The Market Design Initiative: Enabling Demand-Side Markets

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Background

Climate and energy policies are driving the deployment of intermittent and often distributed renewable resources, fundamentally changing the nature of Europe's energy resource mix. This will have far-reaching implications for the relationship between wholesale electricity markets and the delivery of energy services to consumers. It is therefore appropriate that the Commission's Market Design Initiative envisions a future electricity market with engaged consumers—large, medium, and small—at its heart. Achieving the scope of transformation now envisioned under the Market Design Initiative requires wholesale and retail markets to be more closely linked, and both the consumption and production of electricity by consumers will need to interact with these markets in response to price and other information. For this level of engagement to develop at scale it will need to be embedded in the wider vision of harnessing the information revolution to drive innovation, improve the lives of citizens, and foster new industries.

Demand flexibility through customer engagement will be crucial if the challenges posed by decarbonisation of the energy sector are to be met in a cost-effective, affordable, and reliable fashion. As the deployment of intermittent renewable resources continues, the need for flexibility will grow while the amount of dispatchable generation capacity will decline. Furthermore, as decarbonisation progresses through the electrification of the heat and transport sectors, distribution networks will come under increasing pressure. The value of flexibility will therefore take on a local dimension over time, creating opportunities to tap into the potential to shape customers' electricity consumption—and, increasingly, production. These opportunities should be exploited in ways that not only assist in achieving an overall energy balance, but that also respond to local network needs, while still reliably delivering the energy services and quality of life consumers want and need.

Existing market arrangements are unlikely to deliver anything close to the full economic potential for demand flexibility. Accurate and timely price information reflecting the full value of the energy and grid services needed to maintain security of supply is often obscured from suppliers, distribution network operators, and large industrial customers. At the same time prevailing wholesale market rules and practices routinely prevent, discourage, or ignore the potential for participation of non-traditional resources. As a result, those market participants best placed to search out and underwrite the most economic options for investment in needed flexibility have limited incentive or opportunity to do so.

At the retail level, the restricted or undifferentiated range of product and service options available to most consumers, especially smaller consumers, continues to reflect a world in which there was little value in offering new and more flexible ways to use electricity to deliver the energy services they want and need, except perhaps infrequently and under extreme conditions. Retail tariff designs have not kept pace, while recent calls for higher fixed charges and poorly designed demand charges will only make matters worse. Tapping the potential for flexibility in the domestic and SME (small and medium-sized enterprises) sectors—where most consumers will have little interest in or capacity for changing the way they use energy services—will require innovation and investment by both incumbents and new entrants. But without access to prices reflecting the full value of flexibility to the local grid energy providers have no business case for doing so and nothing to offer consumers. Proactive policy and efficient policy

1 The authors thank Sarah Keay-Bright (RAP), Simon Skillings (E3G), Josh Roberts (Client Earth) and Dries Acke (European Climate Foundation) for valuable comments.

delivery frameworks will be needed to optimise the use of electrification in the decarbonisation of retail heat and transport in a timely fashion, and those interventions will need to be guided by more transparent market information about real-time local system needs.

Our recommendations are organised around a timeline of desired outcomes. We identify measures to be taken as part of the current Market Design Initiative that are needed to achieve near-term outcomes that are both feasible and appropriate for the current phase of consumer engagement. Some of these measures are, however, also important in preparing the ground for the more sophisticated and aggressive engagement of demand-side opportunites that will emerge in the medium to long term, particularly as decarbonisation of the heat and transport sectors becomes more urgent and widespread. The shape of these longer-term opportunities will become clearer over time, however we have attempted to characterise some of them here and to identify measures likely to be required in subsequent phases of policy development.

Near-Term Outcomes

Incentivising Demand Flexibility Through Value-Reflective Energy Pricing

Currently, few European consumers are sufficiently incentivised to manage their electricity consumption in ways that reflect market or network conditions. Large, mainly industrial customers who are exposed to wholesale energy prices do have some incentive to manage consumption. But the failure of wholesale prices to adequately reflect the full real-time value of energy, coupled with the effect of price caps and floors, often dilutes that incentive at the very moments when flexibility is at a premium. Smaller consumers, who are rarely exposed to the temporal variation of electricity prices and may be supplied via regulated flat tariffs, have little or no incentive to manage consumption and typically very limited capacity to do so.

