



The Road Ahead

**Markets, value chains, and pacesetters
shaping Europe's Energy Transition**

MARCH 2025

Letter from the author

In leading this report, it is clearer than ever to me how **interconnected** the energy transition is. Individuals and companies working in the transition require that interconnected, holistic view across the energy system for their success. A successful energy transition requires this.

The traditional energy sector value chain of thermal generation, transmission and distribution, and commodity retail has already been disrupted, heavily so in some markets. **New value chains have emerged and continue to rapidly grow and evolve.** This report is structured around six of these new value chains, chosen to capture some of the most important business areas in the transition. For each one we characterise the value chain, associated markets, the key challenges, and what we expect to see through to 2030.

As these value chains have emerged and grown, a **new wave of new companies have entered the market**, building businesses in and across the value chains. The number of such companies is impressive, as is their passion, skill and drive. Incumbents are having to evolve and even pivot their businesses quickly.

Value chain integration and **value chain specialism** is another key theme of the report. There is a general trend towards value chain integration, but specialists will continue to play important roles.

We decided to **identify pacesetters** for each value chain to illustrate companies that are driving that value chain, or a key part of that value chain, forwards. Selecting just four companies for each value chain was one of our hardest tasks, and we recognise many other companies are also at the leading edge. Unsurprisingly the majority of the pacesetters are new entrants rather than incumbents. Most are value chain integrators; some are specialists.

In addition to the value chains, we explore **key challenges** that are critical for a successful energy transition, and **essential competencies** that companies will need to excel at.

This framework: the value chains, the interconnections, the key challenges, and the competencies, provides a basis for **companies to evaluate and fine-tune where and how they play** as the energy transition accelerates in the next five years.

We hope you enjoy the report and find it valuable in honing your strategy, tactics and activities. We'd be delighted to discuss the report with you.



For a 1:1 briefings to discuss topics and explore the implications for your organisation, please contact Stephen Harkin, Head of Client Engagement, stephen.harkin@lcp.com.

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The report is built on our deep research base and the expertise of our 120+ energy experts.

About this report

This report explores **how the European Energy Transition is unfolding**, looking at the whole system: from customers, through networks to power markets and grid-scale energy assets. It:

1. **Focuses on markets** characterising today's markets and how they will evolve through to 2030.
2. **Analyses six value chains** from retail to grid-scale generation, capturing the increasing interactions across different market segments; and with spotlights on three key energy transition challenges.
3. **Highlights 24 Energy Transition pacesetters** who are forging the path ahead.

It has been **developed for two audiences** who will benefit from looking across Europe's energy transition across the above three areas:

- **Energy industry leaders and executives** refining **where and how their companies play**.
- **Energy transition practitioners** seeking insights out of their specific sector **to make the right connections across different parts of the energy transition**.

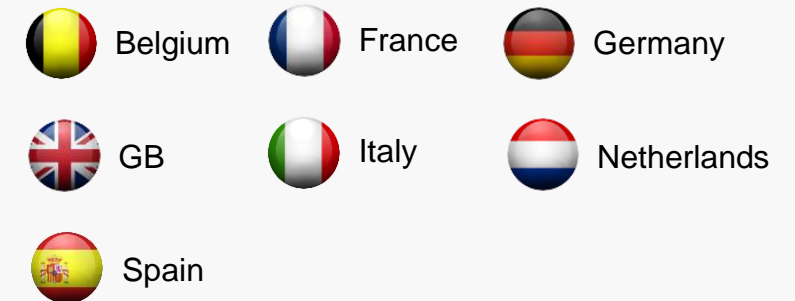
Six Value Chains

- 1 Customer electrification
- 2 Smart energy retail
- 3 Demand-side flexibility
- 4 Grid-scale BESS
- 5 Grid-scale renewables
- 6 Green hydrogen

Three key Transition Challenges

- 1 Making new energy mainstream
- 2 Distribution network congestion
- 3 Power market volatility

Seven European markets



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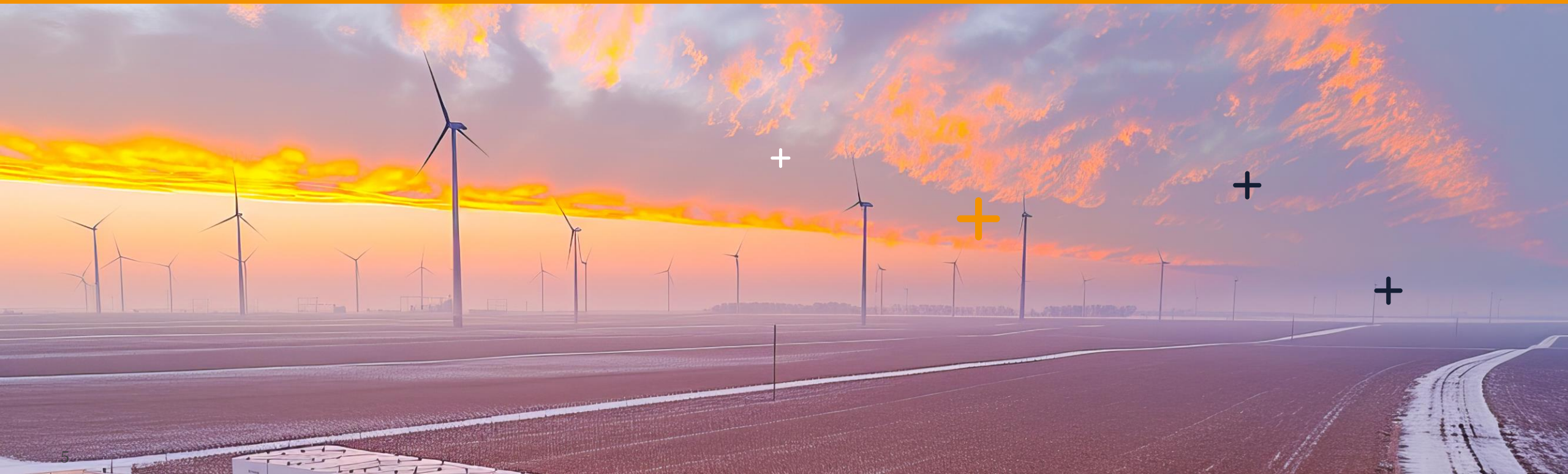
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Summary and take-aways + + +



