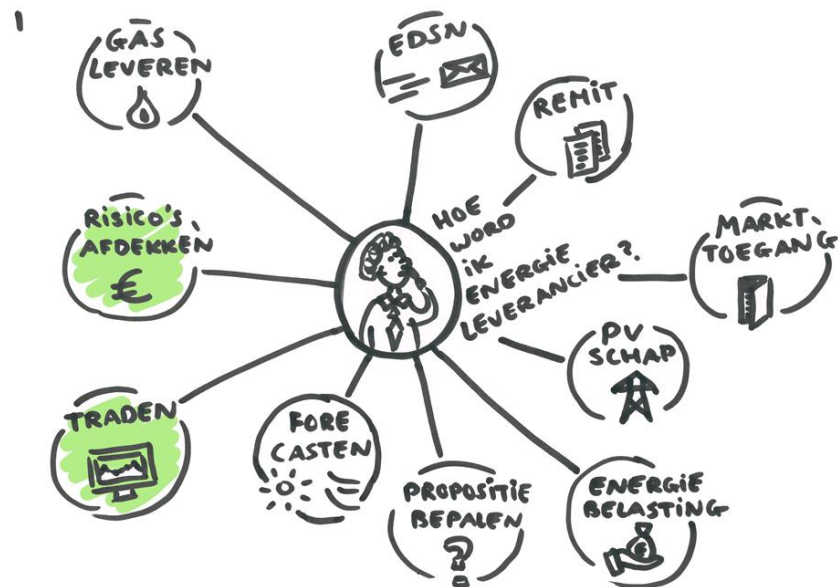




PRIÜGEN

Portfolio Management



Selftest Portfolio Manager (1/4) ?

- I offer to do 'head or tail' with a coin
 - If it is head, you get € 10
 - If it is tail, you pay me € 9
 - (The coin is tested and approved by the relevant gambling authorities)
 - Will you take this bet ?



Selftest Portfolio Manager (2/4)

- I offer to do 'head or tail' with a coin
 - If it is head, you get € 1 mln
 - If it is tail, you pay me € 0.9 mln
 - (The coin is tested and approved by the relevant gambling authorities)
 - Will you take this bet ?
 - How about Bill Gates ?



Selftest Portfolio Manager (3/4)

- I offer to play a game of Ping Pong
 - If you win, you get € 10
 - If I win, you pay me € 9
 - Will you take this bet ?



Selftest Portfolio Manager (4/4)

- What is the expected value of rolling the dice ? Can you make a model ?
- What is the probability of achieving the expected value when you can only roll the dice once ?
- So how much money do you want to bet on the outcome of your 'model' if there is only 1 try ?



So what did we learn ?

- Your risk appetite is (at least) dependent on
 - Maximum acceptable downside (€ 10 or € 1 mln ?)
 - Can you influence the risk (good at ping pong?)
 - Understanding the risks (expected outcome of rolling the dice ?)



