ITPENERGISED

Onshore Renewables & Storage Series

Hybrid Renewables Explainer

Thought Leadership

- Part 1—Definition and market
- Part 2—Enablers and barriers
- **Part 3—Valuation approaches**
- Part 4—Drivers, ITPEnergised hybrid experience and net zero
- Part 5—Visual summary

Introduction

This mini-series takes a closer look at hybrid renewables and how, among a number of solutions, it has the potential to support the Paris Agreement, the UN Sustainable Development Goals (SDGs), a growing world ambition to achieve net zero in our lifetime and to outperform current Environment and Social Governance (ESG) value propositions. This series is written for boards and investment committees of funds, utilities, developers, policy makers and network companies who would like to:

1. Increase returns in lower wind energy yield years;
2. Increase returns when project grid charges are anticipated to start rising;
3. Increase the number and variety of returns by maximising your grid connection as route to market;
4. Increase returns with flatter generation profiles to offtakers / internal retail position;
5. Reduce lifetime cost of energy at a system level, increase self-balancing and reduce costs of balancing;
6. Develop a platform capable of incubating innovation that cuts across silos from pilots to scale;
7. Diversify risk at the point of connection;
8. Defer investments in grid infrastructure;
9. Introduce option value into the portfolio, at least cost, even at the development stage; and
10. Outperform your current ESG proposition with higher renewable energy density.

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Valuation Approaches

In general, a valuation of project IRR, equity IRR, project NPV and additional financial KPIs relevant to investment funds/ developers/ utilities may be calculated at the hybrid level and on a stand-alone basis for the technology being added in the case of a retrofit to evaluate the potential benefits. A working operating hypothesis can be that the existing technology remains unaffected by the addition of the new renewable generator in the case of wind and solar HRPPs alone. For HRPPs with storage a ruleset may need to be added for which generator the storage asset takes excess power from in case of a conflict. Upper and lower bound ranges can be established for assumptions along with probability distribution enabling stochastic models: a standard deviation and therefore a measure of risk.

Positive changes to the financial model that increase value may include, but not be limited to:

- the reduction in capex given the grid connection is shared;
- a reduction in development cost;
- a further reduction in EPC costs given other quantifiable scope sharing;
- a reduction in O&M and asset management costs due to synergies with the existing project;
- additional contracted/ merchant revenues from adding wind to solar or solar to wind. ITPE calculates bankable solar energy yield assessments and can add these to existing/ forecast wind energy yield data to evaluate negative correlation, probabilities of when grid connection capacity may be exceeded and optimization of site specific capacity sizing; and
- Higher gearing if the storage is included within the hybrid project compared to a standalone basis.

Where storage is included in the HRPP additional revenue streams open up, in the UK this could include:

- Capacity market for existing and new assets (1 year rolling or 4 years ahead for up to 15 years);
- Trading in the day ahead and intraday market for arbitrage opportunities;
- Balancing Mechanism (BM) —flex up and flex down;
- Firm Frequency Response (FFR) -> Dynamic Containment (DC) (undergoing regulatory change);
- Embedded Export Tariffs during periods of generation occurring in TRIADs for distributed connected assets (subject to change);
- Short Term Operating Reserve (STOR) - generate/ reduce demand by 3MW;
- Fast Reserve — providing or ceasing Fast Reserve within 2 minutes at >/= 25 MW per minute;
- Embedded benefits—<100MW avoiding costs at the transmission voltage level (subject to change); and
- Local Flexibility Markets—as part of a wider transition of DNOs to DSOs.

A fee may be taken by an optimizer as a percentage of the stacked revenue earned. ITPE will be summarising GB battery storage costs and revenue streams in an upcoming paper.

Balancing Capital Exposure

The hybrid renewables model provides funds, utilities and developers with a financial platform to establish the balance of capital exposure. The wind/ solar generator capital can be derisked through government support and or corporate PPA and the storage capital can be exposed to merchant revenue informing the ratio of design capacities according to financial risk-reward appetite.

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Control and prioritisation

It is known that advanced control systems, and projects equipped with market facing digital twins, can establish storage dispatch patterns according to market signals in order to optimise income for individual and fleets of storage. These control systems can adhere to rulesets that can be adapted from user to user and from market to market.

Further considerations

Negative changes to the financial model that reduce value may include, but not be limited to:

- the reduction in electricity generation of the additional renewable generator due to potential curtailment when generation of the hybrid scheme exceeds grid connection capacity; this being greater in the case without supplementary storage

An optimisation in the financial model may be to include, but not be limited to:

- The trade-off between procuring a larger additional renewable generator - to benefit from better specific capex costs from the EPC contractor - and the probability of more frequent/ larger amounts of curtailment

Stress tests – Analysis work can include a stress test on the HRPP / added renewable generation without subsidies to determine NPV and IRR metrics on this basis. Other scenarios can be built and analysed depending on context.

Portfolio level - Analysis work can also take place at a portfolio level in consideration of existing assets which could be converted to hybrid renewables and new development projects. ITPE has developed a tool to score existing and theoretical wind and solar portfolios for suitability for a variety of hybrid renewable configuration conversions which is then shown as a heat map to identify sites for deeper feasibility that can then shape new Enterprise Value.

Offtake benefits - The financial benefit of the complementary, flatter load profile may also be quantified. Analysis work can also take place to understand how a hybrid may better cover a retail position / PPA / customer offtake / private wire position: taking into account more run hours, a firmer and flatter generation profile given the rising costs of balancing and ancillary services.

Terminal value - Analysis can also take place on the terminal value of projects with a merchant tail.

In the next part to this thought leadership series, we will provide an overview of potential hybrid renewable drivers for funds, utilities and developers and reflect on our own experience at ITPEnergised.