Where and how to play in Europe's Energy Transition

As the Transition gathers pace, six value chains and four key competencies emerge

Companies need to identify which value chain(s) to play in

- 1 Customer electrification
- 2 Smart energy retail
- 3 Demand-side flexibility
- 4 Grid-scale BESS
- 5 Grid-scale renewables
- 6 Green hydrogen

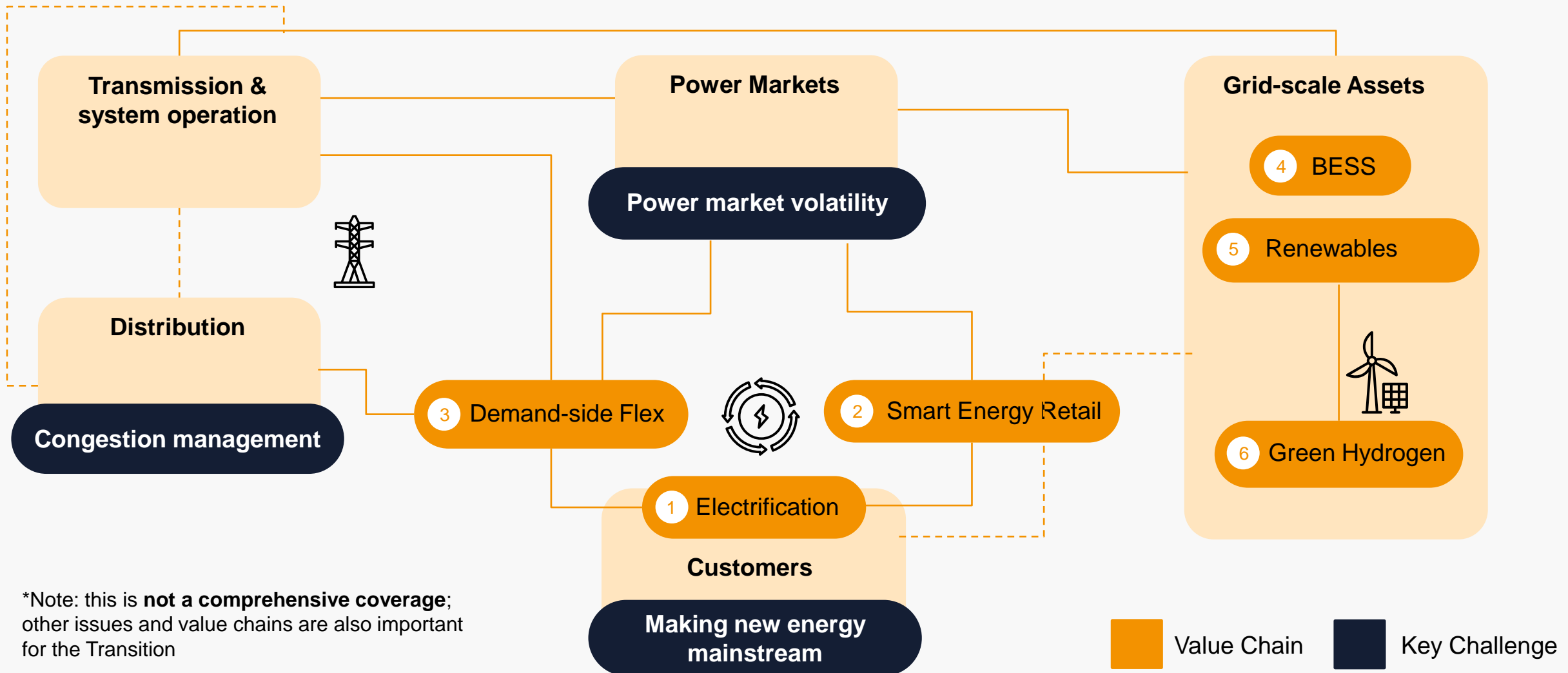
Have a clear strategy on how to play in value chain(s)

- Increasing trend towards value chain integration
- Role for value chain specialists
- Increasing connections between value chains

Strategy execution will require excellence in one or more of four competencies

-  The business of flexibility
-  Customer engagement
-  Power market expertise
-  Electrification, retail and flexibility integration

The energy transition web: six value chains and three key challenges for a successful Transition*

