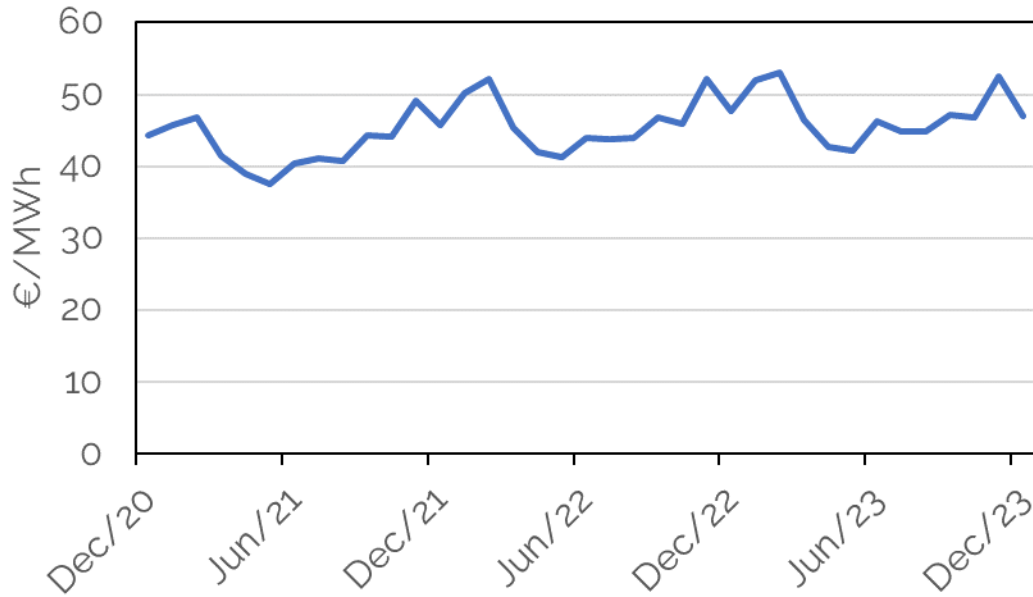# Managing your Market Risks to Enable Future Growth
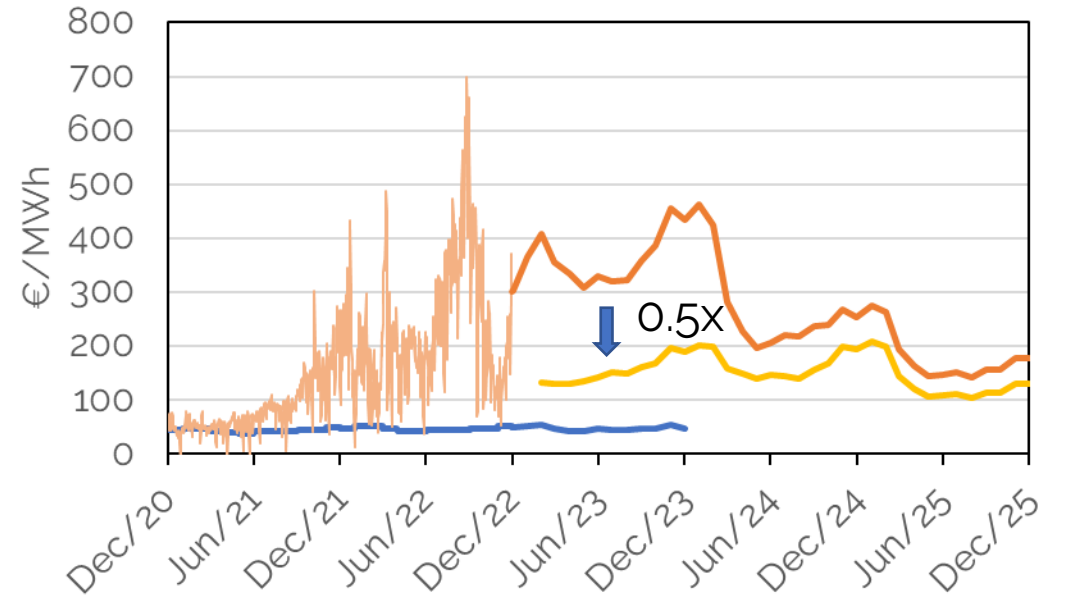
Ewout Eijkelenboom

2 February 2023

Why Risk Management?

German Price Forward Curve

Electricity prices are extremely volatile -> proper risk management required!

