



Financing BESS

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Energy Transition, Project Financing

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ABN AMRO Project Finance

Project & Infrastructure Finance supports its clients via a multi-disciplinary and market-leading approach to three global transition themes



ABN·AMRO

*Go-to bank
focusing on clients
in our current
sectors of strength
and leading
transition themes
of the future.*



Energy Transition

- ✓ Established player in the NW European renewable and energy transition sector with a reach extending to Southern Europe, UK and the Nordics
- ✓ Supporting projects and sponsors in the full energy transition value chains of electricity, gas and heat across Europe
- ✓ At the forefront of financing of emerging technologies, such as advanced biofuels, hydrogen/PtX, CCUS, geothermal, floating wind/solar and battery storage, as well as industrial decarbonisation strategies



Digital Transition

- ✓ Established player in the Digital space and at the forefront of innovation
- ✓ Service and support mega trends such as 5G, Internet of things, Connectivity, XaaS, data storage and usage
- ✓ Innovation driven with clients, sectors and financing structures (e.g. first European data centre PF, cross-over structures, borrowing base facilities)



Mobility & Logistics Transition

- ✓ Strong focus on new technologies contributing to decarbonisation of mobility (e.g. EV charging infrastructure, battery gigafactories)
- ✓ Supporting core logistics and transport infrastructure, focusing on enterprises facilitating mobility and energy transition (ports infrastructure, terminals)
- ✓ Explore financing new mobility & logistics activities which require large investments in transition and decarbonisation (such as public transport fleets, zero-emission shipping, back-bone infrastructure for hydrogen and carbon etc)

