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Introduction to EDF Trading

EDF

A large portfolio of managed assets, proven expertise and global capability to provide market access, asset optimisation, risk management, supply and logistics services

Worldwide interests stretching from Australia to China, France, Japan to the UK, Canada and the US

Around 800 employees located in Europe, the United States, Canada and Asia

A Baa2 credit rating from Moody’s

€3 BILLION

Shareholders equity of €3 billion (2018)

Active in the electricity, natural gas, LPG, oil and environmental products markets. Also active in the coal and freight and LNG markets via JERA Global Markets.

100%

A 100% owned subsidiary of EDF S.A., the world’s biggest electricity generator

Principal business locations: Europe (London, Paris), North America (Houston) and Asia (Singapore)
EDF Trading’s Commodity Specific Business Units

EDFT’s asset-backed trading strategy is executed through nine business units

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<th>Asset optimisation</th>
<th>Business units</th>
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<td>— A large portfolio of contractual and flexible physical assets</td>
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<td>— Access to multi-commodity, physical and financial assets providing time, locational and cross-commodity optimization opportunities</td>
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<td>— Third party and EDF Group related structured transactions creating flexible asset positions, information and trade flow</td>
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<td>- Retail Supplier Services</td>
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| Risk management services | |
| — Risk management services to the EDF Group, its customers and third parties: |
| — Market risk management |
| — Price risk management |
| — Product risk management |
EDF Trading’s European Power Market Expertise

• Optimisation, hedging and market access services as exclusive wholesale market interface for EDF Group’s diverse 121GW European generation fleet.
• Portfolio generated 544TWh in 2018, primarily in core markets of France, UK and Italy.
• As the leading player in EU power markets, EDFT also manages an extensive portfolio of our own assets:
  • Extensive cross border transmission capacity
  • Long term and structured electricity contracts
  • Virtual hydro plants
  • PPAs
• We offer comprehensive 24/7 pan-European services:
  • Physical and financial market access
  • Flow trading
  • Intraday and structured transactions
  • Asset and cross-border optimisation
  • Risk management & proprietary trading
Timeline & Price Action Of Key EU Power Market Events

- Fukushima (Mar-11)
- Eurozone Crisis (Q2-11 to Q4-14)
- Rapid RES Capacity Growth (2012 to 2016)
- Flow Based Market Coupling (May-15)
- Coal Options Rally (Jan-16 to Oct-16)
- French Nuclear Crisis (Q4-16)
- Beast from East & China Blue Skies (Win-17/18)
- EUAs Quintupling (Jun-17 to Oct-18)
- Belgian Nuclear Crisis (Q4-18)
- Global Gas Glut (Q3-19 - )

€/MWh
A Snapshot Of RES Capacity Growth & The Impact

Breakneck growth acted first as aggregate supply shock & now as dominant variable in CWE power price forecasting: short term traders must probabilistically risk weight weather scenario dispersion


Germany RES Capacity Forecast

+64GW in 11 Years

Sources: Clean Energy Wire (Eurostat data) and Refinitiv Point Carbon
Further Impacts Of Key EU Power Market Events (1)

Average Diurnal Price Shape

- Price changes reflect solar growth, with HE11 – HE16 falling, whilst HE1 – HE6 has risen.
- Impact on super-peak HE18 – HE21 block is mixed, so far, but thermal unit closures just starting.
- Unlike AU, diurnal price variability has reduced since 2010 (again, so far).

Location Spreads

- Despite dramatic absolute price volatility since Q4-17 (forward curve prices doubling to Q4-18 & then almost halving) spot location spreads have still converged over the past 2.5 years.
- This has been driven by multiple dynamics, both in:
  - Market design: DE-AT price zone split, Oct-18 – increasing DE exports to NWE
  - Underlying gas & EUA prices: evolved FR-DE merit order and increased system gamma
Further Impacts Of Key EU Power Market Events (2)

Clean Spark Spreads & Clean Dark Spreads

- Concurrently strong EUA market and a very weak global gas market has dramatically upended European fuel spread margins & the associated generation mix.

Negative Price Frequency and RES Curtailments

- Bearish cycle of ever-increasing negative price risk during 2012 – 2016 over-capacity period was broken when financial disincentive escalated as government subsidy constraints tightened.
- With rising proportion of RES now covered by “six hour rule”, we now see >5GW of physical asset optimisation (i.e. curtailment) at high production levels, adding an additional non-linear variable.

