

The Renewables Infrastructure Group

Capital Markets Seminar

2 October 2017



Introduction

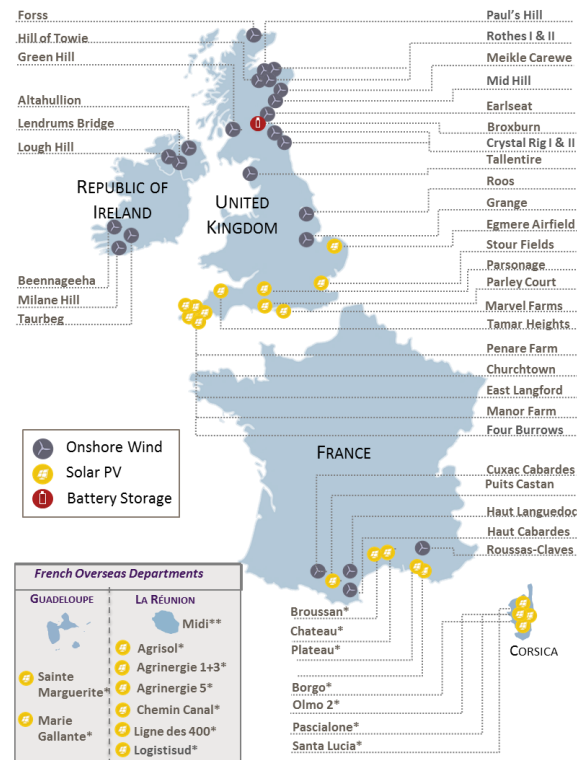
Haut Languedoc, France

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TRIG's Journey Since IPO (July 2013)



- ▲ **Market capitalisation > £1bn**, sector-leading
- ▲ **56 diversified projects** wind, solar & storage (18 at IPO)
- ▲ **774MW** of portfolio generating capacity (256MW at IPO)
- ▲ **Generation consistent with budget**
~1/2% of UK electricity, ~2% of renewables
- ▲ **Over £135m of dividends** paid since IPO – on target
- ▲ **TSR of 8.4% since IPO** vs 7.4% for the FTSE All-Share¹



1. Based on share price plus dividends from IPO to 30 June 2017 on an annualised basis. Past performance is not an indicator of future performance.

TRIG's Approach

Innovators in the renewables infrastructure sector



Expertise

- ▲ Fast-evolving market
- ▲ Staying ahead of the curve – multi-sector, batteries
- ▲ Taking lead in market education

Discipline

- ▲ Continued new allocations to renewables
- ▲ Sectors can and do overheat
- ▲ TRIG's selectivity across its target markets

Scale

- ▲ Cost benefits continue
- ▲ Liquidity
- ▲ Teams at InfraRed and RES

Social Responsibility

- ▲ Safety paramount
- ▲ Set example from Board down
- ▲ 444,000 homes powered, 666,000 tonnes CO₂ avoided



Markets and Technology

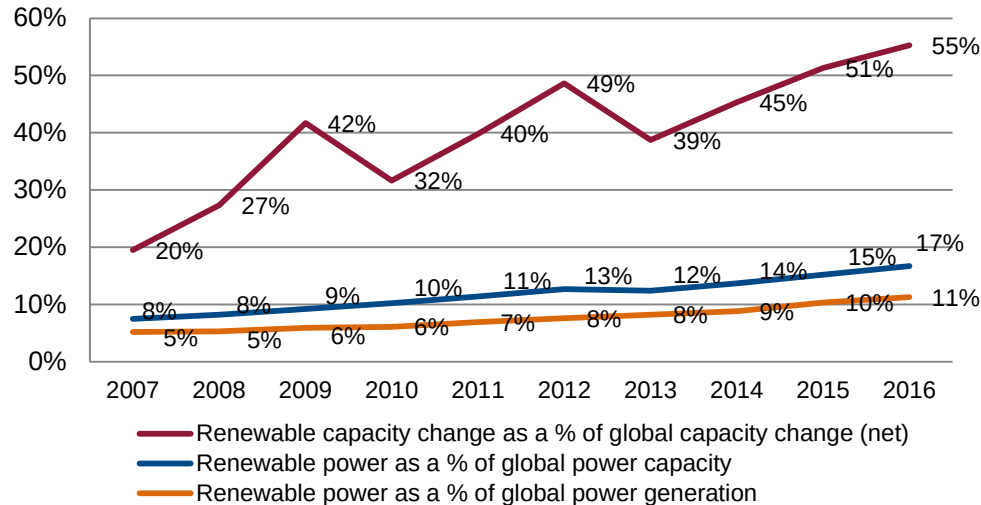
Four Burrows, England

Scale of the Global Market for Renewables

Renewables is now mainstream



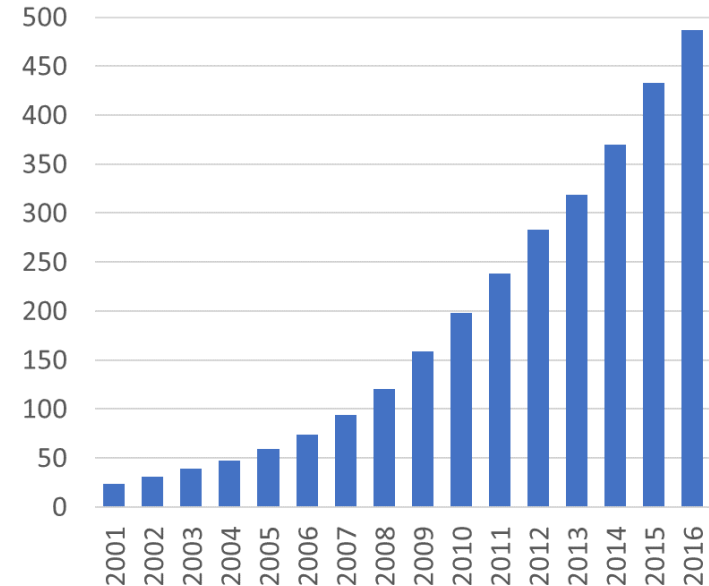
Renewables as % of Global Power Capacity¹



A long way to go...

- ▲ c.11% of 2016 world electricity production from renewables (with 17% of capacity)

Global Cumulative Installed Wind Capacity (GW)²



1. Renewables figure excludes large-hydro. Source: Bloomberg New Energy Finance

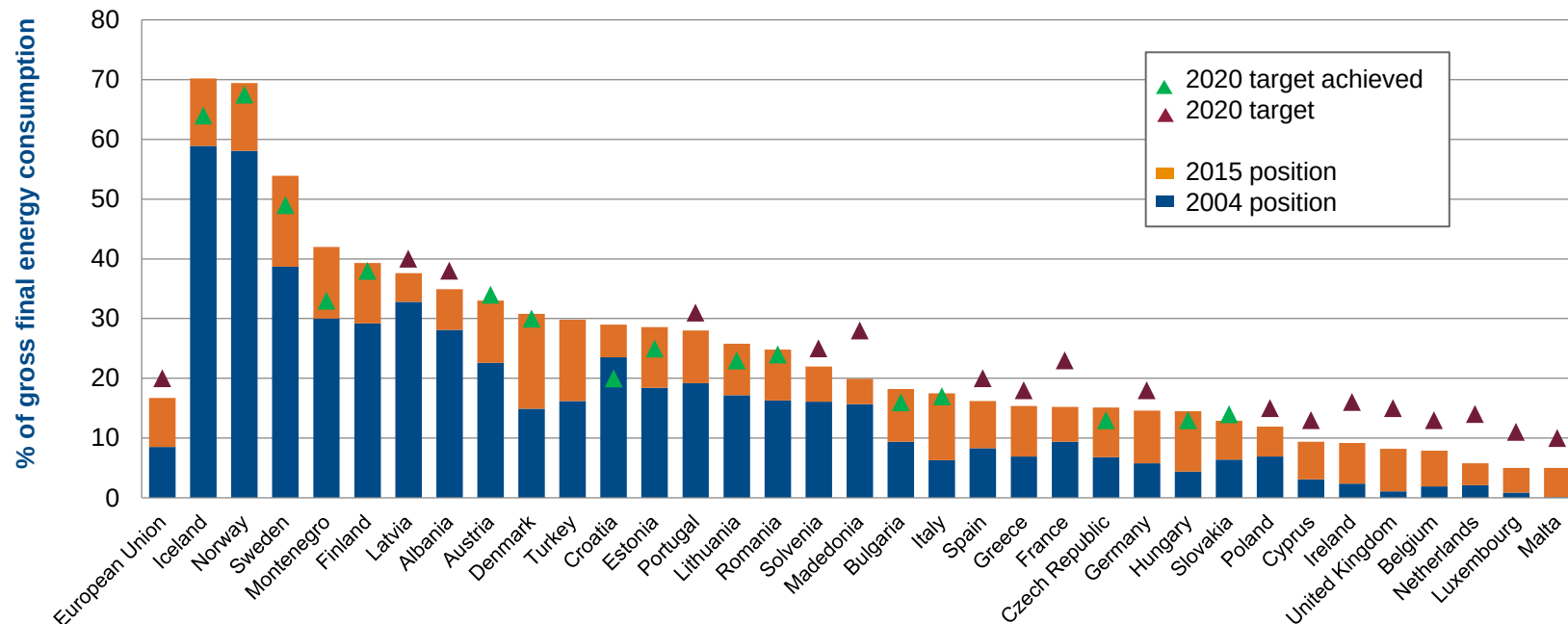
2. Source: Global Wind Energy Council

European Renewables Penetration

EU broadly on track to 2020 targets



Share of Energy Consumption From Renewable Sources¹



1. Eurostat, March 2017

Sustained Investor Demand

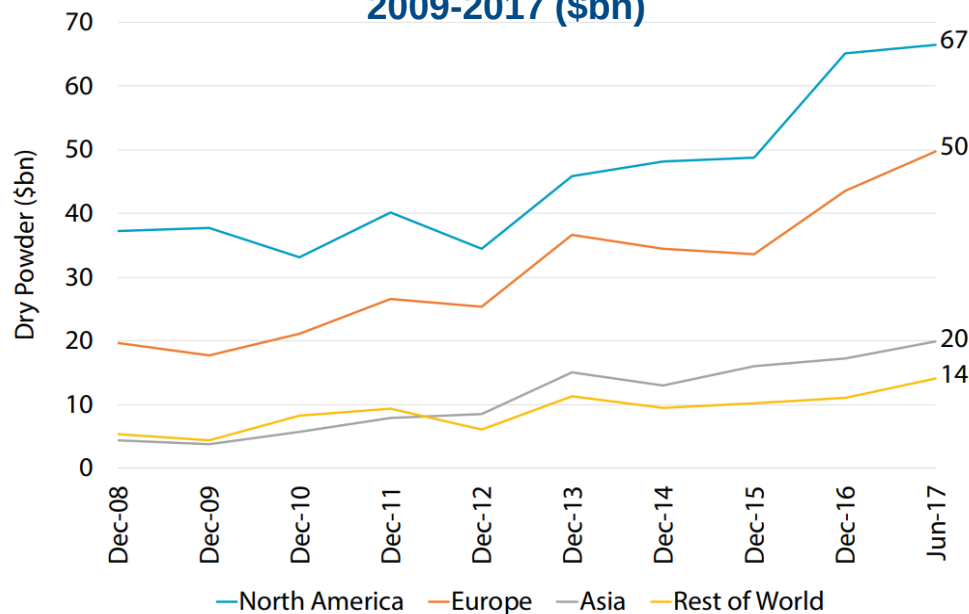
Record allocations to renewables



Unlisted Infrastructure Dry Powder

(by fund's primary geographic focus)

