Building EP**IC** Applications:
Transitioning from "Tactical" to Production Ready Solutions

EP **Innovation Centre**

Date 29/02/2024

Who am I? - From Kosice to London

linkedin.com/in/martin-miškuf

Experience ✛ ✎

Head of Analytics and Model Development London Branch
EP Commodities, a.s. · Full-time
Apr 2022 - Present · 1 yr 11 mos
London, England, United Kingdom

EP Commodities specializes in the trading of energy commodities, transit and storage capacities. We deal with transactions in natural gas, power, emissions allowances, coal and structural products like spreads acro ...see more
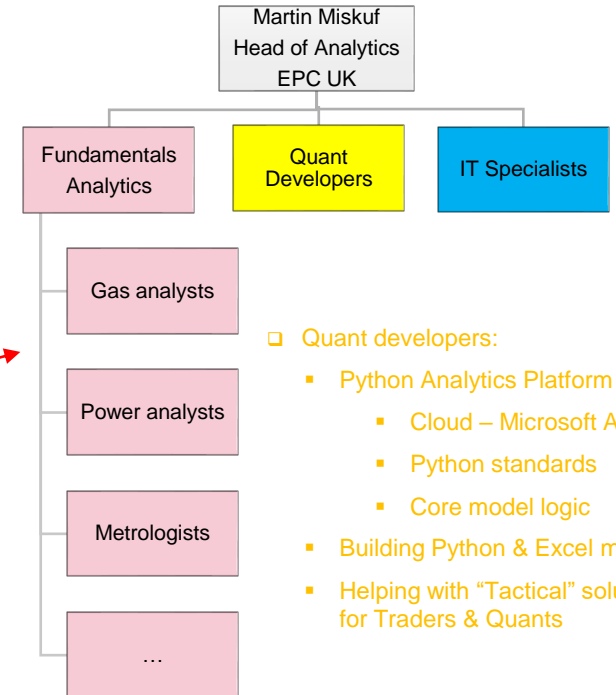
Developer
Gazprom Marketing & Trading
Aug 2018 - Mar 2022 · 3 yrs 8 mos
London, United Kingdom

Developer, Data & Analytics, Gazprom Marketing & Trading, London, United Kingdom
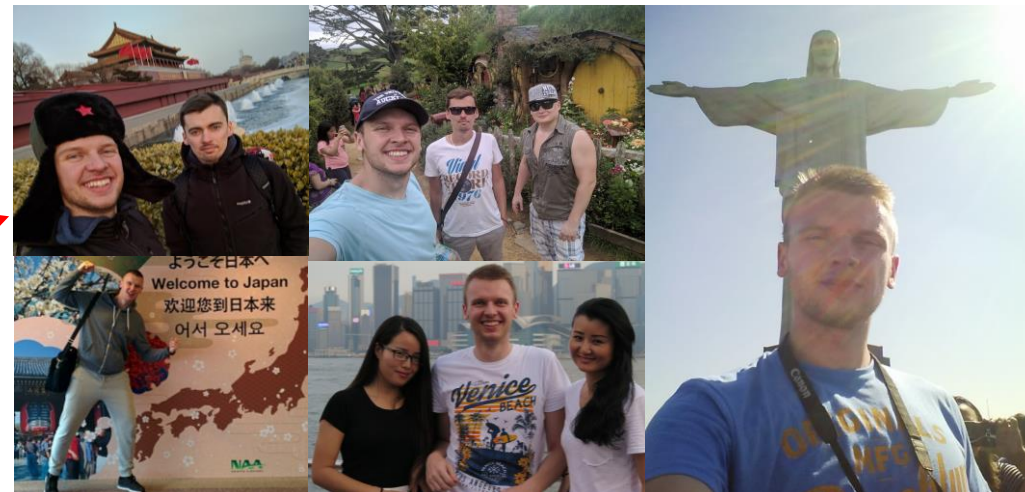Main responsibilities:... ...see more

Ph.D. Student
The Technical University of Košice
Sep 2014 - Jun 2018 · 3 yrs 10 mos
Košice, Slovakia

The team of Intelligent Cybernetics Systems, Department of Cybernetics and Artificial Intelligence, Faculty of electrical engineering and informatics... ...see more

Department of Cybernetics and Artificial Intelligence
stránka Katedry Kybernetiky a Umelej Inteligencie na TU Košice

During PhD: Improved tech, soft, managerial skills … saw the world

Martin Miskuf
Head of Analytics
EPC UK

- Fundamentals Analytics
  - Gas analysts
  - Power analysts
  - Metrologists
  - …
- Quant Developers
- IT Specialists

Now, I'm leading team of 10+ people

❑ Quant developers:
- Python Analytics Platform
  - Cloud – Microsoft Azure
  - Python standards
  - Core model logic
- Building Python & Excel models
- Helping with "Tactical" solutions for Traders & Quants

Agenda

❑ Recap – Who we are, EP Innovation Centre

❑ What should we already know about energy markets & trading?

❑ From "tactical" to production ready solutions

- ▪ Excel models

- ▪ Python – Excel models

- ▪ Cloud based analytics platform

❑ Aspiring to Become an **EPIC** Quantitative Developer

❑ Q&A Session
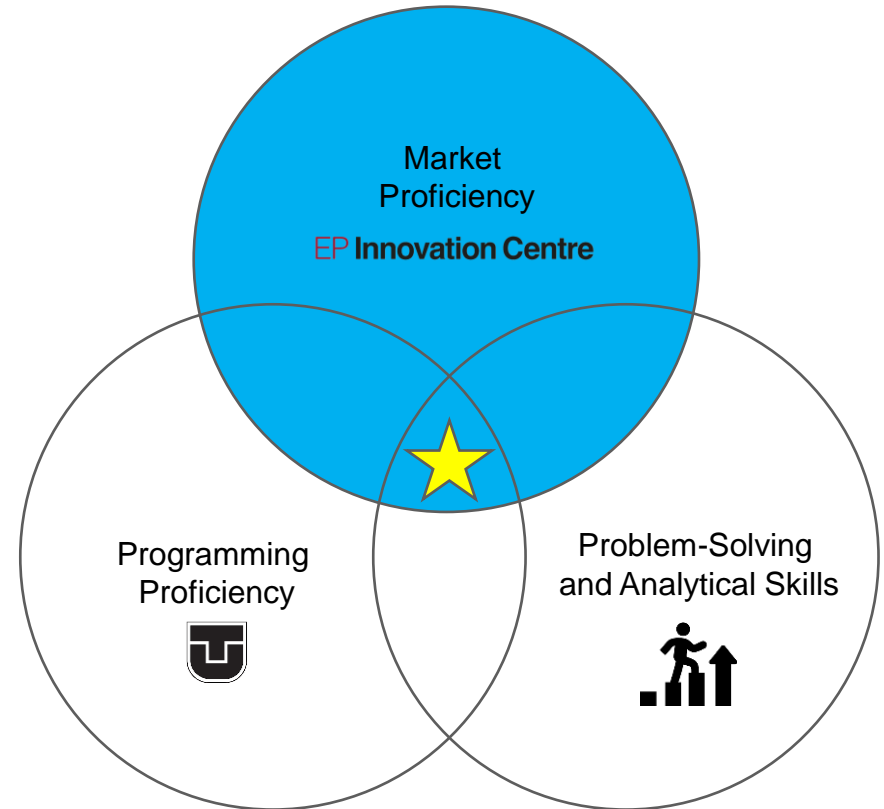
EP **Holding** - Who we are?

Gas Transmission

Operator of the biggest pipeline in Europe and critical gas infrastructure for Western, Central and Southern Europe

Read more

Gas & Power Distribution

Key strategic gas infrastructure operator & relevant power distributor in Slovakia and the Czech Republic

Read more

Heat Infra

A leading supplier of heat in the Czech Republic, serving hundreds of thousands of households and commercial customers

Read more

Gas Storage

A major operator of natural gas storage capacity in the region of Slovakia, Czech Republic and Austria.

