



Event Report | Sept. - Oct. 2022

Energy demand-side flexibility

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Demand-side flexibility covers a wide range of energy efficiency solutions – from electric vehicles that recharge when electricity is cheapest to digitally-connected appliances in buildings. But despite their vast potential, they are still a frequently overlooked solution in policy decisions.

In this special report, EURACTIV looks at the potential and obstacles DSF technologies face.

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Flexibility in power sector could slash consumer bills by €71 billion, study finds

By Frédéric Simon | euractiv.com

Languages: [Deutsch](#)



Demand-side flexibility covers a wide range of technologies – including smart meters allowing consumers to control their heating from a distance or programme appliances to switch off when they are not needed. [Photo: Landis+Gyr]

A first-of-its-kind study on demand-side flexibility – the ability for households to change their energy consumption patterns based on external signals – shows that EU consumers could save more than €71 billion on their electricity bills every year if the technology were implemented to its full potential.

The [study](#), performed by Norwegian risk-management consultancy DNV and published on Wednesday (28 September), is the first to quantify the benefits of demand-side flexibility for European consumers and the economy.

It comes amid surging electricity prices in the EU, which have been

pushed up almost tenfold by the war in Ukraine and Russia's dwindling gas deliveries to Europe.

“With the current geopolitical events causing skyrocketing energy prices and supply risk disruptions, the need to empower end-users” has never been more urgent, the report says.

Demand-side flexibility covers a wide range of technologies – from electric vehicles that recharge at night when electricity is cheapest to digitally-connected appliances in buildings that can be controlled remotely.

Some of them rely on smart meters allowing consumers to control their heating from a distance or programme appliances to switch off when they are not needed. Others rely on artificial intelligence to run manufacturing plants automatically when renewable energy is cheap and abundant.

“We strongly believe in this topic,” says Christoph Mazur, senior program manager at Microsoft. “With our data centres, we realised that we play an important role as energy users,” he explained, saying DSF technologies have helped Microsoft keep its electricity affordable.

With demand-side flexibility, “households and businesses can save money, make money and support the grid, also selling back energy to the grid,” adds Seydou Kane, public affairs vice-president in Europe for Eaton, a US-Irish multinational involved in power management solutions.

Overlooked solution

However, the lack of visibility of demand-side flexibility means it is “a frequently overlooked solution in policy decisions, hindering its potential in accelerating the cost-efficient clean energy transition,” the report says.

The study, prepared for the European trade association SmartEN, aims to fill this gap.

According to the findings,

full deployment of DSF by 2030 could lead to a reduction of more than €71 billion per year for EU households on their electricity consumption. The resulting lower energy prices would bring over €300 billion in indirect annual benefits to people and businesses.

For wind and solar farms, DSF would reduce the need for curtailment by 15.5 terawatt hours (TWh) by 2030 – or 61% less than what it is today, bringing more renewable energy to consumers without investing a single euro in additional generation capacity, the study found.

In turn, the increased availability of renewable electricity would save 37.5 million tonnes in energy-related CO2 emissions annually – equivalent to 8% of the EU’s total carbon emissions.

The additional electricity made available by DSF would also prevent 60 gigawatts (GW) of peak generation capacity from being installed, saving the EU around €2.7 billion annually.

For the electricity grid, this also means €11.1–29.1 billion saved in annual investments that would otherwise be needed to reinforce the electricity distribution grid to deal with the additional load.

Barriers

However, the report indicates that the activation of consumers’ flexibility still faces regulatory barriers.

This is notably due to the delayed implementation by member states of the EU’s 2019 Electricity Market Directive, which introduced new rights for consumers to generate their own

electricity, consume it, or sell it back to the market.

“As the EU shifts away from the traditional energy system and heads towards a decentralised, digitalised and decarbonised transition, new and smart solutions are required to manage the ever-increasing variable generation mix whilst maintaining affordability and security of supply,” the report says.

However, most European consumers do not yet see this reflected in their utility bills, which have gone through the roof with the ongoing energy crisis.