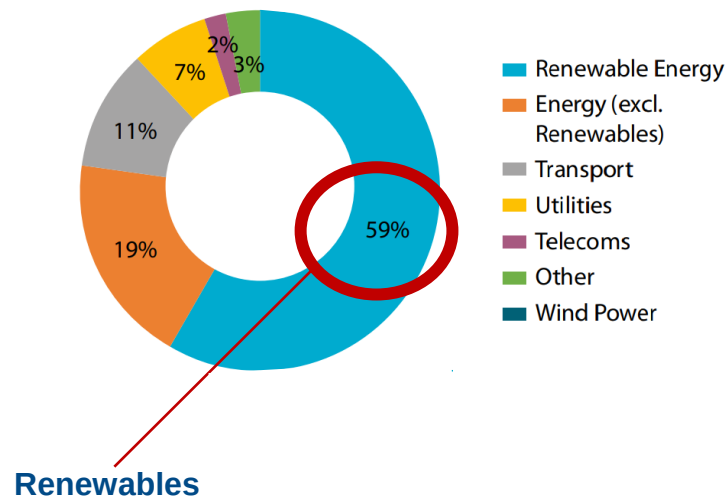
2009-2017 (\$bn)



Completed Infrastructure Deals

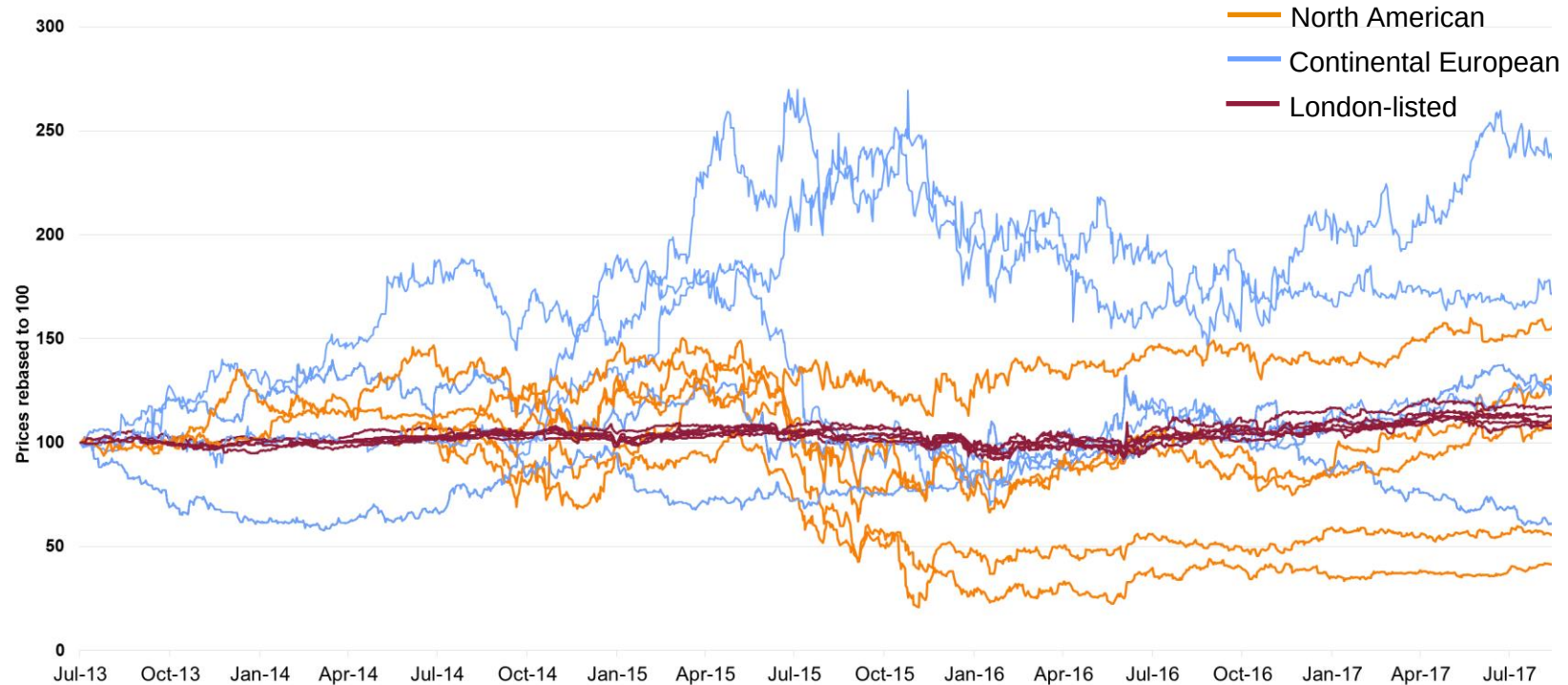
(by category)

Q2 2017



The Listed Sector in a Global Context

London-listed sector versus global peers



Share price reset to 100 at IPO (or July 2013 price if IPO was earlier). North America includes: Pattern Energy, Brookfield Renewable Partners, Nextera Energy Partners, Atlantica Yield, Terraform Power and Terraform Global. Continental Europe includes: Albioma SA, Scatec Solar, Capital Stage, Saeta Yield and Falck Renewables. London-listed includes: BSIF, UKW, JLEN, TRIG, NESF and FSFL. Source: Thomson Reuters



Renewables – Solving the “Trilemma”

(1) Carbon Mitigation



Paris 2015
broad consensus



USA
underlying momentum



UK & Ireland
long-term commitment



China
national imperative



France
new administration reaffirming policy



Japan
denuclearised / energy security



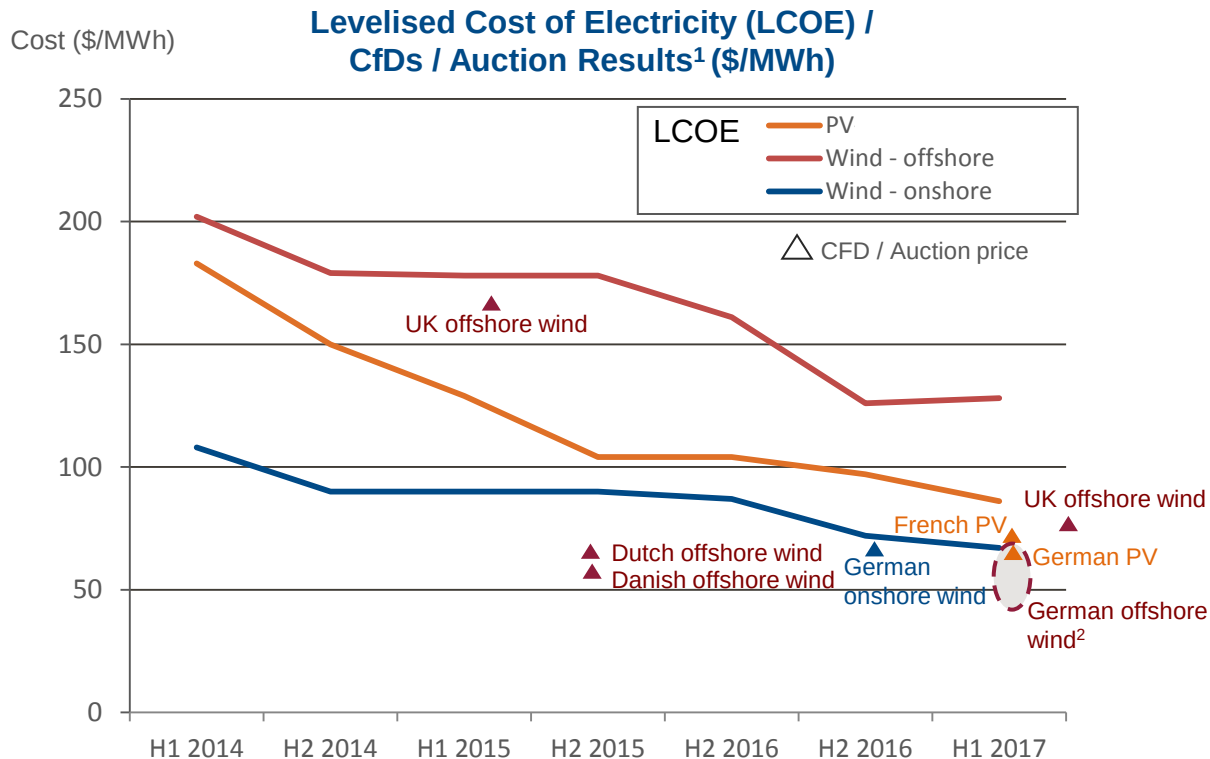
Germany
denuclearised / powering on



Australia
reinvigorated

Broad Global Momentum – No Looking Back

(2) Cost Improvement



What is behind competitiveness?

- ▲ **Technical developments**
(e.g. bigger turbines, cheaper panels)
- ▲ **Economies of scale** including
streamlined operating & maintenance
- ▲ **Improving knowledge & techniques**
reducing risk premium
- ▲ **Subsidy auctions** driving competition in
supply chain, developers

**Renewables competitive
with fossil generation**

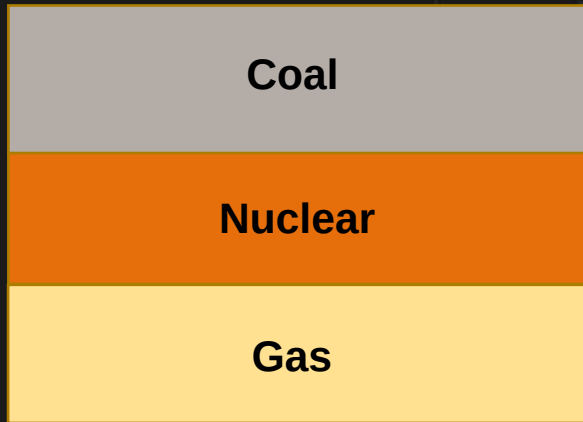
1. InfraRed / Bloomberg New Energy Finance

2. Bid without subsidy (power prices only) – illustrated power price is an approximation

(3) Energy Security

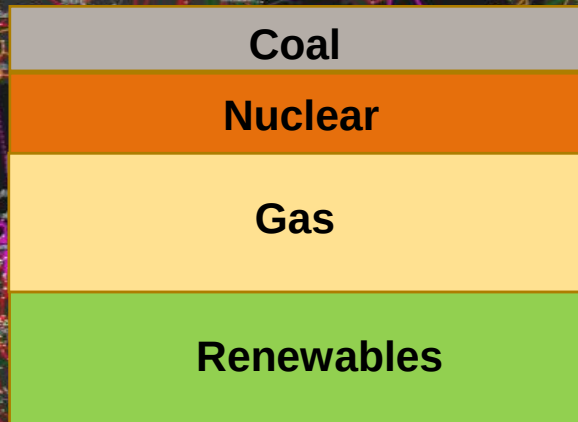
An illustration of Western Europe's changing power mix