The first step toward reversing this situation is to ensure that wholesale prices accurately signal the underlying temporal value of energy and reserves as they fluctuate with growing frequency between conditions of scarcity and oversupply. It would give large industrial and commercial users information that would better align their investment and operational incentives with the energy balancing needs of the wholesale system. At the retail customer level, suppliers, aggregators, equipment manufacturers, and technology companies would find a growing opportunity to compete by offering consumers attractive new products and services that tap into the value of being able to respond to changing conditions in the wholesale market.

Jump-Starting the Use of Economic Demand Response as a Resource

The continued deployment of smart or interval meters to all customers provides the basic functionality that is a pre-requisite for the development of economic demand response. However, beyond ensuring that this basic functionality is in place, it is likely that additional steps are required to overcome the inertia—in some cases active obstruction—that has kept potentially responsive demand on the sidelines. **Establishing a legislated right for all consumers to participate in all wholesale power markets** would be useful in addressing the situation in those Member States that still prohibit such participation in some fashion or where incumbents are not offering time-varying tariff options to their customers. **Suppliers could be required, as a condition of their license, to offer all customers a time-varying tariff option** that meaningfully captures the difference between on-peak and off-peak pricing periods, with zero or minimal standing/fixed charges (i.e., limited to customer-specific costs attributable to an incremental consumer). This should be accompanied with product or service offerings to automate loads.

It may also be useful to consider **a supplier obligation as an early-stage or temporary measure**, with suppliers obligated to meet a certain percentage of their demand over the course of a year by procuring voluntary demand response (down or up) at a price comparable to their concurrent cost of energy in the wholesale market. The obligation could be quite a small percentage at least initially, to familiarise suppliers, network operators and national regulators with the use of demand response as a resource while minimising concerns about feasibility and implementation.

The structure of network tariffs varies widely across europe today. Many residential tariffs are predominantly volumetric, and while this promotes energy-efficient behavior, it does not encourage demand response. Many distribution system operators are keen to strengthen the capacity or fixed components of their network tariffs given that peak energy demand is an important driver of grid investment, and due to concerns regarding timely and adequate cost recovery. Poorly designed capacity components or demand charges can, however, serve to disincentivise energy efficient behavior or demand

response in times of surplus while fixed charges provide no incentive to adjust consumption. As the share of variable renewable generation increases, distribution system operators will need to use more sophisticated tariffs that are bidirectional and vary by time and geography, as discussed later in this paper. In the near term, however, **the EU could introduce network tariff design principles or minimum requirements to:** ensure balanced promotion of both energy efficiency and demand response; encourage both peak demand management and consumption in times of surplus; and guard against discouragement of ownership of distributed renewable generation and its cost-effective integration with the power system. **These principles should at least include minimisation of fixed charges** (i.e. limited to customer-specific costs attributable to an incremental consumer) **and prevention of the use of poorly designed demand charges**.[2]

Expanding Access to Balancing Services, Network Services and Capacity Markets

Demand response can offer a cost-efficient alternative to the traditional means of providing balancing services, network services and capacity and, as energy supply becomes more variable in a low-carbon power system, the demand for many of these services is expected to grow. In some Member States the largest industrial consumers already play a part. However, smaller consumers, including many industrial loads, are effectively excluded from these markets as they cannot individually provide the volumes that are of interest to system operators.

This issue can be addressed by aggregation. By bringing together the demand response of many customers the necessary volumes can be achieved, thereby allowing smaller customers to benefit from the value they can provide to these markets. This can be done by incumbent suppliers, independent service providers, or network operators, though independent entities may have an advantage as they are indifferent to where the value is realised and are therefore likely to maximise the value of consumer flexibility by offering the service to whomever values it most. This can be particularly helpful in the engagement of smaller commercial and domestic consumers where the economic case for engagement is more challenging. Independent service providers may also be more motivated and more likely to innovate new ways of creating value.