“People need to trust the system if you want them to become flexible,” said Monique Goyens, director general of BEUC, the EU consumer organisation.

“And at the moment, there is zero trust” because of rising energy bills, she said. “So speaking now about demand-side flexibility is a bit of a niche conversation,” she added. “It’s not mainstream at all; it’s not top of people’s minds.”

Still, Goyens said she believes in the potential of demand-side flexibility to deliver real savings for consumers in the future. “Consumers need a ‘safe space’ for DSF to be widely adopted,” she remarked. “The system should be voluntary and should not penalise those that don’t choose it,” she said.

Energy pricing also plays a role. Many countries have kept fixed retail prices for electricity to protect households from escalating energy bills. But that also prevents consumers from seeing the benefits of demand-side flexibility since the energy savings may not immediately be reflected in their

utility bill.

“If you’re part of the solution, you need a fair remuneration; you need to get a fair share of that benefit,” said Tadhg O’Brian, a senior official at the European Commission’s energy directorate. “And that is not yet clear to people,” he admitted.

For DSF to become mainstream, it needs to be automated and well-designed, the official continued. “We need to see offers that make sense to consumers and that are easy to use,” he said. “We need someone to design this,” he added, comparing the upcoming rise of DSF to the iPhone, which revolutionised the mobile phone market in the mid-2000s.

The European Commission is aware of these shortcomings and is preparing to reform the EU electricity market to reflect the shift towards a more decentralised energy system dominated by renewables and grid-connected devices.

“The key enabler for flexibility is

digitalisation,” said Maroš Šefčovič, the EU Commissioner in charge of foresight, [who spoke at an event earlier this year](#). “We can also be more flexible by making better use of all the devices that are connected to the grid, such as heat pumps, car batteries or fridges,” he remarked.

But EU member states have been slow to deploy smart meters, which are considered key to unlocking demand-side flexibility and allow the real-time “observability” of the electricity grid.

The European Commission is expected to publish an action plan next week to digitalise the energy system, including a flagship plan to create a “digital twin” of the electricity system as early as next year.

“The electricity grid needs to interact with many actors or devices based on a detailed level of observability, and hence the availability of data,” the Commission says in the draft.