2000



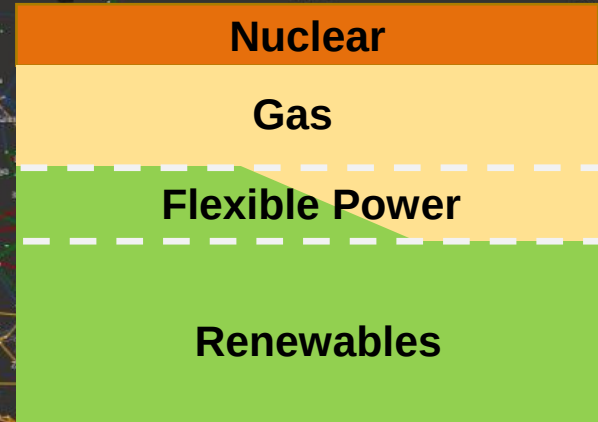
- ▲ Centralised
- ▲ Heavily regulated
- ▲ Domestic focus

2020



- ▲ In transition
- ▲ Subsidised
- ▲ Increasingly traded

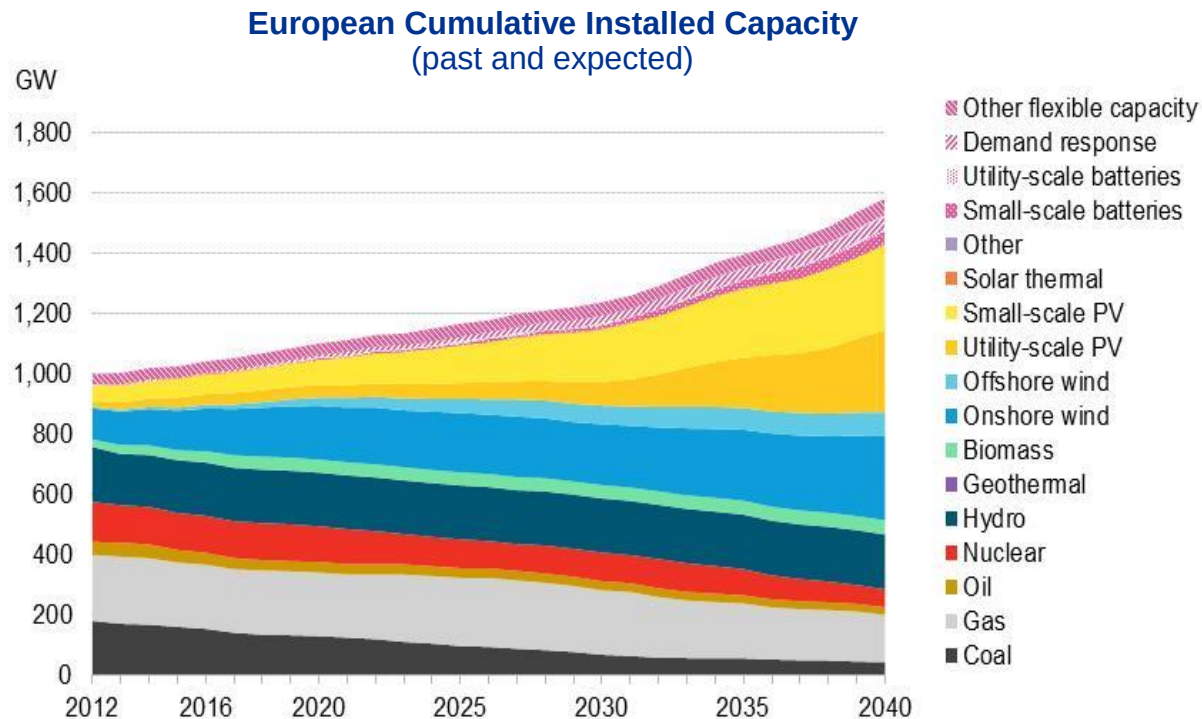
2040



- ▲ Distributed
- ▲ Commercial
- ▲ Connected

European Power Capacity

Expected prevalence of renewables - combined with flexible capacity

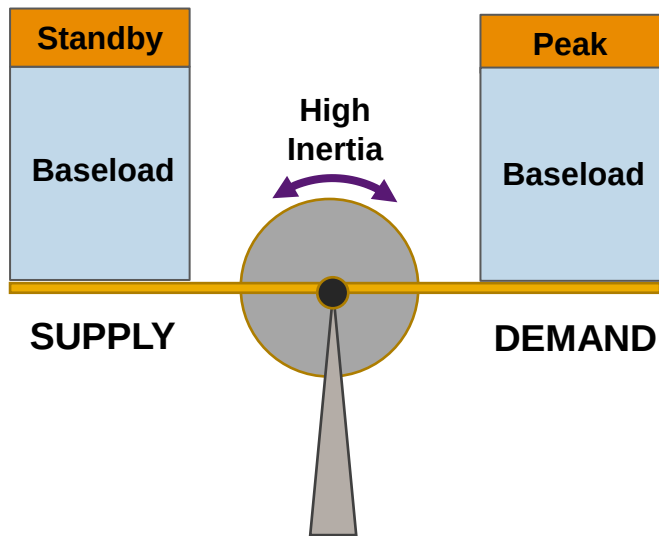


Embedding Renewables

An evolving balancing act

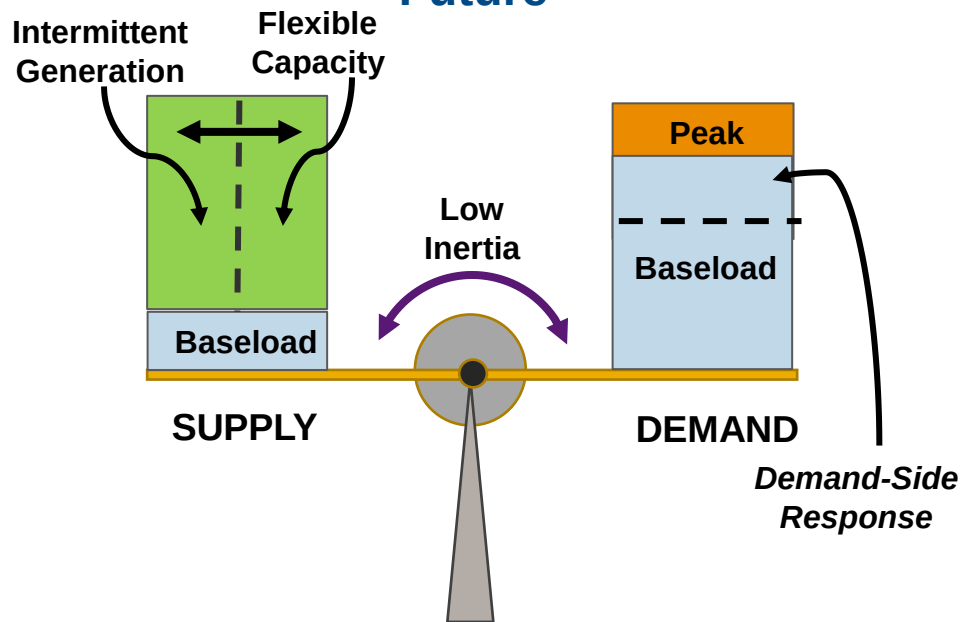


Past



High levels of inertia driven by heavy rotating devices

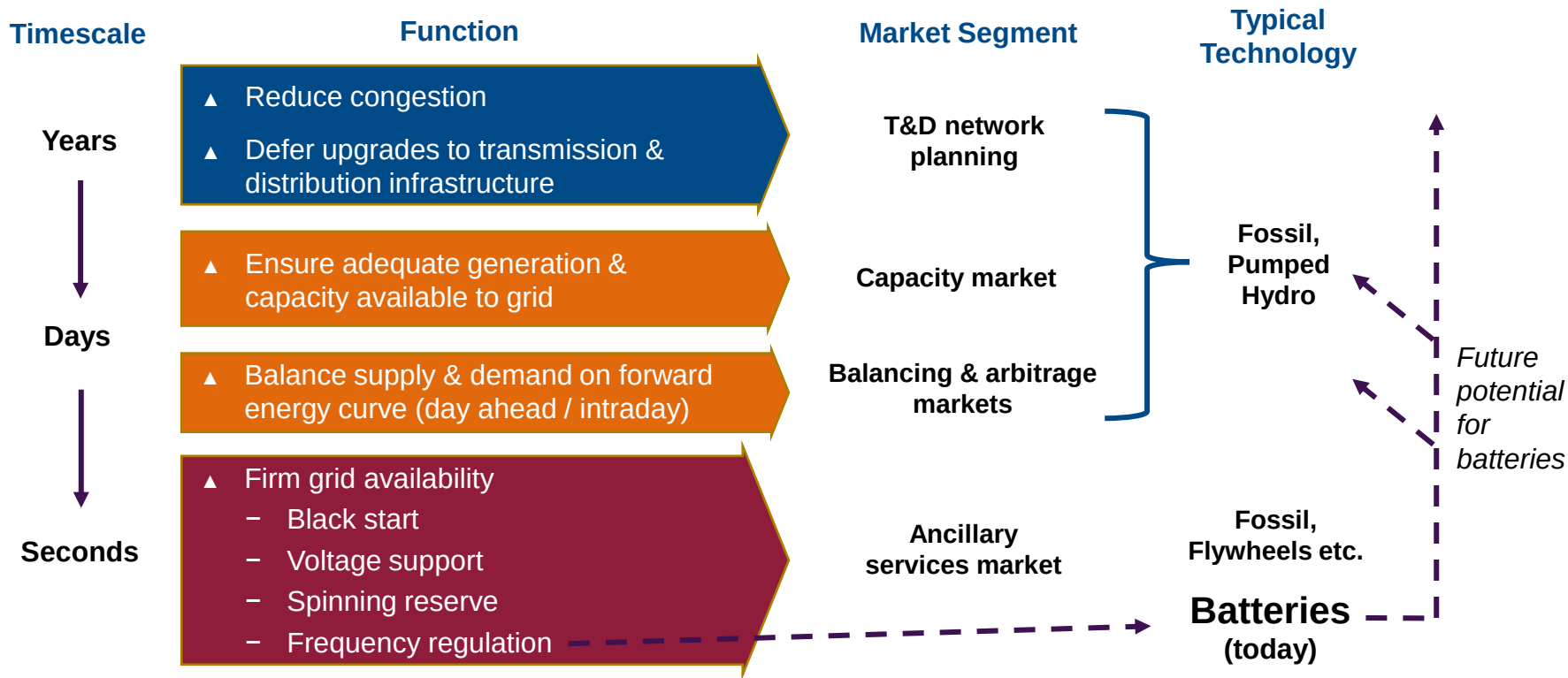
Future



Lower levels of inertia from solar panels & wind turbines

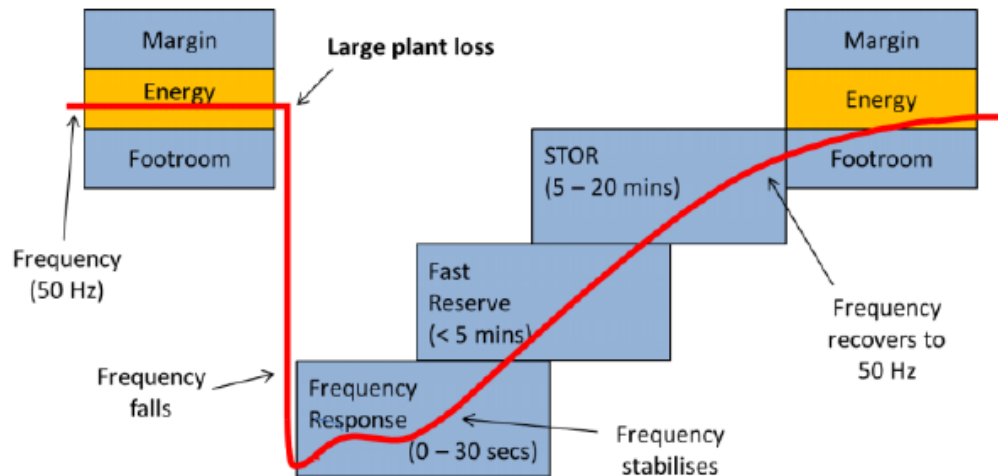
Standby Energy & Storage

A variety of technologies utilised across a range of needs



Managing Frequency Volatility

Flexible generation / energy storage for short duration capacity



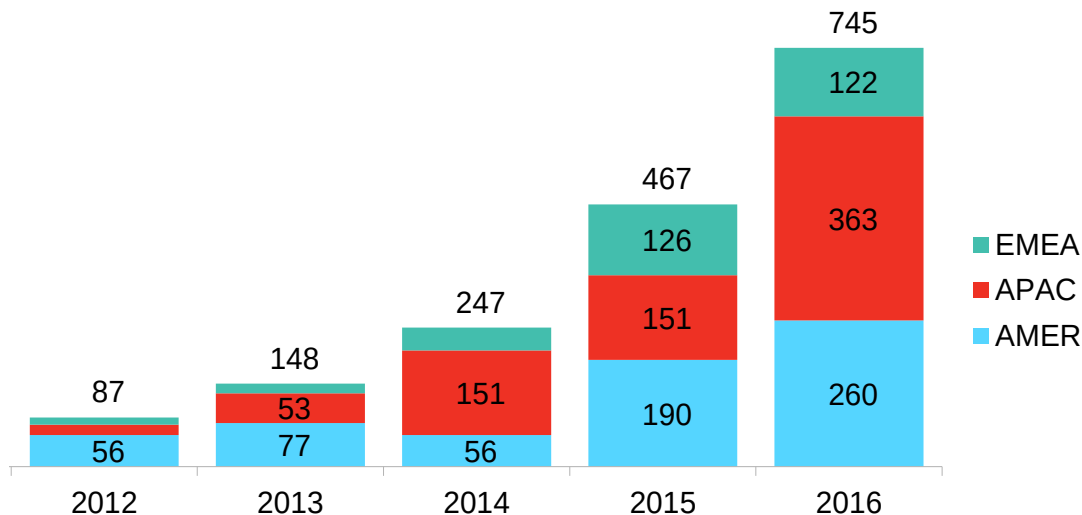
- ▲ Managing frequency volatility requires either:
 - Inertial capacity already online (i.e. existing thermal generation)
 - Capacity which can be switched on to react quickly
- ▲ Flexible generation & energy storage: best positioned for quick reaction capacity

Energy Storage: Batteries Quickly Establishing Role

Falling costs driving deployments