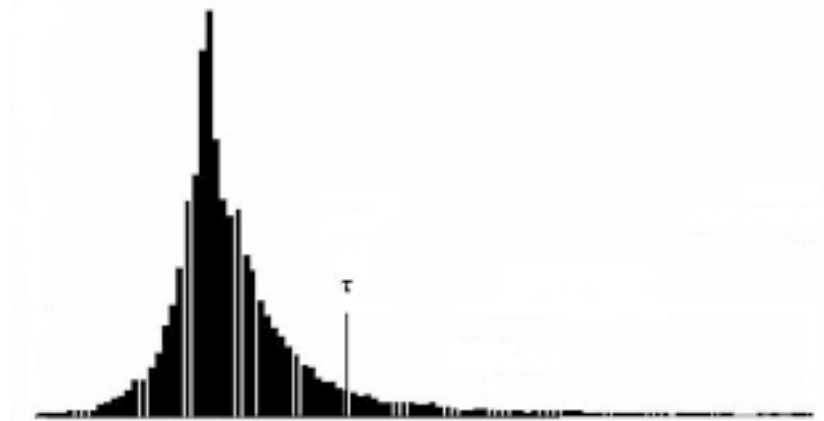
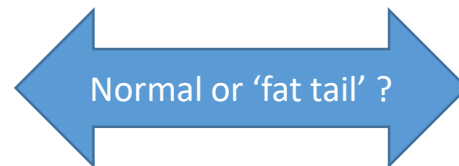
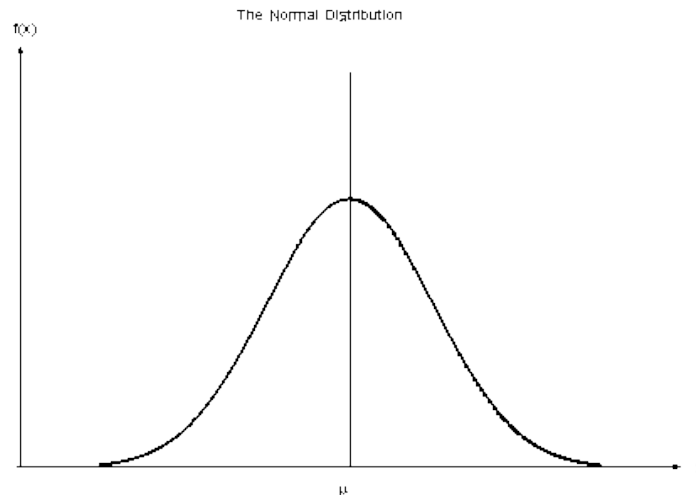
Switching to Portfolio management

- Imagine, you are purchase manager for an industrial producer and you need 10 GWh of power for next year (s).
 - Should you buy 'spot/floating' or 'forward/fixed price' ?
 - Spot: buy every day on the EPEX. Prices per day can vary between 0 and 300 €/MWh, expected value is 50 €/MWh
 - Forward: fix your price now for the whole year(s) on 50 €/MWh.
 - Answer: it depends on your risk appetite
 - What is your maximum acceptable downside ?
 - Can you influence the risk ?
 - Do you understand your risks ?



Maximum acceptable downside

- 10 GWh: every euro change means 10 k€.
- Datapoint: the difference between 'spot' and 'forward' has been 15 €/MWh in 2018. In early 2000's, we have had years where difference was 30 €/MWh.
- So is 150 k€ 'realistic worst case' overshoot on a 500 k€ expected bill acceptable for you & your company ? And a 'historical worst case' risk of 300 k€ ? And the very low probability risk of an even higher 'overshoot' ?



Influence the risks ?

- Imagine: you choose to buy 'spot', it is 'code red' and power prices go to 1000 €/MWh
- Can you do something? Tick the relevant box for your business
 - Nothing.
 - e.g. if your are an ice cream factory, you will not let the power price influence your production
 - Something.
 - E.g. If you are a base metals factory, your reduce your consumption to 50%
 - E.g. Shift demand (cooling, starting your own back up power diesel generator supply, shift maintenance, etc.)
- If you ticked the second box, you will be more inclined to buy spot, as you can influence the risks.
 - In trader talk: Your are 'long flex'. Monetize it!



Understand your risk

- So imagine, you have sold all the output of your metal factory for a fixed price for coming year
 - Should you hedge your power purchase ?
 - What if your metal sales contract has an oil index? Or a hardship clause ?
- Other aspects
 - Hedging costs
 - Typical you have to cover bid/ask spread
 - But also costs to post collateral (esp. if you have a poor credit rating or want to hedge long term)
 - Accounting
 - Just the buzzwords: IFRS, hedge accounting, fair market valuation etc.
 - Management attention
 - What does your peer group do ?
 - Enabling Energy transition (Do you choose to enable the energy transition by keeping/taking on some risks?)
 - Risk vs Opportunity