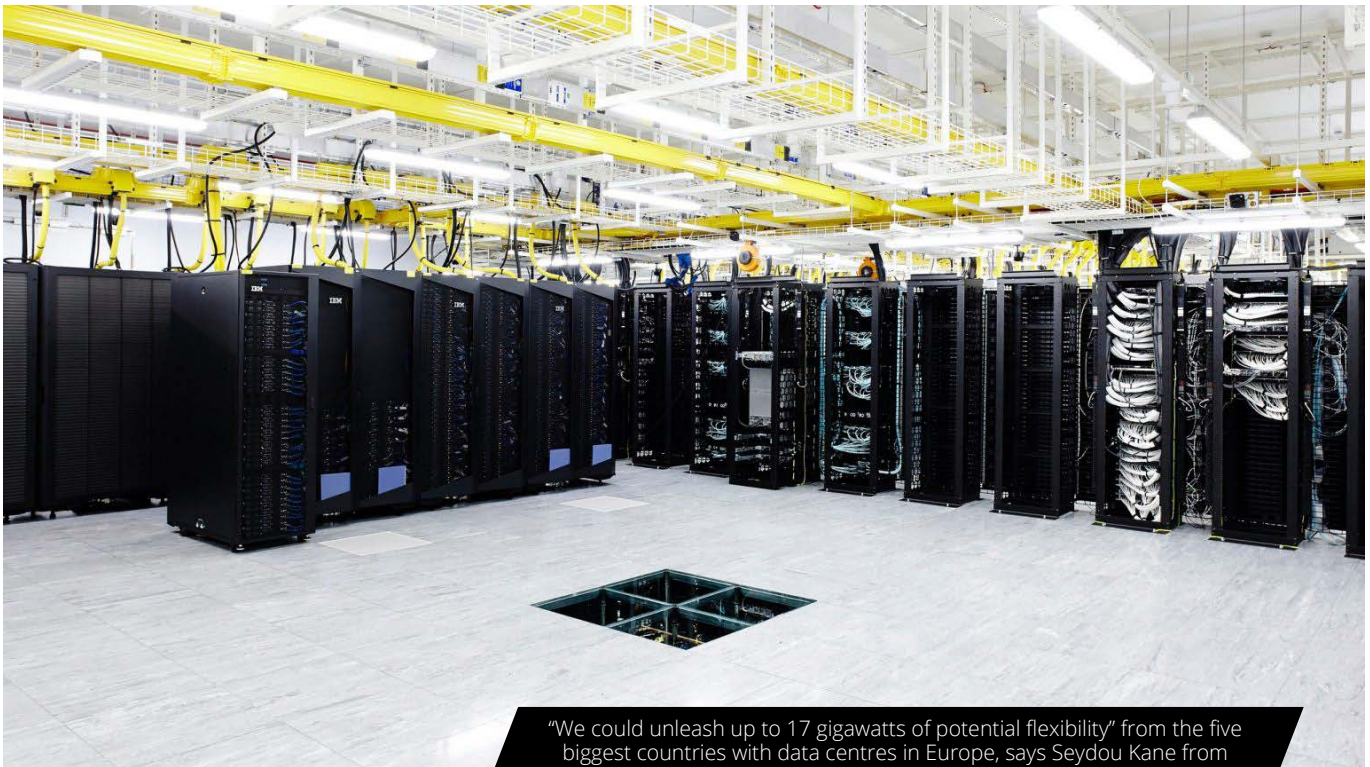
“The electricity network has

become increasingly digitalised in the last decade, but the speed of transformation needs to increase significantly,” it adds.

INTERVIEW

Business executives: Demand flexibility 'becoming mainstream' with data centres, electric cars

By Frédéric Simon | euractiv.com



"We could unleash up to 17 gigawatts of potential flexibility" from the five biggest countries with data centres in Europe, says Seydou Kane from Eaton. [CommScope / Flickr]

The energy demand-response market is moving to the mainstream, thanks to the rise of electric vehicles and the massive growth in power consumption from data centres, which can provide flexibility to the electricity grid in case of peak demand, two senior energy officials have told EURACTIV.com.

Seydou Kane is vice-president for public affairs and general manager for distributed power quality (EMEA) at Eaton, an energy management

company. Daniele Andreoli is the head of flexibility solutions at Enel X, the largest provider of demand response worldwide.

INTERVIEW HIGHLIGHTS

- The five countries with the largest data centres in Europe could bring up to 17 gigawatts of potential flexibility to the electricity system
- Demand-side flexibility enables fast frequency response enabling

more renewable electricity to come on the grid

- Digitalisation has allowed the industry to move from large industrial consumers to small industries and households
- But regulatory barriers remain, notably due to the delayed implementation of the EU's electricity market directive

Demand-side flexibility has been around for many years. How has it evolved over the years and what

can it do today that it could not ten years ago?

Kane: One clear element that is a major difference today from 10 years ago is, for instance, electrical vehicles. We see a massive opportunity in what can be done with electrical vehicles in smart charging infrastructure. This is one key aspect. And by smart, I mean bidirectional and digital.

The other element I would highlight is data centres and the flexibility they can bring to the electricity system. For example, a study that we did last year with Statkraft in Norway estimated that across the five biggest countries with data centres in Europe, we could unleash up to 17 gigawatts of potential flexibility.

Those are the two elements I would highlight in terms of clear opportunity – not to mention energy storage – that is becoming mainstream.

You are talking about existing data centres dealing with emails and cloud computing?

Kane: That's correct. Data centres are enabled cloud, enabled digital. And the demand for those is exponential, pushing their electricity consumption.

But from a UPS perspective (i.e., uninterruptible power supply), what demand-side flexibility enables is a high-speed capability to do frequency response. And you need that capacity to enable more renewables to come on the grid.

