activation of the mechanism was performed during the winter 2022/23 period.

PEAK DEMAND REDUCTION MEASURES
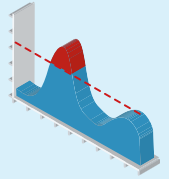
The programme SRAD was implemented as an extraordinary measure to guarantee grid stability in case of insufficient tertiary regulation reserve, and while by design it could fit as a peak demand measure envisioned by the Council regulation, many of its features make it more akin to an interruptibility scheme. Spain projected supply stresses caused by the European disruption of natural gas supply and drought events reducing hydroelectricity capacity which could cause frequency deviations that could put additional stress on the regularly contracted reserves. Moreover, the reduction of wholesale prices was not the foremost goal of this programme as electricity price spikes were smaller in Spain compared to other European countries. Therefore, the Spanish TSO, Red Eléctrica, did not perform an assessment and identification of the peak hours as envisioned by the Regulation. The programme was approved by the Royal Decree-Law 17/2022 of 20 September 2022 and started operating on 1 November 2022. The measure was implemented after an informal consultation. No further communication campaign was launched for the promotion of the measure or to raise public awareness on electrical consumption during peak hours.

DESIGN FEATURES OF THE MEASURE
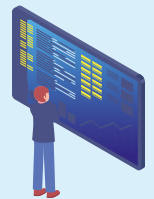
While overall the measure designs were reasonable, the main limiting factor was the requirements that excluded most commercial and all residential consumers from participating. As an additional factor, this mechanism was shaped to ensure the security of supply by providing additional reserves rather than reducing wholesale prices. The SRAD measure was implemented and managed by Red Eléctrica and was categorised as a balancing product, even though in practice it was more akin to a strategic reserve or interruptibility scheme. The first, and single, auction for this mechanism took place on 20 October 2022 covering the period between November 2022 until October 2023. The minimum bid size to participate was 1 MW with the possibility to aggregate delivery units. However, each delivery point

within an aggregator portfolio had to have a minimum capacity of 1 MW, which de facto excluded almost all commercial customers and all residential customers.

The service can be called between 8am and noon in January, February, September, October, November, and December, and from 6pm to midnight between March and August. Red Eléctrica sends an activation notice by landline, mobile or e-mail to an aggregator or a stand-alone site directly involved 15 minutes before the activation. Activations can last a maximum of three hours.

A significant drawback to the participation in this programme is that any asset participating to the SRAD is not allowed to join other markets (e.g., other balancing products). No baseline was requested, but participants needed to provide an accurate schedule of their consumption. This requirement was a significant deterrent for consumers, that did not want to commit to specific consumption schedules a year in advance. Activated volumes are calculated by comparing the hourly meter with the consumption schedule provided. An activation is considered valid if the hourly energy reduced (the difference between the scheduled and actual consumption) is equal to the capacity that was assigned during the auction. SRAD remuneration is based on a mix of availability and energy payment. The auction sets the availability payment, which amounted to 69,97€/MW/h for the first auction. Energy payments are linked to the marginal auction price for upward manual Frequency Restoration Reserve (mFRR) activation. Monetary penalties are being imposed in case of non-delivery. They can represent 150% of the availability price and 200% of the energy price for a given hour.

EFFECTIVENESS OF THE MEASURE
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The SRAD measure, while not comparable to other measures implemented in the context of the Council Regulation, was unsuccessful in engaging consumers of all types, and did not manage to come close to their targeted capacity. Out of the 2 700 MW initially expected by Red Eléctrica, 699 MW were offered during the auctions and 497 MW contracted. At the time of writing, no activation of SRAD has occurred. The tertiary reserves/mFRR did not achieve a level critical enough to launch a SRAD event. Contracted volumes were exclusively composed of industrial customers, which is not

compliant with the EU Regulation. The large discrepancy between the expected and the contracted volume by RED-E can be explained by the technical constraints, the long contracting periods that forced consumers to have a firm schedule one year in advance, and the short turn-around times between the launch of the measure and the first auction, that made it difficult to engage consumers.

INITIATIVES FOR WINTER 2023/24 AND BEYOND
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Red Eléctrica launched a public consultation to improve the functioning of the SRAD in April 2023 and is currently preparing for a new auction expected to take place in October 2023 with the start of the programme being in November 2023. The shape of the programme is not fully settled, most of it is probably going to remain the same form, except for revised participation requirements and other features that might derive from the open consultation process being held by the national regulator. In particular, service providers will be obliged to install a telemetry system as used in the balancing market by the start of the programme, even if the results of the auction will only be public in mid-October. This will leave very little time for a costly installation. Moreover, Red Eléctrica is currently revising its requirements on telemetry for the participation in balancing markets and SRAD mechanism. New requirements are still not published at the time of writing which creates additional uncertainties in particular in regard to the eventual hardware update and installation costs. In addition, the short time between the publication of the programme and its requirements in September and the launch of the auction in October will make it difficult to sign new customers for the service providers.