European
Mega-trends towards 2030

Demographics

Urbanisation

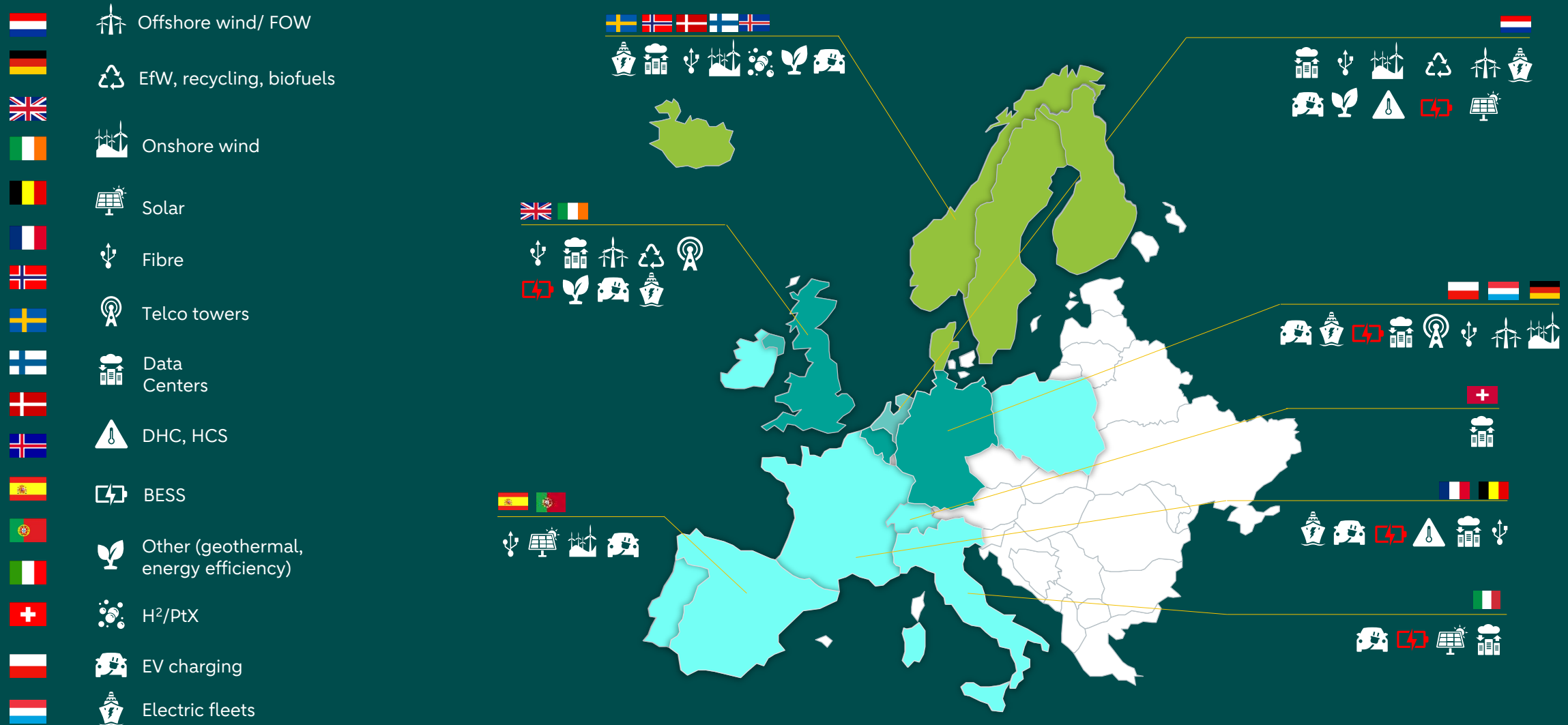
Climate
Change

Connectivity

Energy
consumption

Geopolitics

Geographical and sub-sector presence in Europe



Selected Energy Transition Project Finance Credentials

GIGA Storage (Project Leopard)  Project financing of stand-alone 300MW/1,200MWh BESS asset MLA, Hedging Bank, Account Bank and Agent Netherlands 2025	Project Vector  550MW portfolio 15 BESS assets MLA, Hedging Bank UK 2025	Project Neptune  1.5GW offshore wind HoldCo project financing Mandated Lead Arranger, ECA Lender and Hedging Bank Poland 2025	Project Mufasa  Project financing of stand-alone 364MW/1,457MWh BESS asset Mandated Lead Arranger and Hedging Bank Netherlands 2025	Project Eccles  Project Financing of 400MW BESS MLA & Hedging Bank £220m UK 2025	Cernay-lès-Reims  Project financing of 240MW/480MWh BESS asset Lender, Hedging Bank, Facility & Security agent France 2024	Project Seal  Financing of 2 large scale biomethane production facilities in NL Mandated Lead Arranger, Hedging Bank, Agent, Account Bank Netherlands 2024
Project Monegros refi  EUR 390m refinancing for a 487MW portfolio of onshore wind assets Mandated Lead Arranger Spain 2024	H2Green Steel  c. 4.2bn Green Steel Project Financing MLA, ECA Lender & Hedging Bank Sweden 2024	Project Chargon  Stand-alone 45MW / 90MWh BESS financing in NL Sole Lender, Hedging Bank, Account Bank Netherlands 2024	Zenobe - FleetCo  £435 million green loan for financing of EV bus platform Mandated Lead Arranger & Hedging Bank UK 2024	Project Franklin  200MW and 300MW BESS Project Financing Lender £282m UK January 2024	Project Heracles  Construction Bridge Financing for 700 MW PV solar assets MLA, Hedging Bank ES, IT, PT 2024	Project Lion  SEK 22bn platform (re)financing of district heating portfolio MLA, Hedging Bank Nordics 2024
Project Golden Gate  Pan European Portfolio Construction Bridge financing for solar PV Mandated Lead Arranger, Hedging bank, Account Bank Europe 2023	HS Orka  Capex increase facility for geothermal platform MLA & Hedging Bank Iceland 2023	Project Verdant  Financing of co-located PV and BESS assets Mandated Lead Arranger, Hedging bank UK 2023	Project Arch  Construction Bridge Financing for 448MW solar PV projects in UK and NL Mandated Lead Arranger UK 2023	Rookery  Refinancing of the Rookery South EFW plant Mandated Lead Arranger, Hedging bank UK 2023	Borkum Riffgrund 3  900MW offshore wind holdco project financing MLA, Hedging Bank Germany 2022	Kincardine  Financing of 50 MW floating offshore windfarm in Scotland Lender UK 2021

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Key bankability considerations in BESS