Read more

Renewables

Producer of energy from a balanced mix of renewable energy sources

Read more

Power Generation

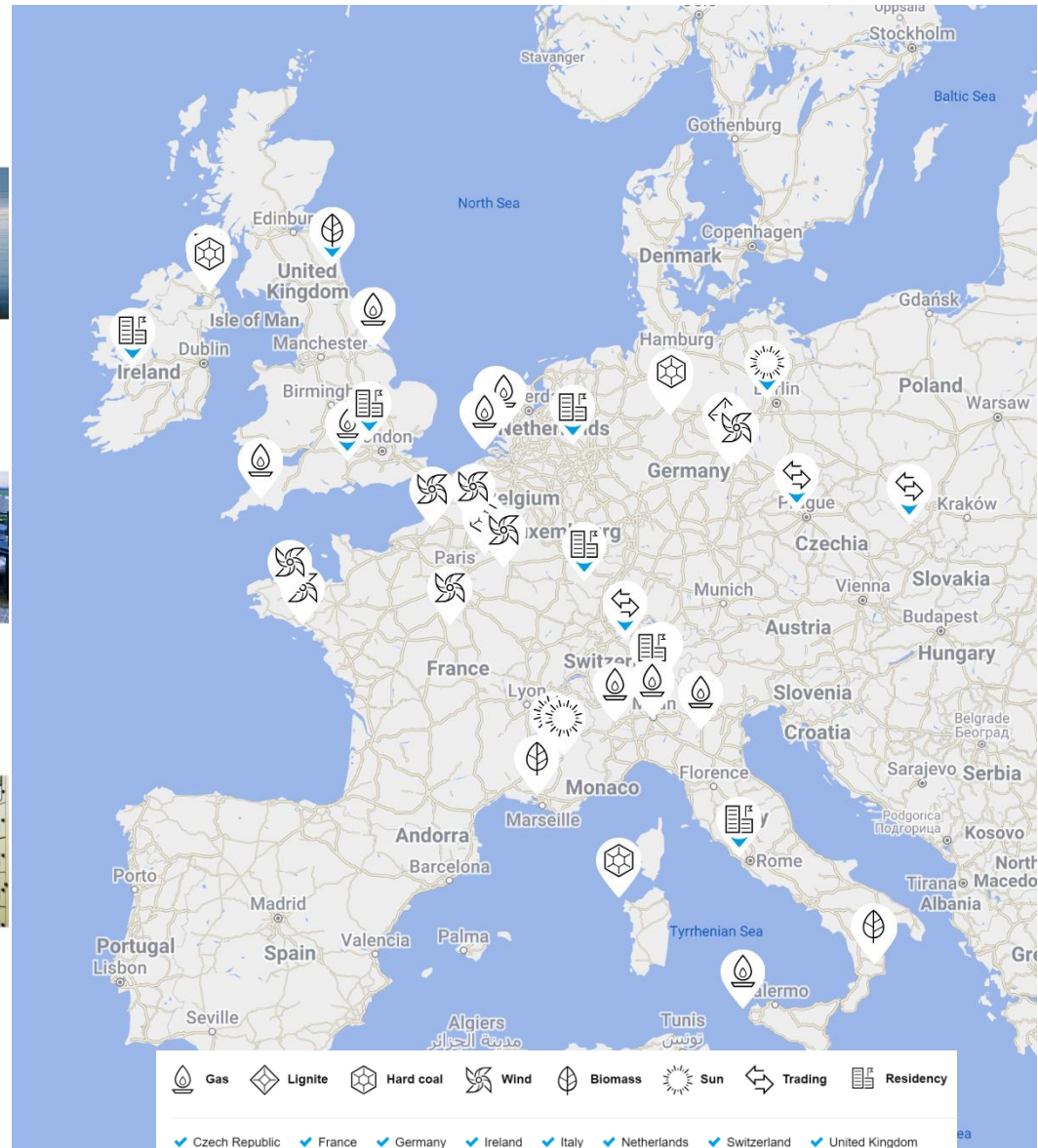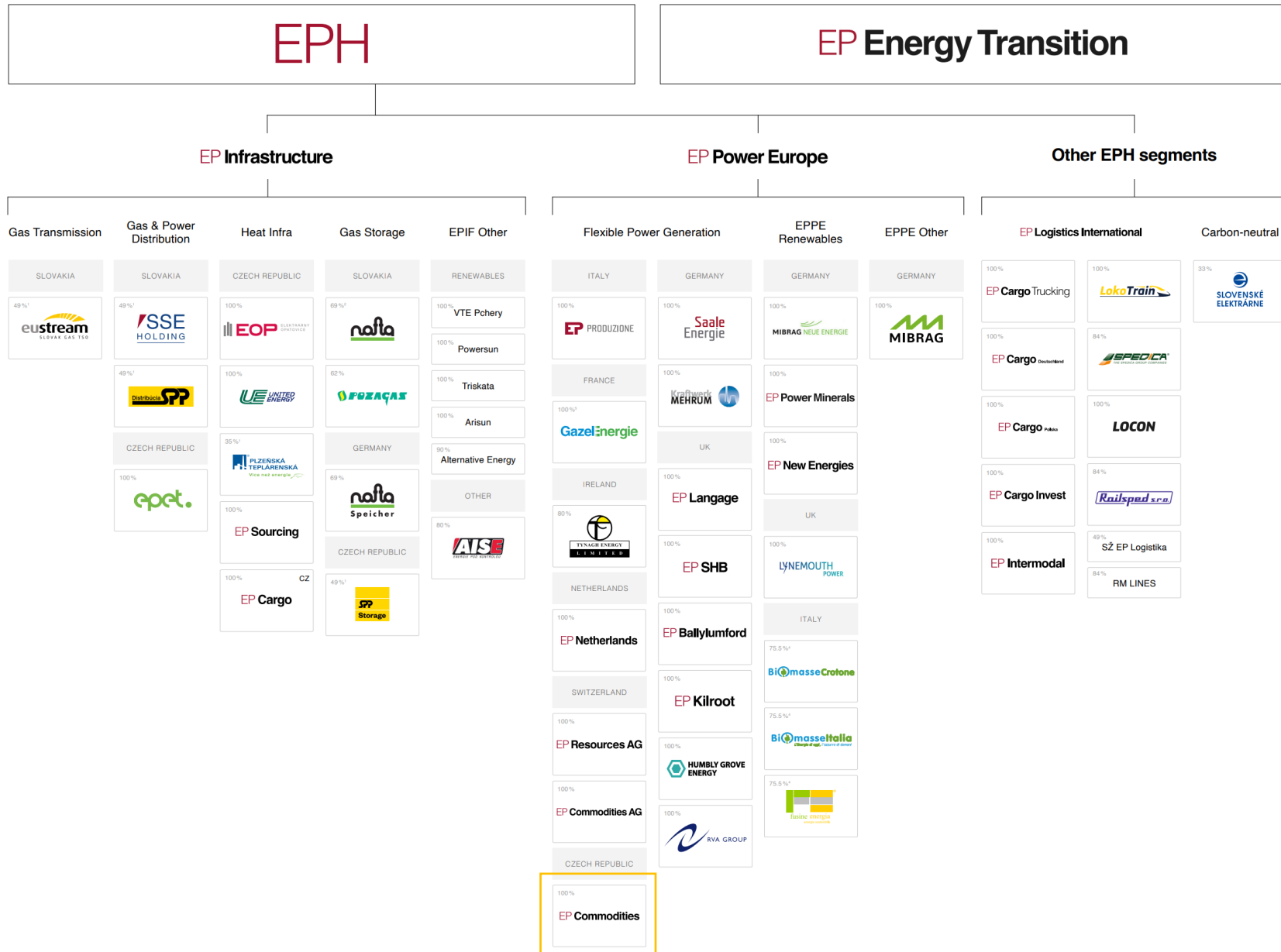One of Europe's leading producers of energy from traditional sources

Read more

Mining

Operator of the second largest mining company in Germany

Read more

| 💧 Gas | ◇ Lignite | ⬡ Hard coal | 🌀 Wind | 🍃 Biomass | ☀ Sun | ⇄ Trading | 🏢 Residency |

✔ Czech Republic ✔ France ✔ Germany ✔ Ireland ✔ Italy ✔ Netherlands ✔ Switzerland ✔ United Kingdom

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4

From EP **Holding** through EP **Power Europe** to EP **Commodities**

The most important slide – Quant dev vs. Delivery center dev
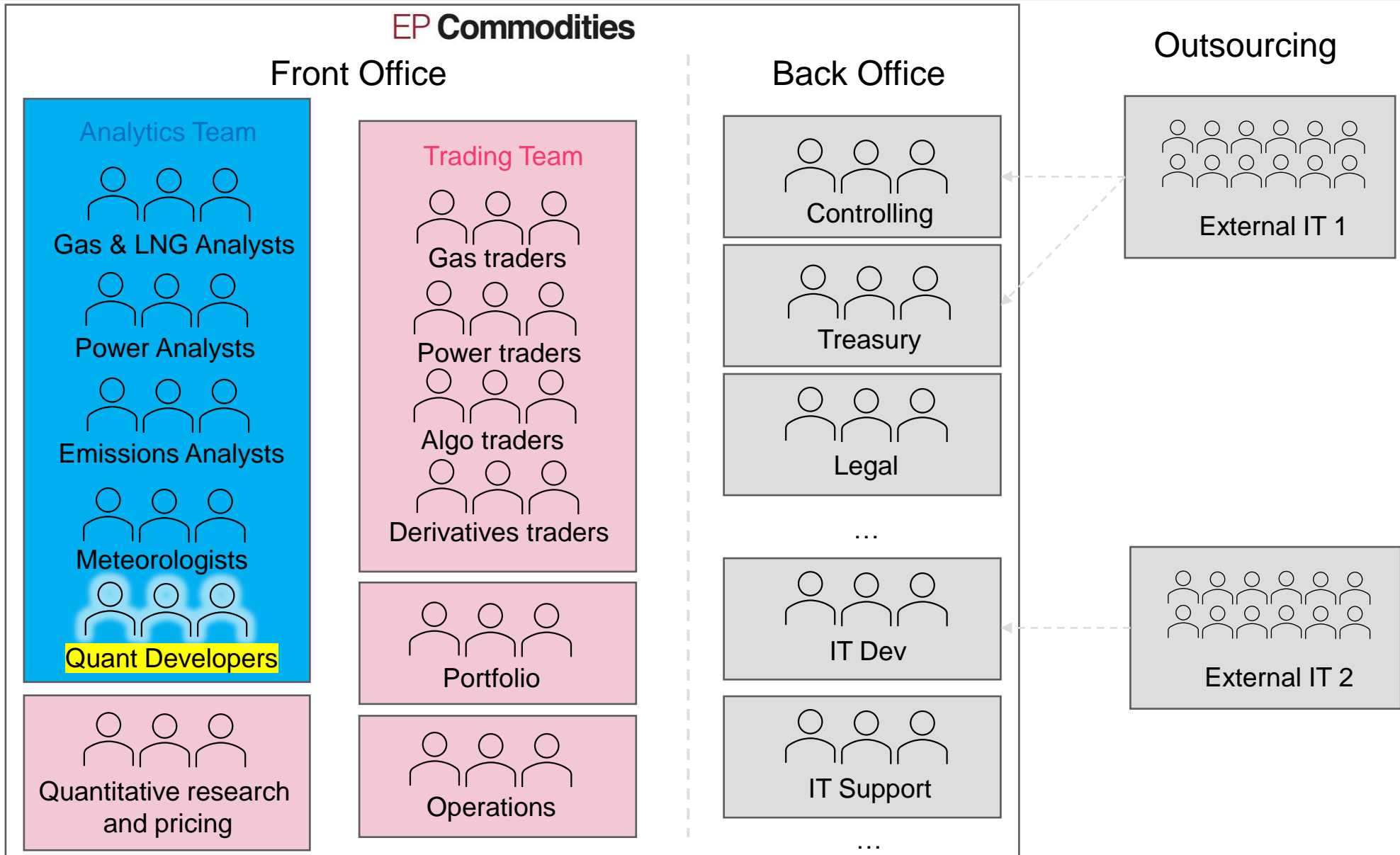
There are three ways to make a living in this business: **be first; be smarter; or cheat**. Now, I don't cheat. And although I like to think we have some pretty smart people in this building, it sure is a hell of a lot easier to just be first.