So how to do portfolio management

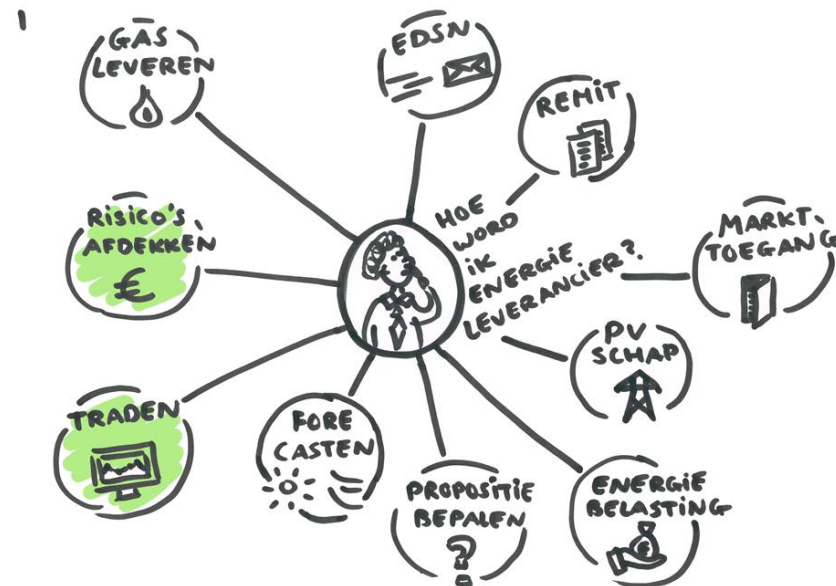
1. Assess your risks (& opportunities)
2. Determine whether you can influence the risk
3. Define your maximum acceptable downside
4. Determine your strategy
 - which risks & opportunities do you keep in house and what do you outsource
 - who is best suitable to manage the risks/capture opportunities
5. Describe your strategy and get buy in (/approval) from your stakeholders
6. Execute (and monitor)





PRIØGEN

Trading: how does it work at Priogen?



Default Scenario for a trading day

7h00-8h00: Traders and Analyst in, focus on price prediction

- 300+ data scrapers have collected REMIT (and other) data per plant, per country etc.
- Weather forecast in -> wind and solar patron for tomorrow
- Demand analysis
- Determine Reference days (“tomorrow looks like May 21, but with slightly less wind”) for EPEX spot bidding behaviour
- Cross Border Impact (‘social welfare calculations’)
- Results: price prediction per country
- For example: German Baseload is 50 euro/MWh tomorrow
- 8h00-12h00: trading
 - If market opens with German baseload trading above 50, we go ‘short’
 - If market opens below 50 euro, we go ‘long’
 - Example:
 - German baseload Day Ahead opens at 53 euro/MWh.
 - We sell 1000 MW
 - If market indeed goes to 50 euro, we make 72 kEuro
 - $1000 \text{ MW baseload} = 1000 \text{ MW} * 24\text{h} = 24 \text{ GWh}$, so every euro movement is 24kEuro Profit or Loss
- 12h42: EPEX spot results come out; typical closure of the Day Ahead trading activities; focus on nomination and preparation for next day



Example 1: Sunny Day Scenario for a trading day

- Our model predicts 50 euro for German Day Ahead
- German Day Ahead market starts trading at 53 euro
- At 8h10, we go short, by selling 1000 MW @53
- From 8h10 to 9h00, the market drops to 51 euro
 - Q1: would you lock in your profit (i.e. by buying back 1000 MW @ 51) or do you stick with your position (because you have a firm view it will go to 50?) ?
- From 9h00 to 10h00, the market retreats to 49 euro
 - Q2: you typical would lock in your profit (i.e. Buying back the 1000 MW if you did not already do so earlier), but would you switch your position to 'long', by buying 2000 MW instead of 1000 MW?
- Pls realize that during the trading day, there is continuously new information incoming
 - Updated weather
 - Outages
 - Fuel price development (during the 'beast from the east' period End of Q1, gas prices moved up many euros during they day, impacting the power prices significantly)
 - Sentiment
 - Etc.



Example 2: Rainy Day Scenario for a trading day

- Our model predicts 50 euro
- German market Day Ahead starts trading at 53 euro
- At 8h10, we go short, by selling 1000 MW @53
- From 8h10 to 9h00, the market rises to 55 euro
 - Q1: would you stick with your position (because you have a firm view it will go to 50?) ? Or would you take a stop loss (locking in a loss of 50 kEuro..)? Or would you even increase the size (by going short another 1000 MW) because you are really positively convinced it will go 50? Or would you switch positions, by buying 2000 MW ?
- From 9h00 to 10h00, the market rises further to 57 euro Q2: See Q1
 - In case you did not take a stop loss: you are now down $4 * 24$ kEuro, so 100 k....
 - Pls realize that during the trading day, there is continuously new information incoming
 - Updated weather
 - Outages
 - Fuel price development (during the 'beast from the east' period End of Q1, gas prices moved up many euros during they day, impacting the power prices significantly)
 - Sentiment
 - Etc.