Key bankability considerations BESS

	Concerns	Mitigants
1. Complex revenue stack 	- Dynamic and complex revenue streams - Dependent on expert (largely algorithm-driven) volatility trading - Ancillary revenues derived from several unfamiliar markets - High level of merchant risk - Complex price forecasting	- Growing expertise in modelling (combined) revenue streams - Increase in historical performance data (price points / trends) - Toll or other fixed-priced arrangements simplify stack - Application of risk-adjusted haircut for debt case
2. Saturation risk 	- Strong pipeline of BESS projects in Europe will lead to saturation of ancillary markets - Lower levels of price volatility due to more BESS on system can depress arbitrage revenues	- Diversification of revenue stack - RES growth projected to outpace BESS additions - Conservatism in modelling of merchant price spreads
3. Grid uncertainties 	- Grid cost increases can significantly impact opex/CFADS - Grid constraints could lead to higher levels of curtailment than assumed in base case, impacting revenue potential	- Potential natural hedge as grid costs likely to be higher in areas where price volatility is higher (improving BESS revenue case) - Time dependent use agreements - Conservative assumptions on curtailment
4. Regulatory risk 	- BESS assets are exposed to various types of regulatory risk (e.g. ancillary services and capacity markets, grid rules, auction mechanisms) - Risks vary depending on jurisdiction, energy policies and expected forecast RES and BESS penetration levels	Cross-border coordination and harmonization growing – e.g. FCR Cooperation, PICASSO (aFRR), MARI (mFRR), TERRE (RR), IGCC (imbalance netting)
5. Rapid innovation 	- A relatively small group of banks is currently financing BESS - Market structures continue to evolve rapidly making standardisation difficult and financing cases more complex	- Certain offtake models are becoming more well-established - Innovation also leading to a greater number of fixed price arrangements (e.g. regulated auctions, subsidies and tolls)
6. Performance warranties 	- Warranty package needs to be comprehensive and cover envisaged asset life, ideally with flexibility on cycling, to protect revenue stack. - Mismatch between contractor and offtaker liability regime can lead to revenue loss for project	- Technical/contractual operational limits aligned with full life warranty assumptions. Compensation for accelerated degradation where overcycling permitted by offtaker - Alignment (with LD buffer) between contractor and offtaker liability

Structurally enhancing BESS bankability

Incorporation of protective mechanisms in the debt structure improves BESS bankability

Mini perm loans



- BESS projects with shorter contract tenors than targeted debt sizing tenor and/or high degree of merchant revenues in stack reduce long-term revenue predictability
- Shorter loan tenors, such as mini perm financings, align debt maturity with more predictable cash flow period, thereby improving BESS bankability

Limiting balloon at maturity



- Limiting the balloon outstanding on loan at legal maturity reduces refinancing risk
- Scheduled amortization supplemented by top-up cash sweeps can be used to reduce target balloon

Breakeven and term-out scenario modelling



- Simulations based on severe revenue downside scenarios and/or CFADS fluctuations for other reasons can provide comfort in respect of debt service during loan life, refinancing risk at maturity (in case of a mini perm) and sufficiency of cashflow to repay debt comfortably within battery warranty period

LLCR-linked cash sweeps



- Lenders may be hesitant to finance a pure energy arbitrage system long-term
- Incorporating cash sweeps increases lender appetite for BESS project financing where revenue has a high degree of variability

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Revenue and financing structures

Revenue models in BESS Project Financing

Established revenue models

Highly contracted

- High (>80%) of capacity contracted against fixed price via fixed toll or regulatory support scheme (e.g. MACSE, Capacity Market) etc
- High level of revenue stability
- Strong downside protection
- Lower debt costs
- Significant level of appetite from project finance lenders



Fully merchant

- Fully exposed to merchant prices with no downside protection
- Potential for highest returns if battery performs well
- High risk profile as no protection against loss in unfavourable market conditions
- Bankability can be enhanced via inclusion of alternative revenue protections (e.g. guaranteed index-linked payout by offtaker, limiting optimiser risk)
- Lowest level of appetite from project finance lenders



Partly contracted

- Models banked include:
 - Long-term CM revenue tranche plus medium-term toll
 - Portion of total capacity fully tolled, remainder left merchant
 - Optimisation or toll contract with floor plus upside profit sharing
- Interest mainly from a sub-set of lenders willing to take significant (c. 50%+) merchant exposure to BESS assets



Co-located Solar/BESS (optimised separately)

- Same grid connection utilised for battery and solar
- Cost savings divided between assets
- Each asset is optimized separately under separate offtake contracts
- Priority typically given for solar dispatch, BESS dispatches during low-solar hours
- Popular model in UK (CfD solar plus optimisation with floor contract on BESS)
- Lending appetite determined by level of aggregate fixed revenues with somewhat of a complexity barrier