Fundamental analytics of energy markets

Market fundamentals

Power example

	UK	NL	FR	DE
Residual Load (GWh/d)	15	-30	-5	30
Price (EUR/MWh)	70	55	60	90

Demand – (Wind + Solar) = Residual Load
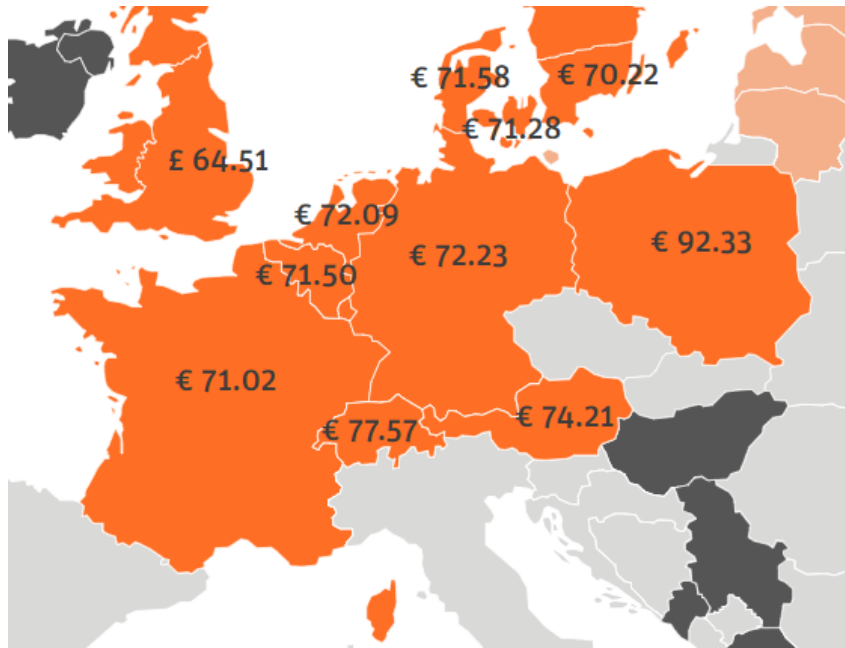Demand – (Wind + Solar + Nuclear + Hydro) = Adjusted Residual Load

Gas example

Date	Supply	Demand	Storage	Imbalance
Winter	840	-1060	146	-74
Summer	793	-551	-144	98

Demand + Production + Border Flows + LNG + Storage = Balance
Storage + Balance = IMBALANCE STORAGE

Location spreads

£ 64.51
€ 71.58   € 70.22
€ 71.28
€ 72.09
€ 71.50   € 72.23   € 92.33
€ 71.02
€ 77.57   € 74.21

Time spreads

Arbitrage

Market price

Expectation

Buy now & store it ≈ future price

What about Liquidity and Volatility?

Winter — Summer
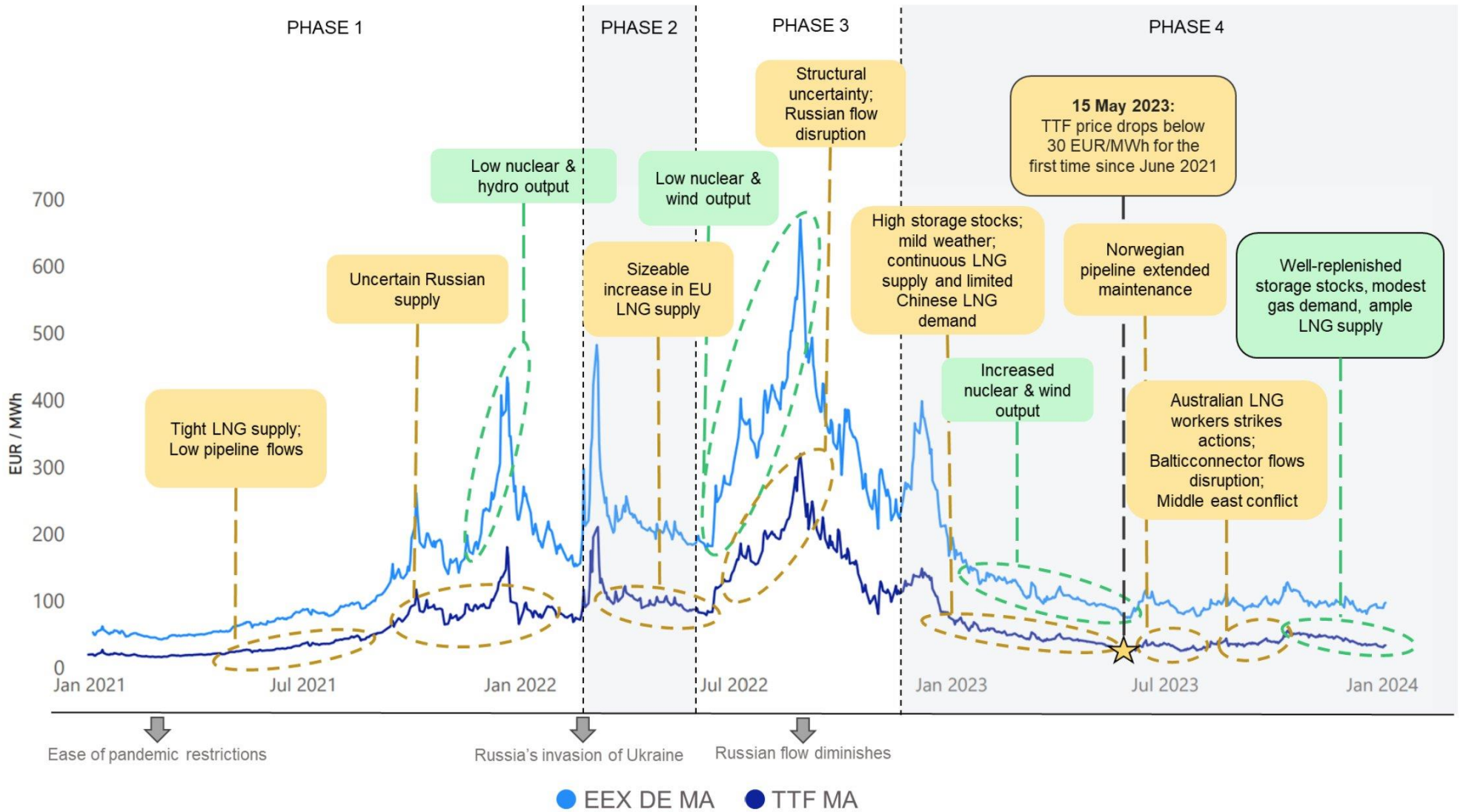
How do we decide: Combination of: **Fundamental Analysis**, Technical Analysis, Open Interest, Commitments of Traders, Option Analysis, …

EU Gas & Power market

How to make money on the energy market

Asymmetrical reaction of market – bad vs good news

"**Buy low, sell high**" remains a timeless strategy.

Additionally:

"Buy high, sell even higher" suggests capitalizing on momentum.
"Sell low, buy even lower" hints at attempting to catch falling prices, often a risky endeavour.
"Buy the rumour, sell the news" advises capitalizing on market expectations before and after significant events.
"Cut your losses short, let your profits run" emphasizes the importance of minimizing losses quickly while allowing profitable trades to continue.
"The trend is your friend" suggests following the direction of market trends for successful trading.
"Don't try to catch a falling knife" warns against attempting to buy assets that are rapidly declining in value without clear indicators of a reversal.