Global Commissioned Utility-Scale Battery Energy Storage (MW)

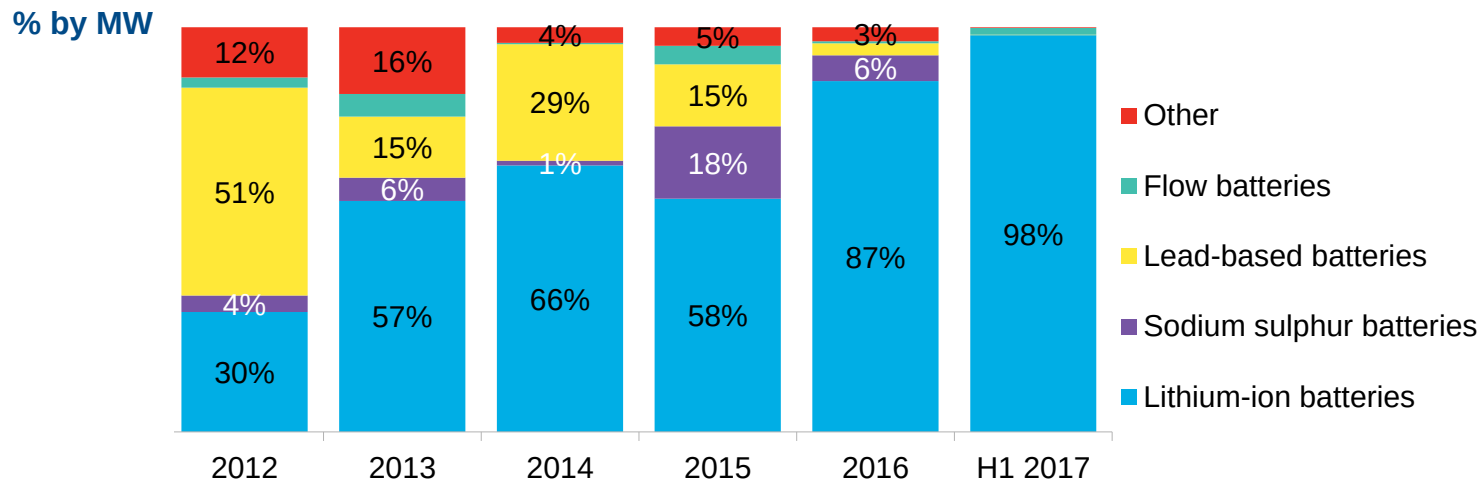


Energy Storage: Battery Technologies

Lithium ion as standard; flow & other technologies in venture development



Technology Mix of Utility-Scale Commissioned Battery Energy Storage Projects

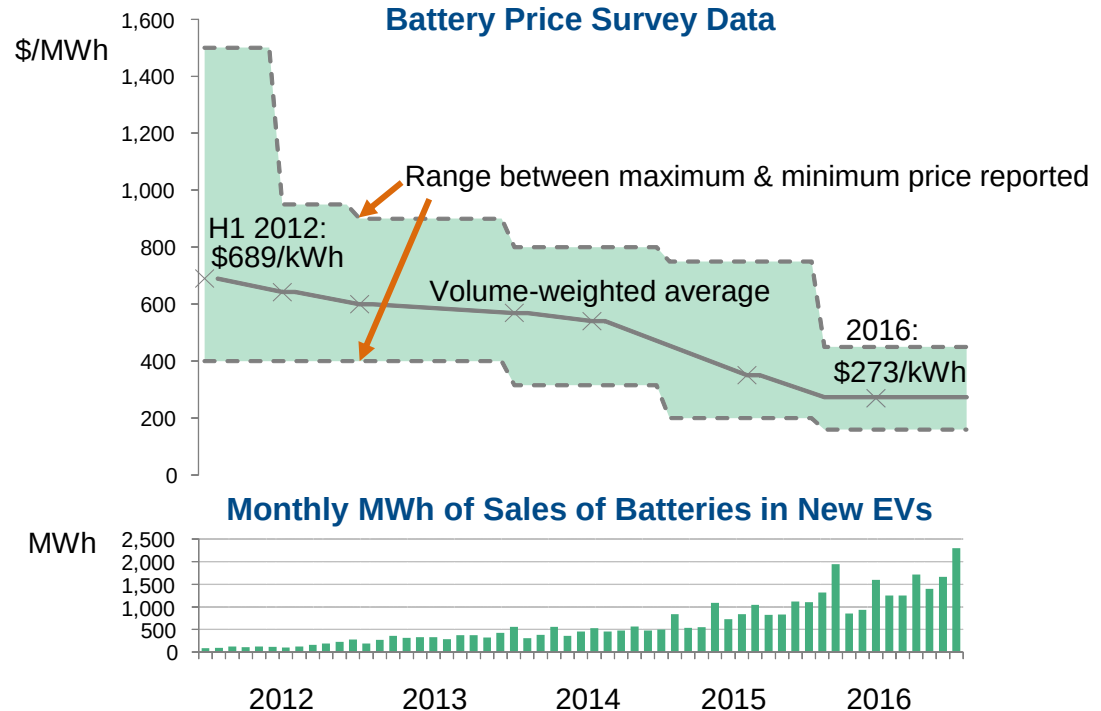


Energy Storage

Market expected to follow solar PV experience curve



- ▲ Pricing
- ▲ Standardized technology configuration
- ▲ Maturing manufacturers
- ▲ EPC & O&M market
- ▲ Degradation and replacement intervals
- ▲ Warranties for central components (batteries, inverters)



Investment Rationale for Energy Storage



- ▲ Frequency Regulation: revenues may be availability-based for an initial period – no wholesale power price exposure
- ▲ Diversification
- ▲ Will become complementary to renewable generation
 - To lower balancing costs: by giving dispatching control over a weather-dependent generation source
 - For time-based arbitrage: to maximize secured power prices
- ▲ By investing now TRIG enhances expertise to address further storage projects as they emerge
- ▲ Opportunities to increase returns from wider TRIG portfolio

Attractive New Segment



Note: Picture is of an operational battery storage plant in the US, developed and maintained by RES.