Financial terms highly dependent on revenue model and warranty period

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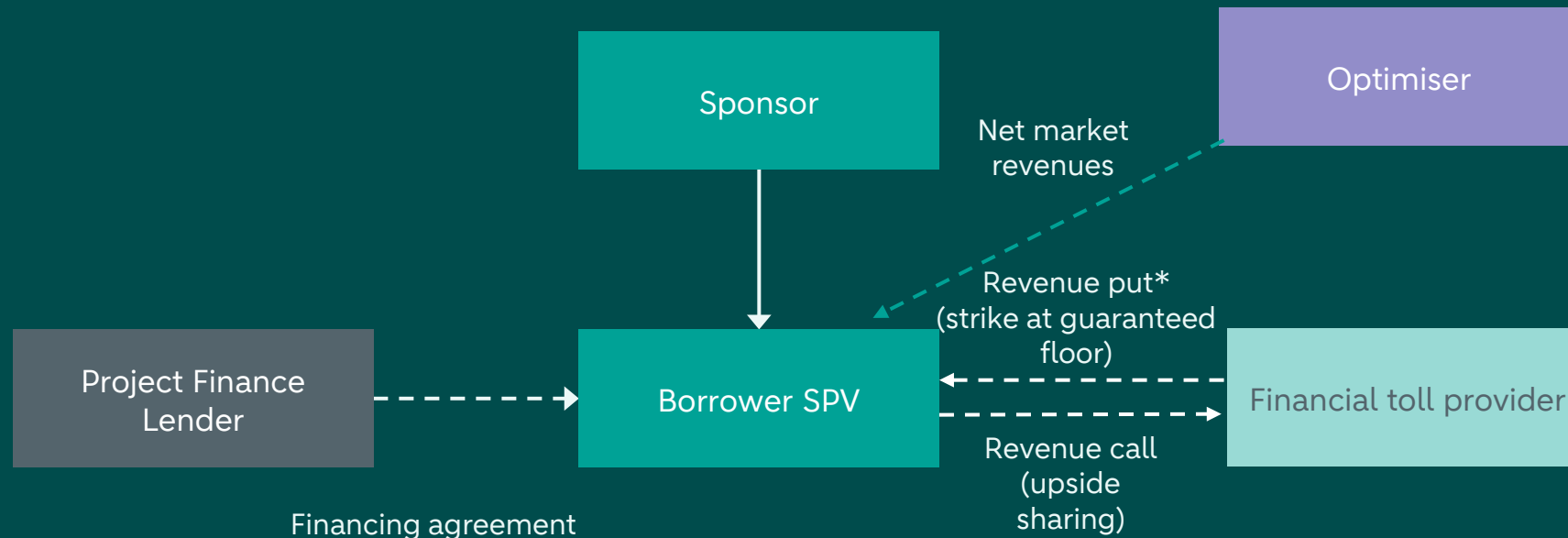
	Highly contracted revenue stack (80-100%)	Partly contracted revenue stack (40-50%)	Fully merchant
Loan tenor (post construction period)	▪ Up to shorter of warranty tenor and contract period	▪ Up to shorter of warranty tenor and contract period	▪ 5 – 7 years
Sizing tenor	▪ Up to end of warranty tenor minus agreed tail (but often shorter in central sizing case)	▪ Up to end of warranty tenor minus agreed tail (but often shorter in central sizing case)	▪ Up to end of warranty tenor minus agreed tail (but often shorter in central sizing case)
Effective gearing	▪ 75% – 85%	▪ 60% – 75%	▪ 40% – 50%
DSCR (fixed)	▪ 1.15 – 1.2x (state-backed) ▪ 1.2x (IG corporate, CM)	▪ 1.15 – 1.2x (state-backed) ▪ 1.2x (IG corporate, CM)	▪ N/A
DSCR (merchant central case)	▪ 1.7x – 1.85x	▪ 1.8x – 2.0x	▪ 2.0x – 3.0x
Margin (over EURIBOR)*	▪ 185 – 220bps	▪ 220 – 275bps	▪ 275 – 350bps

**Standalone BESS. Also dependent on tenor/WAL of financing. Range shows average margin. Step-up grid structure may apply*

Toll structures currently being banked with project finance

	Operational control	Energy flows/settlement	Risk / Revenue sharing	Dispatch rights	Use cases
Physical toll	With offtaker	- Offtaker accesses EMS of system and controls physical charging and dispatch - Owner operates battery but does not own energy flows - Physical settlement	- Toller takes market (and imbalance) risk - Toller captures market value and exploits asset for flexibility, hedging and/or reduction of imbalance - Asset owner receives fixed fee/MW (or floor plus profit share) - Maintenance stays with asset owner	- Fully with tolling party - Battery part of balance group of tolling party	3rd party who seeks full physical control over asset without ownership (e.g. utility, energy trader) - Owner seeking security and (a level of) guaranteed returns, without (full) exposure to market fluctuations
Virtual toll	With asset owner	- Physical flows executed by asset owner - Owner executes offtaker's nominations - Financial settlement	- Offtaker receives returns based on market prices and own nominations - Asset owner receives fixed fee/MW (or floor plus profit share) - Financial settlement	- Tolling party submits dispatch signals - Executed by owner (e.g. via schedule nominations between parties' balancing groups)	3rd party who seeks to direct and benefit from battery without owning / operating asset or physical energy flows (e.g. Terna/MACSE) - Owner seeking security and (a level of) guaranteed return, without (full) exposure to market fluctuations
Financial toll	With asset owner	- Owner managed - Financial settlement	- Financial swap based on asset performance in specific market(s) and in respect of specifically agreed capacity - Net receivable from financial toll counterparty if prices drop below fixed price/strike price. Net payable by asset owner where prices exceed fixed leg	Solely with asset owner (financial)	- Allows owner to retain upside potential of physical optimisation in all markets with (partial) downside revenue hedge to falling net revenues/spreads - Allows separation of optimisation activities from revenue hedge counterparty increasing flexibility

