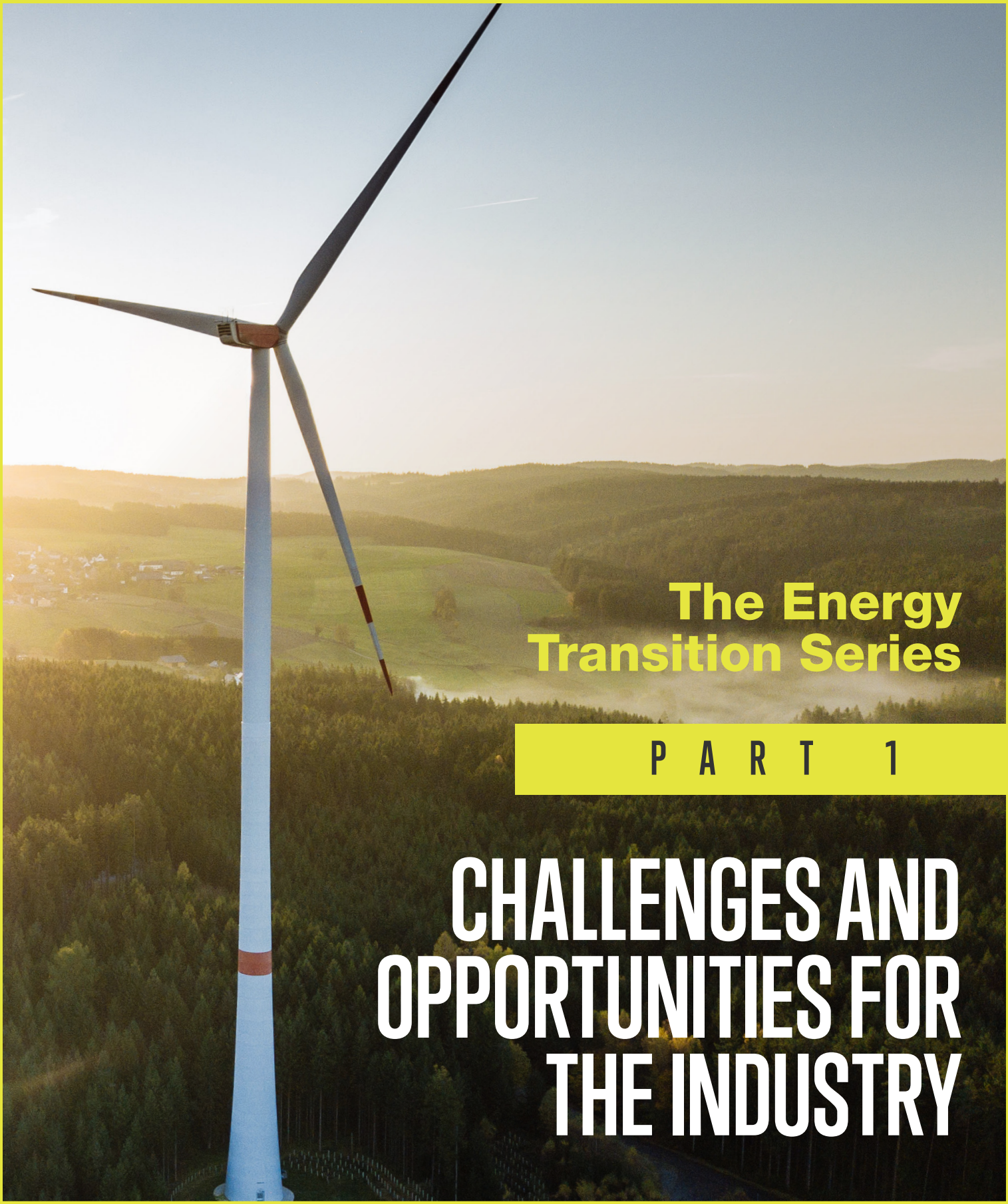

The Energy Transition Series

PART 1

CHALLENGES AND OPPORTUNITIES FOR THE INDUSTRY

A Hansen POV Paper

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HANSEN

A warm welcome to this Hansen Technologies series about Energy Transition! In fact, we are revisiting a series of reports we published on this theme some years ago. The story for Hansen stays the same, we continue our dedication to the energy market in transition and recently celebrated 50 years of supporting customers with their technology needs. It has been a great ride supporting our clients' successful journey. We are off to a good start, and see fantastic opportunities together with our customers today, tomorrow, and beyond. In this updated series of papers, we provide Hansen's view on how the key drivers for Energy Transition create great opportunities for our customers.

Digital technologies have been supporting and enabling energy systems for decades – just as Hansen has been dedicated to the energy market for 50 years. But now we are rapidly moving from a system characterised by large, centralised resources with one-way flows of energy and information, to an advanced grid market with distributed, decentralised, decarbonised resources with two-way flows of energy and information.

And this Energy Revolution – or **Evolution** as we prefer to think of it – is a defining characteristic of the Energy Transition. It's as much a factor as the transformation from fossil-based systems of energy production and consumption to renewable energy sources; the aim to reduce emissions through decarbonisation; or the advance of electrification and energy storage solutions.

The potential for decentralised flexibility sources to help maintain a reliable electricity system is commanding the attention of policy makers, regulatory bodies and industry groups worldwide – and the pace and the urgency is surging as we move towards the Energy Transition.

Transition can be used to create opportunities for all market participants.