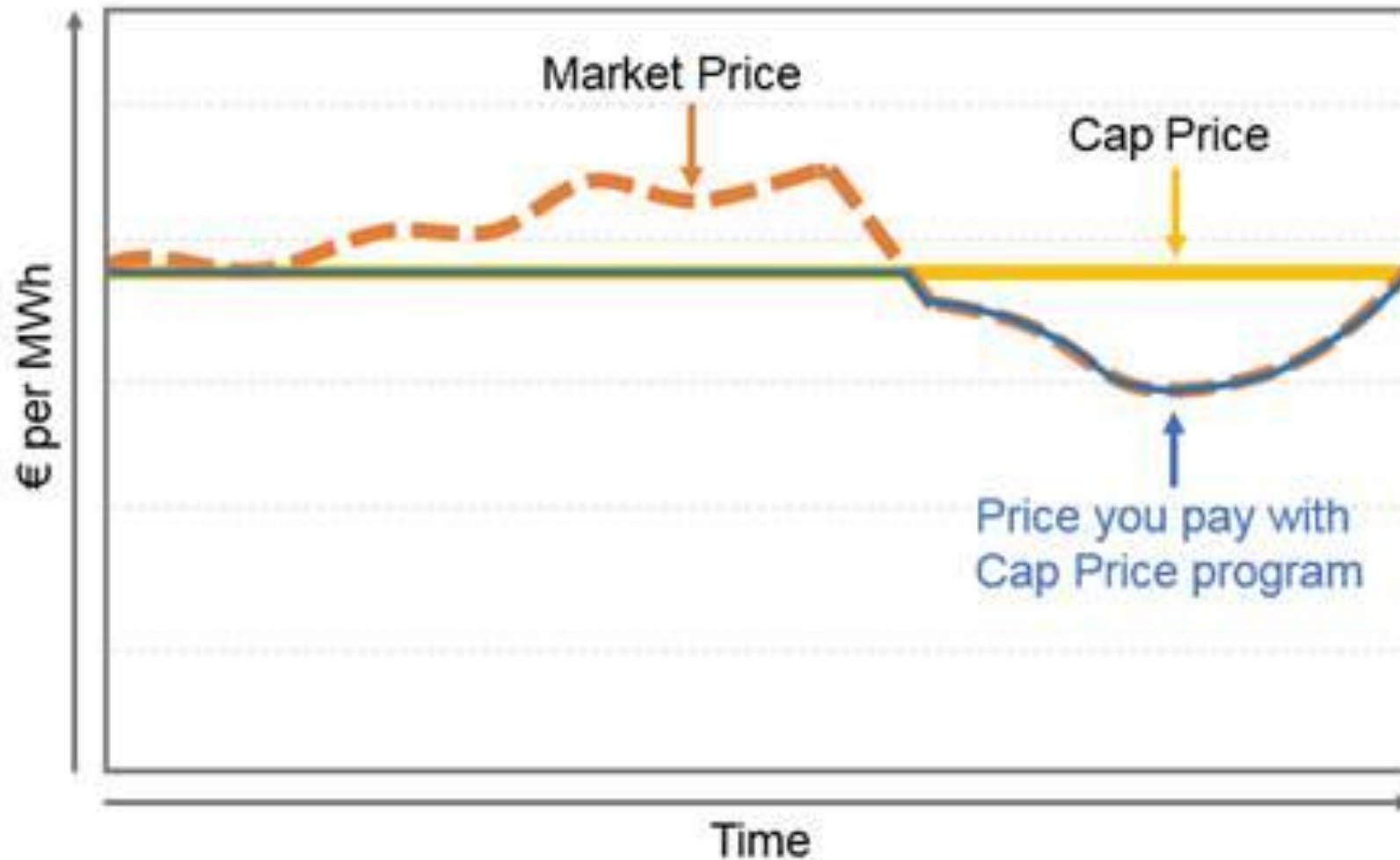


Example of 'afdekken risico'