Market Liquidity

- Symbiotic feedback loop of strong energy market trends and increased AUM for CTAs & funds to deploy has increased financial market futures volumes - and arguably - price volatility.
- Conversely, risk policy changes at key natural players has reduced physical forward volumes.
- Net impact is amplification of technical & algorithmic price drivers compared to fundamentals.
Changes In Future Of European Power Market

German Coal Phase Out

• 20GW of hard coal will be phased out by 2035 with an additional 18GW of lignite being phased out by 2038. Largely linear, but sharp reductions planned for 2022 & 2029.
• Including 8GW of nuke closing by end-2022, DE is losing 46GW or 58% of synchronous capacity over next 18 years, whilst transport power demand is forecast to rise by 5.5GW by 2030
• Strong DE system gains will be needed via lower exports and higher building & industry efficiency

Intra and Inter Country Transmission Legislation

• Balancing N->S flows within DE grid cost €1bn in 2015 & some forecast rise to €4bn by 2022.
• DE-AT single price zone was split in Oct-18 to mitigate the by-product unscheduled “loop flows”.
• Jun-19 EU CEP legislated sharp increase in min. trade-available min cross-zonal capacity to 70%.

Brexit

• EUAs: UK installations have to comply with EU ETS until end of transition period (end-2020), but compliance – and therefore hedging - obligations beyond that are uncertain.
• UK EUA primary auction supply: withheld from 2019 (due to No Deal risk) now being auctioned.
• UK power prices: uncertainty over pricing/hedging post 2020 as caught between three possible policy instruments: EU ETS, UK ETS and Carbon Price Floor (CPF). Repeat of 2019 uncertainty.
• Market coupling: UK might leave EPEX DAH MC, requiring a new explicit cross border capacity auctioning systems to be implemented for imports/exports. Potential cross-border carbon tax?
EU – AU Power Markets: Current & Future Parallels & Differences

Parallels

- **Stack evolution**: rapidly changing generation mix, median SMRC & system flexibility as breakneck RES growth is countered by retiring synchronous thermal capacity
- **RES route-to-market changes**: sunsetting of new-build subsidies and commensurate growth in PPAs dramatically changing risk ownership
- **Transport electrification**: expected to reverse of decade long erosion in net power demand
- **Decentralization of generation & load centres**: rising demand flex countering supply gamma loss
- **Capacity markets**: Patchwork of legislation with considerable medium term uncertainty
- **Frontier technologies**: Policy support for hydrogen economy and CCS

Differences

- **Market design**: Nodal pricing proposal vs zonal FBMC – EU does not want to fragment liquidity
- **Trading**: Liquid multi-year EU energy contracts for dynamic asset re-optimisation & monetisation
- **Regulation**: EU generators must offer at SRMC, whilst REMIT mandates availability transparency
- **CTAs & algorithmic funds**: influence on EU has increased liquidity but amplified price trends
- **Financial innovation**: EU diurnal shape doesn’t justify solar shape/solar firming products yet
EU – AU Power Markets: Lessons For One Another

- **Rise and rise of weather driven power fundamentals**: as supply side increasingly determined by weather too, power traders have to evolve to weather risk managers, with increased need for:
  - Advanced weather analytics and data – statistical distributions, pattern matching
  - Weather derivative innovation – EU wind futures market, AU weather-price quantos

- **Embedded generation analytical blindspot**: AU rooftop PV % dwarfs EU, yet opacity in impact of embedded generation on net demand increasingly challenging analytical variable

- **Diurnal price shape innovations**: value in solar shape / solar firming products, particularly as PPA market accelerates in Europe. Goal should be to complement, not replace, PK-OP market.

- **Physical asset flex monetisation**: value in liquid, multi-year contracts for power & underlyings

- **System flexibility and system security**: enhanced by:
  - Diverse stack – RES, hydro, nuclear, coal, lignite, gas
  - Growing demand side response
  - Dense, interconnected grid

- **Transparent long term policy framework**: importance for long term investors & short term traders as decisions on 2030 - 2050 EU Green Deal targets have price impacts today (via EUAs & unit lifecycle optim)
CONTACT INFORMATION & QUESTIONS?

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