"Energy Transition"… has entered the mainstream. Terms like sustainability or decarbonisation – "net zero", "climate-neutral", ESG even – have gained a recognition barely imaginable only a few years ago, driven by a wave of environmental awareness. But we've also faced a string of upheavals in such a short time. The pandemic, disrupting energy supply, demand and prices. Then the price shocks early in '21 – reaching staggering levels as the year went on. Up to the explosive events of 2022 that have brought home how vulnerable – and how vital – our energy security is.

In the plainest and most practical terms, it's made everyone – commercial, industrial or consumer – painfully aware of cost and supply threats and the need to mitigate them through greater efficiency and control. Along with such challenges, these key drivers for **Energy Transition** can be used to create immense opportunities for all market participants.

Business model redesign is accelerating with the increasing speed of energy technology advancement and the arrival of non-traditional competitors into the sector around the globe. While digitalisation has become a key enabler for new services and products, enriching customer experience and making life smarter. And that's what we've set out to show in this three-part report.

WE CATEGORISE THE CHANGES INTO 5 DS:

D1: Deregulation
D2: Decarbonisation
D3: Distributed Energy Resources
D4: Digitalisation
D5: Democratisation

D1: DEREGULATION TO THE NEXT LEVEL

The utilities sector has gradually shifted course over the past three decades. What started with privatisation of state-owned enterprises in the early 1990s in the UK, eventually evolved into liberalised and organised markets across portions of Europe, Latin America, North America, and Asia-Pacific.

A liberalised energy market for gas and electricity has been established in the EU through a series of legislative packages over time. It is founded on the unbundling of supply, generation and networks; on providing market access to third parties; and on ensuring competition in wholesale and retail markets. It has also announced the European Green Deal REF[1], a set of policy initiatives with the overarching aim of making Europe climate-neutral in 2050, becoming the first-climate neutral continent.

Deregulation strives to revise, reduce, or eliminate laws and regulations that hinder free competition in the supply of goods and services, embracing the climate objectives and thus allowing market forces to drive the economy. There are many things to consider and radical market developments ahead – like the idea even that it could soon become financially viable for consumers to buy and store energy rather than buying from the grid.

Some regions, and Europe is a prime example, where regulations are moving more rapidly to a harmonised system, will benefit from the advances in technology-driven advances. Global energy markets, whether regulated or deregulated, are driving forward with rapid expansion and commitment to renewable energy and decarbonising. But there are structural challenges too, like the need to modernise the US grid which is “stuck in the 1940s”, as highlighted as recently as CERA Week in March 2022, and creating queues of stacked renewable projects waiting to come online. REF[2] Not only does this hinder decarbonisation goals but prevents technology-driven change.

But it’s increasingly being recognised that the future is decarbonised, decentralised and digitised, and that changes to the industry will be accelerated by rapid electrification, infrastructure modernisation, and high stakeholder expectations. Equally, this transition is bigger than anything previously experienced and with the prevailing uncertainty concerning how it will play out — and that makes it especially challenging.

Now, technology evolution, distributed energy resources and customer preferences are creating a second era of disruptive models. These new models are characterised by the emergence of micro markets within the sector — storage, rooftop solar, e-mobility — as well as individual customers gradually discovering energy source control and consumption through advanced technology. Today’s strategies naturally follow country or regional-level policies and are motivated by political and regulatory goals.

These externalities typically come in the shape of major policy shifts, e.g., toward controlling carbon emissions or increasing customer choice. In many cases, these shifts cause a sea change in industry structure, competitive philosophy, and financial outcomes. Although these strategy drivers differ by global region to reflect local circumstances, they have similarities.

We expect to see an acceleration of regulatory changes to adapt to the new era. There may not be a global harmonised model in the near future, but expect more of e.g. power connectors across borders, harmonisation of business processes, and other shared objectives and projects.

EVOLUTION [NOT A REVOLUTION] AND THE DRIVING TRENDS

The entities responsible for distributing and managing energy from power sources to the final consumers have been traditionally one-directional and based on predictable, controllable, and centralised generation. But now they will need, more and more, to operate with increasing levels of flexibility, which will warrant greater interaction with network customers and potentially single-end users. This new approach will require a radical change in business processes and tariff-setting for network services, plus totally new approaches and new roles.

Technology advancements, electrification, the energy transition, and its multitude of evolutionary components not only changes the roles in the market but opens up exciting technology-driven opportunities. They're driven by an equally intriguing range of trends and innovations to watch.

Spotting trends that stand up for any length of time, in an industry and environment as fast-moving and radically changing as ours, can be quite a feat. But we've selected an array that could command lasting attention – as well as identifying and augmenting some other sources'.

RENEWABLE ENERGY

The widespread adoption of renewable energy, as highlighted throughout this report, brings immense benefits – but also a lot of challenges. Key factors are not just how to generate energy from renewable sources but how to capture, store, transmit, distribute and utilise it – tackling issues like intermittent sources such as wind and solar power or improved interconnection. What is required of the supply chains to support getting that energy into the market in the most cost-effective and dynamic way will require digitalised, effectively real-time cloud-based technology solutions. Hansen has a particular focus on the technologies that enable that.

INTERNET OF ENERGY (IOE)

Helping to move traditional central architecture power systems into adaptable infrastructure, IoE addresses many of the legacy structural challenges and offers greater efficiency and optimal design for building energy systems. IoE enables distributed machine-to-machine energy management systems. Such systems transform energy transmission and optimise energy equipment pools to lower costs. Smart meters and monitoring applications, such as context-aware sensor technology, track energy parameters in real-time. These are featured prominently in network communication for smart energy.