Let's trade

NL Gas (TTF): https://www.tradingview.com/chart/?symbol=NYMEX%3ATTF1%21
DE Power (DEB): https://www.tradingview.com/chart/YvghIZYz/?symbol=NYMEX%3ADEB1%21

Tech analysis indicators: MACD, BBW, RSI …: https://www.tradingview.com/ideas/relativestrengthindex/

The EPIC life of a quantitative developer

What my mom thinks I do

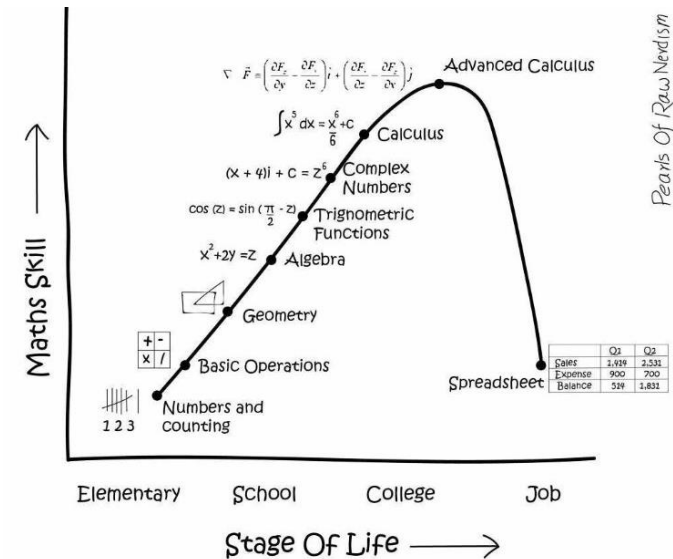What my co-workers think I do

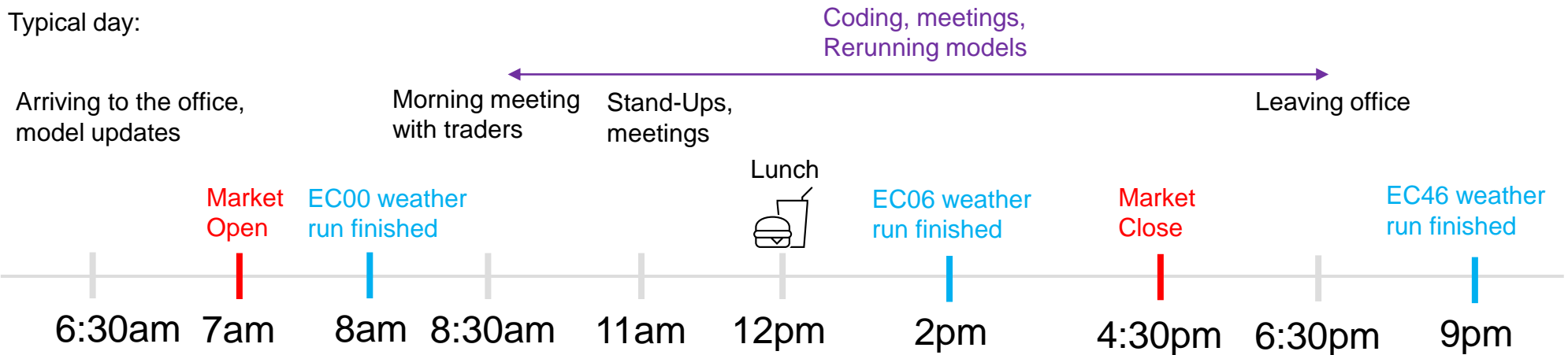What my friends think I do

What my family thinks I do

What I think I do

What I really do

Life in the Front Office

Typical day:

Coding, meetings,
Rerunning models

Arriving to the office,
model updates

Morning meeting
with traders

Stand-Ups,
meetings

Leaving office

Lunch

Market
Open

EC00 weather
run finished

EC06 weather
run finished

Market
Close

EC46 weather
run finished

6:30am 7am 8am 8:30am 11am 12pm 2pm 4:30pm 6:30pm 9pm

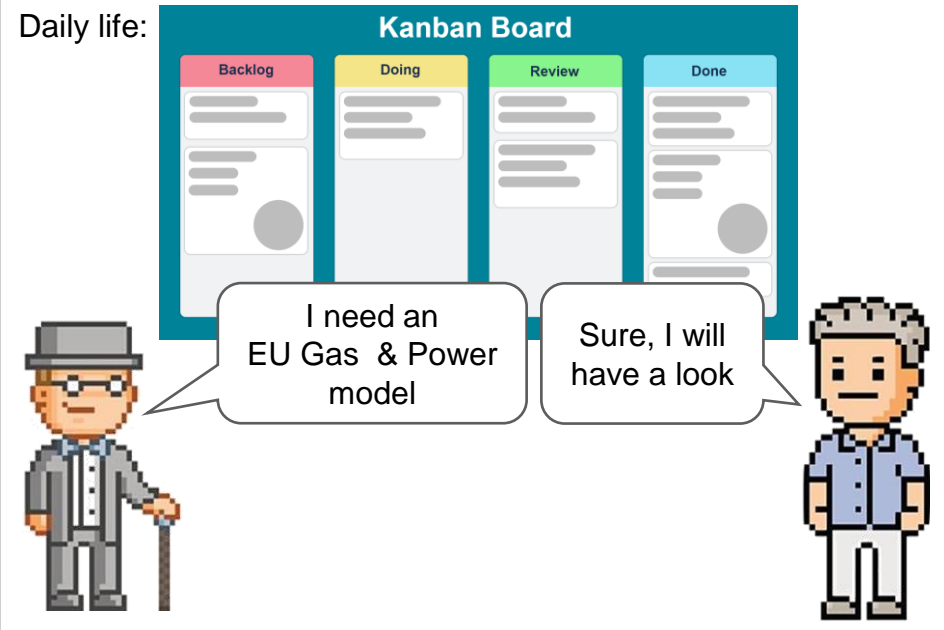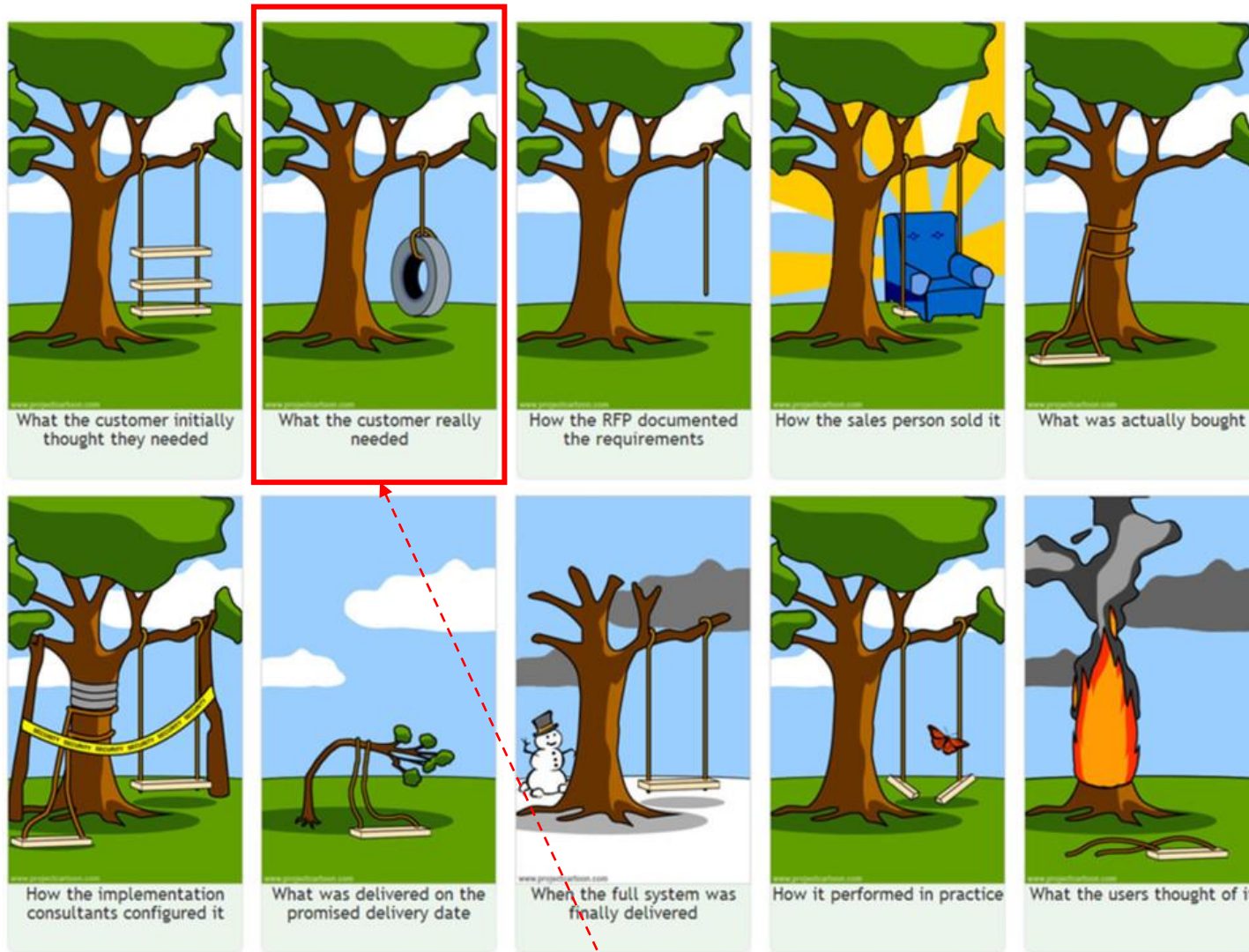**Yearly life:**
- January – Peak winter, Ski trip
- February – High wind
- March – End of winter season, Bonus, Company Ski trip
- April – Start of summer season, first storage injections
- May – Summer heatwave warnings, Holiday no 1.
- Jun – Holding meetings
- July – Maintenance season starts, Holiday no 2.
- August – Peak summer, high solar – negative power prices
- September – FR strikes season
- October – Start of Gas year, start of winter season
- November – Seasonal weather forecasts, first cold spells, storage withdrawals
- December – Christmas/New Year low demand period, Holiday no 3.

Daily life:

Kanban Board

| Backlog | Doing | Review | Done |

I need an
EU Gas & Power
model

Sure, I will
have a look

From "Tactical" to Production solutions

As a technical professional, **avoid over-complicating or overthinking solutions**.
Leveraging **market knowledge** will help you strike the right balance between complexity and the value your solution delivers to users.