In order to realise the benefits of demand aggregation and the role that independent service providers can play in delivering them, barriers to non-traditional sources and to third-party participation that exist in many Member States must be addressed. Established suppliers may well view third-party access as unwelcome competition, while generators and vertically integrated utilities may consider demand flexibility in general as a threat to their core business. In many Member States, market rules favour incumbents and large generators by, for instance, imposing unnecessarily high minimum participation requirements. Established suppliers are often able to effectively prevent their customers from contracting with third parties either by applying unreasonably onerous contractual penalties or simply withholding permission. Furthermore, in some Member States, demand response is not recognised as an acceptable alternative to generation and is effectively prevented from participating in flexibility markets.

European-level regulation needs to ensure that demand response can compete on an equal footing with generation to serve these markets, that the roles and responsibilities of market participants are appropriately defined and that both existing and new market participants are treated in an equitable fashion. In addition, the right of customers to choose their service provider needs to be upheld, as does the ability of independent service providers to contract with a supplier's customer without the need to first seek that supplier's agreement.

Data Collection, Security and Privacy

Customer engagement is dependent on the introduction of smart or interval metering, which will involve gathering huge amounts of consumption data. This data will have considerable value to both incumbents and independent service providers, who will be able to extract patterns to support commercial activities and tailor services to individual consumers. **Given its commercial value, it will be important that customer data is collected and held securely, and that individual customers retain control of access to their own data. Furthermore, in the interests of ensuing equal access, it is recommended that the collection and management of data is performed**

2 For a detailed analysis of rate design, including the determination of network operators' allowed revenues and network tariff design for the collection of revenues, see Lazar, J. and Gonzalez, W. (2015, July). *Smart rate design for a smart future.* Montpelier, VT: The Regulatory Assistance Project. Retrieved from http://www.raponline.org/document/download/id/7680

by an independent, regulated and disinterested entity, rather than by market participants with a commercial interest including, for example, distribution system operators.[3]

Medium- and Longer-Term Outcomes

The measures identified above are needed both to deliver near-term outcomes and to prepare the ground for expansive opportunities likely to emerge in the longer term. These measures are necessary but will not be sufficient to capture emerging opportunities. More aggressive and sophisticated measures will become feasible and are likely to be needed over time, particularly as we tackle the challenge of decarbonising transport and heat.

Engaging Domestic Consumers: Linking Wholesale and Retail Markets

While large wholesale customers have the capacity and incentives to respond directly to better information about conditions in the energy market, engaging the potential for retail demand response is a more complex challenge. Making timely and accurate information available to all consumers is both essential and increasingly feasible, and some smaller customers may well choose to exploit that information in managing their consumption directly and should be afforded the option to do so. But most smaller consumers will have limited capacity and little interest in investing the time, money, and effort required relative to the expected financial rewards. Furthermore, while the communication of market conditions in the bulk power system to wholesale market participants is relatively straightforward, it is a more complex task to align incentives for each of a very large number of retail loads with real-time system conditions at the retail distribution level.

Eventually, retail tariff options must be developed that more accurately reflect not only the time-varying value of energy but also the value of increasing or decreasing individual consumption at the local system level. Such more sophisticated tariff options are essential if suppliers, aggregators, appliance makers and information/communication technology providers competing to deliver superior consumer value for money are to be expected to shape their offerings in ways that leverage the value of more responsive retail electricity consumption to a low-carbon energy system. Some member states already include rudimentary locational signals in the distribution "use-of-system" tariffs applied either directly or indirectly to all customers. With the rollout of smart meters the opportunity arises for electricity and network tariffs applied to the small commercial and domestic sectors to become dynamic in nature, reflecting a customer's actual consumption and impact on the power system during each trading period. The development and implementation of more sophisticated price signals will necessitate innovation and learning by doing; the EU has an important role to play in facilitating this through its R&D programs, allocation of EU funds, provision of guidelines and sharing of best practice.