With IoE you have an intelligent distributed control through energy transactions between its users. It leads to the development of a smart grid and improves coordination and optimisation in the macro-energy system. Smart-Metering-as-a-Service (SMaaS) and cloud-based Meter Data Management (MDM) solutions will provide in-depth data on energy consumption to energy and water distribution companies, utility providers, and industrial or commercial users. A secure communication hub that transmits the metering data to a cloud server to store and analyses it will identify usage patterns, prevent leakage, forecast demand, optimise supply, and manage production efficiency.

ENERGY MANAGEMENT

The distributed energy systems interact and connect across centralised and decentralised electrical networks. They support advanced grid services such as net metering, load aggregation, and real-time energy monitoring. Cloud solutions for energy management handle massive amounts of data that smart meters and other grid components generate. Data analytics provide intelligent energy cloud solutions for smart grids and buildings which can analyse historical and real-time data to predict energy generation and consumption patterns to optimise the use of renewables in the system and reduce the overall electricity bills.

ENERGY STORAGE (BESS)

While we have abundant technologies today to generate power we're still lacking in cost-effective energy storage solutions. Battery Energy Storage Systems (BESS) allow excess generation to be stored when demand is low and used later, rather than being wasted. This supports stable pricing by proactively managing demand from consumers, as a report from StartUs Insights "Renewable Energy Trends & Innovations in 2022" REF[3] puts it, by having the opportunity to purchase energy for future use, to stock it up during ideal conditions. – which can also later help in reducing grid loads during peak times.

BESS is the first technology that is not transmission but that can replace transmission: it can act as transmission or generation depending on the situation. One challenge is that in some markets these systems are not allowed to be both. BESS is not only an important factor for consumers and prosumers alike when considering their decentralised energy demand and price competitiveness but is increasingly an important component in power trading as a balancing mechanism.

BLOCKCHAIN

Among the biggest emerging energy industry trends is the use of blockchain technology. It can "unite all energy stakeholders under a single decentralised network", as StartUs Insights' report noted: electricity producers, distribution network operators, metering operators, financial services providers and traders can all potentially benefit. Smart contracts ensure all transactions pass through a secure and – a core defining feature for its champions – immutable network. And the technology can enable anyone to be an energy market player with access to economical, transparent, and traceable green electricity.

This will liberalise energy markets even further and could become a significant mechanism and technology enabler for operationalising energy democracy. Software as a service or SaaS solutions utilising blockchain will deliver secure records of ownership and consumption of electricity to automate settlement, auditing, and back-office processes.

ENERGY AS A SERVICE (EAAS)

Some industry trend-spotters are heralding energy systems revolving around DERs and drawing on developments in artificial intelligence and the Internet of Things, which together with blockchain and what some identify as a growing number of prosumers, become energy-as-a-service solutions. These allow the transition from selling electricity to selling services such as consumption management, optimisation of production, and tracking consumption, as the StartUs insights report captures it. And with local energy sources and storage options can accelerate energy efficiency across the grid while providing access to more people.

We believe we will increasingly see EaaS platforms that integrate with any electric device to enable energy trading; systems that employ a pay-as-you-go model for solar, household appliances, pumps, and farming equipment. New payment models – pay-per-use, pay-per-time, and pay-per-amp – will provide customers with the flexibility to adjust their energy usage by factoring in the various benefits of each model.

DISTRIBUTED ENERGY RESOURCES (DER)

As we can see in the section that follows, and explore at length in Part 2 of this report – Distributed Energy Resources are at the core of the underlying process of the Energy Transition. To note here some of the key takeaways: By enabling power generation at the place of consumption they can eliminate the loss and cost of energy transmission. While DERs are as energy-efficient as large power plants, their proximity to consumers lowers the network losses involved in the distribution of electricity. They also comply with higher standards in terms of accessibility and quality of energy, and the reliability of energy supply.

Distributed energy reduces the need for connected capacity and enhances the efficiency of the energy system. The decentralised generation contributes to local energy balance and involves end-user assets in the energy management processes.

DEMAND SIDE MANAGEMENT

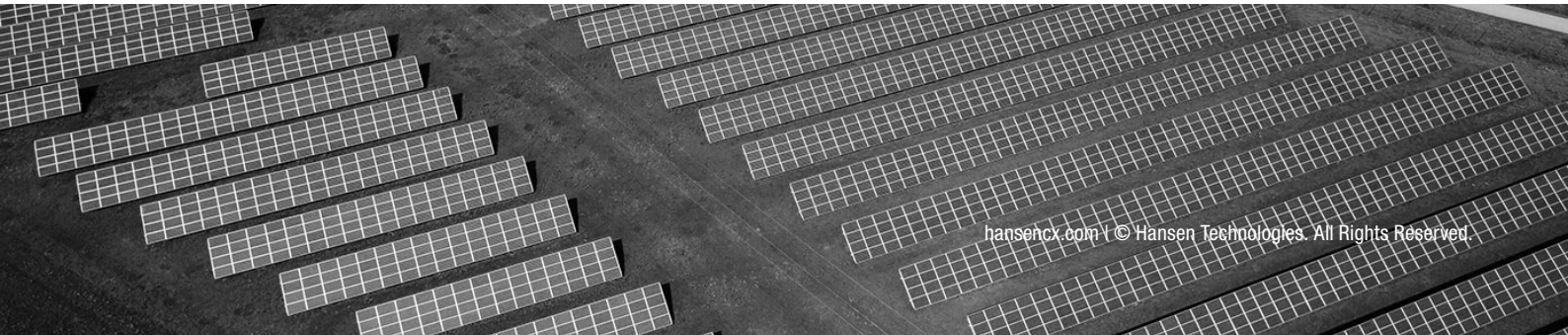
The traditional, centralised architecture for constructing power systems is no longer efficient in the face of new challenges, such as a shift in the nature of consumer demand. These include a growth in the diversity and dynamics of specific energy requirements and a transition to digital demand. The variety of electricity requirements that meet special parameters such as direct current, low voltage, or high quality require new systems to measure and control energy consumption.