Reducing Cost of Renewables

UK market: evolution towards subsidy free

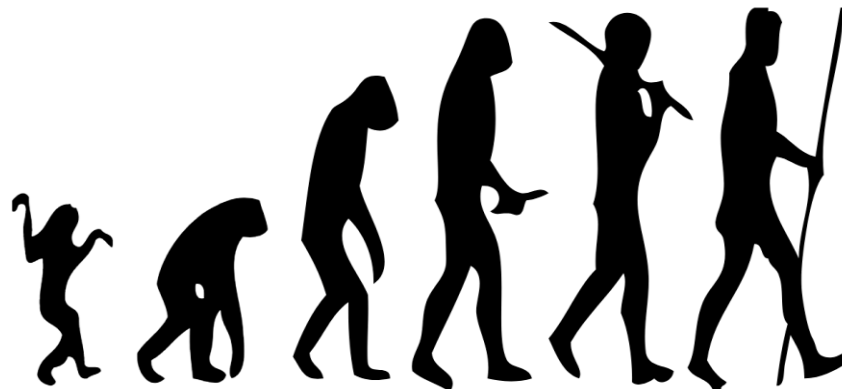


	Project Revenue Mix ¹			Differentiators	
	Past →	Present →	Future	Benefits	Aspects to manage
Solar PV	Power Market 1.2 ROCs+	—	Power Market (no subsidy)	- Flexible scale - Output predictability - Reducing panel costs	- A “thinner” developer / O&M market - Seasonality
Onshore Wind	Power Market 0.9 ROCs+	Limited number of CfDs	Power Market (no subsidy)	- Larger scale - Strong supply chain - Cost advantage in best locations	- Output variable - Community factors (e.g. noise/flicker/visual/planning applications)
Offshore Wind	Power Market Up to 2.0 ROCs	CfDs (15 years)	Power Market (no subsidy)	- Massive scale - High load factors - O&M history & supply chain (UK global leader)	- Accessibility for O&M - Budgeting specific risks (e.g. corrosion) - Ownership structures

1. For period of subsidy scheme.

Excludes smaller elements of revenue such as embedded benefits. ROCs generally available for 20 years post-commissioning. Schematic only.

- ▲ Sensitivity analysis
- ▲ Structuring options to mitigate project risks
 - No (or lower) leverage
 - Hedging power prices
 - Corporate PPAs
- ▲ Maintaining a balanced portfolio: power price exposure & inflation correlation
 - ROC projects: continue to come to the market
 - Feed-in tariff and CfD projects: lower power price exposure & typically stronger inflation correlation
- ▲ Greater visibility for repowering



Disciplined approach to an evolving market

Debt Structure: Term Project Debt

Disciplined approach



- ▲ Limited to 50% of portfolio enterprise value
- ▲ Quantum depends on project risks
- ▲ Fully amortising within period of firm power prices (i.e. the subsidy period)
 - Average subsidy period remaining: 14 years
 - Average debt tenor: 12 years
- ▲ Limited exposure to interest rate rises
- ▲ Cost of debt reflects terms when taken out, average cost c. 4.7% (range 2.4% to 6.0%)

Project Category (Younger = <10yrs)	Gearing ¹ typically available	TRIG's portfolio at 30/9/2017		
		Average gearing ¹	% of portfolio	# of projects
Younger solar projects	70-80%	<60%	15%	22
Younger wind projects	60-70%	<50%	34%	10
Older projects		<30%	20%	13
Ungearred projects		0%	32%	11
		36%		56

Source: TRIG

1. Gearing expressed as debt as percentage of enterprise value

Debt Structure: Short-term Acquisition Debt

Disciplined approach



- ▲ Limit to 30% portfolio value (~ 15% enterprise value if projects 50% geared)
- ▲ Repaid from retained cash and equity raises
- ▲ £150m facility, 3-year revolving, renewal 2019
- ▲ LIBOR + 205 bps

	Amount drawn at 30/9/2017	% of Portfolio Value
Revolving Acquisition Facility	£25m	<3%

Source: TRIG

1. Gearing expressed as debt as percentage of enterprise value

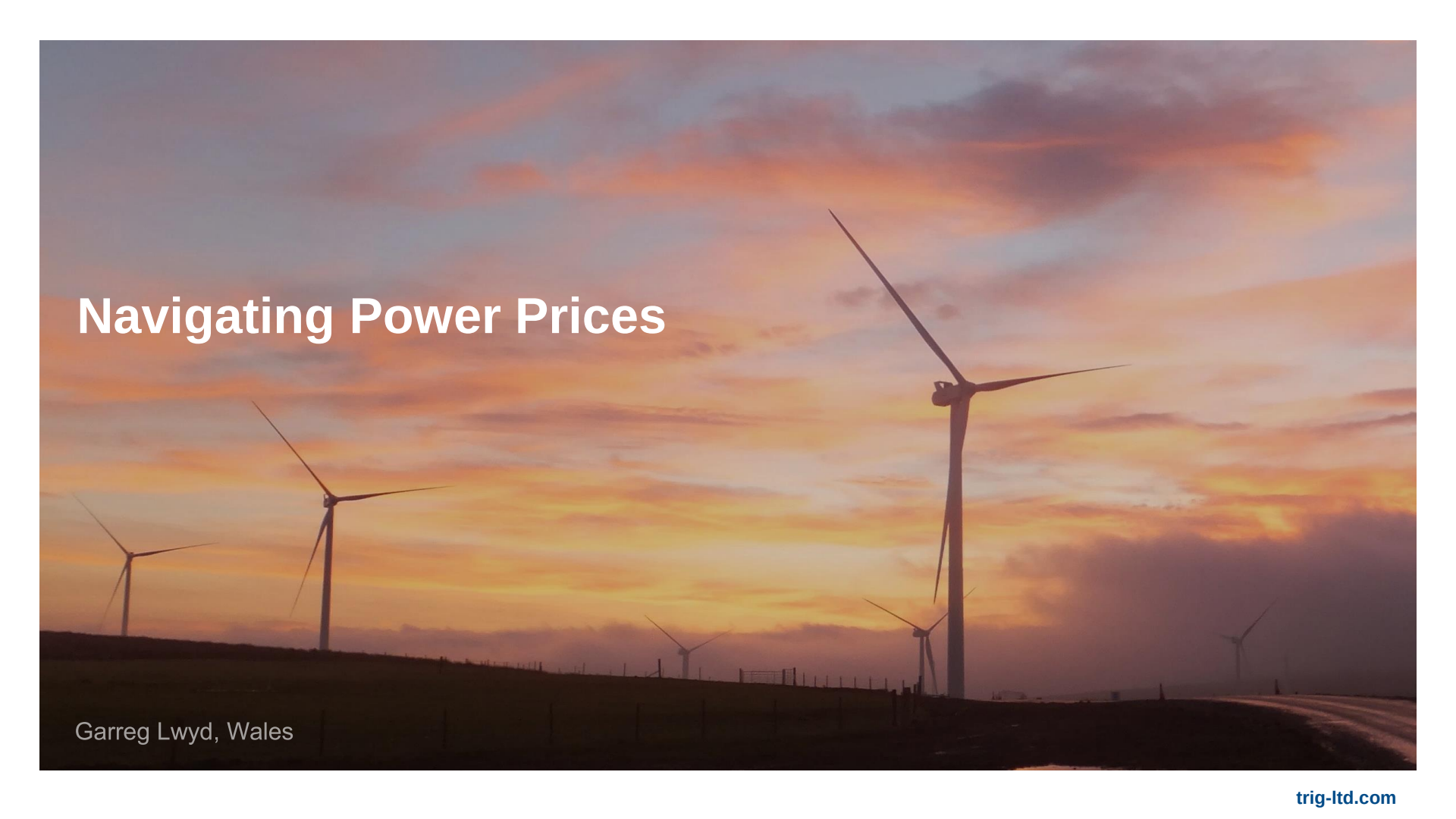
Case Study: Freasdale Wind Farm (2016-17)

- ▲ Strong manager experience
- ▲ Established risk management techniques
- ▲ Favourable pricing
- ▲ TRIG's construction projects completed on schedule

***Capitalising on
upstream experience***



Navigating Power Prices

A photograph of several wind turbines silhouetted against a dramatic sunset sky. The sky is filled with clouds in shades of orange, yellow, and blue. The turbines are positioned on a dark, rolling landscape. The overall mood is serene and evokes a sense of clean energy.

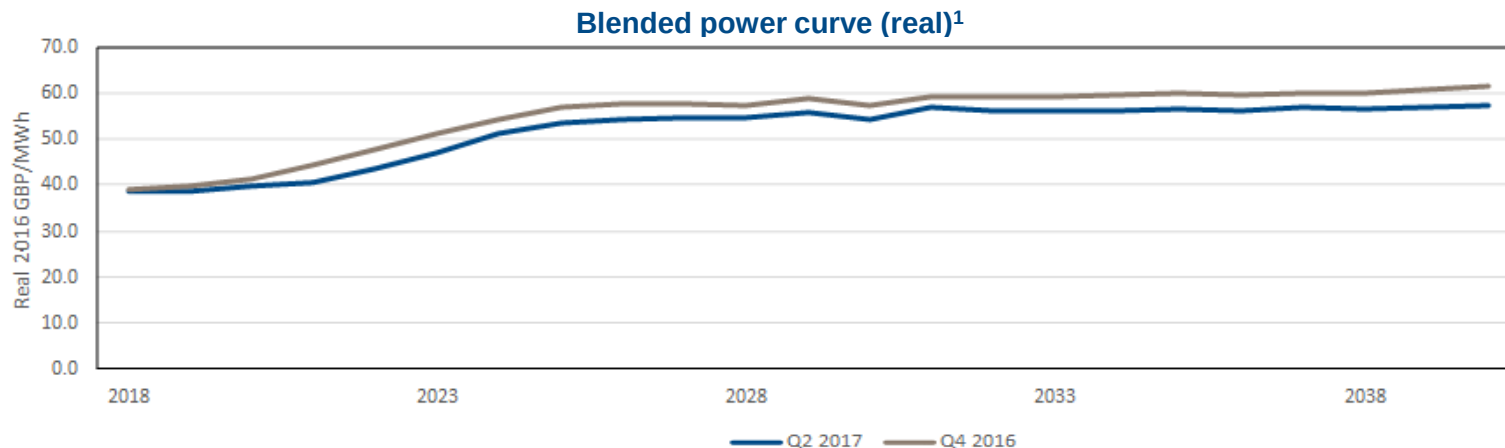
Garreg Lwyd, Wales

The Power Curve

Where does it come from?