Use case 1: Building Gas S&D (Supply and Demand) model – Excel

https://gasdashboard.entsog.eu/
https://gas.kyos.com/gas
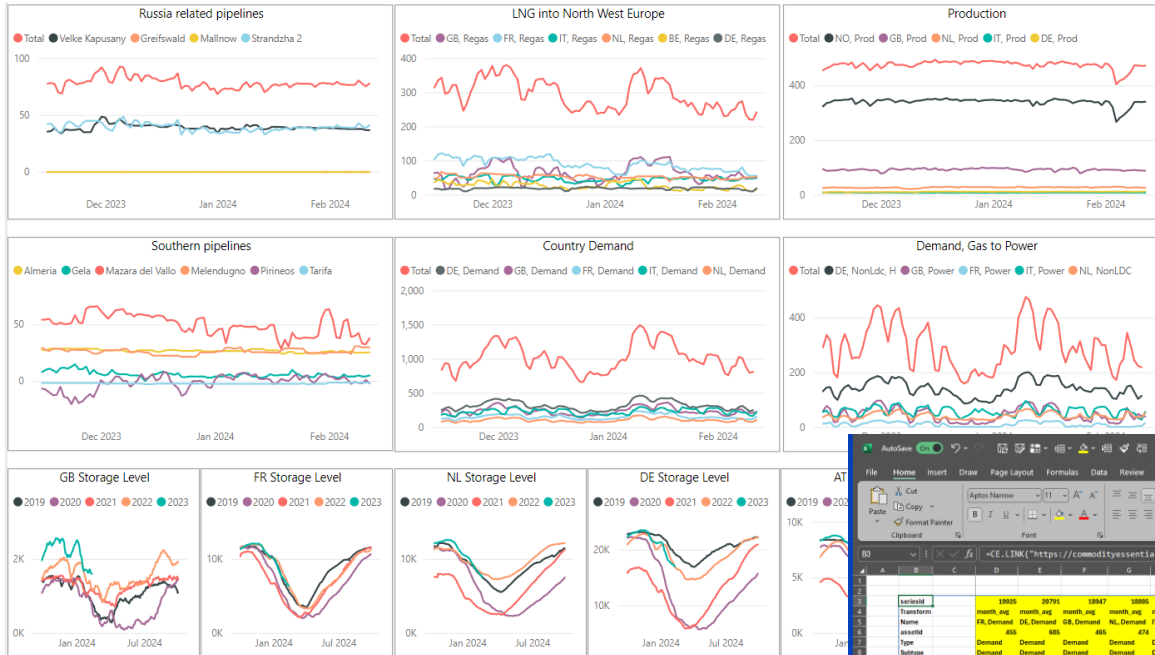https://commodityessentials.com/
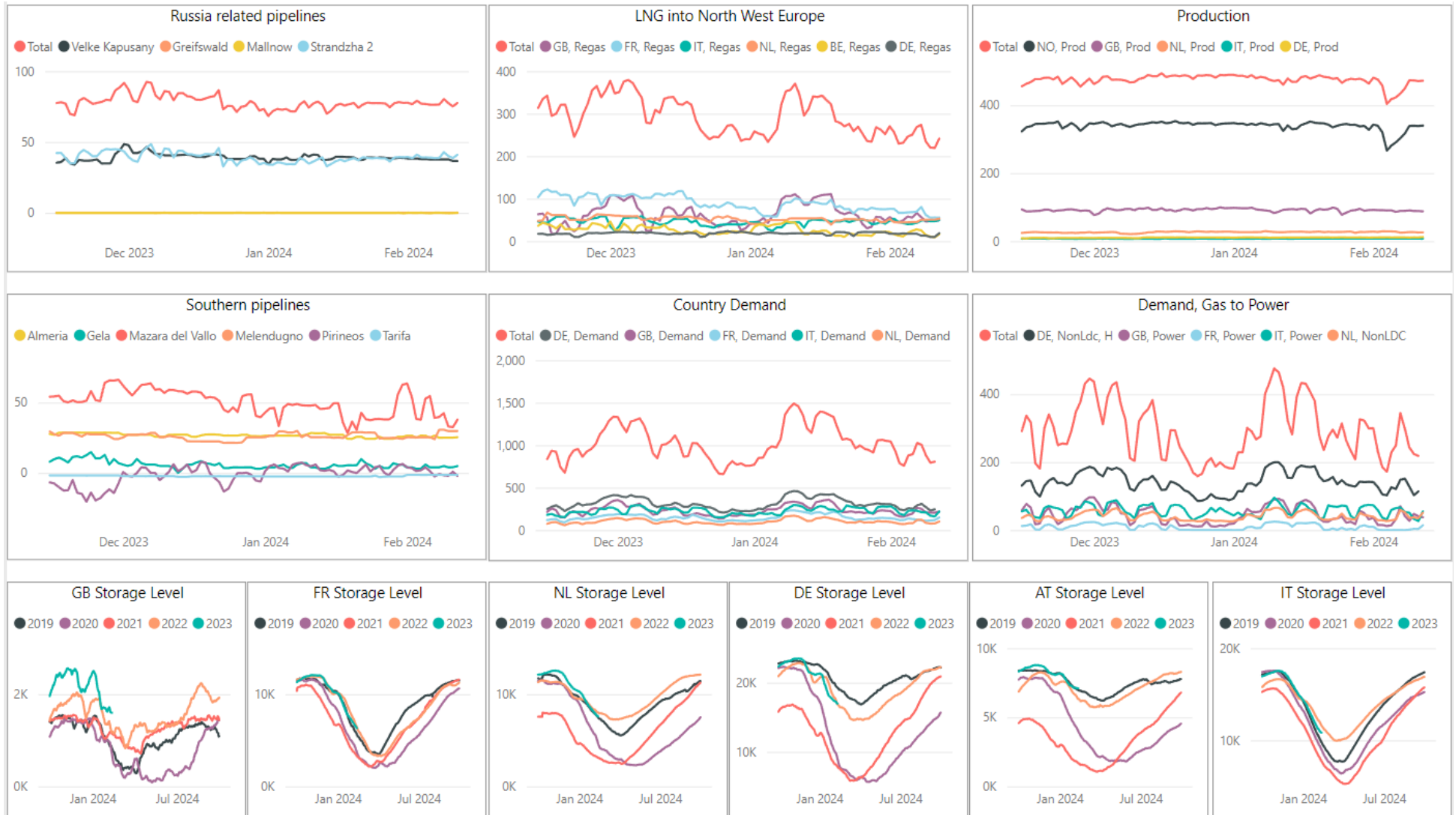
Use case 1: Building Gas S&D (Supply and Demand) model – Excel

Offers an API and Excel Add-In.
We've successfully obtained a university license for **EPIC**

Excel spreadsheets can utilize externally built functionality. This includes formulas with API links.
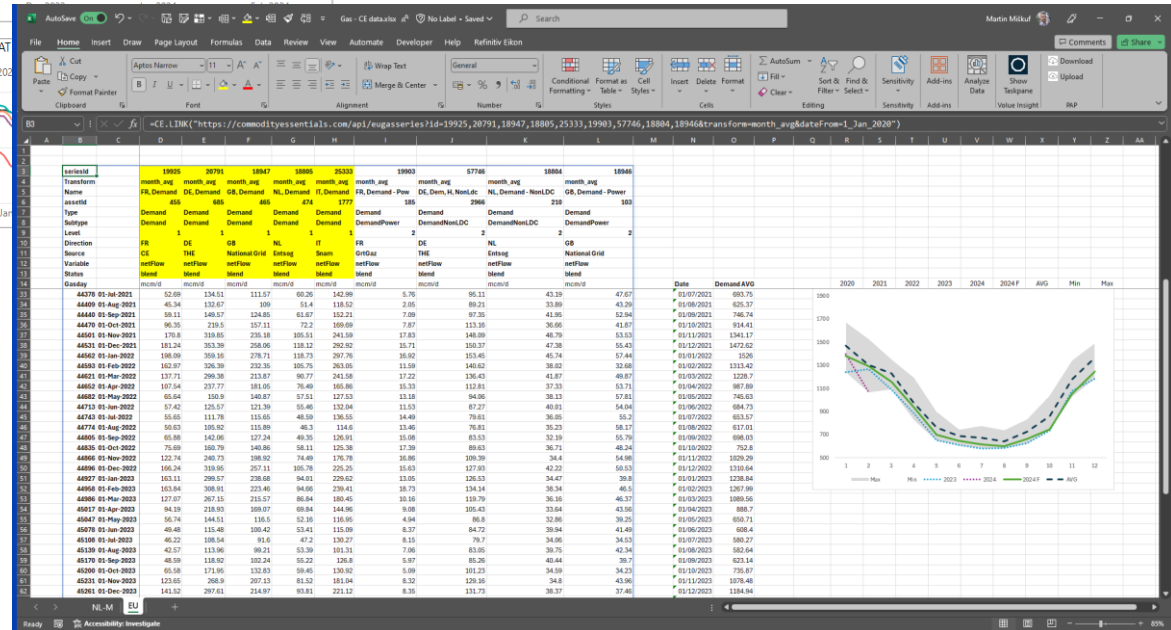
Use case 1: Building Gas S&D (Supply and Demand) model – Excel

"Tactical solution" / There are three ways to make a living in this business: **be first**; **be smarter; or cheat**.