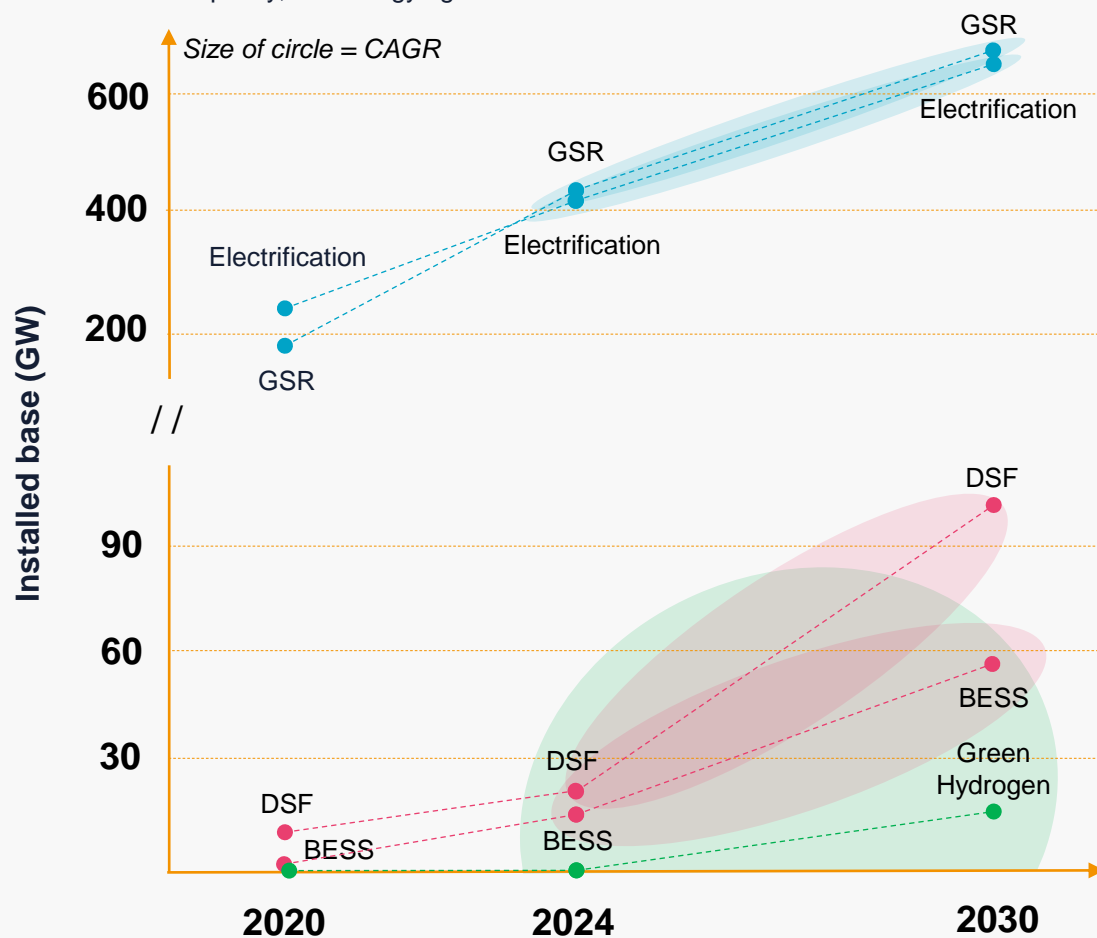


*Note: this is **not a comprehensive coverage**; other issues and value chains are also important for the Transition

All value chains will see sustained growth through to 2030: flexibility value chains will grow the fastest

Figure 1: Installed capacity by value chain over time

Note: these are capacity, not energy figures.



Source: LCP Delta research

Electrification and Grid-scale Renewables (GSR): steady growth

- Almost as much household electrification capacity (261 GW) will be added as grid-scale renewables (267 GW) in the next six years to 2030.
- Grid-scale renewables comprises wind and utility-scale solar.
- These are *capacity*, not *energy figures*; electrification includes residential-scale PV (and figures here only cover household electrification).
- These two factors are driving increasing volatility and network congestion.

Demand-side Flexibility (DSF) and Grid-scale BESS: newer, fast growing

- BESS and demand-side flexibility additions (41 GW and ~80 GW additions in the six years to 2030) are responding to the above opportunities.
- BESS has scaled fast and has overtaken DSF; both will grow at >30% CAGR, with more uncertainty over DSF (both upside and downside potential).
- BESS and DSF capacity are not directly equivalent: only a proportion of DSF capacity is available at any one time.

Green Hydrogen: emerging, nascent

Green hydrogen's risked pipeline for 2030 stands at 12.GW, compared to an installed base of only 0.4 GW in 2024 – high growth rates but from a minimal base as the sector emerges.

Smart Energy Retail (SER)

Smart energy retail is not a tangible asset so not plotted on this chart. It will grow from 6% of the retail energy market to 18+% by 2030.

Value chain 1 summary: electrification builds momentum

Electrification of household heat, EV charge points, solar PV and residential energy storage



2024 base	409 GW	Increasingly intertwined with:
Additions	261 GW*	
CAGR	10%	

2 Smart energy retail

3 Demand-side flexibility

Key take-aways

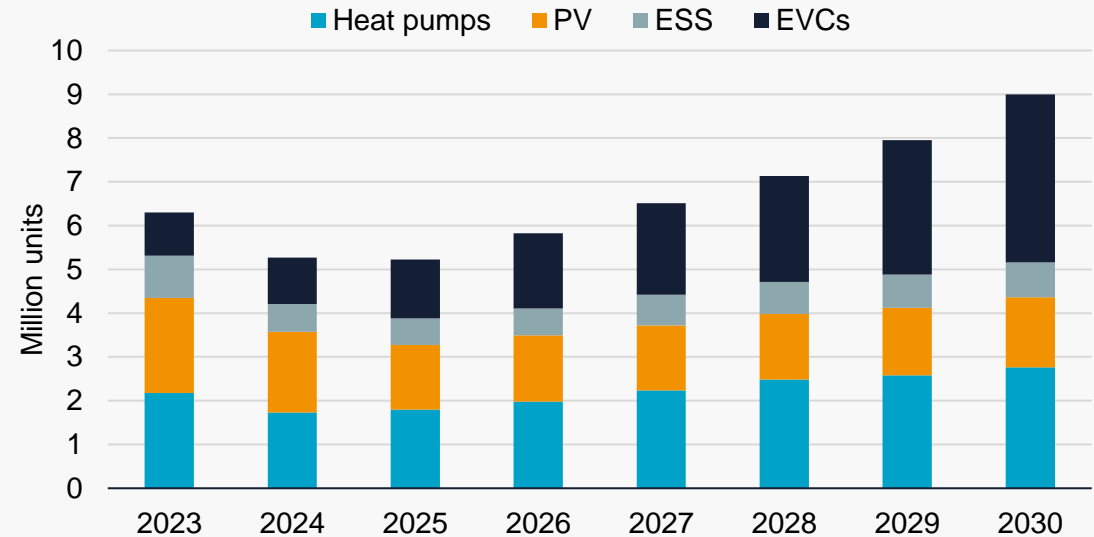
- Steady 10% CAGR after two years of decline**, with 42 million assets added by 2030; however by this time two in three households will still not have *any* electrification assets.
- 78% of customers buy from installers**, predominantly local installers, with national (and international) installation brands growing share. Energy suppliers' share currently stands at 17%.
- Trusted electrification brands**, bringing integrated solutions with **finance, energy retail, flexibility** and **de-risked propositions** to customers are growing market share.