Because the traditional system has an inertia that is clearly going to create an issue in terms of circulation of electricity into the grid. So that's how data centres can be an

active player in terms of flexibility. In that sense, demand-side flexibility can provide immediate backup in a data centre.

Daniele, from your perspective at Enel X, what is the main progress made in demand-side response technologies in the last decade?

Andreoli: I would say huge progress has been made.

We started decades ago by organising the first demand response event in the US. Back then, everything was manual, there was no real platform connecting customers in real time. The event was announced one day in advance so we could prepare everything to make it happen.

Since then, things have moved forward so fast with digitalisation. Our success as an aggregator relies on a proprietary technology platform that allows aligning the dispatching orders from the TSOs or the DSOs with the end-users that must be called. That will enable us to see in real-time what's happening with consumption and to dispatch the flexibility accordingly.

And that allowed us to move from an old-fashioned manual style of doing business to something that can be activated in an automated way.

On top of this, technology and digitalisation during that time allowed us to involve smaller assets in the flexibility markets, moving from industrial plants to commercial and small industries to EVs and residential.

Having access to real-time data is one thin, but acting upon consumer behaviour is a step further, right?

Andreoli: Indeed, but the data helps build energy usage awareness. Thanks to our application, energy users can see what's happening. So when there is an activation response, they can see on the monitor if they are performing well or not. And that allows them eventually to intervene.

Are these interventions more interesting to bigger energy consumers who will see a direct impact on their electricity bill?

Andreoli: Definitely. We are mostly working with commercial and industrial customers. Because it's clear that we can extract a lot of flexibility from them.

But with private consumers, too, technology has overcome a lot of barriers and made it possible to deploy demand-side flexibility – for example, with electric vehicles, connected buildings, etc. We can now easily unleash also the potential from that side.

But clearly, you need to put together thousands of small appliances to provide something meaningful to the grid, while with one single data centre, you can really unlock a lot of potential in one fell swoop.

Kane, is that your experience at Eaton as well with DSF mostly of interest to businesses with the consumer side to be unlocked in the future?

Kane: Definitely. If we look at the scale of efficiency gains that can be made, the commercial and industrial players can move the needle much easier, much faster than what we see on the private consumer side.

However, we shouldn't overlook the advent of prosumers and the contribution individual households

can make. They are taking very clear conscience of the control they can have and the money they can save.

And in the context we have today, saving money on your electricity is a big deal. You can make money by selling back to the grid, but you can also engage in the energy transition by generating from renewable sources.

We operate in those two dimensions. Commercial and industrial data centres are the low-hanging fruit, but we do believe that in a distributed energy world, individual customers are also becoming much more dynamic. This is why we engage as well at the household level.

Asides from implementing the 2019 energy market directive, what would it take to unlock the potential of private consumers?

Andreoli: The main barrier in most countries is a lack of rules, which impedes households from participating in the provision of energy services.

At the European level, there is the 2019 electricity market directive, but it's not really implemented. We are lacking this implementation. Some details should also be clarified, for example, on the role of aggregators – how we can aggregate multiple customers together and be responsible and measured on an entire portfolio, not just on single users.

What are aggregators?

Andreoli: There are companies like Enel X that can put together a portfolio of different resources – from households to batteries or big industrial plants – which, as a

portfolio, can respond to certain grid events, or grid needs, in a perfect way.

Do people or businesses decide themselves to group together?

Andreoli: No, the aggregator is making these portfolios, explaining to the consumer how we work together and how we monetise their flexibility on the market as we represent them.

Then we bring this opportunity to the TSOs, who pay us to provide a particular service that can be a real-time ancillary service.

From that moment, we can activate all our resources or select the resources that are ready to respond at that moment. Maybe one site is overperforming, and another is underperforming. But as a portfolio, we are giving exactly the service that the TSO is requesting.