Excel spreadsheets
APIs
Excel connections
Excel Add Inns

External Data 1

External Data 2

…

External Data n

Users
Can easily get data
Build models
But everything is "manual"

Office

WFH

SharePoint

Costs are almost nothing, not great reliability, great for prototyping
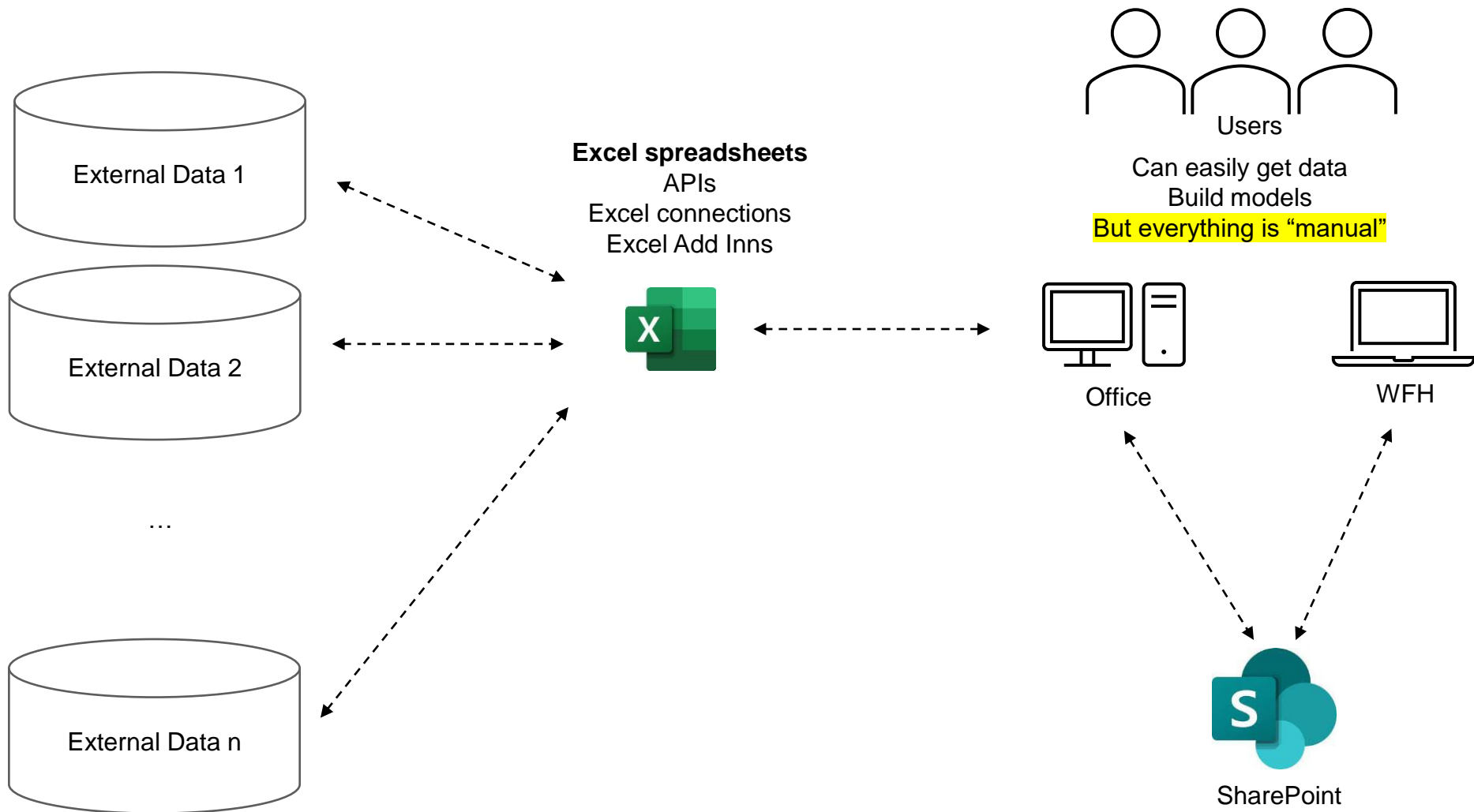
Use case 2: Building Power S&D model – Excel & Python

Electricity production and spot prices in Germany in 2024

https://energy-charts.info/charts/price_spot_market/chart.htm?l=en&c=DE&interval=year&year=2023&legendItems=011111110000000

Use case 2: Building Power S&D model – Excel & Python

Excel spreadsheets updated by
Python script using [OpenPyXL](#) package

Excel spreadsheets using
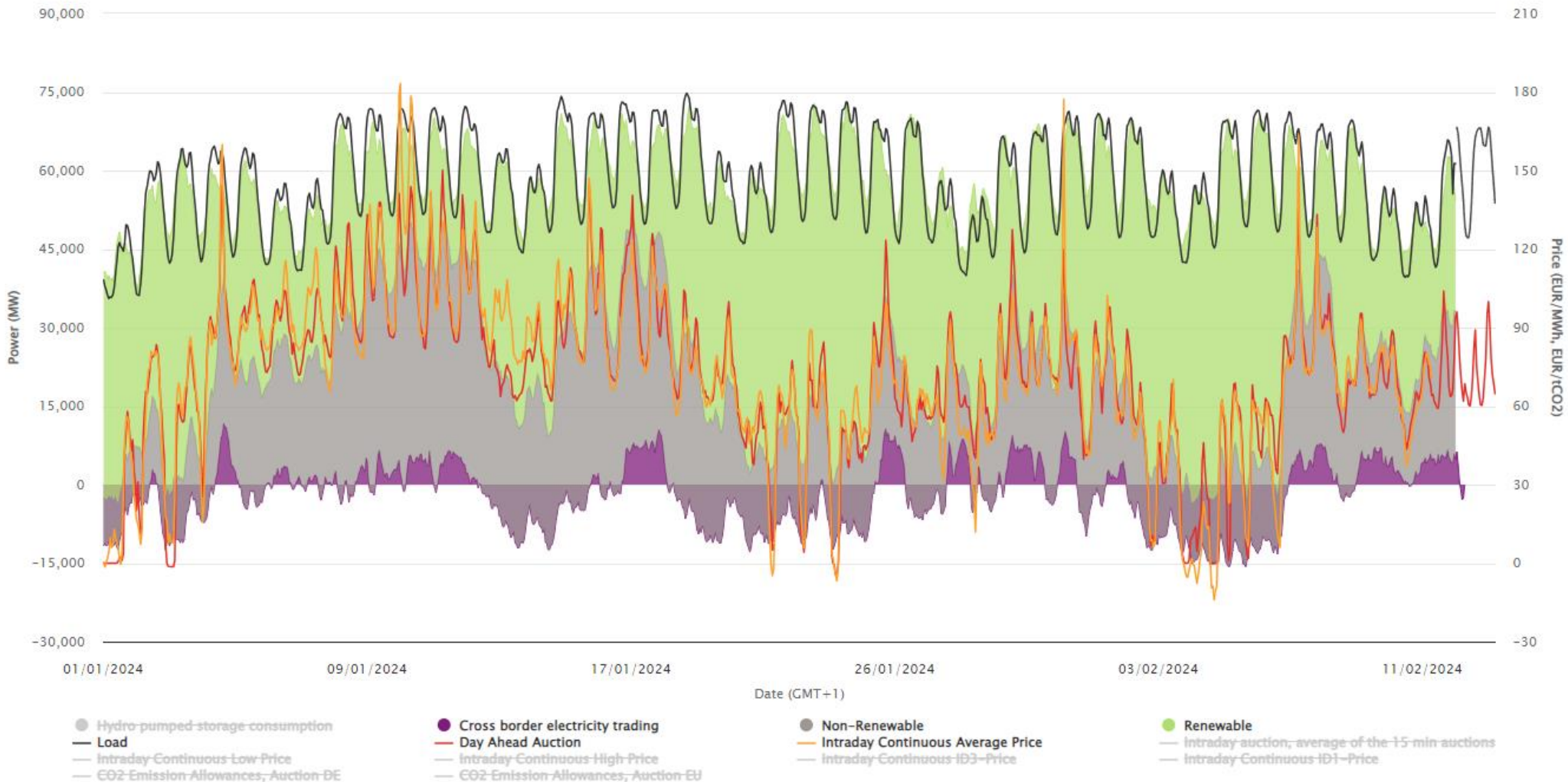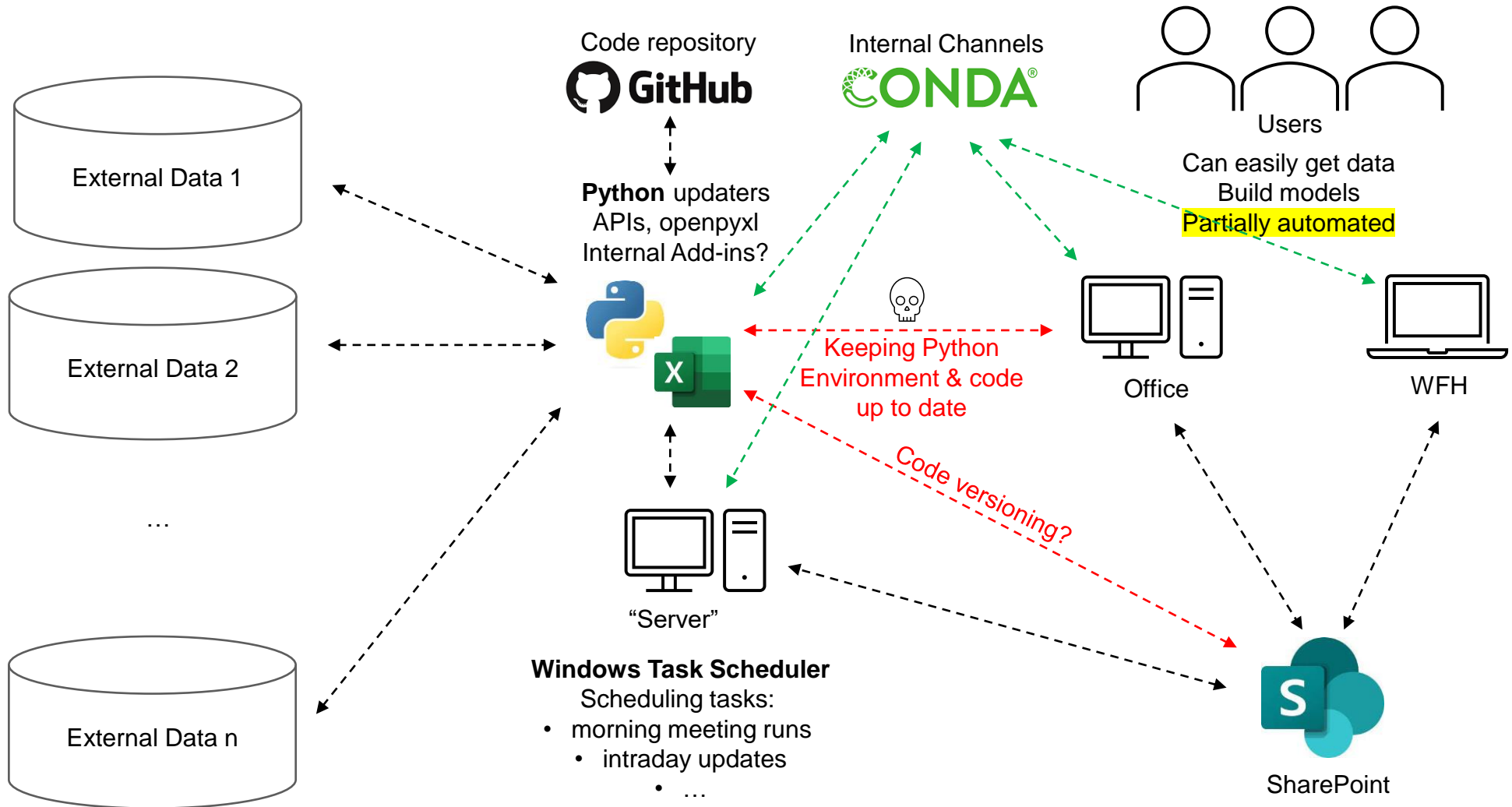an internal Excel Add-in JavaScript