Financial toll 1 – revenue swap (total revenues)



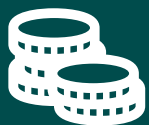
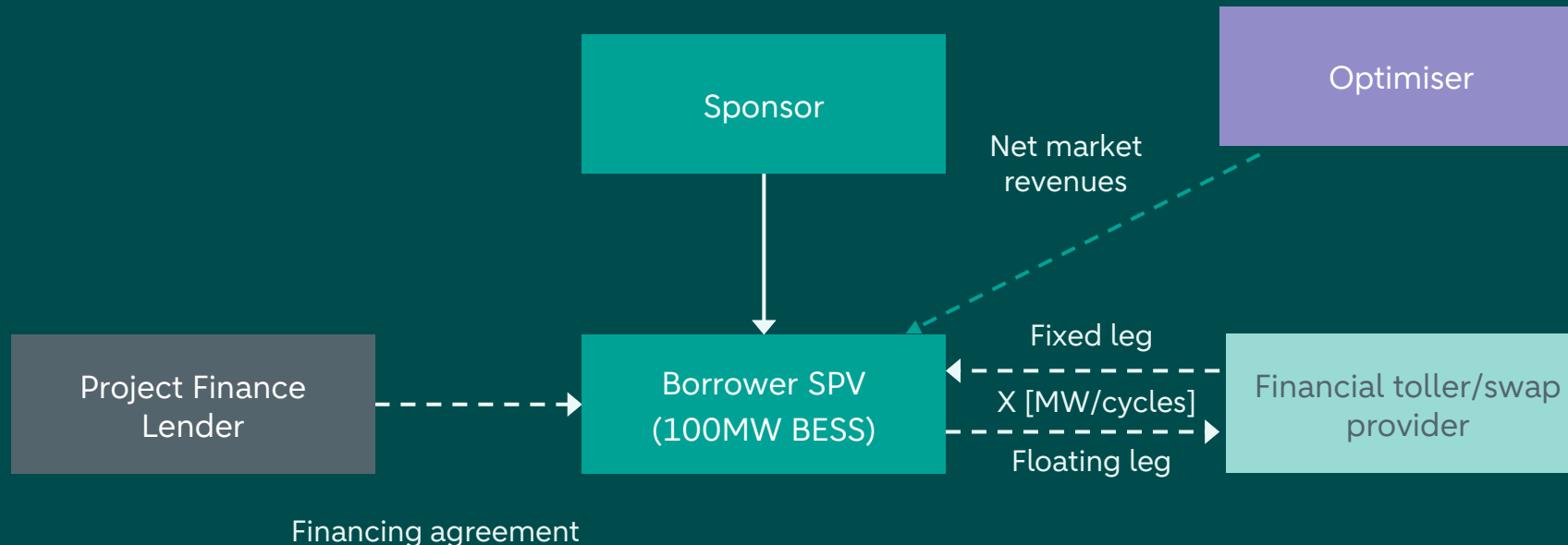
Revenue stack for project financing =

1. Strike price on revenue put (fixed DSCR) +
2. Net market revenues minus % share to counterparty (merchant DSCR)

- Form of revenue floor with upside sharing
- Optimisation can be arranged separately, increasing flexibility
- Transacted under ISDA documentation via revenue call and put options
- Put option automatically exercised if net revenues of SPV fall below strike price, triggering payment of difference by financial toll provider
- If net revenues above strike price(s) call option(s) exercised to pay upside economics to counterparty
- Strike price on put may be adjusted for time/revenue performance
- Guaranteed fixed amount can easily be identified for debt sizing
- Not widely available in Europe yet but starting to appear in UK

**Option premium payable in respect of revenue put*

Financial toll 2 (fixed - floating swap on wholesale price spread)