KYOS Energy Analytics

KYOS Energy Analytics

- International client base across Europe, plus Americas and Japan
- 30+ people, of which 20+ in Haarlem
- More than 100 corporate clients for its software services

KYOS renewable energy services

KYOS supports all players in the renewable energy sector

Project developer	Bank or investor	Utility or Aggregator	Corporate off-taker

Software
- KYOS Analytical Platform - complete software system to price and manage renewable assets and PPAs
- Make long-term power price projections and perform what-if analysis
- Monitor and manage a complete portfolio of assets, PPAs and hedges
- Analyse different hedging strategies before entering in new deals
- Obtain detailed risk reports for managers, investors and analysts

Advisory
- Get valuation support during PPA negotiation and M&A activities
- Get regular PPA valuations for accounting and trading purposes
- Get support with arbitration cases, re-financing and re-powering

KYOS

An advanced approach to measure market risks

How to quantify price risks of renewable project?

Price Projection - Annual Baseload

- Classical approach:
  - Use long-term price projections
    - Vendor A, B, C
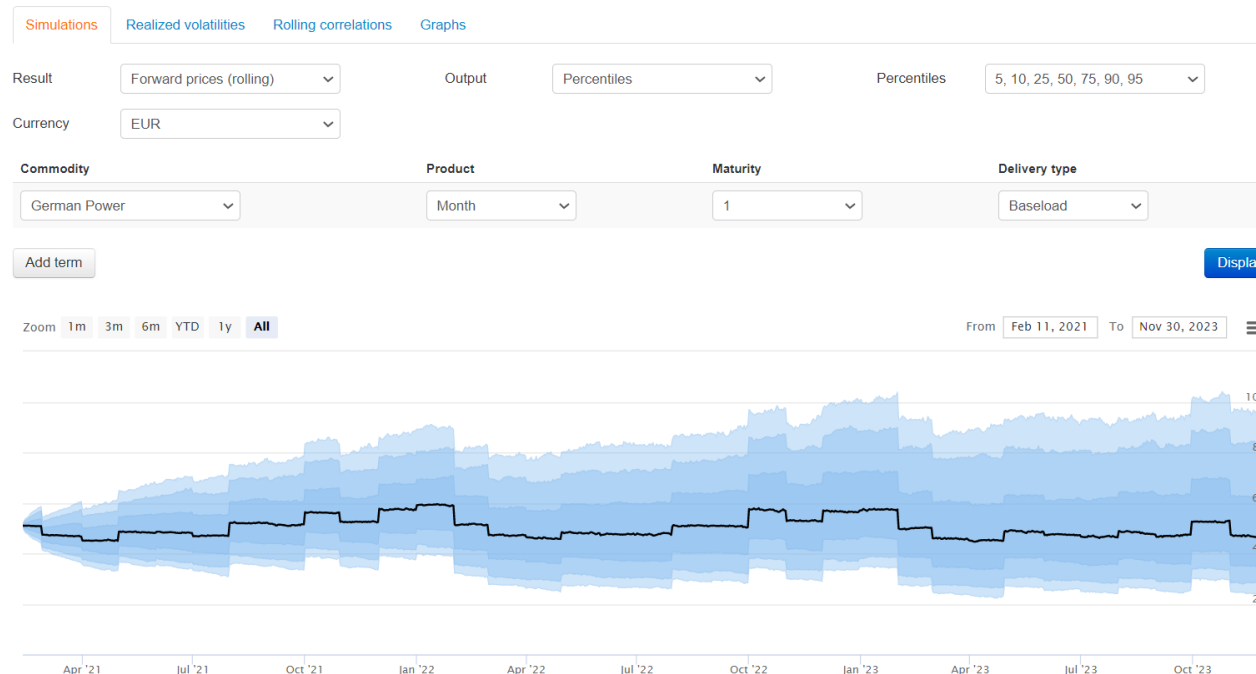   - Scenario X, Y, Z