[The Zen of Python](#)
[KISS principle](#)

Use case 2: Building Power S&D model – Excel & Python

"Tactical solution" / There are three ways to make a living in this business: **be first**; **be smarter**; or **cheat**.

Code repository
GitHub

Internal Channels
CONDA

Users
Can easily get data
Build models
Partially automated

External Data 1

External Data 2

...

External Data n

Python updaters
APIs, openpyxl
Internal Add-ins?

Keeping Python
Environment & code
up to date

Code versioning?

Office

WFH

"Server"

Windows Task Scheduler
Scheduling tasks:
- morning meeting runs
  - intraday updates
    - ...

SharePoint

Getting more complicated, better reliability, costs are going up

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21

Use case 3: Building Power DA model – Cloud Based Python Analytics Platform

More countries, every hour

Social welfare maximization
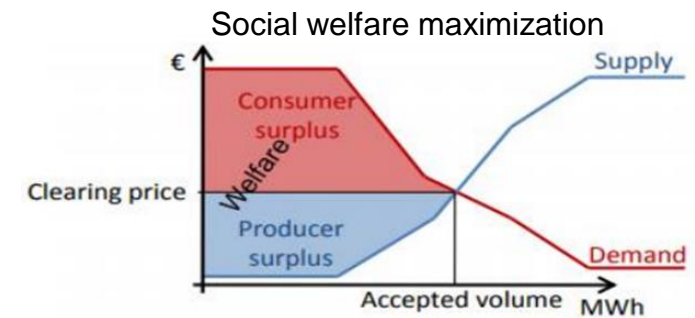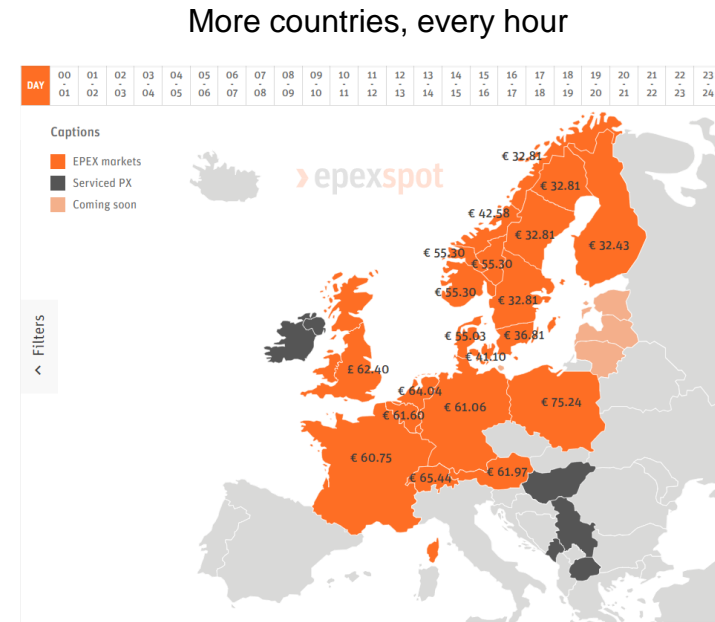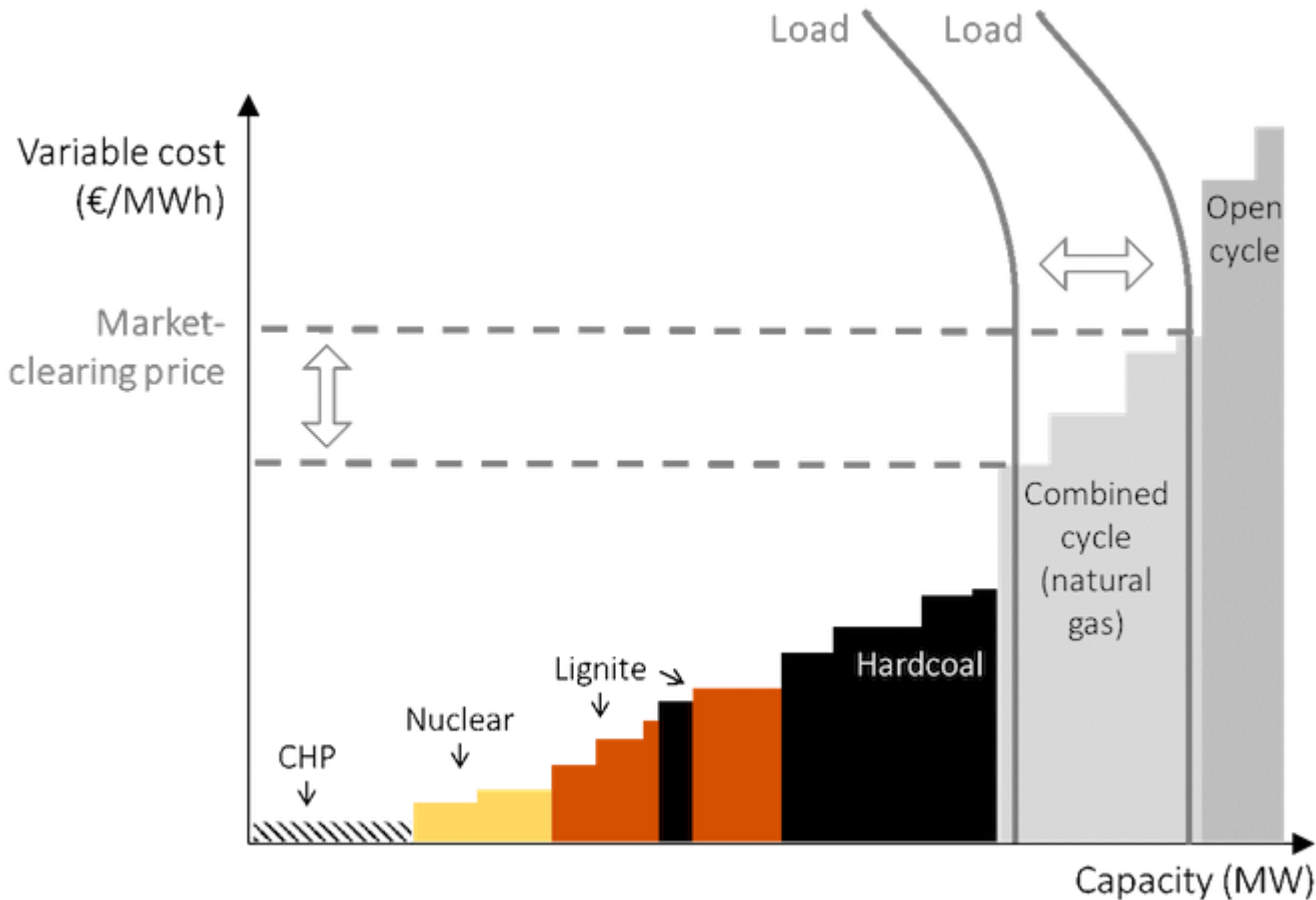
Merit – order model: http://open-electricity-economics.org/book/text/04.html
EUPHEMIA Public Description: https://www.epexspot.com/sites/default/files/2020-02/Euphemia_Public%20Description_Single%20Price%20Coupling%20Algorithm_190410.pdf
Aggregated curves: https://www.epexspot.com/en/market-data

Stack for the Cloud Based Python Analytics Platform

Cloud Analytics Platform
Running analytics, controlling, trading & algo-trading models