Electrification of multi-family homes, commercial buildings and industry will also see rapidly growing electrification

For example, **84GW of behind the meter solar >10kW** will be added to **2030**.

*Includes all electric heating additions

Figure 2: Annual sales of electrification assets



Source: LCP Delta research

Pacesetters

Our pacesetters have track records of installing electrification assets in households at scale, simplifying customer journeys.

1KOMMA5

Enpal

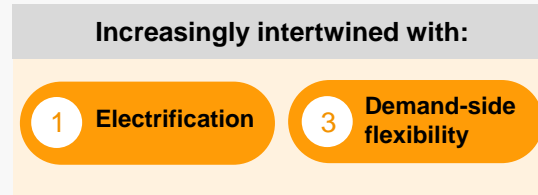
thermondo

zonneplan

Value chain 2 summary: smart energy retail is growing fast, providing enhanced ways for customers to manage their bills



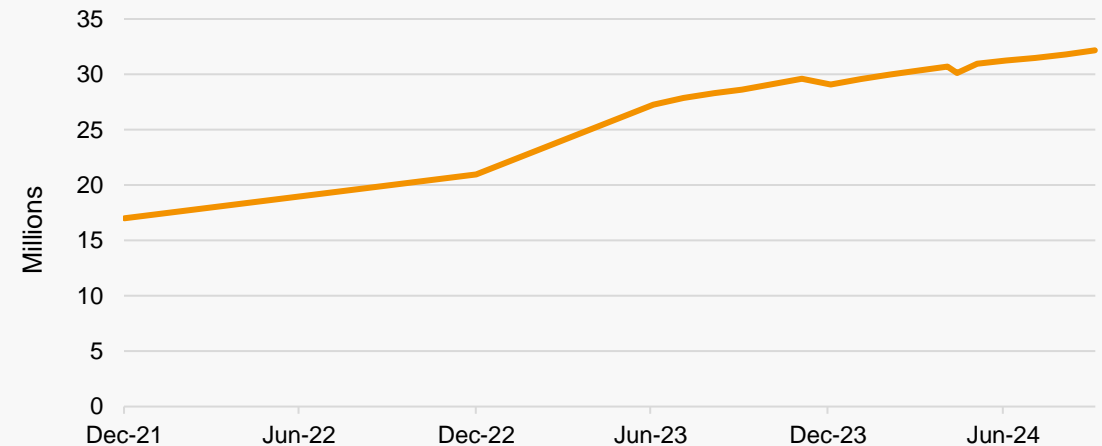
2024 base	6% of customers
Additions	18+% of customers
CAGR	25+%



Key take-aways

1. The energy retail market is shifting from **old ‘adversarial’ retail** to **‘smart’ energy retail**, following the execute-engage-empower-collaborate framework of working *with* customers.
2. Many elements of the value chain are offered, but **integrated suites of propositions** covering the full value chain are **less common**.
3. The **market shift** from old to fully integrated smart energy retail **stands at ~6% today** (in terms of number of customers) but will grow by a factor of at least 3 through to 2030.

Figure 3: Number of active users registered through energy retailers’ insights apps



Source: LCP Delta research

Pacesetters

Our pacesetters comprise three leading smart energy retailers, and one specialist providing services to other energy retailers.

Eliq

Octopus Energy

OVO Energy

tibber

Value chain 3 summary: demand-side flexibility's growth is at an inflexion point



2024 base	20 GW	Increasingly intertwined with:
Additions	80 GW	
CAGR	38%	

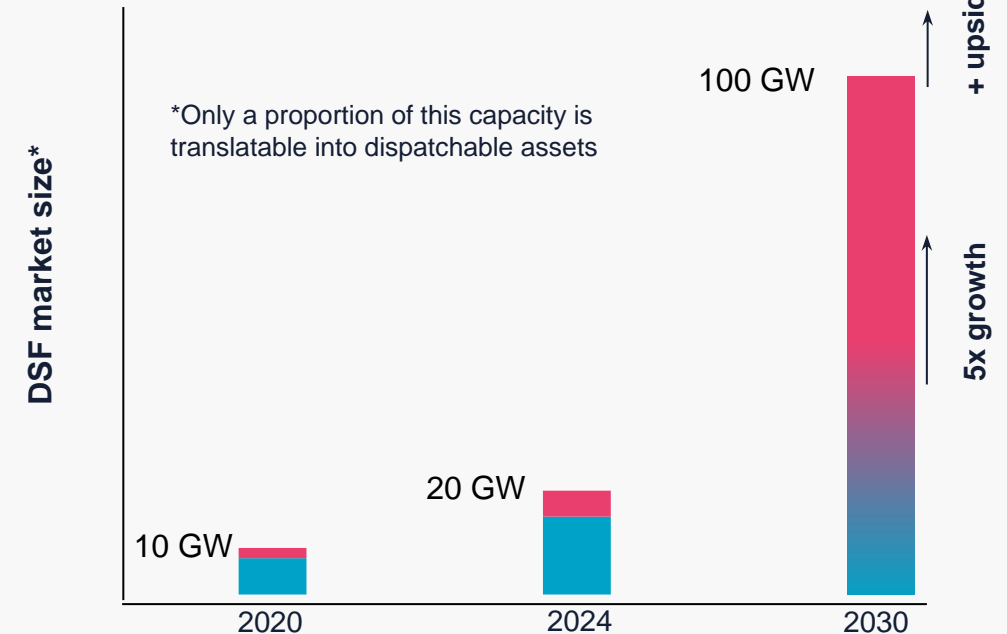
1 Electrification

3 Smart energy retail

Key take-aways

1. **Market access is improving across most countries**, but there remains significant work to do in five of the seven countries.
2. **The value chain for demand-side flexibility is complex but is maturing fast** with specialist players enabling partnership approaches.
3. There are **multiple sources of value**; **stacking** and **optimising** across these, including locational values where present, is a core skill.
4. **Growth is at an inflexion point** with a significant proportion of the 261 GW of new, connected household electrification assets installed over the next six years being used flexibly (in addition to further unlocking the installed base of existing assets plus commercial & industrial assets).