Some TSOs want each site to be monitored independently; they don't want to see the aggregation. But we consider this as a barrier. It doesn't work in this way; we cannot ask each household in the plan to respond at the same time with perfect behaviour. What we do is compensate for all behaviours in a way that allows us to give a reliable service to the TSOs.

Kane: The most important is trust. There must be trust in the system so that the mechanism is fair, transparent and easily accessible.

Some technologies enable such a market, like smart meters, which generate data about user behaviour. Data is fundamental if we want to move towards demand-side flexibility because that underpins the basis for any trading. And we need to make sure data is not corrupted, is cybersecure, etc.

Aside from smart meters, have you quantified the infrastructure investments needed to enable demand-side flexibility?

Andreoli: There is no need for great investments in grids or other particular areas. The real investments are on the side of aggregators or the energy users who want to participate. Because we need to pay for some enablement costs to allow these customers to participate in demand response markets.

But these investments are pretty low. The real benefit of demand-side flexibility is that instead of building new power plants to cope with peak demand, you can use existing resources to provide that kind of service. And with very low investment, you can enable that.

We go client-by-client to enable each single site. So the investment is on our side as an aggregator to provide the technology platform to handle the demand-side management.

What about grid upgrades at the distribution level? Are reinforcements needed there?

Andreoli: Not for demand-side flexibility. Grid reinforcements are indeed essential to accommodate more renewable energies.

If a farmer wants to install solar PV panels, this can be a challenge for the distribution grid because the farmer will be able to feed the electricity back into the grid. And the grid was not designed for that. This is where grid reinforcements are needed. But specific investments are not needed when it comes to unlocking demand-side flexibility because we provide everything ourselves.

You do, however, need grid reinforcement in order to allow the bidirectional flow of electricity because, as you said, the grid wasn't designed for this.

Andreoli: Yes, but this has nothing to do with unlocking flexibility; it has to do with enabling distributed energy generation sources.

When we convince a consumer to reduce their consumption at certain times of the day because there is not enough energy available at that moment – few investments are needed to enable that.

Kane: If you want to become energy independent as a consumer, there are indeed costs involved: you will invest in solar PV panels or a battery, for example. And you will look at the return on investment that you will get from this.

But when it comes to demand-side flexibility, there are not additional investments involved. You only engage in load shifting, basically.

The report by DNV cited regulatory barriers to the deployment of demand-side flexibility. What are the best practices and which countries are getting it right?

Andreoli: To me, the UK and Poland are good examples because they allow demand response to participate in the capacity market. And that makes it easy for us to convince industrial users to participate.

The authorities there launch auctions for the long term – not just for one year but permanent. So we are encouraged to make investments and enrol customers in this market.

We need to educate customers; it's not easy. If you go to them with a quick fix for just one winter, it won't work as well. It's much better to work with customers in the long run.

Are there other examples?

Andreoli: Ireland is an interesting benchmark when it comes to ancillary services. Because they are coping with a low inertia system. Since many conventional power plants have been retired, they are dealing with many renewables. So they don't have the inertia that comes with conventional power plants.

And so, they reformed the ancillary services market to fit their needs but were open to demand response and new participants. And that makes it possible for us to participate in an ancillary service programme with demand-side flexibility resources more easily.

What kind of ancillary services can be supplied by demand-side flexibility?

Andreoli: For example, we are working together with Eaton to bring a data centre owned by Microsoft into the market for ancillary services with an uninterruptible power supply (UPS). In this case, basically, we use the data centre as a backup system.

A portion of the energy stored in the UPS of the data centre can be instantly activated to react to the grid's frequency. So in case, there is a deviation from the frequency of the grid, the data centre can immediately react and provide for a very short time – a few seconds or even milliseconds – a little contribution that can restore the frequency of the grid.

And that's a great example of cooperation among companies to make this happen.

Kane: Norway is an interesting market as well. As a household, you can easily trade and sell solar power back to the grid, which can be an inspiration for others.

What we would advocate for at Eaton is to have more harmonisation and standardisation at the EU level and simplification.