Users

Both up to date ☠

WFH

Office

nexus repository
Internal Channels

Manual Install and Configuration

Client apps

Azure Load Balancer

Azure Kubernetes Service (AKS)

Azure Cosmos DB

Front end

Back-end services

Ingress

Namespace

Namespace

SQL Database

API Services

Web App

Namespace

Kubernetes cluster

CI/CD

Argo Update

Docker push

Azure Container Registry

Docker pull

Dev/Ops

Role-based access control

Azure Active Directory

Virtual network

Azure Key Vault

Service Bus

CI/CD
PEP8 formatting
Testing
Tagging
Publishing packages to internal channels
Releasing on Could Platform

Devs

Getting very complex, better reliability, costs high (cloud services, devs, devops, …)

Aspiring to Become an **EPIC** Quantitative Developer

To excel as a quantitative developer:

- Master Programming Languages: Become proficient in languages like Python, R, C++, or Java.
- Learn Statistical Techniques: Understand concepts like probability theory, regression analysis, and machine learning algorithms.
- Acquire Domain Knowledge: Deepen your understanding of financial markets, products, and mathematical models.
- Practice Problem-Solving: Sharpen analytical skills through regular problem-solving and participation in coding competitions.
- Familiarize with Quantitative Tools: Gain proficiency in tools like pandas, NumPy, TensorFlow, or MATLAB.
- Stay Updated: Keep informed about new methodologies, technologies, and market trends in quantitative finance.
- Develop Communication Skills: Effectively convey complex concepts to technical and non-technical stakeholders.
- **Gain Practical Experience: Seek internships or entry-level positions to apply theoretical knowledge in real-world scenarios.**
- Build a Strong Portfolio: Showcase quantitative skills through a well-curated portfolio or GitHub repository.
- Continuously Improve: Embrace lifelong learning to expand expertise in quantitative finance and software development.

The Power of Tiny Gains

1% better every day $\quad 1.01^{365} = 37.78$

1% worse every day $\quad 0.99^{365} = 0.03$

Improvement or Decline

1 Year
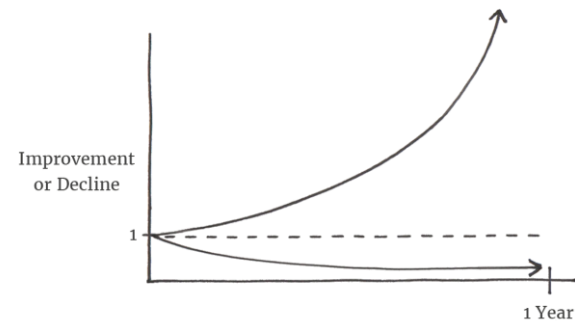
Marginal gains refer to small incremental improvements made in various aspects that collectively lead to significant overall improvement.

1998 1999 2001 2004 2005 2007 2008 2009 2010
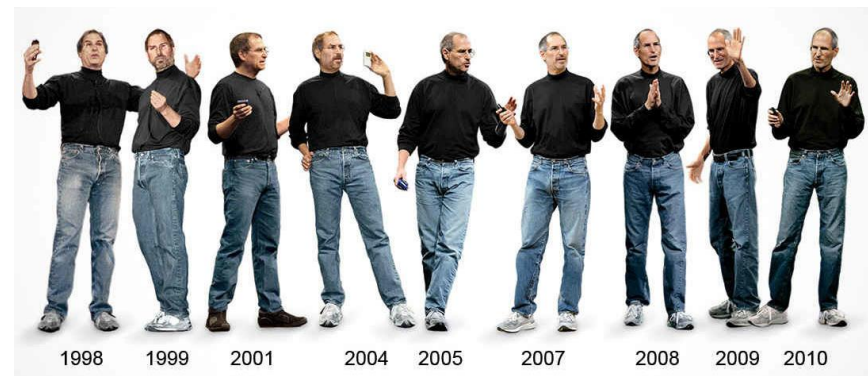
Decision fatigue refers to the deteriorating quality of decisions made by an individual after a long session of decision making.

EP **Innovation Centre** – *"Every journey starts with the first step"*

☐ **Enhancing Education and Research Quality**: Collaboration aims to elevate the quality of education and research at TUKE through innovative initiatives.

☐ **Skill Development in Commodity Market**: Provides a unique opportunity for students to acquire valuable skills in commodity market analysis and trading, fostering practical knowledge alongside academic learning.

☐ **Centre of Excellence - TECHNICOM Office**: TUKE hosts a Centre of Excellence where talented students can access the TECHNICOM office, equipped with excellent hardware and resources for hands-on learning.

☐ **Opportunities for Exposure**: Students have the chance to visit trading offices in Europe and the UK, gaining exposure to real-world trading environments and networking opportunities.

☐ **Empowering Talent**: The collaboration empowers talented students to excel by providing them with resources, mentorship, and opportunities to thrive in the field of commodities trading and analytics.

☐ **Interested? Contact us for more information.**

  ▪ erik.kajati@tuke.sk

  ▪ iveta.zolotova@tuke.sk

  ▪ martin.miskuf@epcommodities.cz

In May 2023, the research and innovation center EPIC was inaugurated within the TECHNICOM facility

Captivating snapshots of university students exploring our London office in September 2023.
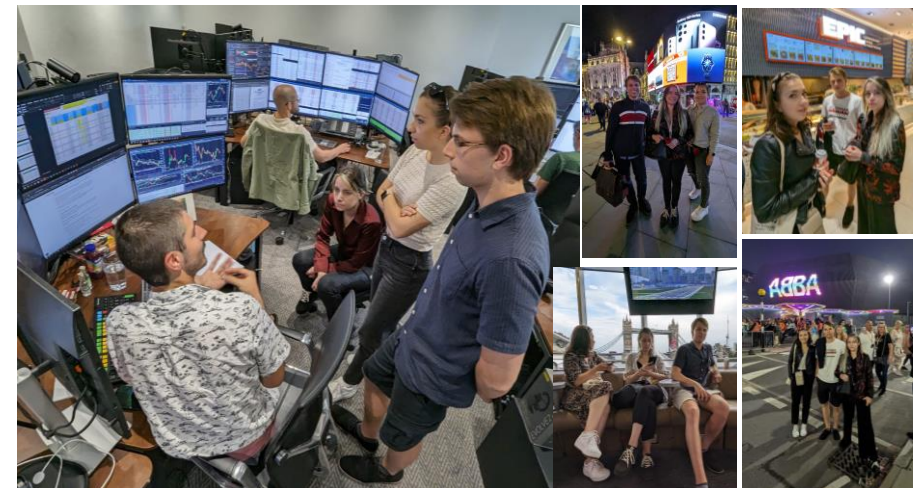
Q&A and some useful links

- LinkedIn
  - Lion Hirth (Prof. energy study programme in DE): https://www.linkedin.com/in/lionhirth/
  - Gabriele Martinelli (Reuters power): https://www.linkedin.com/in/gabriele-martinelli-10bb1819/
  - Joachim Gessner (Bloomberg News): https://www.linkedin.com/in/joachimgessner/
  - Tom Marzec-Manser (ICIS Gas): https://www.linkedin.com/in/tom-marzec-manser/
  - Matthew Jones (ICIS Power): https://www.linkedin.com/in/matthew-jones-5a25862a/
  - Jonathan Howells (Market reports): https://www.linkedin.com/in/jhhowells/
  - Marcello Kolax (Tech Analysis): https://www.linkedin.com/in/marcello-kolax/
  - Stefan Feuchtinger (Emissions): https://www.linkedin.com/in/steffeuchtinger/

- EMBER: https://ember-climate.org/insights/
  - European Electricity Review 2024: https://ember-climate.org/insights/research/european-electricity-review-2024/

- BRUEGEL: https://www.bruegel.org/keyword/energy
  - European natural gas imports: https://www.bruegel.org/dataset/european-natural-gas-imports
  - Europe's under-the-radar industrial policy: https://www.bruegel.org/policy-brief/europes-under-radar-industrial-policy-intervention-electricity-pricing

- IEA reports https://www.iea.org/analysis?type=report
  - Electricity 2024: https://www.iea.org/reports/electricity-2024
  - Gas Market Report, Q1-2024 : https://www.iea.org/reports/gas-market-report-q1-2024

- Oxford Institute for Energy Studies: https://www.oxfordenergy.org/publication-topic/energy-insight/#

- Gas - ENTSOG: https://gasdashboard.entsog.eu/

- Power / Electricity - ENTSOE: https://transparency.entsoe.eu/

EP **Innovation Centre** – collaboration bc., Ing., PhD. Theses & Projects

❑ UK Analytics, Quant and Trading department will specify some projects which will be consulted with university.

❑ We can categorize tasks into 2 groups:

- Research projects (bc., Ing., PhD. dissertations)
  - Modelling energy markets using Composite AI
  - Energy security of Europe / Industry 5.0
  - Game-theoretic modelling of energy markets
  - Algorithmic trading
  - Neuro-Dynamic Programming
  - Structured convex quadratic programming models
  - Statistics of Extremes
  - Statistical Methods for Trend Detection
  - Numerical Solutions for Stochastic Differential Equations
- Engineering projects (Commercial projects)
  - Back testing & model tuning - Time expensive verification of models build by UK Quant and Analytics team
  - Building of POC (Proof of Concepts) for new technologies
  - Other MIMO (Most Ignored but Most Obvious) business challenges
  - Euphemia and SciPy vs Mosek – mixed integer problem

22	23	24	25	26	27	28
7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12

PhD. Student

PhD. Student

PhD. Student

Semestral Project | Master thesis | PhD. Student

Semestral Project | Master thesis | PhD. Student