Energy Efficiency platforms that focus on enabling renewable energy adoption by small and medium-sized business, community initiatives, local authorities, city heat and power management and municipalities to manage power requirements will increasingly see the utilisation of smart energy systems that will provide easily accessible data on energy usage of business assets and optimise data collection across a range of machinery, property and assets.

DIGITISATION OF TRADING

Trading of power, which is increasingly moving to automated trading, driven by algorithms, will continue to transform to meet the increasing volume, velocity and veracity of data that decentralised and distributed energy markets bring. The balancing market is expected to change the most in the future. As more DER come onto the market, the market will have to adopt and accept smaller bids and the balancing period will change to much shorter time periods to optimise cost and revenue. The balancing market will become international. Transition to regional markets means that market mechanisms are further harmonised between countries. This opens an opportunity for further centralisation of trading and auction platforms and datahubs.

To talk in general terms of the different balancing service markets, such as the Frequency Containment Reserve (FCR) markets, on a global scale is complicated. It's implemented in various ways depending on the system operator's approach or the design of the electricity market. Some countries such as the US operate electricity markets with a nodal pricing structure – and partly vertically integrated utilities. Other countries such as Germany show liberalised markets with zonal pricing approach. Naturally, the general concept of operating an electricity market also affects the markets for balancing services. However, physical product specification such as activation speed or duration are very often comparable.



COMMUNITY ENERGY TRADING

Looking beyond the evolution of manual physical trading of power to automated trading, another other exciting future for power trading will come through converging technologies. We could see the acceleration of direct access to renewable energy services, like trading, by using blockchain platform to bypass bureaucratic processes that inhibit the natural expansion of distributed generation and this will empower community energy trading without requiring microgrids or incumbent grid partners.

VEHICLES TO GRID [V2G]

Advances in electric vehicles (EVs) and charging solutions focus on enabling the transition to zero-emissions transportation by solving infrastructure-related challenges. V2G is the leading use case for infrastructure evolution and the progression of interconnectivity to smart grids, development of smart cities and towns around the world, and the smart electrification of our everyday connected lives.

Developments in software systems that enable EVs to charge, manage charging based on time or rate, and export electrical energy stored in the EV battery back to the local distribution network, creates an array of opportunities. Collating data from batteries to feed back into the grid will require additional meter data management services feeding into the smart grid, and complex billing and payment solutions to support the consumer/prosumer of the EV.

As we work towards the development of virtual energy networks of existing energy grids to achieve simultaneous energy balance there will need to be developments in using AI-powered energy sharing systems to support the existing grid infrastructure.

To deliver electric vehicle charging and V2G functionalities the volume, velocity and veracity of data being transmitted in the network will need AI to assess battery capacity of electric vehicles, connectivity to the grid, and capabilities to measure and improve energy variability and costs for vehicle owners.

D2: DECARBONISATION

Decarbonisation and technological advances are transforming the electricity sector in regard to both generation and demand.

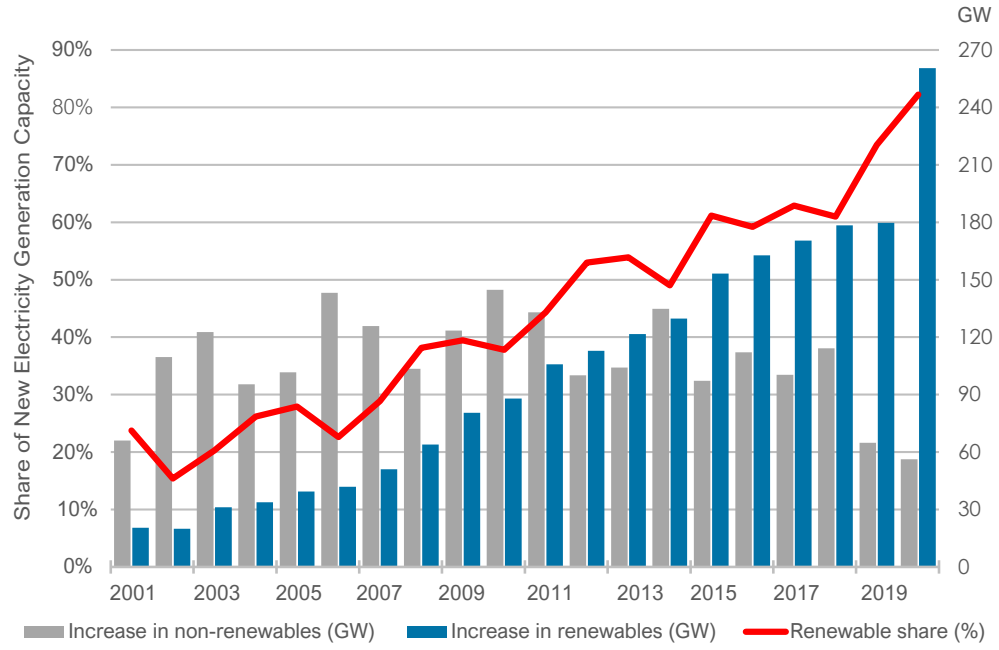
The energy sector has significant potential for decarbonisation. With the decreasing costs of renewable technologies, the sector is on track potentially to become carbon neutral by 2050. Initiatives have grown increasingly ambitious: the EU 2030 Framework for Climate and Energy raised the targets for eg, greenhouse gas emission reduction and renewable energy consumption REF[4].
The UN 2015 Paris Agreement set out an ambitious undertaking to limit global temperature increases and combat climate change REF[5]. Then, the European Climate Foundation raised the ambition to net zero emissions in Europe by 2050 REF[6].