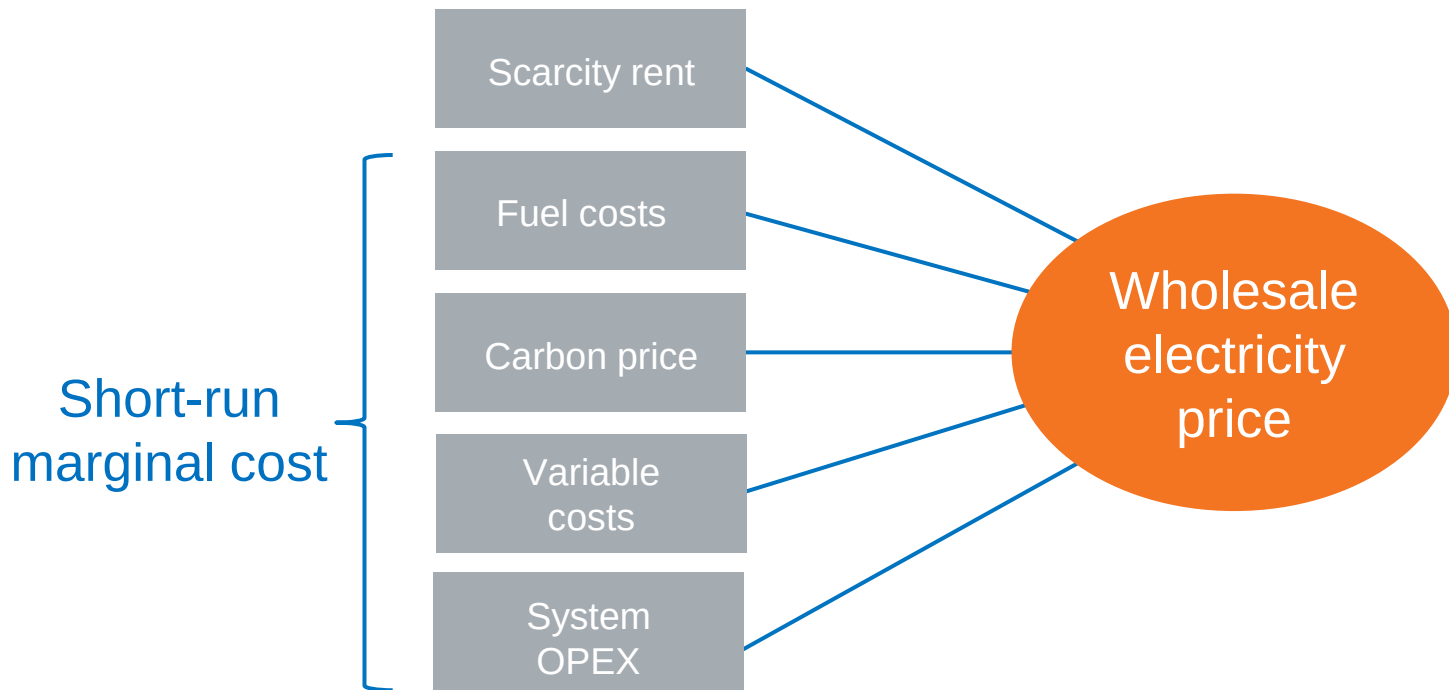
- ▲ Leading power price forecasters
- ▲ Each provides revised forecasts 3 or 4 times a year
- ▲ Each has own model and methodology
- ▲ TRIG updates valuation and forecast to reflect new curves twice a year



1. Power price forecasts used in the Directors' valuation for each of GB, Northern Ireland and France are based on analysis by the Investment Manager using data from leading power market advisers. In the illustrative blended price curve, the power price forecasts are weighted by P50 estimates of production for each of the projects in the Company's 30 June 2017 portfolio.

Constituents of Power Price Forecasts

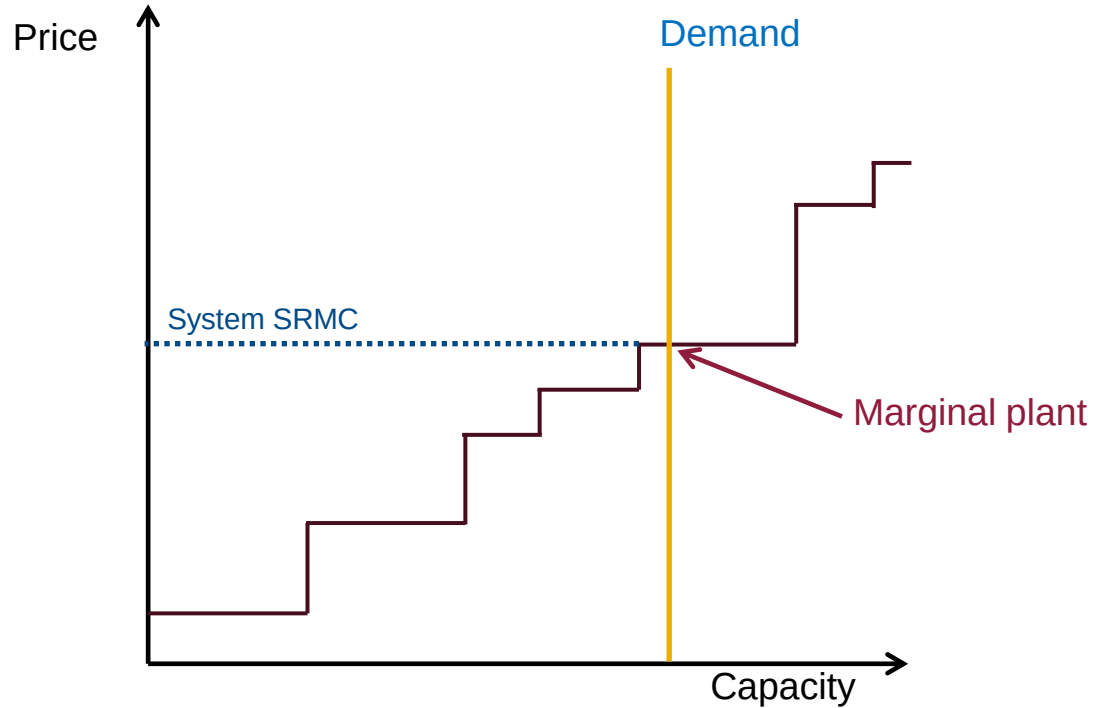
Wholesale Power Price = Short-Run Marginal Cost + Capital Return / Profit



Note: Schematic only for illustration.

Theoretical Marginal Cost Supply Curve

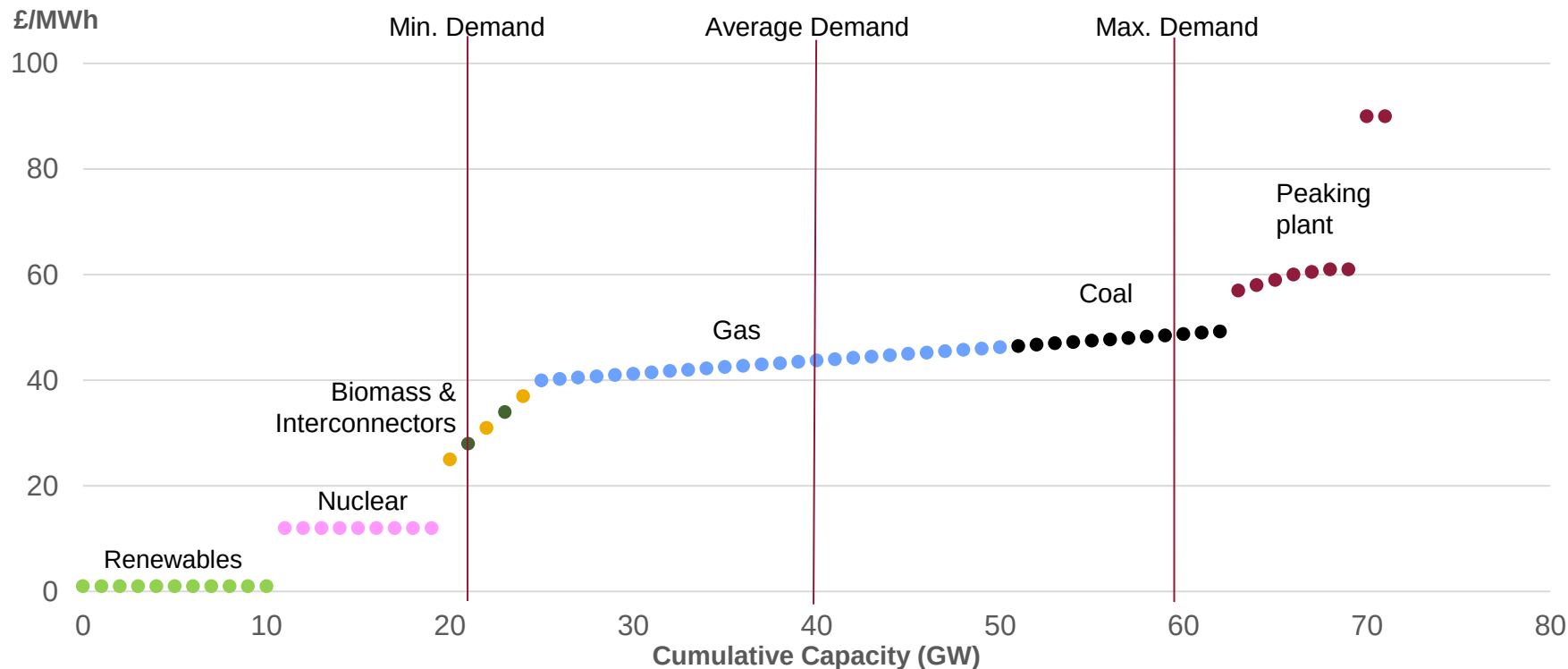
Marginal plant sets wholesale price



Note: Schematic only for illustration.

Short-Run Marginal Cost Supply Curve (Merit Order)

Gas-fired power tends to set the marginal price



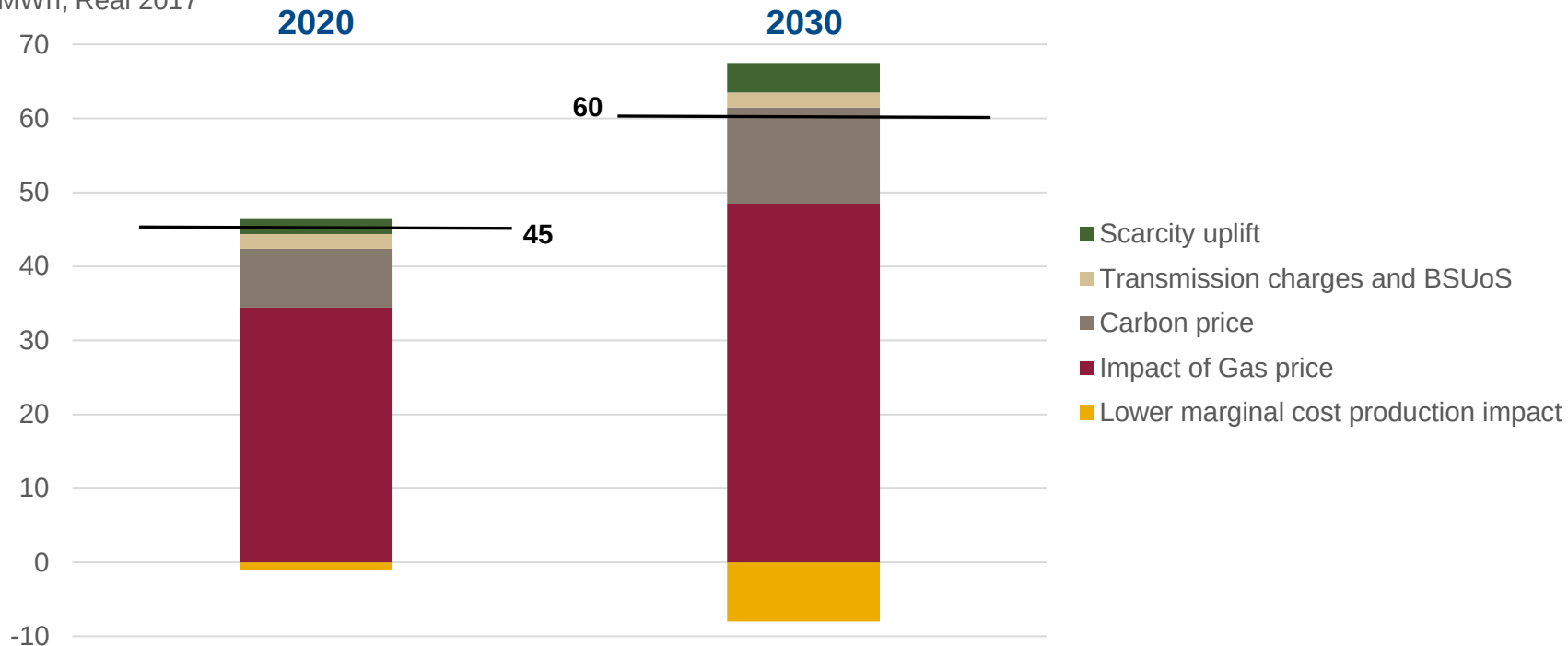
Note: Schematic only for illustration.