Figure 4: DSF capacity



Source: LCP Delta research, SmartEn

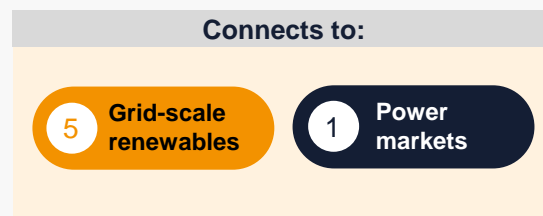
Pace setters representing a cross-section of companies in the demand-side flexibility value chain



Value chain 4 summary: grid-scale batteries: a European growth story



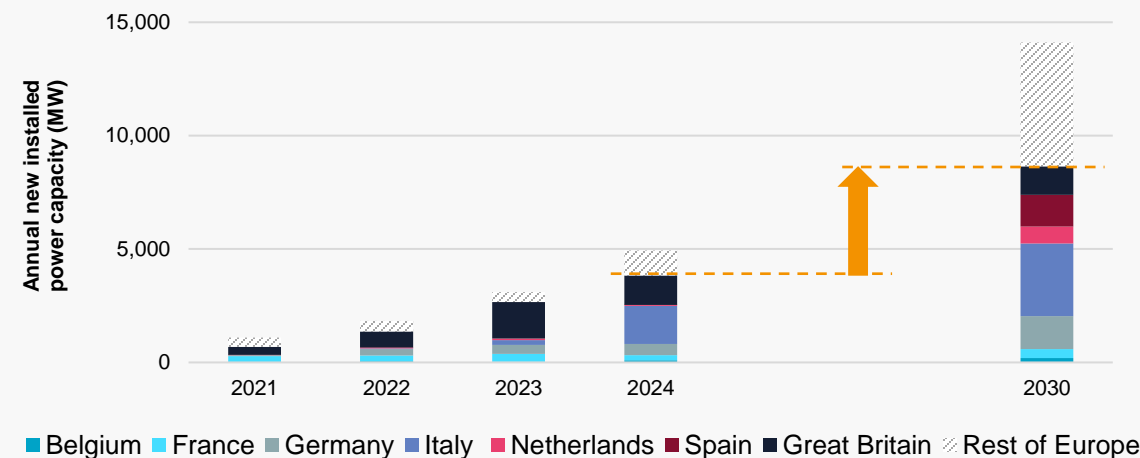
2024 base	13 GW
Additions	41 GW
CAGR	33%



Key take-aways

- The market for battery storage is expanding across Europe** with 41 GW of new capacity installed through to 2030.
- GB is losing its spot as the most attractive battery market in Europe**, with the market pivoting to Central Europe where flexible capacity has lagged renewable deployment.
- Leaders in the storage space are pursuing multinational, integrated business models**, some bringing optimisation in-house, and with single national markets at risk of an element of saturation.

Figure 5: Batteries have scaled fast in the last four years



Source: LCP Delta research

Pace setters

The opportunity represented by grid-scale storage is recognised by players across Europe, large and small, including both traditional energy companies and battery specialists

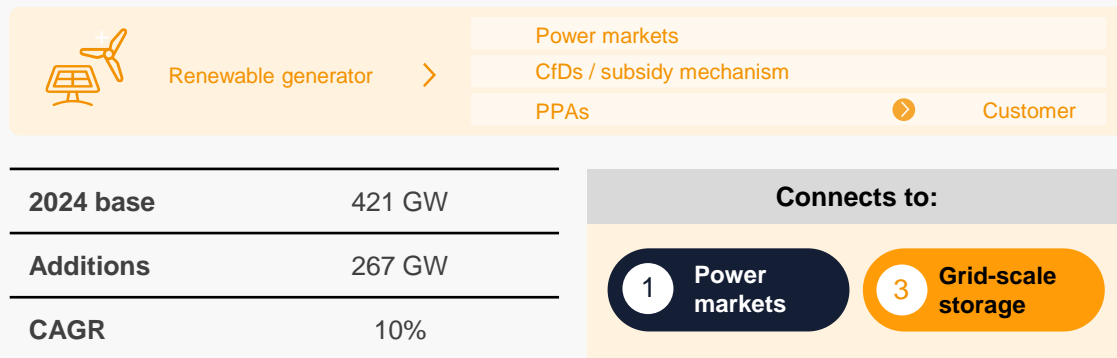
enel

Harmony Energy

Statkraft

Tesla

Value chain 5 summary: grid-scale renewables continue to grow with more sophisticated power market interfaces