SWEDEN

Sweden implemented a demand reduction measure aiming at using industrial flexibility to achieve the 5% reduction of electrical consumption. The measure targeted industrial consumers. The approval of the measure by the European Commission came by the end of the Winter 2022/2023 and activations occurred during February and March. The measure met limited success as only up to 75 MW were contracted and its effect on the reduction of electrical consumption during peak-hours was minimal. The mechanism should raise significantly more volume to achieve the 5% reduction of electrical consumption during peak hours for the Winter 2023/2024.

PEAK DEMAND REDUCTION MEASURES
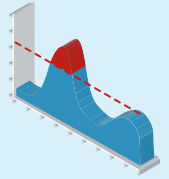
On November 10th, 2022, the Swedish government mandated the Swedish TSO, Svenska kraftnät, to carry out the special procurement of demand-side flexibility during peak-hours. The process started with the identification of electricity consumption in peak-hours. The selection was performed in accordance with the provision of the Regulation 2022/1854 but with neither a dedicated resource adequacy assessment nor a public consultation. Svenska kraftnät identified 8am to 11am and 4pm to 7pm during weekdays as peak-hours.

Svenska kraftnät developed a mechanism tailored for industrial customers, leaving out commercial and residential consumers. The Swedish NRA, the Energy Market Inspectorate, approved the market design and the funding proposed by Svenska kraftnät on 14 December 2022. However, the activation of flexibility only started in February 2023, after the approval of the measure by the European Commission, missing two months from the intended period. The TSO website was used for the promotion of the measure and as a one-stop-shop for documentation.

DESIGN FEATURES OF THE MEASURE
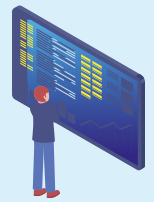
The peak demand reduction measure design was not conducive to the participation of a varied type of consumers, focussing only on industrial consumers, and prevented aggregators from participating in other markets in parallel with the same asset. Svenska kraftnät procured flexibility through direct contracts with a number of market participants for the period until end of March 2023. Participation in the measure was possible only for industrial clients or aggregators with an industrial portfolio. Value stacking was not possible as the same volumes engaged in DR schemes were not allowed to participate in the measure. Regarding metering requirements, an hourly meter was enough to be qualified for the measure. During the procurement process, market participants indicated their availability on an hourly-basis and

their activation price. The minimum bid size was 1 MW with the possibility to aggregate a pool. From the procurement process, a contract was signed between the TSO and the participant specifying the activation hours, the price of activation, and the maximum volume available for the whole duration of the measure.

Service providers had to send a baseline of the consumption of the participating units, that would be compared to the actual consumption of the units. The TSO did not need to send an activation notice, as hours of activation are stated in the contract. While the activation was guaranteed, the remuneration of the programme was solely energy-based.

EFFECTIVENESS OF THE MEASURE

The overall effect of the measure in the overall demand reduction observed in the period was only marginal. As stated by Svenska kraftnät, the electrical consumption reduction of 9,2% in December 2022 and 9,1% in January 2023 was caused by voluntary reduction, as the programme only started in February. From February to March 2023, 11 898 MWh of electricity was saved thanks to the mechanism, which falls far below the level targeted by the Council Regulation (monthly peak electricity reduction should have been 123 840 MWh[10]). This volume was achieved only by activating the flexibility of assets not involved in other DR schemes, with no participation from commercial or residential consumers. The maximum volume that was contracted for a single hour period was 75 MW.

INITIATIVES FOR WINTER 2023/24 AND BEYOND

No clear indication has been released by Svenska Kraftnät whether the mechanism will be improved and/or extended for the winter 2023/2024 as the Council Regulation 2022/1854 covered only the winter 2022/2023. Furthermore, no critical assessment of the reform was published in Sweden.

[10] Data based on smartEn own calculation using Svenska Kraftnät's publication on December 2022 peak hours electrical consumption (https://www.svk.se/siteassets/om-oss/rapporter/2023/reduction-in-sweden-dec-2022_final.pdf)

The smartEn map 2023 focuses on the implementation of the regulation 2022/1854, more particularly on Article 5. An assessment performed by ACER in June 2023 gave an extensive view of the different types of measures implemented by Member States covering the overall components of the Regulation. We did not want to publish this smartEn map, without making a reference to these other types of measures introduced, that while not a peak-demand products in themselves and thus out of scope of the analysis of this report, are still valuable to raise awareness with consumers, and could be the steppingstone for further development of DSF. We have identified three types of measures implemented by Member States that did not involve dedicated market-based products: an "Hit-and-hope" approach, communication campaigns on best habits, and energy-saving measures.