As large new and potentially more flexible uses for electricity are deployed, for instance in heat and transport, it may be appropriate to apply such time-varying retail tariffs as the default option for those applications. Studies suggest that this approach could be highly effective in mitigating the impact of electric vehciles (EVs) on both additional generation requirements and grid infrastructure. It seems likely that EV manufactures or entities operating on their behalf will become "service providers", perhaps in collaboration with other market actors, using control technology installed in their products to manage charging demand in accordance with system or network needs and providing a comprehensive package to customers. Applying dynamic tariffs as the default option could similarly be appropriate where heat is decarbonised via electrification.

Steadily increasing the availability and sophistication of retail tariff options that reflect the temporal and locational value of retail electricity consumption in parallel with the development of smart appliances that can respond autonomously to such prices and with "smart home" products and services that can use them to enhance consumers' comfort and convenience at low cost, has the potential to deliver improved quality of life, increase customer engagement and at the same time reduce the cost of decarbonising the energy system as the value of demand flexibility grows over time. **Should the development of appropriate retail tariff options not keep pace with innovation in the retail consumer space and with increasing flexibility requirements, such development may need to be supported by regulatory intervention.** It will be important that the smart appliances and "smart home" products and services that will allow customers to respond either directly or via service providers become available in timescales

3 As an example, refer to the establishment of the Data Communications Company (DCC) in Great Britain. See: https://www.smartdcc.co.uk/about-dcc

that complement the rollout of time-of-use or dynamic tariffs. While the system level benefits of smart appliances may be significant, the incremental value as seen by an individual consumer may be low. **The development and deployment of smart appliances in appropriate timescales may therefore need to be supported by appropriate European appliance standards or possibly tax incentives or other targeted deployment incentives.** Particular consideration should be given to appliances with long lifetimes in order to avoid stranded assets or prevention of a consumer's future opportunities to participate.

Interventions Necessitated by Decarbonisation of the Heat and Transport Sectors

While a great deal of attention has been focused on decarbonising electricity, decarbonising the heat and transport sectors will become an increasingly pressing issue. The outcomes of complex investment and fuel-source choices available to consumers will have a significant impact on the pace and cost of decarbonisation, and those outcomes will in turn have significant consequences for the electricity and gas systems, both in terms of the need to deal with additional intermittent renewable capacity and the need for local network reinforcement.

There is considerable uncertainty as to the timing and scale of these impacts, particularly in the heat sector. For example, the distribution network impact will be heavily dependent on whether direct resistance heating is favoured over thermal storage; whether air-sourced heat pumps are gas or electrically driven, and the role to be played by biomass and by district heating. Better energy market pricing, smarter tariff designs, and more inclusive electricity markets will certainly help in driving positive outcomes, but optimising the choices made by millions of consumers and their local authorities may well call for more than just smart demand-side markets. **Policymakers should begin now considering the role that measures such as standards, targets and regulation, including the opportunity to deploy more ambitious building efficiency standards, may have to play in shaping heat sector outcomes to minimise adverse system impacts and maximise overall benefits for consumers.**

It is already becoming clear that transport decarbonisation will have significant consequences for the electricity system even if the ultimate scope of electrification remains uncertain. Purchases of plug-in electric vehicles (EVs) are increasing, and advances in technology and policies can be expected to accelerate adoption over time. Fuel cell electric vehicles may yet become the technology of choice particularly outside city centres, but it is already clear that the adoption of EVs will have significant impacts on grid infrastructure. In order to accommodate the growth in EVs cost-effectively and minimise the impacts on the distribution networks, there will be a need for smart charging which could at the same time improve EV ownership economics. During the early stage of roll out, this could be achieved through economic incentives such as time-of-use or dynamic tariffs combined with automation to manage charging decisions, including the possible default application of such tariffs as discussed above. Over time, with greater penetration of EVs and the emergence of more sophisticated pricing signals and more complex system dynamics, control through a third party in exchange for an attractive "fee for charging services" arrangement will become more necessary and more likely.