- Disadvantages:
  - As good as the inputs
  - One or limited scenarios
  - Does not cover extreme/unexpected events (see current market)
  - Not easy to model cannibalization/shape risks
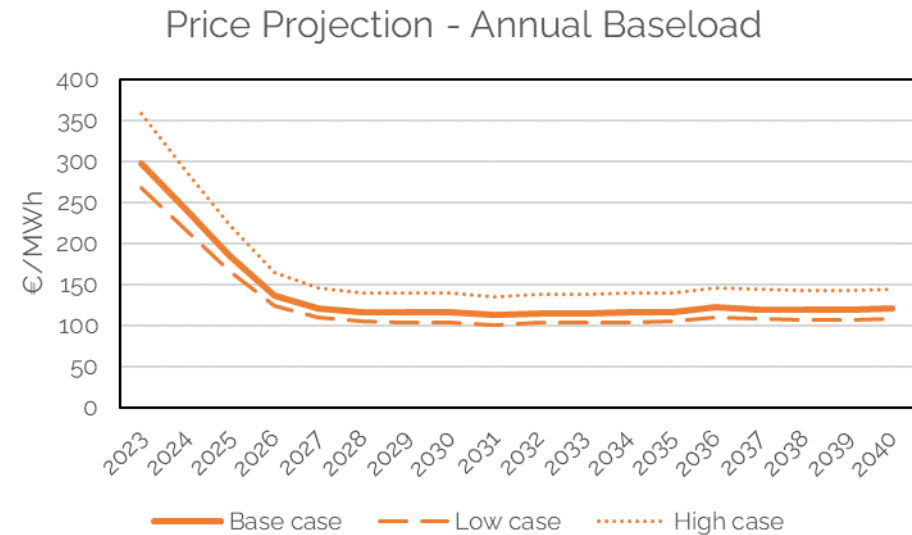
# Combine LT price projections with simulations

- A single forecast of power prices is not enough

- Price simulations allow for large number of possible scenarios, also edge cases

- Monte Carlo simulations of power prices:
  - Forward prices and hourly spot prices
  - Arbitrage-free: on average equal to forward curve

Why simulate volumes too?

- A single scenario of production forecast is not enough

- Renewable generation is negatively correlated to power prices

- Simulate renewable generation with a systematic approach:
  - Smart historical sampling from historical years
  - Imposing a negative correlation with the power prices to meet the expected <u>capture rates</u>
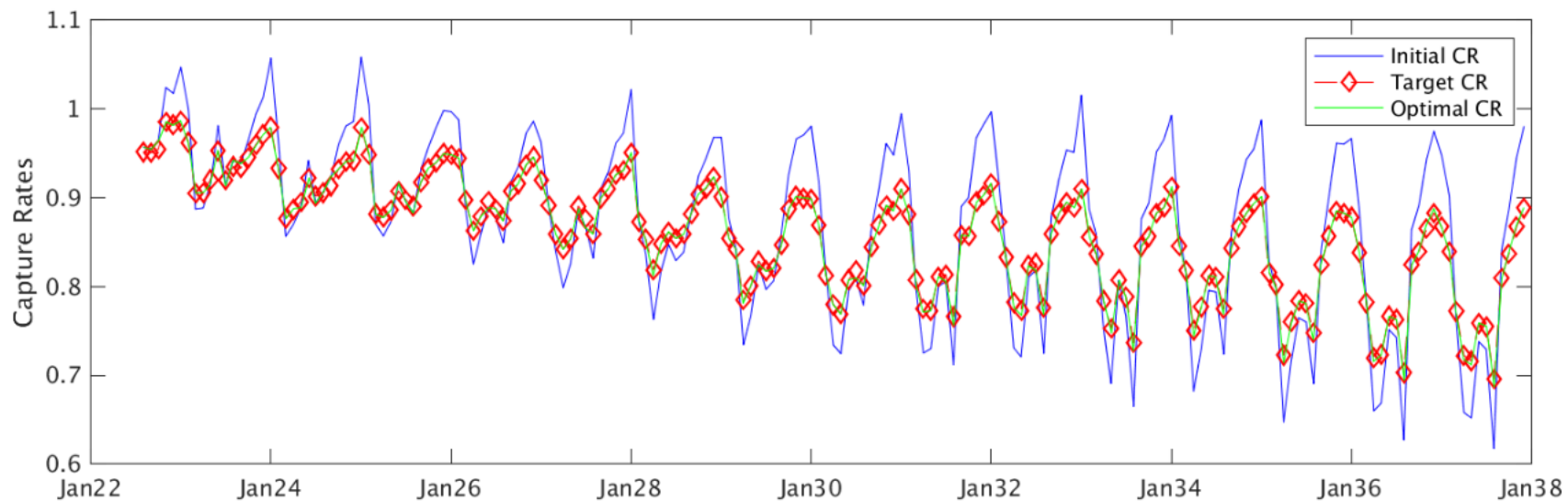
How can this help you?