"Hit-and-hope" approach

The "Hit-and-hope" approach was developed as a way to support grid stability in event of stress rather than a peak-shaving measure. In some cases, the TSOs developed a tool for the communication of supply stress events to consumers via an app, a dedicated website or through media communication. The goal was to alert consumers and advise them to reduce their consumption during the stress event. These alerts were sent to the overall population with no specific consumers targeted. Response to these messages was fully voluntary, not monitored and not remunerated. The French TSO, RTE, developed a hit-and-hope mechanism called ECOWATT. Preliminary tests launched in April 2022 highlighted that an alert sent through ECOWATT led to a 1% overall reduction of electrical consumption. However, general response to the hit-and-hope approach tends to reduce after multiple mobilisations. RTE identified peak hours as between 8h-13h and 18h-20h during weekdays. One of the outcomes is that an extensive number of alerts with no reward for responding will tire out the general population, leading to reduce effectiveness. Moreover,

ECOWATT was designed to be activated exceptionally during events of severe supply-side scarcity rather than being activated almost every day during peak hours.

Countries that reported the introduction of the hit-and-hope approach include France, Finland, Ireland, Poland and Portugal.
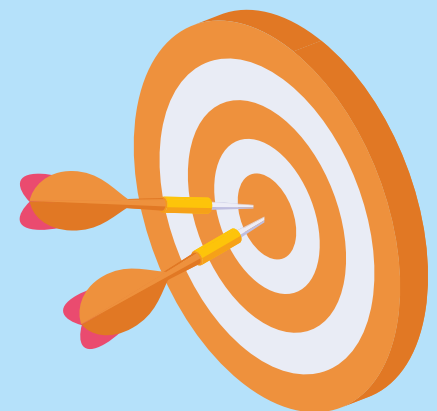
Communication campaigns

Another measure commonly implemented throughout the EU is the diffusion of a public communication campaign. These campaigns aimed at raising awareness of upcoming difficulties for the electric grid and peak-hours consumption. Communication campaigns could address certain consumer profiles (industrial, commercial or residential) to exhibit best behaviour to adopt during peak-hours.

The effectiveness of a communication campaign is difficult to assess as high electricity prices were the main driver toward the reduction of electricity consumption. However, raising awareness and clearly explaining the potential for flexible electricity consumption during peak hours should go hand in hand with the introduction of a peak-shaving measure.

Countries that reported a communication campaign on best practices for peak-shaving or energy saving include Austria, Belgium, Croatia, Czechia, Denmark, Finland, France, Great Britain, Germany, Ireland, Latvia, Lithuania, Malta, the Netherlands, Portugal, Sweden, and Switzerland.

Energy-saving measures

Finally, there were a myriad of energy-saving measures introduced by Member States not related to peak prices. The effectiveness of these measures is in many cases unclear, and were designed as emergency measures, not permanent by design. In particular those measures that directly affect the wellbeing, comfort and the habitability of our cities, like the reduction of public street lighting. They should serve as an absolute last resort, but never as a regular tool, in lieu of the use of DSF. Some of the measures introduced were:

- **Energy saving measures targeting the public sector. Most common actions included:**

  - The reduction of heating or air conditioning use in public buildings

  - The switching off unnecessary lighting in buildings or public monuments

  - The diminution public street lighting hours

  - The diminution of temperature in public swimming pools and sport centres

- **Energy savings targeting the private sector:**

  - Targets to reduce use of heating or air conditioning

  - Instructions to shut off of lighting and energy-consuming appliances

- **Energy savings targeting households:**

  - Technology improvement or replacement for energy intensive home appliances or heating system

  - Favourable loans for the refurbishing of home insulation

Countries that reported the introduction of energy-saving measures include Belgium, Croatia, Czechia, Denmark, Germany, Ireland, Hungary, Latvia, Lithuania, Malta, the Netherlands, Poland, Romania, Slovenia, Spain and Switzerland.

List of Acronyms

AOE	Appel d'Offre Effacement		**MW**	Megawatt
BTP	Beat The Peak		**MWh**	Megawatt hour
EU	European Union		**SO**	System Operator
DFS	Demand Flexibility Service		**SRAD**	Servicio de Respuesta Activa de la Demanda
DR	Demand Response		**ToU**	Time-of-Use
DSF	Demand Side Flexibility		**TSO**	Transmission System Operator
DSO	Distribution System Operator		**UPDC**	Unità periferica distacco carico
mFRR	manual Frequency Restoration Reserve		**UVAM**	Unità Virtuali Abilitate Miste

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