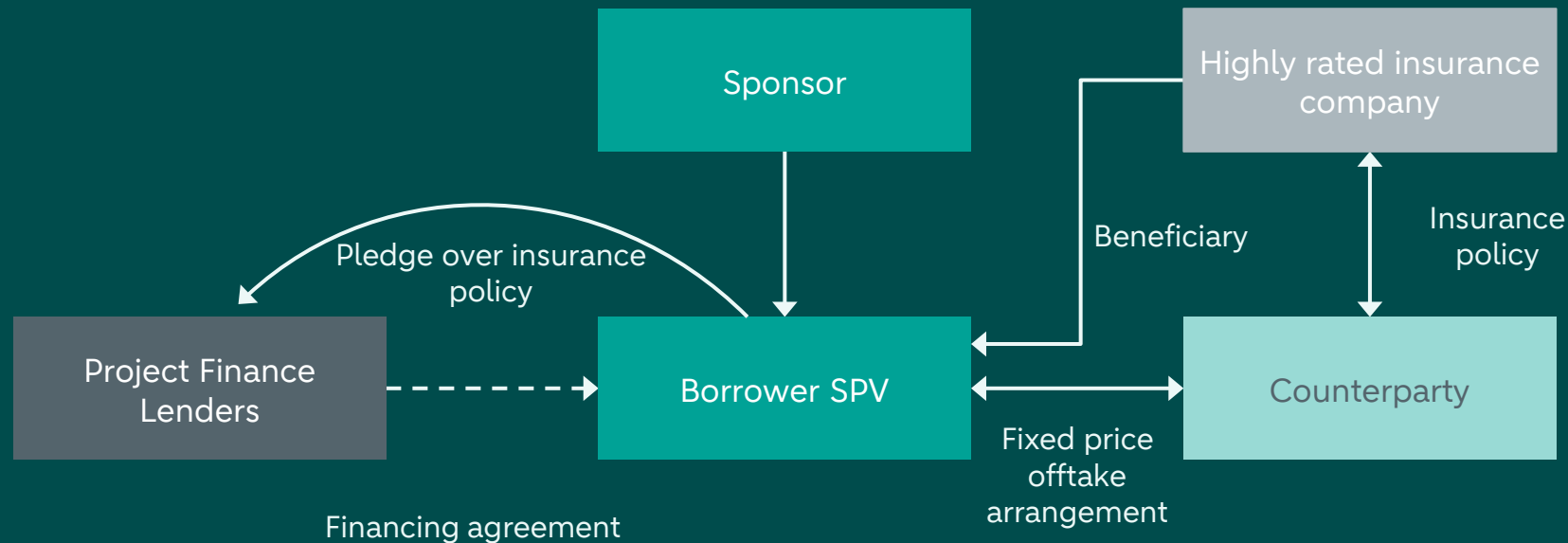
Revenue stack for project financing =

1. (Provided hedge is effective) fixed leg payment (fixed DSCR) +
2. Expected net market revenues minus fixed leg* (merchant DSCR)

- Fixed / floating swap on wholesale price spreads only, for specified contract capacity or # of cycles
- Fixed leg set by reference to view on forecasted spreads in DAM
- Floating leg based on actual spread achieved in DAM OR outcome of (virtual) nominations of counterparty
- Net periodic differential payment
- Downside hedge to falling wholesale spreads whilst retaining upside potential for physical optimisation in all markets
- Bankability flags:
- i) Where toll set by reference to MW, a difference in tolled capacity and capacity physically bid into DAM market can create revenue mismatch and an imperfect hedge
- ii) revenue mismatch possible where counterparty can nominate trades
- iii) potential mismatches can lead to inability to identify guaranteed fixed amount to apply fixed DSCR and difficulty forecasting merchant difference