While market pricing and tariff design and implementation can do much to engage consumers in minimising the costs of heat and transport electrification, pro-active cross-sectoral infrastructure planning processes are nonetheless likely to be required, particularly at the distribution level. It is too early to draw actionable conclusions about the full extent of the impact heat and transport electrification is likely to have on electricity and gas system infrastructure, but policy makers should be working now to develop the necessary planning and delivery framework and the Commission can provide useful guidance or direction in that regard.

Electricity Markets at a Local Level

As decarbonisation and advances in technology increase the take-up of distributed resources, transmission-connected generation capacity will decline and local network constraints will assume more significance. As discussed above, this trend will be reinforced by the electrification of the transport and heat sectors, which will place additional pressure on distribution networks.

Demand flexibility, particularly at the commercial and domestic levels, is ideally placed to address local network constraints and provide a cost-effective alternative to traditional investment in overhead lines, cable, transformers and other capital-intensive grid infrastructure. Realising this potential will require regulation that encourages network operators to make

objective choices between traditional investment and "smart" alternatives, including flexible demand. In essence, it is necessary to decouple total revenues from assets and energy sales and strengthen their linkage to performance in achieving public policy objectives. Upcoming EU legislation could provide the mandatory principles needed to shape Member State regulatory reforms in this direction. **The current trend toward output or performance-based regulation of DSOs in some Member States is appropriate, but the policy priorities expressed in these performance-based schemes, and the size of the rewards and penalties, are in many cases inadequate to the task. Performance objectives should be better defined, coordinated and monitored at EU level, and the pace of grid modernisation and enabling regulatory reforms across the EU must be accelerated.**[4]

If demand flexibility is to be used to best effect it will also be necessary that flexibility be employed wherever it can add most value, whether that be energy balancing or capacity services at a national level, or resolving network issues at a local level. National and local network requirements should compete to procure available flexibility services in an open market so as to achieve the greatest common good. **If it becomes apparent that this is not happening, regulatory intervention may be appropriate to ensure that best use is being made of flexible resources, including via the design of performance-based network operator regulations.**

Different visions exist of how these markets may emerge or be organised, and in Europe it is likely one size will not fit all. The vision developed by the Universal Smart Energy Framework (USEF) builds on the existing European unconstrained trading and ancillary service market model, but extends market reach down to distribution level.[5] An alternative approach is that adopted by New York's "Reforming the Energy Vision", which envisages local market platforms organised by distribution system operators (DSOs) and more closely linked to network planning.[6]

Whichever route is chosen, the framework must be designed to deliver the full cost-effective potential that maximises the benefits to society. In all cases, customer engagement with existing energy, flexibility, and capacity markets and in providing network services, will add considerable complexity to what are already complex arrangements. To a large extent this is unavoidable and should be manageable in a digital age. However, if the engagement of (particularly smaller) consumers is to be encouraged, complexity will need to remain behind "closed doors" and transaction costs minimised. There is no need for customers to be aware of how their flexibility is used and their involvement would ideally be limited to initially selecting the product or service that most suits their particular lifestyle choices.

The Importance of Information Transparency

One important issue arising out of the multi-use market-based allocation of demand flexibility and a future where distribution networks are likely to become security-constrained, is information transparency. Network operators may, on occasion, need to veto the activation of flexibility contacts in order to maintain network security and it is important that parties to those contracts are aware of this possibility. Conversely, network operators would need to be aware of all contracts whose implementation may impact network security and all market participants would need to be aware of network status. The proposal to adopt a "traffic light" procedure to address this latter issue seems sensible.[7] Using this procedure, green would indicate those areas of the grid that were healthy with no constraints on contract use, yellow would indicate areas with potential security issues and the possible need for the network operator to request flexibility, while red would indicate areas were network operation outside normal parameters was possible with a potential need to veto the activation of contracts and possibly suspend the market. Where contract activation is vetoed, parties to those contracts would suffer financial loss and would need to be compensated.