Systematic risk assessment framework

| Define your asset | Create simulations | Set-up PPA and hedges | Risk analysis |

- Historical data
- Expected P50
  - Given
  - Estimated by model
- Capture rate development
  - Given
  - Estimated by model

- Forward curve!
- Accurate model
- Calibration!
- Multiple commodities to portfolio view
- `Also volumes

- Capture PPA details
- Standard contracts
- Flexible!

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Risk analysis

Define your asset → Create simulations → Set-up PPA and hedges → **Risk analysis**

- Cashflow/earnings distribution
  - Aggregated over longer time horizon
  - On monthly level
- Unhedged asset
- **Hedged asset**
- **Portfolio effect**
  - Assets in different locations/countries and technologies
- Clear metrics, e.g. EaR

Earnings at Risk   Cash-flow at Risk   Volumes at Risk

Earnings at Risk Summary	Commodity	Currency	95% at Risk
Commodity	Total	EUR	54 419 254
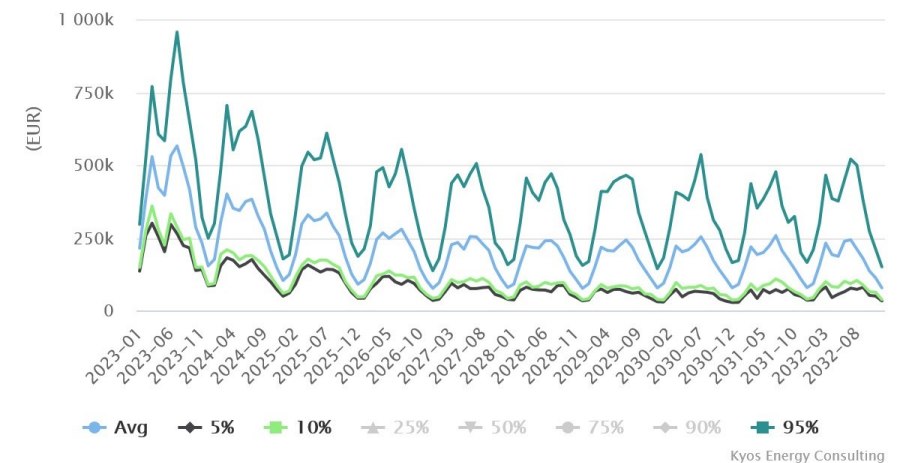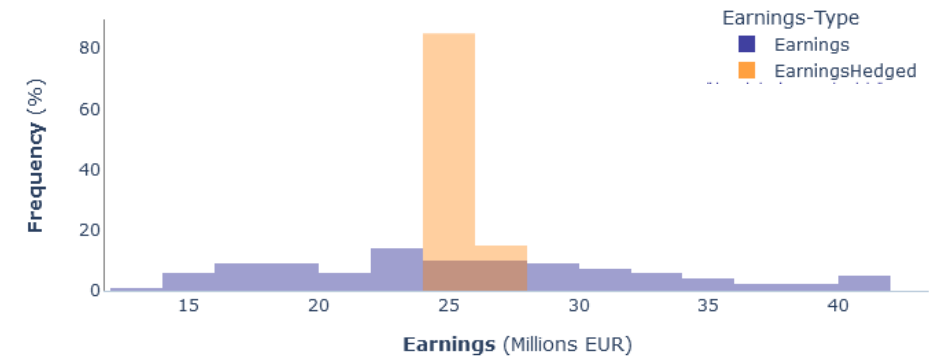
How does this help you?

Pre-deal/FID

- Financing:
  - Monthly cashflow distribution gives view on worse case project cashflows
  - Help to assess DSCR

- Structure your PPA:
  - Change PPA parameters and see impact on risk distribution
  - Assess expected EBITDA distribution

- Holistic portfolio view
  - How does this asset change overall portfolio risk? (technology/location diversification)

Asset in operation

- Risk reporting
  - Continuous monitoring of expected revenues in changing markets