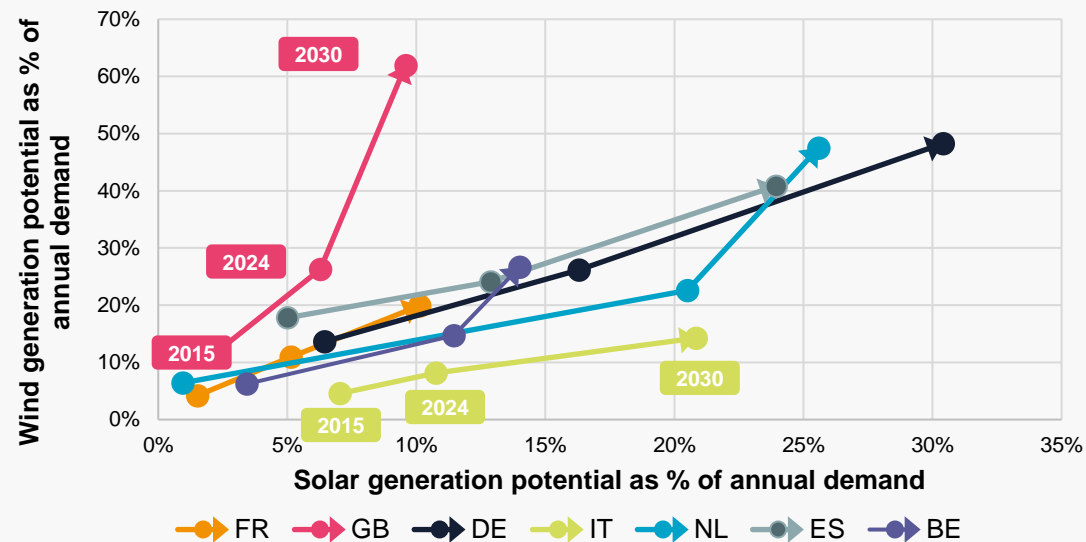


Key take-aways

- Four of the seven countries will have solar and wind capacity able to meet 60% of their annual demand in 2030*. Average grid carbon intensity more than halves to <100g/kWh in 2030.
- Increasing sophistication is required from renewable generation's interface with power markets.
- Managing capture rates, curtailment risk, imbalance and network charges is of growing importance.
- Corporate PPAs and merchant power revenue, rather than solely government subsidies and revenue mechanisms, is increasing as a route to market.

* Actual amounts will be lower due to curtailment.

Figure 6: Generation potential from installed wind and solar in 2015, 2024, 2030



Source: LCP Delta research

Pace setters

These companies have built significant renewable generation capacity and have strong pipelines for the period to 2030.

Iberdrola

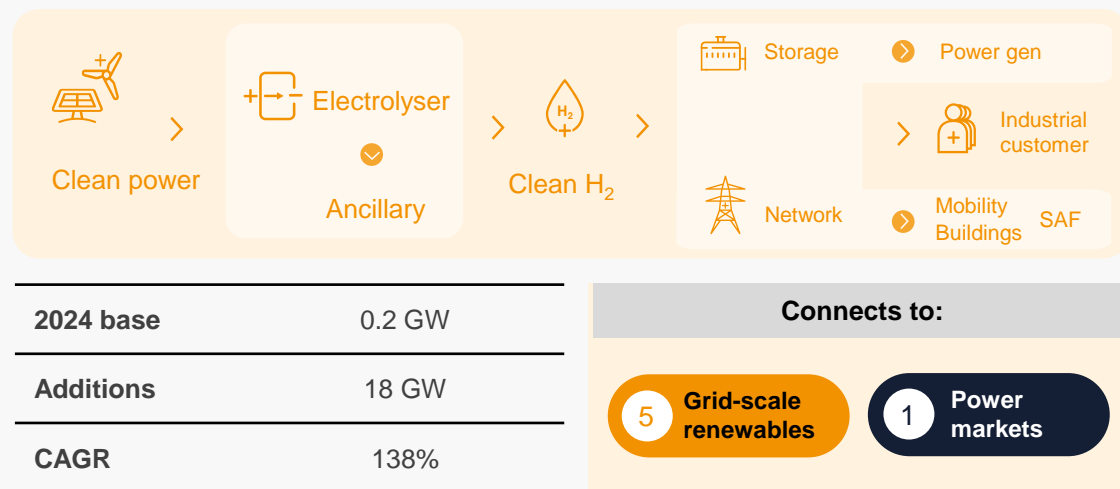
Orsted

RWE

Vattenfall

Source: LCP Delta research

Value chain 6 summary: green hydrogen - a complex value chain transitioning from pre-commercial to commercial

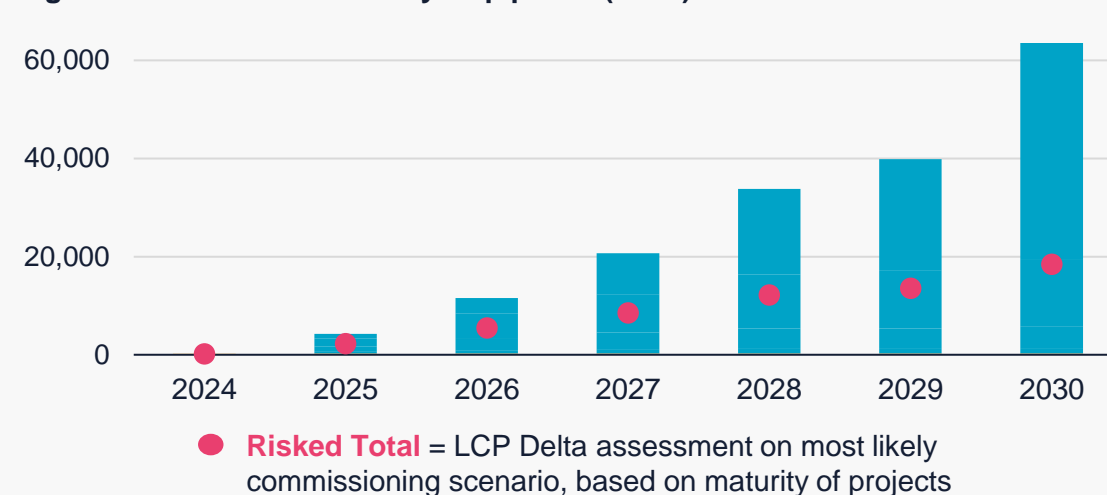


Key take-aways

- The project pipeline is (slowly) building:** 18 GWe (risky) by 2030, but the pipeline has been shifting to the right as projects take longer to reach FID and the sector moves from public to private finance.
- Complex value chain:** lining up clean power, electrolyser investment, and long-term customer offtake agreements at the same time.
- Industrial decarbonisation and synthetic fuel applications** account for 84% of the pipeline, driving scale as project sizes grow.
- Plans and aspirations for wider energy transition role:** but hydrogen to power, system services and others will be largely be post 2030.