Constituents of Power Prices

Key elements: natural gas and carbon prices



£/MWh, Real 2017



Note: Schematic only for illustration.

Why Do Forecasters Assume Real Power Price Growth?

Projected increases in gas and carbon prices



▲ Gas prices expected to increase from current low levels

- Current gas supply excess expected to turn into shortfall
- Asian power demand to grow with GDP and also switching from coal to gas
- New gas facilities require higher prices to be profitable

▲ Carbon prices – expected to increase as EU policies take effect

▲ Overall UK / EU electricity demand – modest growth projected

▲ Power plant retirements + slow new builds => tighter power market

▲ Currency movements

- Gas is increasing imported – from Europe, Middle-East and US
- LNG increasingly the price setter – priced in dollars
- As a result power prices and forecasts are sensitive to FX

▲ New gas generation – where is new capacity coming from?

- Forecasters assume Capacity Market provides the incentive

▲ Carbon pricing policies

- Both EU and UK expected to support increases

▲ International politics

- May impact LNG supply, demand and pricing
- Interconnectors / pipelines – interruptions to supply possible
- Brexit – currency / GDP / new build-out assumptions may change

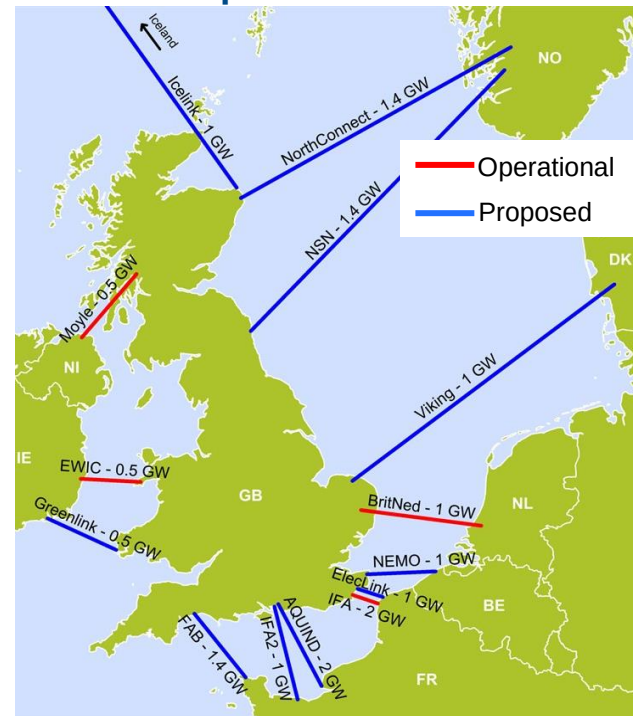
▲ Ireland

- Ireland's Single Energy Market
- SEM heavily influenced by GB (though priced in Euro)
- GB and SEM interconnected – tend to move in parallel

▲ France

- Less influenced by gas than UK – but gas expected to be influential in the future
- Current carbon prices lower than GB but expected to align over time
- Interconnected with neighbouring countries

UK / European Interconnectors



Power Purchase Agreements

Typical route to market



- ▲ Renewable Generators sell their electricity via Power Purchase Agreements (PPAs)
- ▲ PPAs typically take one of two structures:
 - Fixed Price
 - % discount to a Electricity index
- ▲ $\text{Generator Electricity Price} = \text{Electricity Price Index} \times (1 - \% \text{Discount})$
- ▲ % Discount consists of the Intermittent Generator Balancing Costs, Admin Costs, plus Purchaser Profit

Capture Prices

Key elements for a renewables generator



- ▲ A generator's electricity capture price depends on:
 - Chosen electricity index
 - % discount / balancing cost
 - "Cannibalisation"
(large quantities of correlated intermittent generation impacting on wholesale electricity prices)
- ▲ Depending on the risk profile there are a number of electricity indexes that a generator may choose from which are based around base load production, such as:

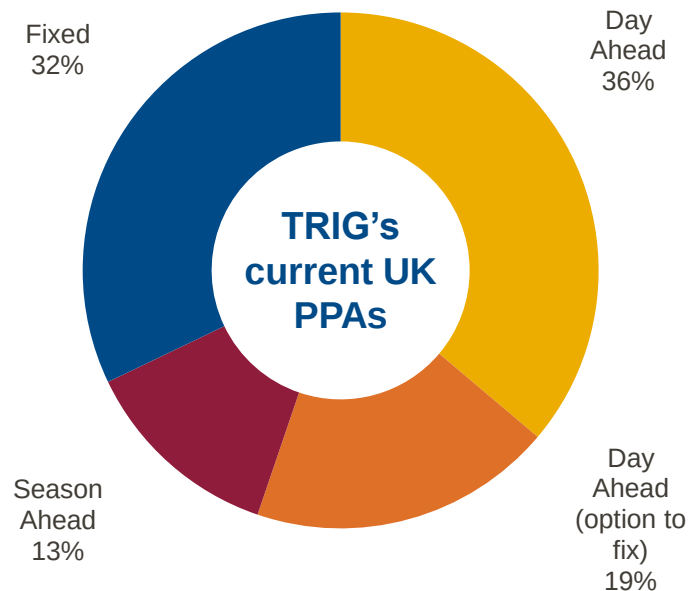
	Fixed / FiT (where available)	Season Ahead (Summer/Winter)	Day Ahead	Intra-Day
% Discount	n/a	10%+	5% - 7%	4% - 5%
Cannibalisation	n/a	n/a	X	XX
Price Volatility	n/a	Low	—————→ More	

Optimising Power Prices

Portfolio approach to PPAs



- ▲ TRIG has a range of PPAs with a variety of indexes
- ▲ Diversification / use of different indices helps manage exposure to price volatility
- ▲ TRIG's generation is weather-dependent & intermittent: may not benefit from intraday price spikes



Optimising Power Prices

Potential to increase capture prices



- ▲ Season-ahead & floors: becoming scarcer
- ▲ Increasing competition from PPA providers: reducing discounts
- ▲ Further discount compression potential:
 - Scale of tenders through aggregation of portfolio
 - Profit sharing: potentially with some balancing risk
 - Selling through trading platforms: flexibility on choice of index
 - Selling “firmer” power with the benefit of storage & flexible generation



An aerial photograph of a wind farm situated on a large, dark brown, heath-covered hill. Numerous white wind turbines are scattered across the landscape, connected by a network of light-colored access roads. In the background, rolling green hills and a prominent snow-capped mountain range are visible under a clear blue sky with some light clouds. The overall scene depicts a rural, highland environment in Scotland.

Our Approach to Performance Optimisation

Hill of Towie, Scotland

RES' Operating Experience



- ▲ Over 35 years of experience in renewables
- ▲ Delivered over 13 GW of renewable projects
- ▲ Worldwide we support 2.8 GW of operating wind farms / solar parks / energy storage assets
- ▲ Dedicated team of over 200 people providing services on over 70 projects
- ▲ 24 hour control room for remote monitoring



Our Approach To Project Optimisation



Project Design

Long-term performance
built-in

1st Day of Operation

Project set up to deliver
maximum value

Long-Term Operations

Maximise Up-time
throughout life cycle

Performance Upgrades

Always looking to improve
performance

Reliability-Centred Maintenance

Optimising revenue all the time

Models for Maintenance Planning

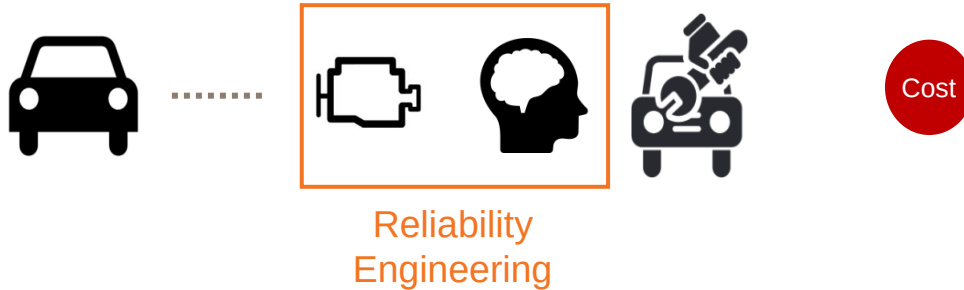
Run-to-failure



Maintenance-to-schedule



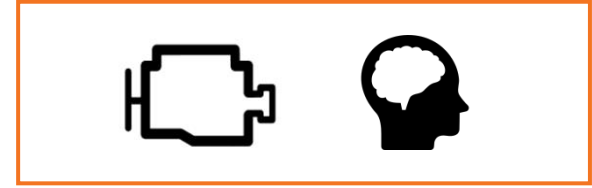
Reliability-centred maintenance



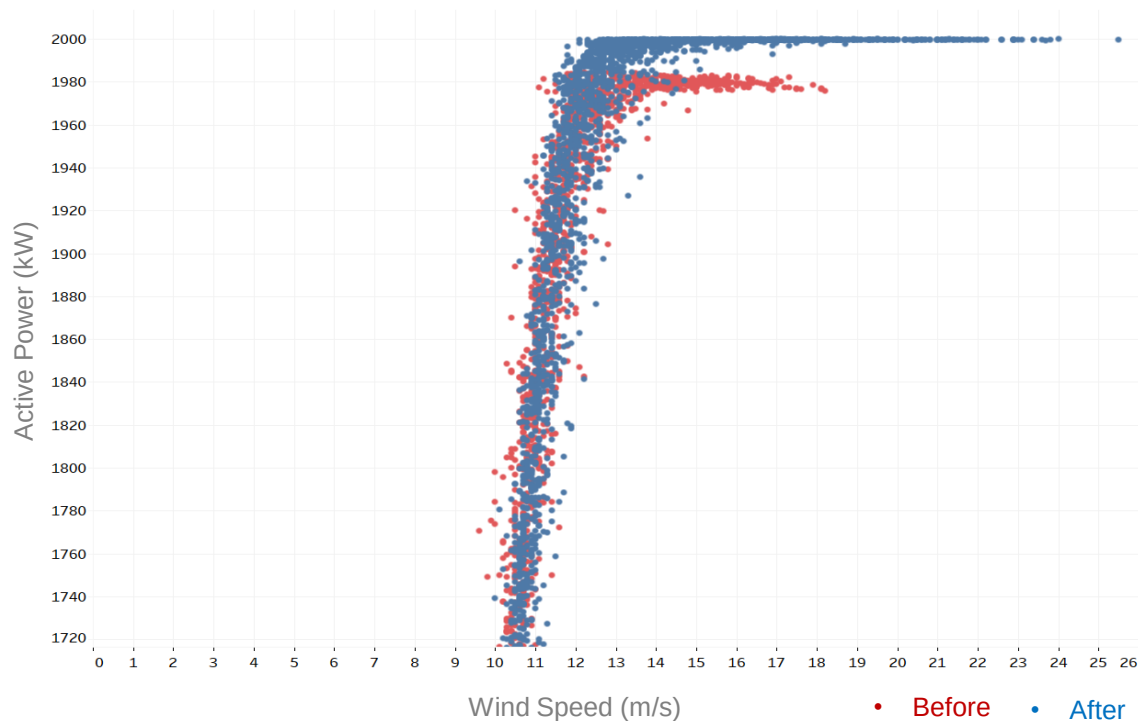
Data-Driven Approach to Reliability-Centred Maintenance



- ▲ Automated daily check
- ▲ Monthly health checks
- ▲ Condition monitoring tracking
- ▲ Periodic plant inspections and assessments
- ▲ Fleet-focused multi-technology



Wind Case Study: Maximising Production



Power output was not following correct performance curve.