At the moment, it's tremendously complex to replicate solutions from one country to another. EU regulations are there, but countries still have a lot of power to tweak and implement those regulations locally. That's why more harmonisation would greatly facilitate and accelerate demand-side flexibility.

Don't get me wrong; there have been tremendous improvements over the past 20 years. But the energy crisis we have today calls for a strong collective response rather than implementing solutions country by country.

Andreoli: Let me take an example: telemetry. In some countries, TSOs have introduced requirements to see the real-time consumption data from each individual site that wants to participate in the demand-response market.

That is a nice-to-have but not really a must for the TSO because this is something the aggregators can do. So, they are pushing us to spend thousands of euros to put a machine in the field instead of letting the aggregators provide a simpler service for just a few hundred euros.

Or for instance, a lot of countries

are remunerating resources so that they can be activated in case of a demand peak. But in other countries, they don't – they only pay for the resources when activated. So on the one side, you have fixed revenues that you can rely on. And on the other side, you have uncertainty. And clearly, it's far more challenging to convince an industrial customer or even a household to participate in a market under those conditions.

Another example: in some countries, they declare in advance how many times in the year they can call you, and for how long. And in others, they can do whatever they want. So you can imagine that from the customer perspective, being on call anytime during the entire year – maybe for as long as one day – it's too much, and they don't want to participate.

So if you shaped those rules in a more user-friendly way, we could create momentum and bring many customers to today's flexibility market.

The European Commission has proposed a mandatory target for every EU country to reduce consumption at peak hours by 5%. Can demand-side flexibility

contribute?

Kane: In the very short term, the biggest savings are going to come from simple things like turning your thermostat down to 19 degrees or turning off public lighting in some places at night.

Those are kind of “push” measures. And where they exist, other solutions like demand-side flexibility and energy storage can help as well.

Sure, but that's not going to happen at scale this winter...

Kane: It's going to be very difficult, yes.

Andreoli: The energy crisis won't be resolved with a single solution – each one can contribute. In some countries, demand-side flexibility is up and running and will be able to help with some incremental resources.

What's important for us is that we don't see demand-side flexibility just as a temporary solution but as something to be also done in the long term.

Many consumers have lost trust

in the electricity market because of skyrocketing bills while those with fixed contracts are probably breathing easier these days. So do you need necessarily dynamic price contracts as a consumer to enable demand-side response?

Andreoli: Probably not, I would say. The difference is that customers with a variable price contract can make savings from energy management decisions by shifting their consumption during certain times of the day. And an aggregator can help them do this on their behalf. But it's different from participating in a flexible market organised by the government. From this perspective, the type of contract is not relevant.

Kane: More than the type of contract, what's important is to keep things simple and predictable for the consumer. This is going to be the key.

Andreoli: Consumer trust is indeed essential. But despite the crisis, we also see a lot of willingness from companies and consumers to participate in the energy transition. I hope regulatory details can be fine-tuned so that we can unleash that potential.

PROMOTED CONTENT

DISCLAIMER: All opinions in this column reflect the views of the author(s), not of EURACTIV Media network.

New report into Demand-side Flexibility quantifies huge scale potential in 2030 for both consumers and EU clean energy transition

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By SmartEn – Smart Energy Europe



[Daniele Mezzadri (Shutterstock)]

The peak electricity demand reduction obligation has placed the contribution of demand-side flexibility at the top of the EU agenda. However, consumers' flexibility should not be limited to an emergency context. A new study published on September 28 identifies and quantifies the multiple benefits in the EU in 2030 of a full activation of flexibility from buildings, transport, and industry in order to achieve the 55% GHG target cost-effectively.

In a time of geopolitical instability, with the constant threat of supply risk disruptions and skyrocketing energy prices, Europe braces for a challenging winter. These unprecedented circumstances have intensified the urgency to identify reliable, cost-effective and immediately deployable solutions to cut EU energy dependency from Russian gas and reduce bills for consumers.

Demand-side flexibility is one of

them.