- Test portfolio adjustments
  - Assess effect of additional hedges on risk profile
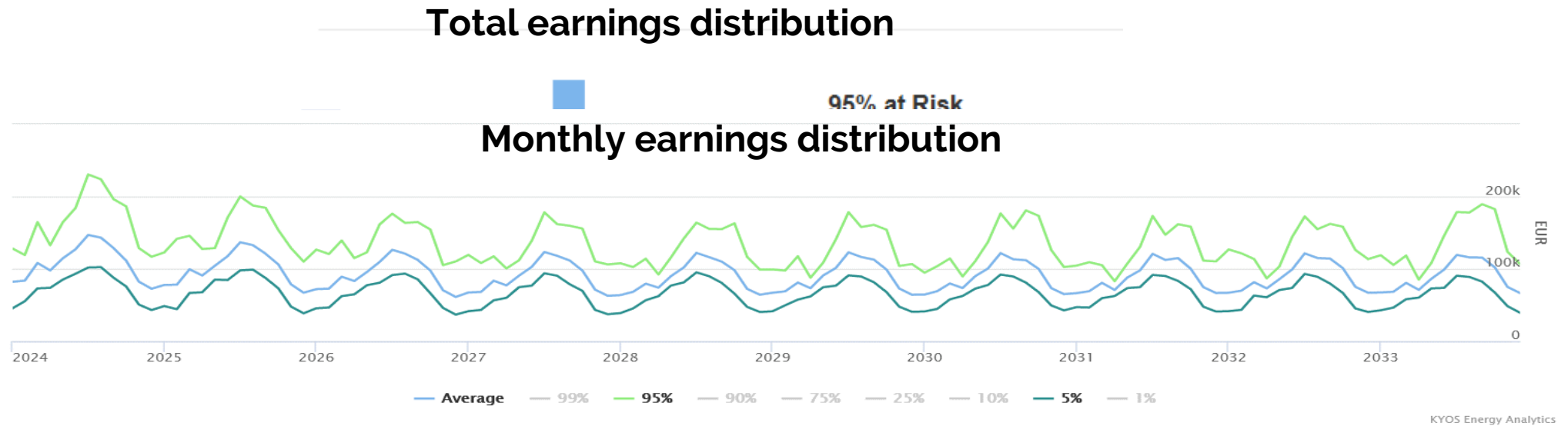
- Implement portfolio adjustments

Case study

<u>IPP with PV asset in Spain. Looking to expand into Italy – worried about EBITDA variations</u>

- Step 1 – look at current risk profile.
 - Spanish PV asset hedged with 75% PaP PPA at fixed price

Total earnings distribution

95% at Risk

Monthly earnings distribution

Average — 99% — **95%** — 90% — 75% — 25% — 10% — **5%** — 1%

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Monthly earning distribution: usefull information for cashflow planning and debt sizing

Translation: There is a 5% probability that your realized earnings will be more than €1.9mln below current expected earnings

- Step 2 – look at risk profile of planned Italian PV asset.
  - For simplicity also with 75% PaP PPA at fixed price
  - Same valuation logic
  - Take care of Italian zones…
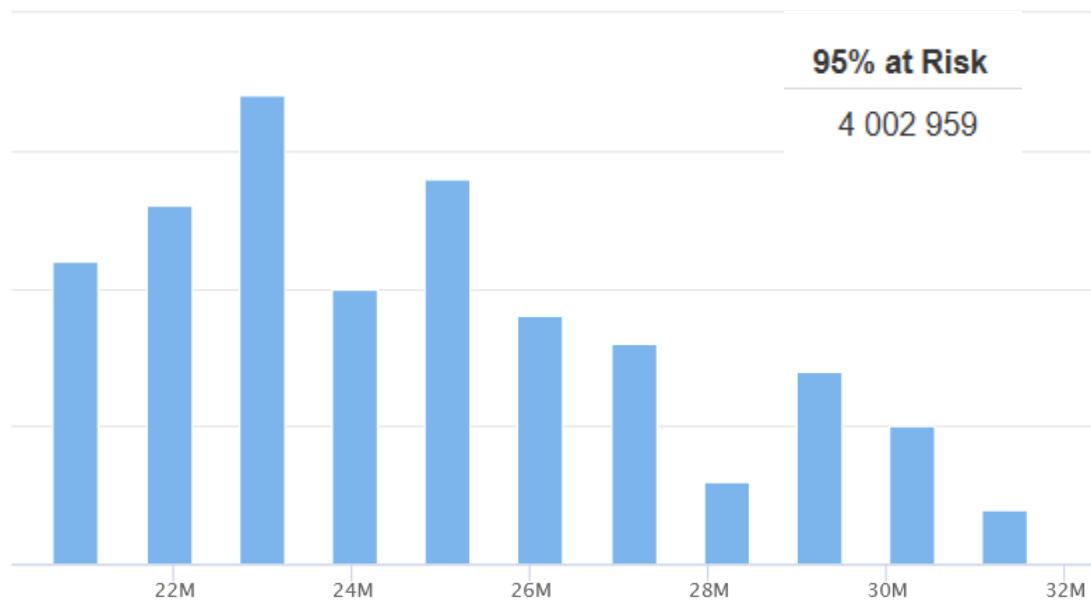