4 See Lazar, J. (2014, May). *Performance-based regulation for EU system operators.* Montpelier, VT: The Regulatory Assistance Project. Retrieved from http://www.raponline.org/document/download/id/7332

5 For more information, see Universal Smart Energy Framework, Retrieved from http://www.usef.info/Home.aspx

6 New York Department of Public Service. (2015). New York Reforming the Energy Vision (REV): Market Design and Platform Technology Groups. Retrieved from https://newyorkrevworkinggroups.com/

7 Grid Innovation Online. (undated). Grid Operation and market sphere – a market model based on traffic light logics. Retrieved from http://www.gridinnovation-on-line.eu/Articles/Library/Grid-Operation-And-Market-Sphere--A-Market-Model-Based-On-Traffic-Light-Logics.kl

Related Resources

Demand Response as a Power System Resource

http://www.raponline.org/document/download/id/6597

While initially developed to help support electric system reliability during peak load hours, demand response resources currently provide an array of additional services that help support electric system reliability in many regions of the United States. These same resources also promote overall economic efficiency, particularly in regions that have wholesale electricity markets. Recent technical innovations have made it possible to expand the services offered by demand response and offer the potential for further improvements in the efficient, reliable delivery of electricity to end-use customers. This report reviews the performance of demand response resources in the United States, the program and market designs that support these resources, and the challenges that must be addressed in order to improve the ability of demand response to supply valuable grid services in the future.

Elements of Market Design for Poland

http://www.raponline.org/document/download/id/7883

Both the European power sector at large and the Polish power sector in particular are at a pivotal moment. Power systems are in transition, driven by commitments to continuing emissions reductions, growing penetration of renewables, and the need to provide affordable and reliable power. The Polish power system faces a number of challenges stemming from the profile of its power system, rising demand for power during summer peaks, and increasing penetration of renewable resources on the system. Its largely homogenous fleet of inflexible, aging thermal plants struggles to meet system needs during times of highest system stress despite a high reserve margin (18 percent).

This paper identifies the first steps that policymakers can take towards improving system reliability and flexibility through reforms to Poland's energy market. These include increasing cross-border flows of energy along existing interconnectors, mobilising demand response, and aligning retail price signals with wholesale markets. Addressing price distortions in the energy market by restoring a healthy balance between supply and demand, allowing for full scarcity pricing in the balancing market, and addressing the operating reserve will also be required to address the challenges facing Poland's power system.

EU Power Sector Market Rules and Policies to Accelerate Electric Vehicle Take-Up While Ensuring Power System Reliability

http://www.raponline.org/document/download/id/7441

How and when plug-in electric vehicles (EVs) are recharged can dramatically affect the electric grid. As a result, regulation of the power sector could have a significant influence on the rate of EV rollout. This paper explores how regulation can be developed to minimise negative grid impacts, maximise grid benefits, and shrink the total ownership gap between EVs and internal combustion engine vehicles. The author discusses EU power sector policies and market rules that can facilitate or promote EV take-up with a focus on the role and design of time-varying electricity pricing, adaptation of EU electricity market rules to enable demand response and properly value flexibility, and the character of regulation that will likely be needed to encourage distribution system operators (DSOs) to be effective contributing partners to the EV rollout.

Harnessing Demand Side Resources in Electricity Markets: Evidence From the United States

https://www.e3g.org/news/media-room/us-experience-shows-rewards-of-demand-side-reform-are-clearly-worth-the-eff

Ahead of the launch of the Market Design Initiative, the authors of this policy brief noted the U.S. head start in the use of demand side resources and the clear and useful lessons for Europe. Demand side resources can be both a reliable and cost competitive alternative to generation capacity, and their use offers the potential to avoid significant volumes of electricity demand and greatly improve system resilience. Capturing the benefit of demand side resources requires an "all hands on deck approach," with the involvement of federal legislators, state regulators, and businesses, and rules that continue to favour conventional supply mean that these markets cannot be created overnight.

Market Design for the Energy Union: The Institutional Structure for a Flexible and Integrated Energy Market

https://www.e3g.org/library/Market-design-for-an-integrated-and-consumer-focused-Energy-Union

Building an "Energy Union" with consumers at its core represents an opportunity for EU Member States grappling with the challenge of securely decarbonising energy systems at least cost. The internal energy market (IEM) must be structured in a way that makes it easy for Member States to share resources at the wholesale electricity level. The authors urge policymakers to seize this opportunity to review the nature of markets and institutional structure; achieving the needed changes will require a commitment far beyond the current policy agenda.