- You choose to source your power on Spot Basis
 - for example, because the windmill owner wants to sell its output to you on EPEX basis, and you want to enable the energy transition by sourcing green power
 - For your budget, you use the current forward market
- However, what if spot goes 'trough the roof' ?
 - Example: in 2018, the average spot price was 52.5 euro, whereas the forward early September 2017 (when many commercial & industrial companies finalized their annual budget for 2018) was 36.5 e/MWh
 - Several examples where yearly spot settled for double the forward (and also years for half the forward 😊)
- How to hedge ?
 1. ISDA Swap ("fixed for floating")
 - No upside, no downside, but legal/accounting complex, and complex margining.
 2. Insurance (ProfilePriceCap)
 - Upside, no downside, simple, but at an upfront costs. See next slide



ProfilePriceCap: for fixed price insurance against high prices



Talk like a trader (1/4)



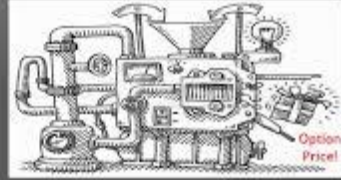
Wrong

1. I think the price will rise
2. I think the price will decrease
3. I sold without having the stuff
4. I buy now, so I can sell later

Correct

1. I'm pretty **bullish**
2. I'm pretty **bearish**
3. I'm **short**
4. I'm going **long**

5 Inputs:
• Stock Price
• Strike Price
• Time to Expiration
• Interest Rate
• Volatility



Talk like a trader (2/4)

Wrong

1. Prices are moving up and down a lot lately
2. Let's hope XYZ pays their bills
3. I want to trade on the TenneT system, but those guys want me to put down a 96.000 euro guarantee first.
4. I bought power and I sold gas

Correct

1. We have high **volatility**
2. I've quite some **credit exposure** on XYZ
3. TenneT requests 96k **collateral**
4. I'm long spark **spread**

Talk like a trader (3/4)



Wrong

1. I can play with the companies money, however I should do it in such a way that the chance I loose 100k in a day is <5%
2. I bought 50 MW power for delivery next year
3. James is a nice guy who always buys me drinks and helps me closing deals. Pitty he never finished his studies.
4. I bought something for 50 euro, which now has a value of 45 euro. I still hope I can sell it tomorrow for 50+ euro, but my risk manager tells me sell it now for 45 euro as we can not risk it going any lower

Correct

1. My **VAR** limit is 100k
2. My **exposure** is 50 MW Cal19 (long)
3. James is my **broker**.
4. I'm approaching my **stop-loss** limit @ 45.



"There were only five figures in his six-figure bonus."

Walk like a trader (4/4)

Wrong

1. I'm going well dressed to work
2. If my boss comes to me, I pay attention
3. When at work, I'm busy or at least pretend to be busy
4. I could do my work better from a home office

Correct

1. I put on whatever I want, you do not want me to miss a trade because I'm distracted by a tie or so ?
2. My boss should not distract me.
Oh what, did he say the B-word? I'm coming right away.
3. When I don't feel inspired, I start kidding around. Or are you forcing me to do a bad trade ?
4. I really need the atmosphere (and IT environment) on the tradefloor.



JUST A NORMAL DAY AT THE NATION'S MOST IMPORTANT FINANCIAL INSTITUTION...





PRI  GEN

Background on Priogen

Priogen: rapidly growing energy trading company on the back of the energy transition

Key highlights

2009-2016
From inception
to mid sized
company

- Founded by Burcak Tokgoz (CEO) together with a business investor, based on vision that the Energy Transition will make short –term power markets increasingly volatile.
- Established trading infrastructure on the back of an in house developed fundamental model (supply, demand, transmission constraints) of EU power markets .

2017-2018
Leveraging
Infrastructure

- Rapidly developed new capabilities in wind and solar optimization and today manages approx. 8% of on shore wind capacity in the Netherlands, closed its first solar deals.
- Expanded power trading to Italy, Hu, CZ, Spain , started gas trading.
- Further end to end professionalization of the organization, including new MT members, growing the business to 60 people, further professionalizing core processes.