With the targets set from the Paris accord and firmly committed to at the COP26 meeting we can see from the chart from IRENA, the International Renewable Energy Agency, (below) how the build-out of renewable energy resources is evolving REF[7]. IRENA data show that in 2020, renewable generating capacity expanded by far more than in recent years and well above the long-term trend – particularly in China and, to a lesser extent, the US. The surge increased the overall share of renewables in total capacity expansion, which reached 82% in 2020, while the renewable share of total generation capacity also rose, to 36.6%.

Solar and wind energy continued to dominate renewable capacity expansion, jointly accounting for 91% of all net renewable additions in 2020. Along with the renewed growth of hydropower, it led to the highest annual increase in renewable generating capacity ever seen, says IRENA.

But projections for the future energy mix have been thrown into stark relief by the energy price and supply shocks of late 2021 and brought to a head with the subsequent invasion of Ukraine. It's drawn fierce attention to the question of security of energy supply and led business and governments to challenge current strategies. Is the phase-out of coal, gas, or nuclear feasible or sensible – or, equally, does it highlight the need to increase and accelerate the provision of alternative sources?

Renewable share of Annual Power Capacity Expansion



It's still a big debate. CERA Week in Houston in March 2022 – the first post-pandemic “in-person” event – saw over 100 panel discussions and presentations about “energy transition,” which observers said embraced everything from eliminating coal, gas and oil use altogether, to using all forms of energy, including fossil fuels, for the foreseeable future, but capturing the emissions.

But the urgency could not be greater. Russia’s invasion of Ukraine coincided in late February with the latest report from the UN’s IPCC and a clarion call on how extensive the dangers of climate change have become. As one major energy investment figure responded: “We need energy security because we’ve got an energy crisis. We’ve also got a climate crisis… They are two sides of the same coin.”

The transition towards a low-carbon economy means a growing role for renewable energy sources, greater energy efficiency and electrification of transport and other sectors. It also involves giving consumers a more meaningful role, allowing them to manage their demand actively, produce electricity for self-consumption and feed the excess into the grid.

Modern energy consumers are looking with increasing urgency for ways to lower their overall energy costs and help build and contribute to a greener environment. State-of-the-art solutions help them reach these goals in a more stress-free manner.

Sustainability will also become, a major focus as more and more people begin to make conscious choices concerning energy consumption, energy costs, and renewable energy.

The demand for sustainability will have far-reaching consequences, and the energy market must adapt.

D3: DISTRIBUTED ENERGY RESOURCES

The increase in Distributed Energy Resources is the result of the rapid shift from a system characterised by large, centralised resources with one-way flows of energy and information, to an advanced grid market with distributed, decentralised, decarbonised resources with two-way flows of energy and information.

DER is at the core of the underlying process of the Energy Transition – as we explore at length in Part 2 of this report, examining the trends, as well as the barriers and showing how Distributed Energy Resources change business operations

But as we can see here, the increased focus on renewables and local production fundamentally alters how we produce, use, store and trade electricity. It transforms many elements of the energy system, and changes how we all live.

STRONG GLOBAL ELECTRIFICATION TREND

Global electricity demand is resurgent. After a small decline in 2020 [due to Covid lockdowns], global electricity demand grew by 6% in 2021, according to the International Energy Agency's January 2022 Electricity Market Report REF[8]. It was the largest ever annual increase in absolute terms (over 1,500 TWh) and the largest percentage rise since 2010 after the financial crisis.

The global trend for electrification is particularly highlighted within the transport sector. As the White House said at the end of 2021, announcing increased access to electric vehicle charging infrastructure as the US aims for EVs to account for half of new vehicle sales by 2030, "the future of transportation in the US and around the world is electric."