Power Market Operations and System Reliability in the Transition to a Low-Carbon Power System

http://www.raponline.org/document/download/id/7600

As the power sector moves quickly toward decarbonization, authoritative research is demonstrating that a reliable transition that achieves economic, security, and climate goals is not only possible, but can be done at no more than – and possibly less than – the cost of "business as usual." To achieve this, however, the discussion about market design needs to shift from traditional notions to a focus on what kind of investment will most efficiently complement production from a growing share of variable resources. This paper, which follows from an earlier collaboration between RAP and Agora Energiewende for the European Pentalateral Energy Forum, is the latest in a series of RAP papers on how market design can efficiently facilitate the transition to a clean power sector. It points out that the debate over energy-only versus energy-plus-capacity markets, while important, misses the point to some extent. What is needed is a more comprehensive discourse about how to optimise the mix of market instruments, governance, and regulation to best capture the need for an increasingly flexible system – ensuring that low-carbon reliability solutions can be implemented at reasonable cost.

Resource Adequacy, Regionalisation, and Demand Response

http://www.raponline.org/document/download/id/7798

This policy brief reinforces the need for a regional approach to resource adequacy and highlights the importance of demand-side resources to ensuring reliability and meeting clean energy targets in Europe. Utilising data from the latest ENTSO-e Scenario Outlook and Adequacy Forecast, the author demonstrates that although some Member States and regions may suffer a capacity deficit, Europe as a whole maintains a surplus through 2025. This suggests that a more coordinated regional or European approach to resource adequacy assessment would result in investment efficiencies, lowering the cost of national reliability mechanisms and supporting the orderly retirement of aging, higher-emitting generation. When reasonable assumptions about demand response are factored in, the Member State capacity deficits out to 2025 are eliminated or greatly reduced. RAP recommends that policymakers recognise and capture the reliability and economic potential of more active demand response resources, which represent a competitive and operationally convenient alternative to supply side resources.

Smart Rate Design for a Smart Future

http://www.raponline.org/document/download/id/7680

The electric utility industry is facing a number of radical changes, including customer-sited generation and advanced metering infrastructure, which will both demand and allow a more sophisticated method of designing the rates charged to customers. In this environment, traditional rate design may not serve consumers or society best. A more progressive approach can help jurisdictions meet environmental goals and minimise adverse social impacts, while allowing utilities to recover their authorized revenue requirements. In this paper, RAP reviews the technological developments that enable changes in how electricity is delivered and used, and sets out principles for modern rate design in this environment. Best practices based on these principles include time-of-use rates, critical peak pricing, and the value of solar tariff.

Teaching the Duck to Fly

http://www.raponline.org/document/download/id/7956

Jim Lazar confirms that electric grid managers and utilities can integrate high quantities of variable renewable energy, like solar and wind power, and dramatically reduce carbon emissions by using several existing, and dependable market-proven strategies and technologies in this update to the 2014 "Teaching the Duck to Fly." The original analysis included ten strategies designed to reduce strain on the grid during daily periods of high renewable energy generation. The strategies, most of which still apply, include such measures as timing the use of energy-intensive equipment to coincide with high renewable energy production. This updated report identifies several new approaches that have proven effective and valuable to utilities already integrating high levels of renewable energy. These include the use of ice storage for air conditioning, controlling water and wastewater pumping, and focusing renewable energy purchases on projects that produce energy when demand is greatest, such as wind farms that peak in late afternoon.

The duck curve describes the new shape of consumer energy demand in markets with high levels of renewable energy. Demand in such markets, which used to peak in the early afternoon, now peaks later in the day, and grids may experience lower demand during the former mid-day peak. The updated strategies continue to enable substantially greater renewable energy integration, better system reliability, and lower costs by modifying the load profiles and better utilising existing assets.

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