2019+
Ample
opportunities
to grow

- Expansion into USA.
- Expansion power & gas across Europe.
- Expanding new capabilities in meteo, technology, and new markets and products.

Key Facts

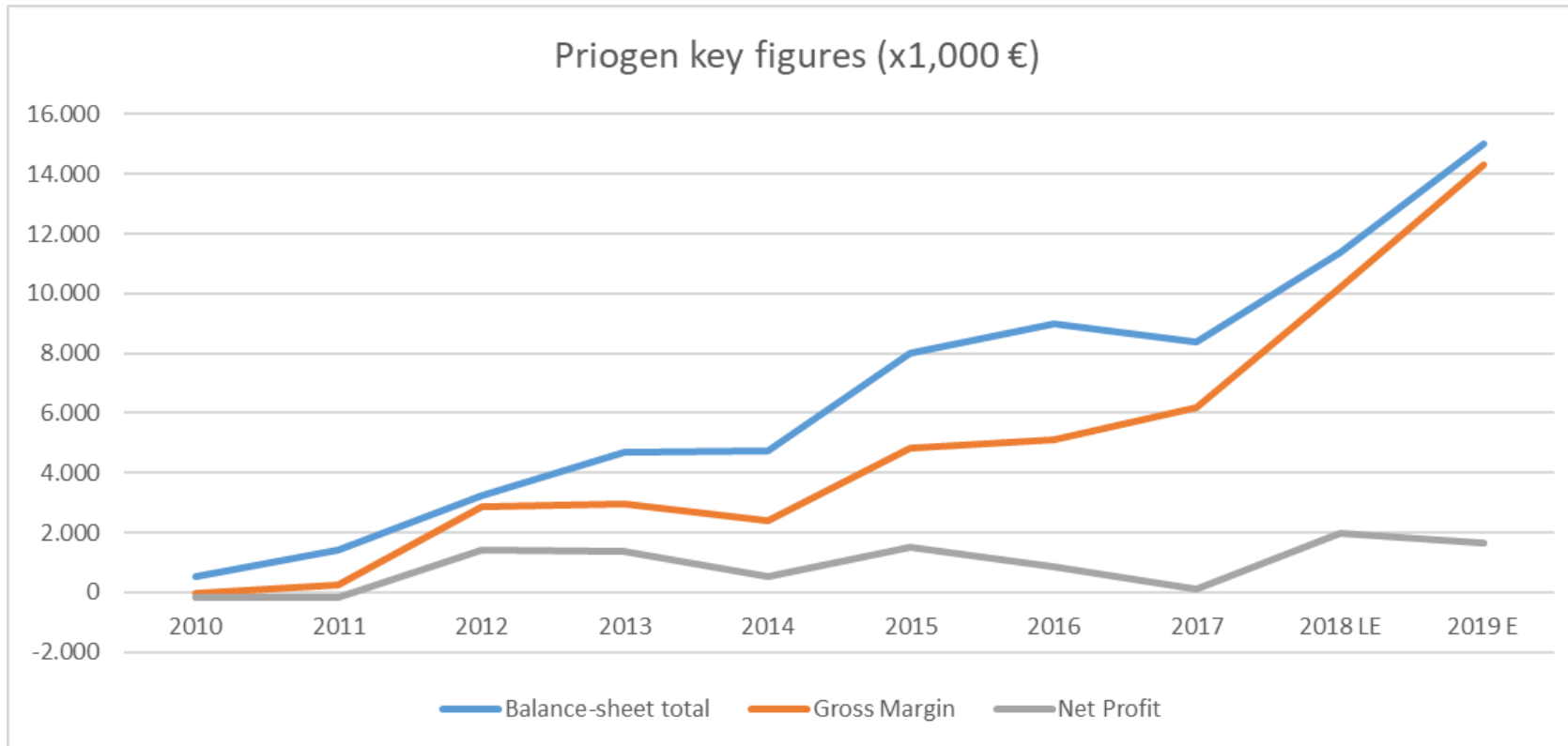
- Early mover in acknowledging trading impact of energy transition.
- Profitable since 2012.
- Focus on Short Term Power Trading.