The green hydrogen pipeline is building

Figure 7: Cumulative electrolysis pipeline (MWe)



Source: LCP Delta research

Pace setters

These project developers identify economically viable projects and work closely with partners to deliver them.

Lhyfe

Protium

POWER2X

Stegra

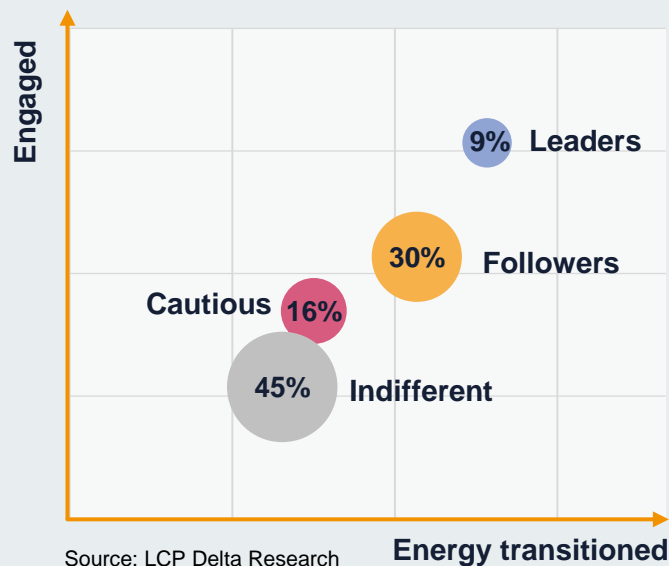
Three key challenges for a successful energy transition

These challenges also represent opportunities for companies that can overcome or mitigate them

1. Making new energy mainstream

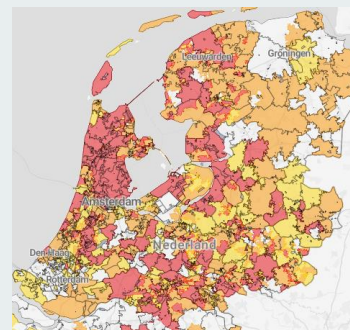
A successful energy transition requires the majority of customers to be engaged. ‘Leaders’ (9%) are highly engaged, and there is a clear opportunity for companies to work with Followers (30%). The Cautious and Indifferent customer segments will be harder.

Figure 8: Energy transition residential customer segmentation



2. Managing distribution network congestion

Figure 9: Local grid congestion in the Netherlands



Source: Netbeheer Nederland

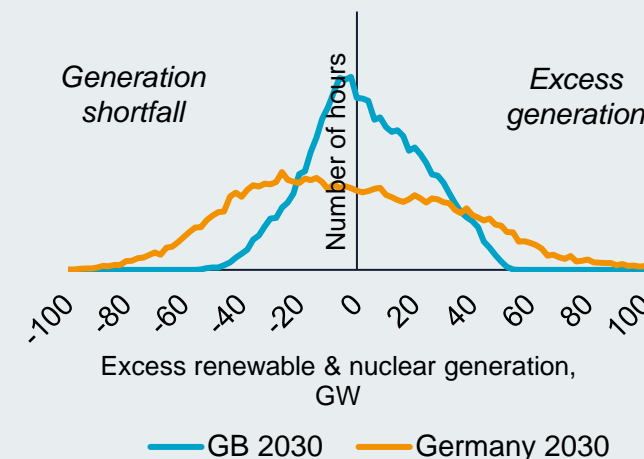
There is a wave of congestion coming to distribution networks as electrification gathers pace and distributed renewable deployment continues to grow. Some countries are already experiencing this.

- Relying *only* on traditional network reinforcement will not be sufficient.
- New flexibility tools can be used to benefit from customer’s turn-up and turn-down flexibility

These new flexibility tools can be deployed quickly, saving money, buying time, and sharing value with customers.

3. Managing power market volatility

Figure 10: Hours with excess renewable and nuclear generation in 2030



Source: LCP Delta Research

Volatility is trending upwards as renewable penetration continues to grow, with generation often exceeding demand. The challenge is to dampen down extreme volatility.

This is an opportunity for providers of flexibility: grid-scale batteries, demand side flexibility, and flexible power plants.

Successful companies are making decisions between integration & specialism; and are making connections across value chains



Integration *across value chains*

There is an increasing trend towards **value chain integration**.

This is driven by a desire to maximise margin capture, as well as building a stronger business model and in some cases better customer experience.

Example: a number of companies have built whole value chain capabilities to install, finance and optimise electrification assets for customers.



Specialism *within value chains*

Specialists provide best-in-class capability and enable others to partner to provide whole value-chain coverage.

Specialists need to ensure they have **sustainable USPs**.

Example: companies specialising in optimising battery revenue streams, or providing energy insights to retailers, provide partnership opportunities for other value chain players that do not have this specialism.



Connections *between value chains*

Value chains are rarely siloed; companies can **play in multiple value chains** exploiting connections and synergies between them.

Single value chain plays need to capture & respond to **connections to other value chains**.

Example: forecasting the value of flexibility requires a holistic view of the supply of flexibility from grid-scale storage, demand side flexibility and thermal plants.

OR

AND

As silos break down, winning companies will excel at one or more of four competencies

The **energy transition requires competencies that connect across value chains**, both for successful commercial strategies as well as for policy makers and regulators. This contrasts with historic approaches that were often siloed.