Our homes, offices, hospitals, schools, vehicles, and industries all have the potential to shift and shed energy consumption to reduce their energy demand in peak hours, when electricity is mainly produced by gas and prices are high. Following the same logic, consumers should be able to receive signals to consume more when energy is cheaper and renewable electricity is abundant in the grid.

With flexible consumption from energy demand sectors alone, we can already achieve a reduction of 3.7% in Russian gas imports and save €16 billion in total gas costs in 2023. In 2025, the potential savings are nearly double, amounting to a 7.1% reduction in Russian gas imports – equivalent to €31.4 billion saving.

The 5% national peak electricity demand reduction obligation, announced by President Von der Leyen during her recent State of the Union speech, would stimulate schemes to activate this dynamic, time-dependent, flexible consumption of consumers, as an emergency intervention. However, the activation of consumers' flexibility should not be limited to an emergency context. It has a paramount relevance to achieve the renewables and GHG reduction targets in 2030.

Consumers should be enabled to play a pivotal role in accelerating the deployment of renewables in the EU energy system, further justified by the current security of supply concerns. Consumers should be empowered to become prosumers that generate and store on-site renewable electricity, and to share and trade renewable electricity generated in the local community they are part of. They have a crucial role in managing the increasing flexibility needs of the energy system, and they should benefit from playing such a role in the decentralised, digitalised, clean energy transition.

smartEn – Smart Energy Europe carried out a [study](#) with independent expert consultants, DNV, to quantify the benefits of demand-side flexibility in the EU in 2030 for both consumers and the whole energy system.

Among the findings, notable

results were found when the full activation of flexibility is unleashed from buildings, electric vehicles, and industry in 2030. More tangibly:

- 37.5 million tonnes can be saved annually in GHG emissions
- €11.1 – €29.1 bn can be saved annually in distribution grid investments
- €71 bn would be saved annually by consumers directly
- 15.5 TWh (61%) would be the avoided renewable curtailment
- €2.7 bn would be saved annually in avoided peak generation capacity

The smartEn/DNV study, which was presented during a [high-level event](#) in Brussels on 28 September, is a timely addition to the growing, but still limited, corpus of detailed research into the potential benefits of demand-side flexibility. Importantly, it is the first time that the benefits of demand-side flexibility were comprehensively calculated for the EU in 2030. The findings serve as a clear warning to not undervalue consumers' flexibility given the huge potential impact toward an efficient, clean electricity system they can have.

Member States, National Regulatory Authorities and System Operators shall engage in a similar effort to quantify and plan, in the short, medium, and long term, which energy demand sectors have flexibility potential to unleash, how to further increase the deployment of flexible capacity and how to stimulate its activation through an enabling regulatory framework.

EU rules have already been set in 2019, in the form of the Electricity Market Design, to eliminate barriers and shape enabling frameworks. Specifically, the EMD opened electricity markets and mechanisms to demand-side resources, allowed

for the participation of aggregators, required System Operators to become neutral market facilitators and procure flexibility services from the market, allowed stacking of services and allowed consumers to receive dynamic price offers and participate in local energy communities. However, most of these provisions, relevant for demand-side flexibility, have not been implemented yet, as monitored by smartEn in different Member States in March.

The activation of demand-side flexibility potential has never been so high on the EU agenda. The national peak electricity demand reduction obligation should be a stimulus to correctly implement the 2019 Electricity Market Design and grasp the benefits of demand-side flexibility.

In addition, interoperability, data access and data sharing are required to allow for transparent interaction and the integration of consumers in the increasingly variable energy system. The forthcoming EU Digitalisation of Energy Action Plan should be another milestone to further foster a harmonisation of rules and support for innovative use cases for a common European data space – with active consumers as the game changers.

smartEn gathers more than 75 companies directly responsible for 13 GW of flexible capacity across 15 European countries. These are climate-friendly resources already deployed, that would need signals and markets to fully deliver their benefits for consumers and the entire energy system. It is a resource efficiency priority to activate them, while smartening the way the energy system has functioned until now.



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