95% at Risk

2 506 292
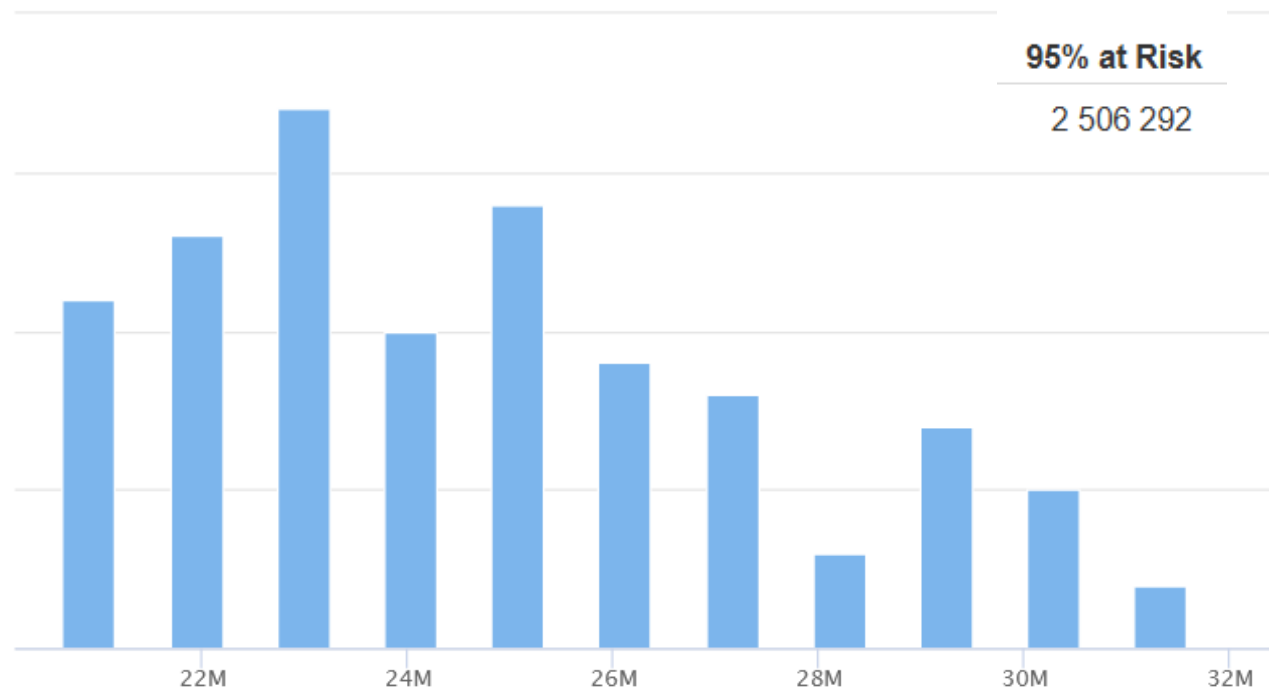
EaR Spain: €1.9mln
EaR Italy: €2.5mln

Total EaR: €4.4mln?

- Step 3 – Portfolio view
  - Combine both geographies in one risk assessment
  - Requires correlated set of price and volume simulations of both countries
  - Assess combined earnings distribution

95% at Risk
4 002 959

EaR Spain: €1.9mln
EaR Italy: €2.5mln

**Total EaR: €4.0mln
-> 10% portfolio effect!**

In other words: actual
EBITDA risk of adding Italian
PV asset is less than
expected.
Allows for more investments!

Summary

- Simulation based valuation of renewable assets and PPAs is essential to understand price and volume risks

- Valuable tool for
  - Pricing PPAs
  - Defining PPA strategies
  - Optimizing market hedges
  - Supporting financing/investment analysis
  - Daily risk management and reporting

- Not only for aggregators, but more and more used by project developers, investment funds and banks.

- Understanding risks in your portfolio key for future growth!

KY●S

We look forward to supporting you with the right tools and advice!

KYOS

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