*Assuming swap transacted ATM, no net payable expected day 1

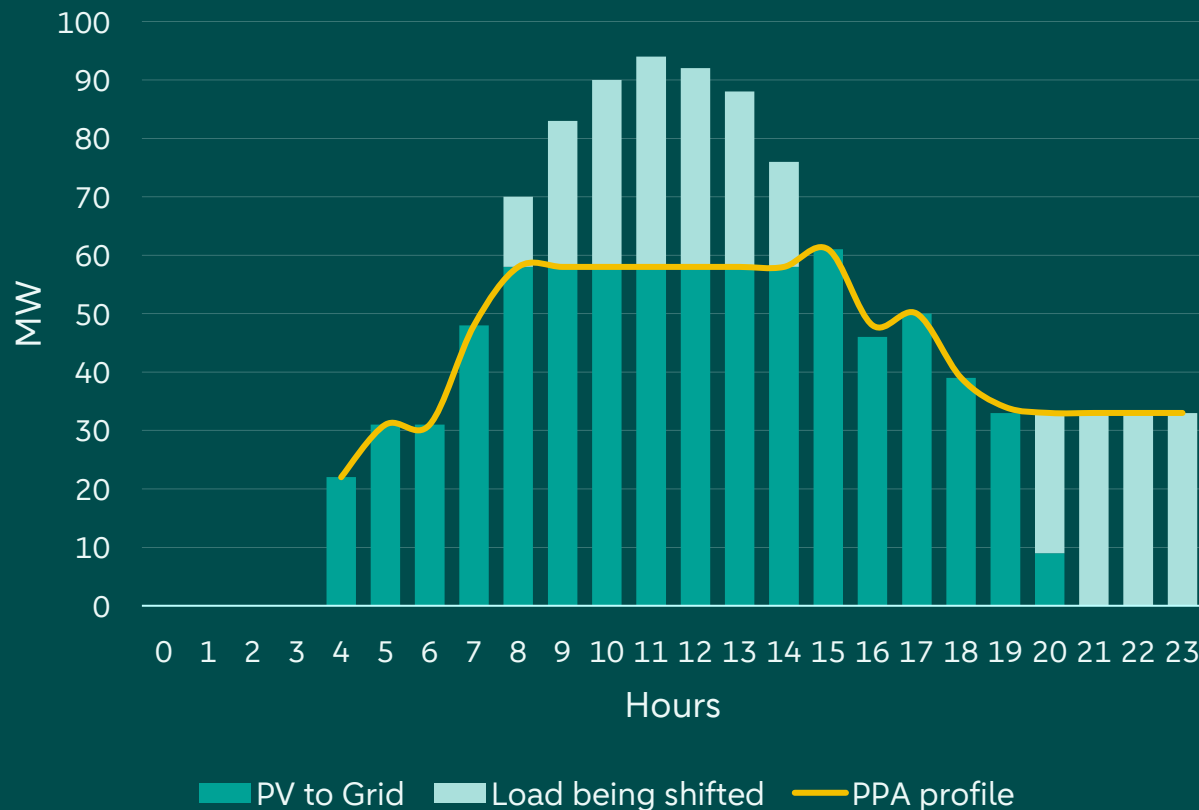
Credit insurance in lieu of bankable tolling counterparty



- Used selectively in renewables to credit enhance structure – e.g. to facilitate financing of long-term merchant revenue structures
- Can be replicated for BESS via bespoke obligor default or debt service insurance policy for counterparty willing to offer long-term fixed price contract but without credit standing to support such obligation
- De-risks credit exposure on Counterparty from lending perspective, however:
 - Priced against low debt margins due to high rating of insurance party
 - Higher opex required to support insurance premium
 - Lower DSCRs, decreasing operational risk buffers
 - Potential gaps and carve-outs in insurance (as with any insurance product!)

Colocated BESS/solar – hybrid PPA model

Hybrid PPA model



- PV + BESS assets used together to modify a solar-only profile into a fixed pre-agreed shape for offtaker
- Can be used where owner cannot optimise standalone BESS more profitably or prefers higher fixed revenue %
- Shape risk managed by agreeing PPA supply curve that matches PV + BESS injection profile
- PPA is financially settled against agreed profile. Physical nomination optimised daily for best load shifting
- Hybrid PPA should attract significant premium over PaP or solar fixed profile PPA (better fit of energy demand of offtaker, predictable volume supply, easier to re-trade than solar-only PPA)
- Flexibility for BESS optimization is retained around the load-shift to generate additional upside
- For financing, requires careful analysis of:
 - Regulatory constraints applicable to co-location
 - Lower solar production scenario (higher allocation of BESS to PPA/lower PV (or more expensive grid) to BESS = lower merchant revenues)
 - No grid charging scenario (only from solar, assuming a conservative production scenario)
 - Liability regime under PPA for non-delivery vs LDs under solar/BESS

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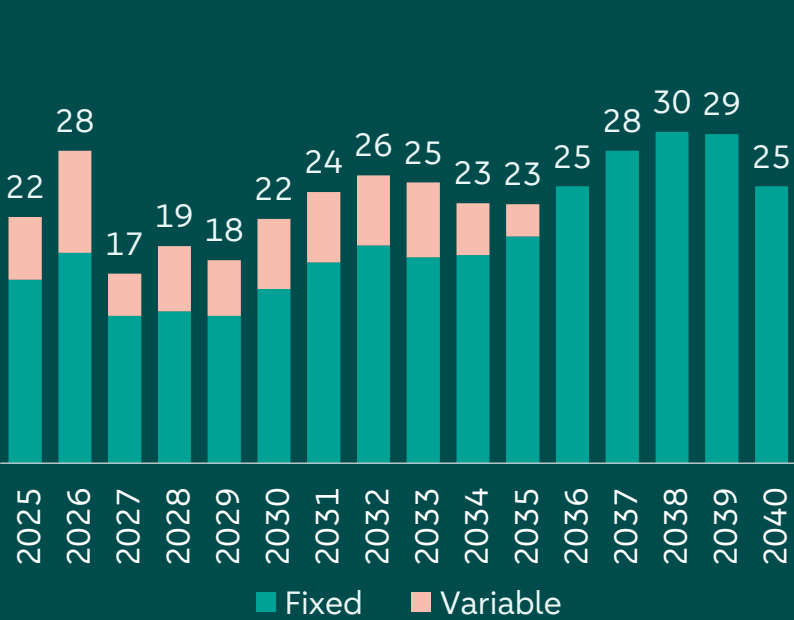
Alignment mechanisms sponsor/lender