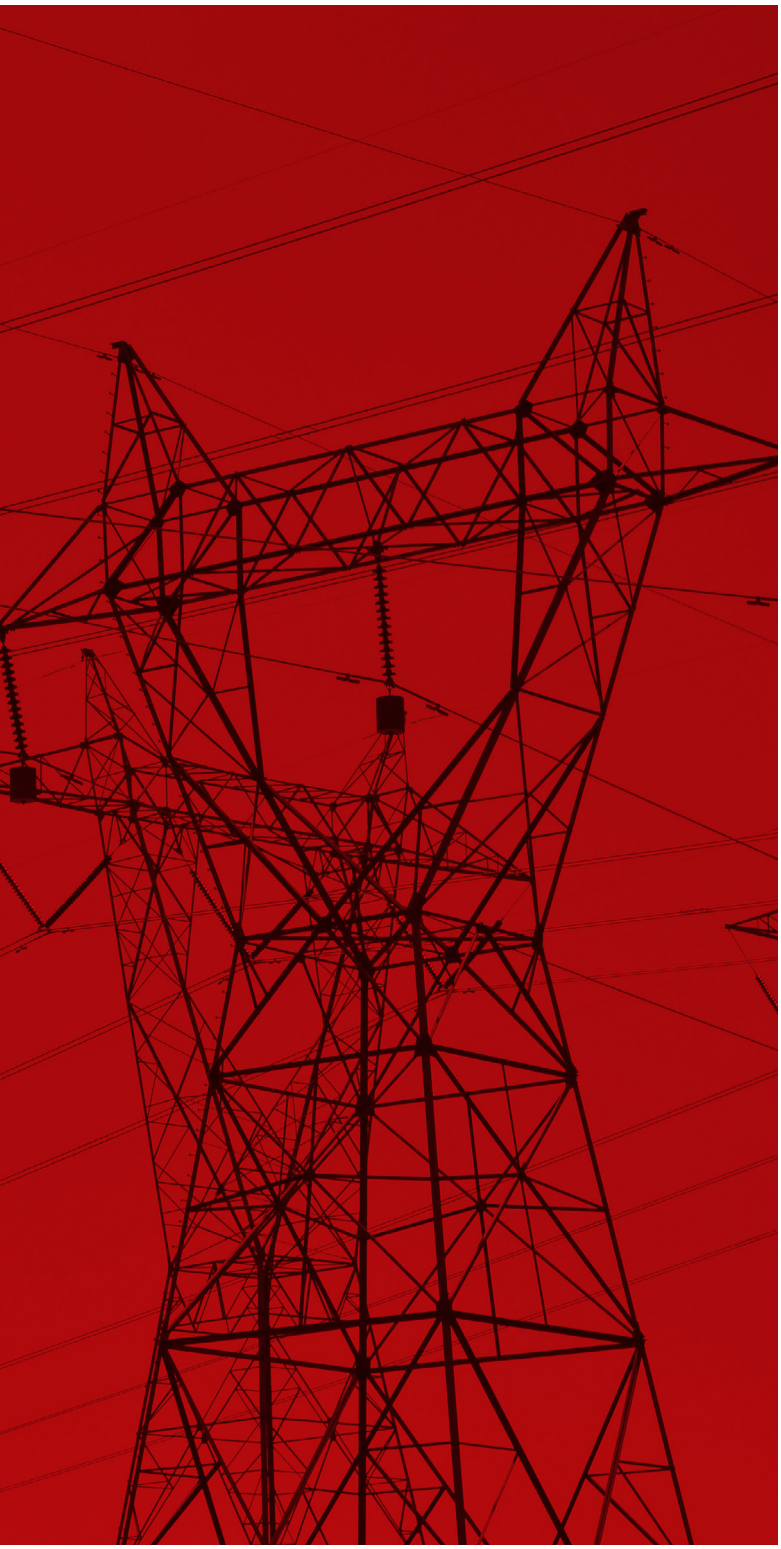
Electric vehicle sales in 2021 were 6.5 million, more than twice the previous year's. And sales are expected to reach 62 million units per year by 2050, with a total global EV stock of 700 million, according to research from Wood Mackenzie.

EV sales are expected to top a combined 7 million a year in China, Europe and the US by 2025. While improved EV costs will propel sales and double EV numbers to a combined 15 million a year in those three regions by 2030. Indeed, all automobile sales in Europe (86%), China (81%) and North America (78%) will predominantly be EVs by 2050, says Wood Mackenzie REF[9].

With the rollout of EVs, the possibility to integrate charging infrastructure to enable smart charging and possible vehicle-to-grid (V2G) applications can help reduce overall system costs, stimulate grid reliability, and optimise the utilisation of grid assets. As we noted in our earlier entry in the section on Evolution and the Driving Trends section (Vehicles to Grid [V2G] page 7) is potentially a key driver for infrastructure evolution and the progression of interconnectivity to smart grids, development of smart cities and towns around the world, and the smart electrification of our everyday connected lives.

The V2G principles are a disrupter and leading use case in modernising power systems as two-way networks managing varied voltage generation and distribution. It seems certain that V2G will play a huge role as the forerunner for hosting more DER and tackling voltage management.

The pursuit of low carbon, options is set to dramatically change the shape of the overall demand on the power system and at the same time introduce new sources of flexibility. The outcome of these changes is a shift in both: The need for flexibility to manage the system; and who and what provides that flexibility. The problems of hosting high DER penetration are beginning to show throughout outdated grid systems. Voltage rise management has now become a major problem for grid operators. Traditionally, electricity networks were designed to supply electricity in a single direction from the generator to the consumer. This allowed for voltage supply to steadily drop, as it moved from substation to customer.



For DER technologies such as solar and batteries to export electricity upstream from the grid, they must do so at a higher voltage than their local supply. As a result, grids are now beginning to see significant overvoltage events occurring during midday, when PV generation is highest and solar inverters push up local voltages.

If rising voltage levels are not managed well, system— wide costs will increase, and the end-user will suffer. Maintaining a safe customer voltage is critical to ensure that consumer electronics are not damaged and do not operate inefficiently, or simply fail.

With adequate enabling infrastructures, DER can participate in existing markets, emerging markets at the distribution level and other potentially suitable new products. The emergence of business applications and monetisation of DER depends on many factors, such as broader electricity market design and energy policy, regional resource availability and the penetration level of DER. Consequently, the pace of development and utilisation of DER will vary between regions.