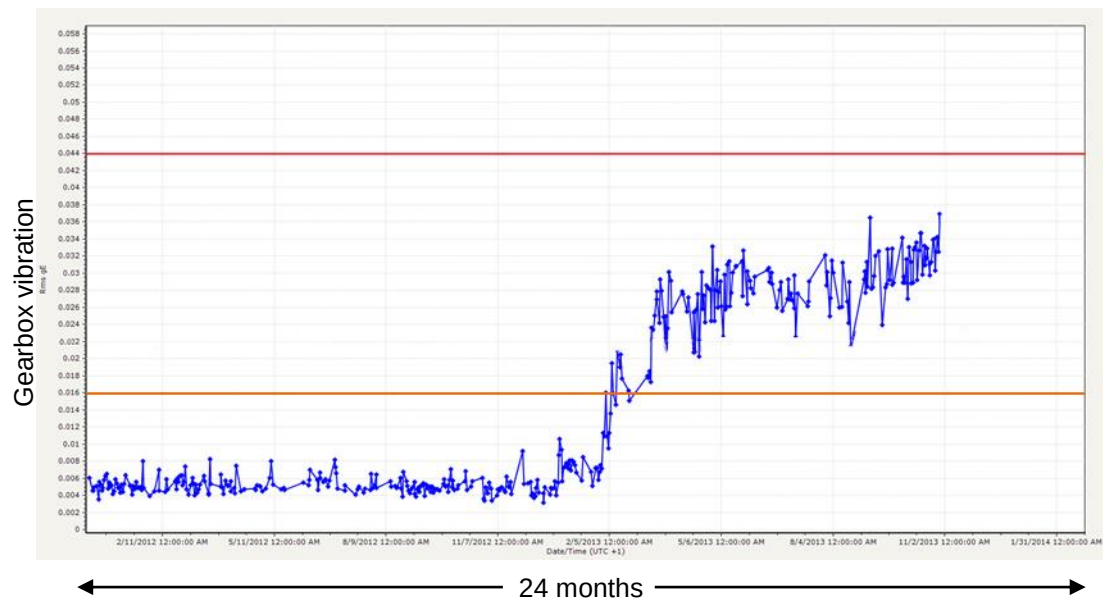
A controller bug reduced output by 1-2%.

**Production improvement
circa £10k p.a.**

Single dot = 10 minute data average

Wind Case Study: Predicting Component Failure

- ▲ Vibration condition monitoring to avoid major component failure
- ▲ Track failure development to optimise component exchange



Wind Case Study: Preventative Maintenance



Gearbox failure

Run to failure £165,000

Preventative maintenance £70,000

Saving £95,000

NB costs include maintenance and lost production

Solar & Storage: Rapid Response

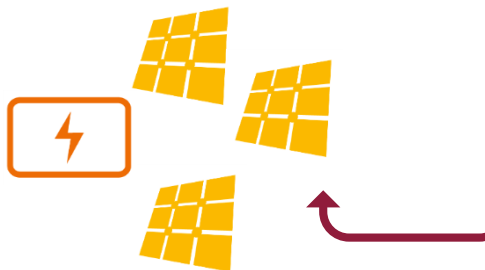


24h Monitoring



Each site reports up to 10,000 measurements every 5 minutes

Solar & Storage Portfolio

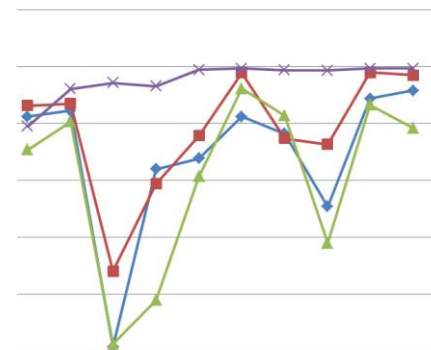


Site Response



Performance anomaly identified

Performance Analysis

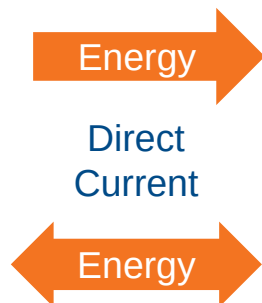


Diagnosis completed

Solar Panels



Battery Storage



Inverter



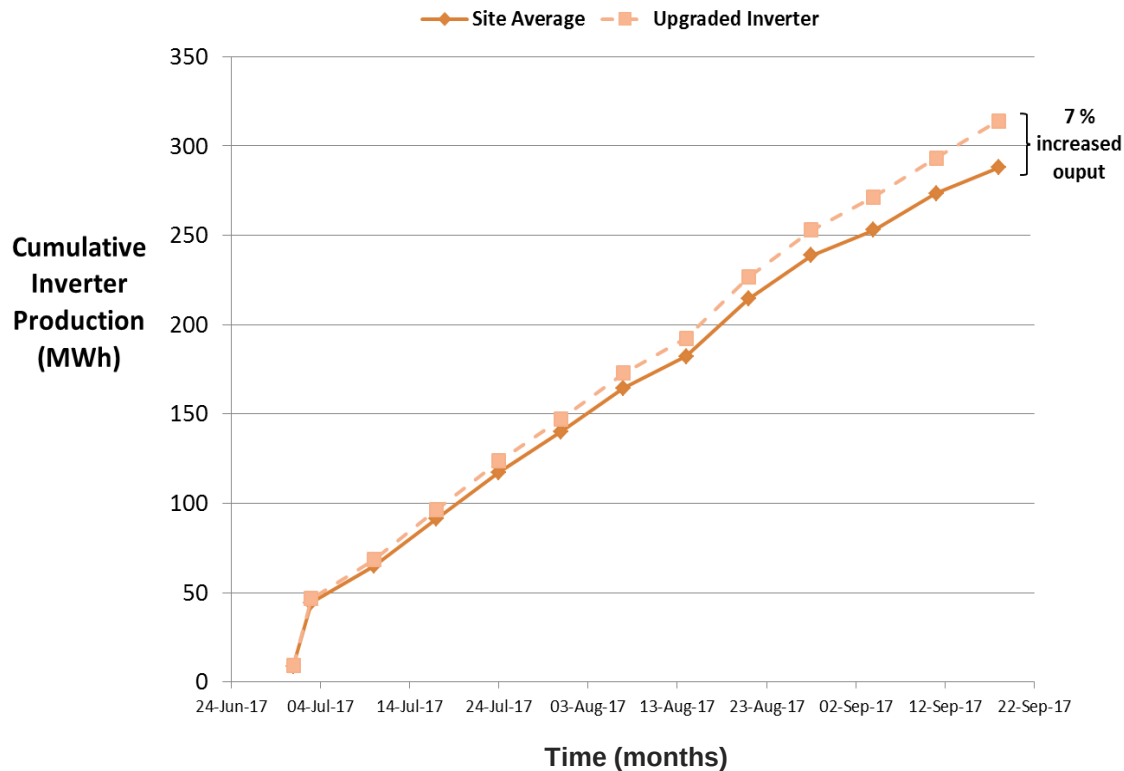
Alternating
Current
Energy

Power Grid



- ▲ Inverter optimisation can have a big impact on project performance
- ▲ Panel or battery cell optimisation has 2nd order impact

Solar Case Study: Inverter Upgrade

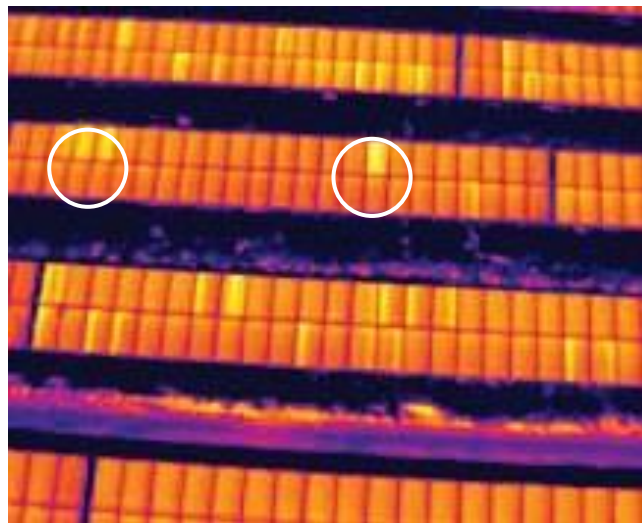


Inverter upgrade

- ▲ Cable reconfiguration
- ▲ Temperature monitoring
- ▲ Capacitor testing

Revenue increased by £40k p.a. after one inverter upgrade

Solar Case Study: Thermographic Drone Survey



Hot panels producing energy but not at maximum efficiency

Panels replaced under warranty, increasing revenue by £44k p.a.

Further Value – Life Extensions

Maximising economic life



▲ Commercial

- Planning consent
- Contracts

▲ Technical

- Equipment condition
- Enhanced monitoring
- Capital investment
- Changed operating strategies
- Safety / HSQE



Assessing tower natural frequency

Further Value – Repowering

Replacing infrastructure



- ▲ When?
- ▲ Planning permission
- ▲ Plant evolution
- ▲ What stays, what goes?
- ▲ Contracts
- ▲ Subsidy free
- ▲ Safety / HSQE
- ▲ Skill set



▲ Extending sites

▲ Co-locating additional technologies

▲ Life extensions

▲ Repowering



A wide-angle photograph of a wind farm in a rural landscape. Three large white wind turbines are visible, standing on a grassy field with some low-lying shrubs and trees in the background. The sky is filled with large, white, fluffy clouds against a bright blue background. The overall scene is peaceful and scenic.

Closing

Altahullion, Northern Ireland

Expertise in identifying value opportunities

Investment discipline

Asset optimisation

Strong fundamentals driving sector growth

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