- 80% of employees have Master or PhD degree.
- Moved to 'state of art' office.
- Growth in scope (geographical as well as commodity).

- Clear growth plans going forward.
- Established name with universities in NL (100+ applicants for trader-trainee vacancies).



Key figures



- Company profitable since 2012
- Significant year on year gross margin growth
- Low EBITDA as result of continued investments to grow company
- Except for dividend payments, all profit reinvested



Activities Priogen



- ▶ Trading European short term power markets.
 - ▶ Trade decisions based on a data driven approach with in-depth meteo analysis.
 - ▶ Weather models.
 - ▶ Meteorological staff.
 - ▶ Flexibility pricing models.
 - ▶ Detailed production and consumption forecasts.
- ▶ Portfolio management for external Wind and Solar assets.
 - ▶ Result: Risks & Revenues tailored to your risk appetite
- ▶ Connecting innovative development projects to the 'real world'
 - ▶ Sponsored by grid operators, governments and R&D partners.

Priogen core business is taking risks, added with service business

Description

Power Trading

- Directional position taking based on output of fundamental price forecasting model.
 - Cross country arbitrage based on power flow forecasting.
 - Hourly arbitrage.
 - Time spreads.
-

Gas Trading

- Power/Gas flexibility optimization.
 - Cross country arbitrage based on fundamental price forecasting.
 - Virtual storage optimization.
-

PPAs & Profiles

- Taking over the management of wind & solar parks & batteries, providing a.o. revenue guarantees (up to 5 year ahead)
 - Providing “full service” retail profiles, taking over forecast & unbalance risks and providing price caps
-

Virtual powerplant

- Converting real power plants risks and opportunities into a standardized contract (“Virtual Power Plant”), bridging the gap between physical producers and major trading houses.
-

Service

- Wind & Solar output forecasting.
- Flow forecasting (for a TSO)
- Junior partner in renewable research projects, providing forecasting and risk mgt expertise.



Business Model is based on >100k interdependent parameters to model electricity demand and supply movements in Europe

Input

Fundamental Supply and Demand

- Individual generating units
- Planned/unplanned outages
- Load/consumption per region
- Costs and pricing of fuels
- Meteorological forecasts (sun, wind, temperature etc)
- Cross border flows, including interconnector analysis
- Regulatory and subsidy frameworks and analysis by geography

Highly granular data analysis

- Fuel price analysis (coal, gas, emissions)
- Individual unit availability
- Nodal grid status in development
- Behavioral predictions (supply, demand, TSOs)
- Analysis of Global Meteo data

Big Data

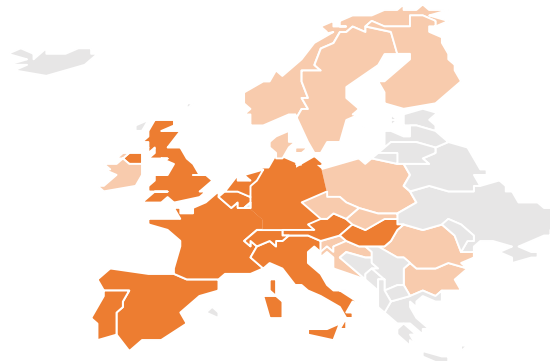
- Over 100,000 different parameters
- Over 1.2 million new data records collected each day
- Available real-time or with minimal delay
- 100s of data and information sources

Leverage technology

- 300+ datascrapers, real time structured and fed into databases

Model

- Markets covered 



- Fundamental and behavioral estimations by country of supply and demand
- Analysis and estimate cross country flows
- Best estimate plus scenario analyses based on fundamentals and historical big data records
- Price forecasts per region and time unit
- Continuous improvement by deviation analysis and optimization -> daily reconciliation and key input for research and development
- Supported by sophisticated risk management system
- Vast majority of conversion from supply and demand to price is automated by algorithms

Output

Power price forecasts

- Continuously updated based on new information
- 12 Countries, expandable to all of Europe
- From next 15 minutes to 3 months ahead, with a focus on day ahead to week ahead

Power system forecasts

- Power flow between countries
- Power plant usage / generation mix
- Power grid bottlenecks and congestion
- Consumption forecast per country and region
- Renewable energy production – i. e. Wind and solar output