D4: DIGITALISATION

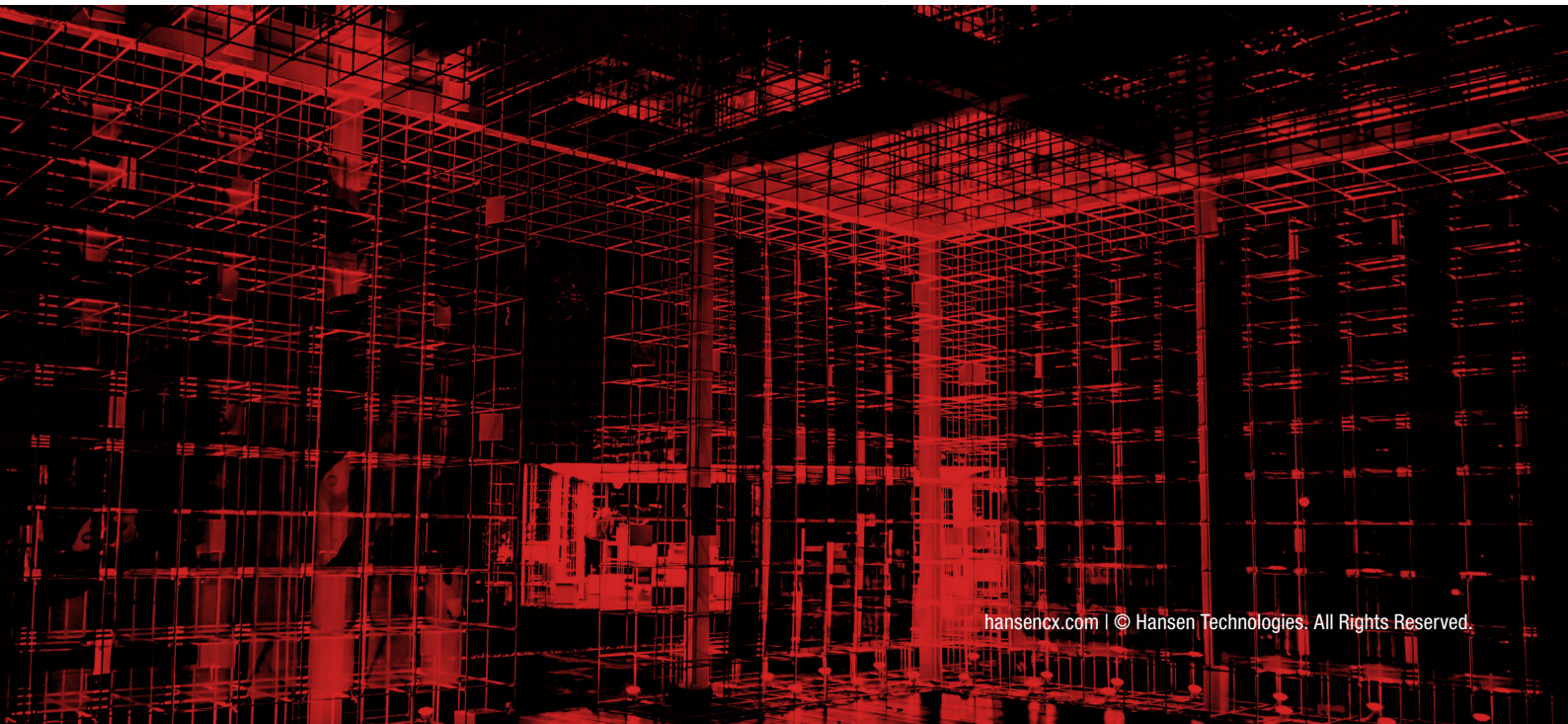
Digitalisation is a key instrument for the energy transition delivering the vital goals of a better-functioning, smart, integrated and cleaner energy system. At each step of the supply chain – production, distribution, storage, supply, and consumption – Digitalisation provides new tools to manage the energy system more efficiently and facilitates the entry of new market participants and the development and deployment of new data-driven energy services. It's the enabler of two key industry trends: Decarbonisation and decentralisation – both critical to enabling the energy transition that humanity needs so desperately to deliver.

Twenty-first century utility customers want unprecedented levels of transparency and accountability from their utilities, including outage and billing alerts, as well as more sustainable and green energy services. The energy system must become more dynamic and flexible to cope with multidirectional power flows and influx of customer connections. In connection with the implementation of smart meters and DER, this will most likely entail a greater focus towards customer preferences around generation, storage and electricity mobility.

Consumers can reduce their consumption during periods of high demand and increase their consumption during periods of low demand. This will contribute to a more evenly balanced load on the system. Since the maximum load (i.e. the period with the highest demand) determines the dimension of the physical power grid, a more even load will utilise the grid better, and in some cases reduce the need for grid upgrades.

Technologically empowered end-users have the capability to optimise their energy management. Their activity in terms of energy management decisions includes demand response from household appliances, household and local community battery management, electric vehicle charging, energy storage in non-electrical form – heating and cooling. For a utility that grew up mostly just selling kWh and mailing out monthly bills to a guaranteed customer base, the need to compete for customers and meet new consumer expectations can be challenging.

In the past few years, utilities have taken a growing interest in customer experience (CX). As customers, commercial and industrial players transform to become vital parts of the energy market, they will be at the heart of change. Ultimately, decentralised customer flexibility significantly changes how different industrial bodies interact with their connected customers.