The business of flexibility: becoming a core energy transition skill-set

Both the demand for, and supply of, flexibility will continue to grow rapidly (but not always in sync with each other).

Flexibility will dampen down wholesale market volatility, reduce network and system operation costs, and reduce customer's bills.

Critical skill-sets and expertise required include:

- All aspects of the Virtual Power Plant value chain, including optimisation.
- The **competition and complementarity between sources of flexibility**: thermal plant, batteries, and demand-side flexibility.
- The **nature, depth and breadth of the different markets for flexibility** and how they complement and compete with each other.



Convergence of smart energy retail, demand-side flexibility and electrification

- These three value chains are increasingly converging – transforming 'old energy retail' and disrupting the traditional OEM business models.
- Business models that integrate energy retail, electrification assets & flexibility will become increasingly dominant.
- Proposition excellence and customer segmentation; finance (for customer's electrification assets); software (to unlock flexibility); and AI & digital excellence (creating great customer experiences and to manage flexibility) are essential skill-sets.

As silos break down, winning companies will excel at one or more of four competencies (2/2)



The growing importance of customer engagement

Customers are connected to five of the six value chains analysed in this report. Customer engagement excellence is required for:

- Electrification & decarbonisation of buildings (including energy efficiency).
- Unlocking demand-side flexibility.
- Network and system operators increasing interaction with flexibility, much of which will involve customers and their assets.
- Industrial decarbonisation, with solutions such as green hydrogen.
- Corporate PPAs with large energy users.

Mastering customer engagement becomes a key energy transition skill for many companies.



Power trading insight and excellence

Intra-day and day-ahead volatility are defining themes of the energy transition, with balancing risk becoming ever more important. Power markets feature in nearly all value chains; excellence (in full or in part) is required by:

- Energy retailers, particularly with the growth of settling on actual load profiles.
- Providers of flexibility.
- Renewable generators, traders and those providing route-to-market services.
- Electrolyser operators in the green hydrogen value chain.
- Network and system operators – even if they do not participate directly in these markets.

‘Excellence’ requires the right platforms, tools and forecasting capability to capture opportunities and manage risks.

* Different forms of flexibility have different attributes, and therefore are not always directly comparable

24 Pacesetters driving the Energy Transition forwards

These companies represent a mix of integrated and specialist plays, and are a **selection** of a wider set of companies at the leading edge.

1 Household electrification	1KOMMA5 Integrated home electrification company, active internationally	Enpal Integrated German home electrification company from a PV heritage	thermondo Germany's largest heat pump installation business offering energy management and PV	zonneplan Integrated Netherlands home electrification company, from a PV heritage
2 Smart energy retail	Eliq Energy data & insights software for energy retailers and more	Octopus Energy Tariff innovator combined with electrification solutions and a flexibility leader	OVO Energy Tariff innovator, insights and customer decarbonisation journeys	tibber Integrating dynamic tariffs, energy management and consumer flexibility
3 Demand-side flexibility	axle energy A leader in taking automated aggregated residential assets to markets	sympower A leading independent aggregator for C&I customers	The Mobility House Energy Connecting EV charging to energy markets, and first mover in V2G flexibility	Voltales Europe's largest aggregator of flexibility from residential HVAC
4 Grid-scale BESS	enel Largest installed storage capacity across Europe	Harmony Energy A leader in GB projects, now moving into continental Europe	Statkraft An early-mover in BESS, developing and trading assets	Tesla Integrated supply of battery modules plus battery optimisation
5 Grid-scale renewables	Iberdrola Global renewables developer with strong pipeline	Orsted Significant installed base & pipeline despite recent investment scale-back	RWE Significant renewables pipeline across the seven markets	Vattenfall Strong activity in the seven markets in addition to Sweden
6 Green hydrogen	Lhyfe Commissioning green hydrogen projects today for industry and mobility	POWER2X Power2X's project pipeline exceeds 1 GW of electrolysis capacity	Protium Protium is one of very few developers operating without subsidy	Stegra Planning to produce 5 million tonnes of green steel per year by 2030

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Expertise across...



Generation Storage Power trading Solar



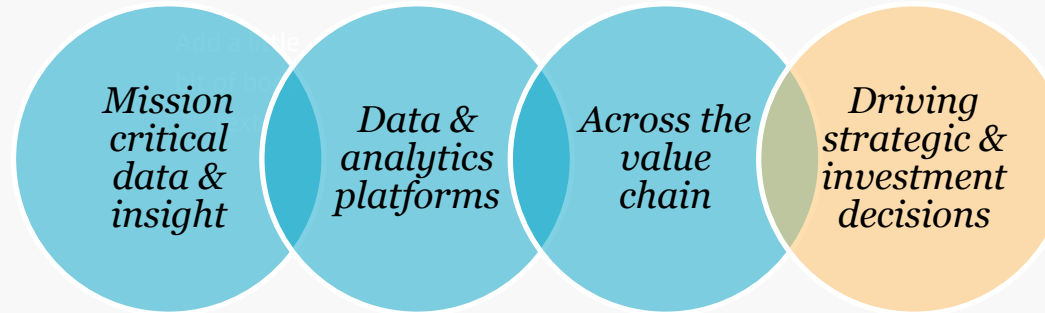
Networks Flexibility services Hydrogen



EV charging Home energy management Electrification of heat

...joining dots across the whole value chain

Supporting clients to invest in and navigate the energy transition



- for
- + Investors
 - + Energy companies
 - + Asset & infrastructure owners & developers
 - + Governments & regulators
 - + Product manufacturers
 - + Power traders

Coverage	Energy experts	Clients	Offices
Europe is core	120+	250+	Berlin Edinburgh London Paris
International reach & client base			

Strategic support

Business growth advice	Revenue forecasting	Due diligence	Customer insight
Market insights	Policy & regulation	Whole system modelling	Training & masterclasses

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