Structural mechanisms to align interest of equity and debt

Mechanism	Outline	Rationale
Regearing as contracted % increases 	▪ Fully merchant revenue model permitted at financial close (against conservative gearing) ▪ Gearing increases pre-agreed based on increments of contracted %	▪ Allows some debt into fully merchant project day 1, with ability to wait for optimum contracting moment and increase to typical PF gearing level prior to COD
Overcycling cash sweep 	▪ Additional prepayment on debt when cycling exceeds the annual throughput assumption in the warranty base case reduces warranty tenor and accelerates degradation	▪ Permits flexibility for overcycling in business case, but allocates accelerated economics fairly and preserves tail between expected repayment and warranty life assumed in the base case
Upside cash sweep 	▪ Above an agreed DSCR level excess cash partly used to amortize debt more quickly	▪ Keeps equity/debt repayment timing more closely in line with that expected in base case ▪ Needs to be linked to overcycling cash sweep to avoid double counting
Flexible repayment mechanism 	▪ Split of repayments into fixed and top-up tranches ▪ Variable component sized via target balance sweep or target repayment date sweep	▪ Part of debt amortisation is converted into “pay when you can” tranche ▪ Mandatory payment component lower (protects against default in periods of lower cashflow) with ability to catch up during more profitable periods

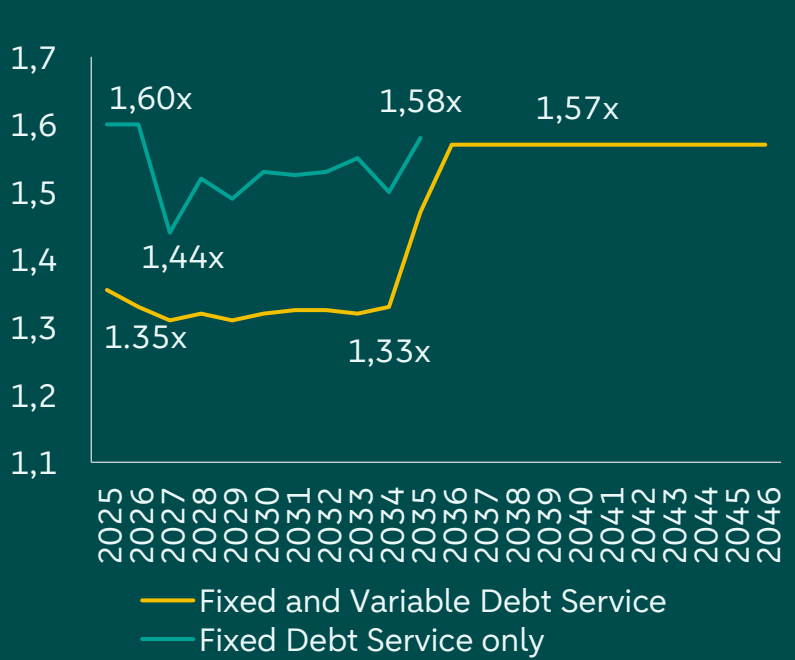
Split fixed/variable repayment schedule for volatile cashflows

Principle Repayment: Fixed vs Variable



	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Fixed	74%	67%	77%	69%	72%	71%	74%	75%	73%	80%	88%
Variable	26%	33%	23%	31%	28%	29%	26%	25%	27%	20%	12%

DSCR



Profile

- Repayment capacity of all debt tested at inception
- Fixed Tranche sized using selected methodology (typically on fixed cashflows/conservative merchant revenue scenario)
- Variable Tranche: top-up amount required to achieve Target Debt Balance or a Target Repayment Date

Conditions

- Fixed Repayment compulsory (otherwise non-payment EoD)
- Variable payment – target only, no default if not met
- Variable amount can be "caught up" during higher revenue periods
- Dividend lock-up until Target Debt Balance reached
- Affords higher flexibility on repayment timing
- Extremely suitable for asset classes with high level of volatility such as BESS

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