D5: DEMOCRATISATION

Democratisation is about putting the power in the people's hands – making the clean energy transition more equitable. It embraces cooperative renewable projects such as community solar, biomass, and wind projects. Operationalising Energy Democracy like any development brings challenges and opportunities. There is often a diverse set of stakeholders involved that need to align, and foster collaboration to promote and adopt such programs.

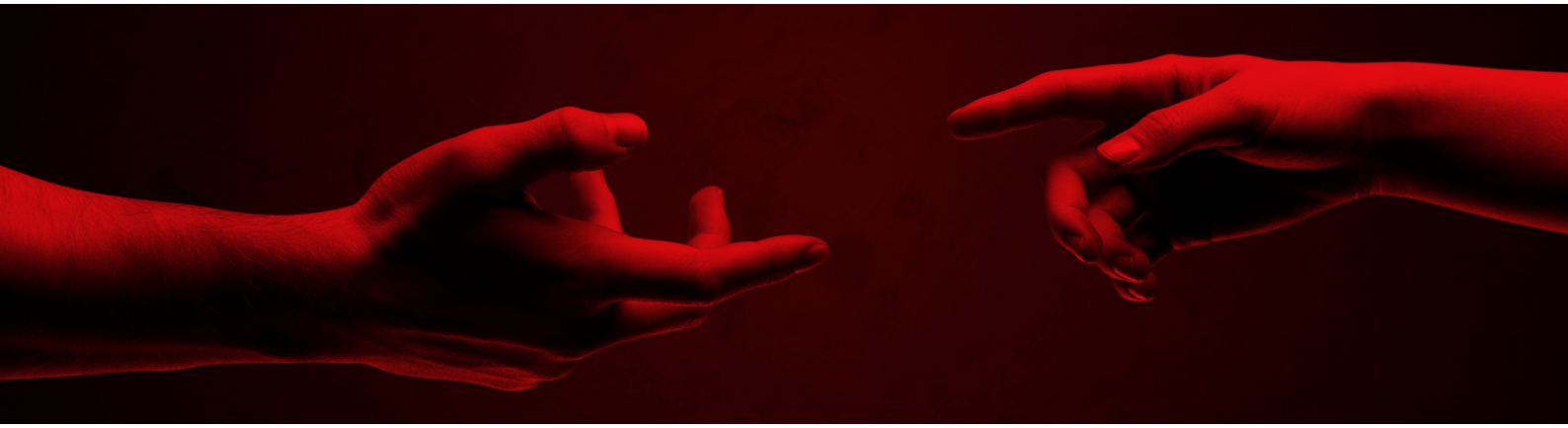
Energy democracy is very much an emergent social movement focused on advancing renewable energy transitions by rethinking, maybe reclaiming, and restructuring the dominant energy agenda. As the Frontiers in Communication report "Operationalising Energy Democracy" REF[10] says, by integrating technological change with the potential for socioeconomic and political change, the movement links social justice and equity with all kinds of innovation in energy – both social and technical. It also advances a vision that includes communities powered by 100 percent renewable energy while enjoying greater ownership and control of the energy sector in response to needs defined by them – and with the majority of energy coming from decentralised systems.

Some of the most fertile and fruitful developments in community solar projects are to be found in the US, for example Hansen's partnership with Hampshire Power, which illustrates exactly why these projects are a critical path to net zero and embracing decentralised DER is how we democratise access to clean electric power.

Democratising and decentralising energy production through sources of renewable energy, such as community solar and wind, enables entire ecosystems which will yield long-term socio-economic dividends underpinned by sustainable livelihoods. Energy access strategies like community solar not only democratise access to a renewable energy source but advance efforts to achieve the net zero agenda.

We're clearly at a pivotal point now in the shift towards renewable energy: some of the biggest clean energy investment deals in history are being made now, the costs of building and operating renewable energy assets are decreasing, and social and political pressure has never been higher. And these areas of renewable and democratic energy projects are really set to soar.

The economics in many cases are there today, the supply chains and the climate awareness. There's also much more political and regulatory support now, we are seeing innovative energy efficiency policy coming in to play around the globe – so all the building blocks are potentially in place or coming online. But growth requires scale – and scalability is critical, as is developing flexible and secure platform, as well as being able to simplify the experience for customers. We'll explore those issues in depth in Part 3 as well as how the required strategies are being enabled by technologies to bring forth this new era.



HANSEN ENABLES THE ENERGY TRANSITION

When facing the dynamics from decarbonisation, DER and decentralisation, the Digitalisation momentum offers tremendous opportunities. Advanced data analytics is changing the relationship between energy companies and their customers. By leveraging this data effectively, forward-thinking utilities can get ahead of the pack.

But moving towards a real-time market and larger market areas means that the requirements for automation in data management and analytics increase as a result of the additional complexity and volume of available data.

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HansenTrade™	Automated trading analytics and risk management
HansenCatalog™	Commercial product and technical service catalog and lifecycle management
HansenInsight™	Business and operational data analytics and decisioning
HansenMDM™	Metered AMI, calculations and disseminating event management
HansenMarket-Message™	Market messaging and EDI capabilities to manage transactional data communications
HansenCPQ™	Cross-market omni-channel quote and order capture

ABOUT HANSEN

Hansen Technologies (ASX: HSN) is a leading global provider of software and services to the energy, water and communications industries. With its award-winning software portfolio, Hansen helps over 620 clients from over 30 offices worldwide to create, deliver and engage with their customers, to manage and analyse customer data, and control critical revenue management and customer support processes.

For more information on Hansen Technologies visit hansencx.com
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