


Auditing UK energy policy without a cluster: a laptop, a duck, and twenty years of wind


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DuckCon – 24th June 2026





DUCKDB: THE RISE OF IN-PROCESS ANALYTICS & DATA SINGULARITY


PT. 1





BARRY SMART



INTRODUCING DUCKLAKE: LAKEHOUSE ARCHITECTURE REIMAGINED FOR THE MODERN ERA




BARRY SMART




FABRIC BENCHMARKING PT.I SPARK vs PYTHON NOTEBOOKS

ROUND 1



BARRY SMART



endjin blog:
<https://endjin/blog>

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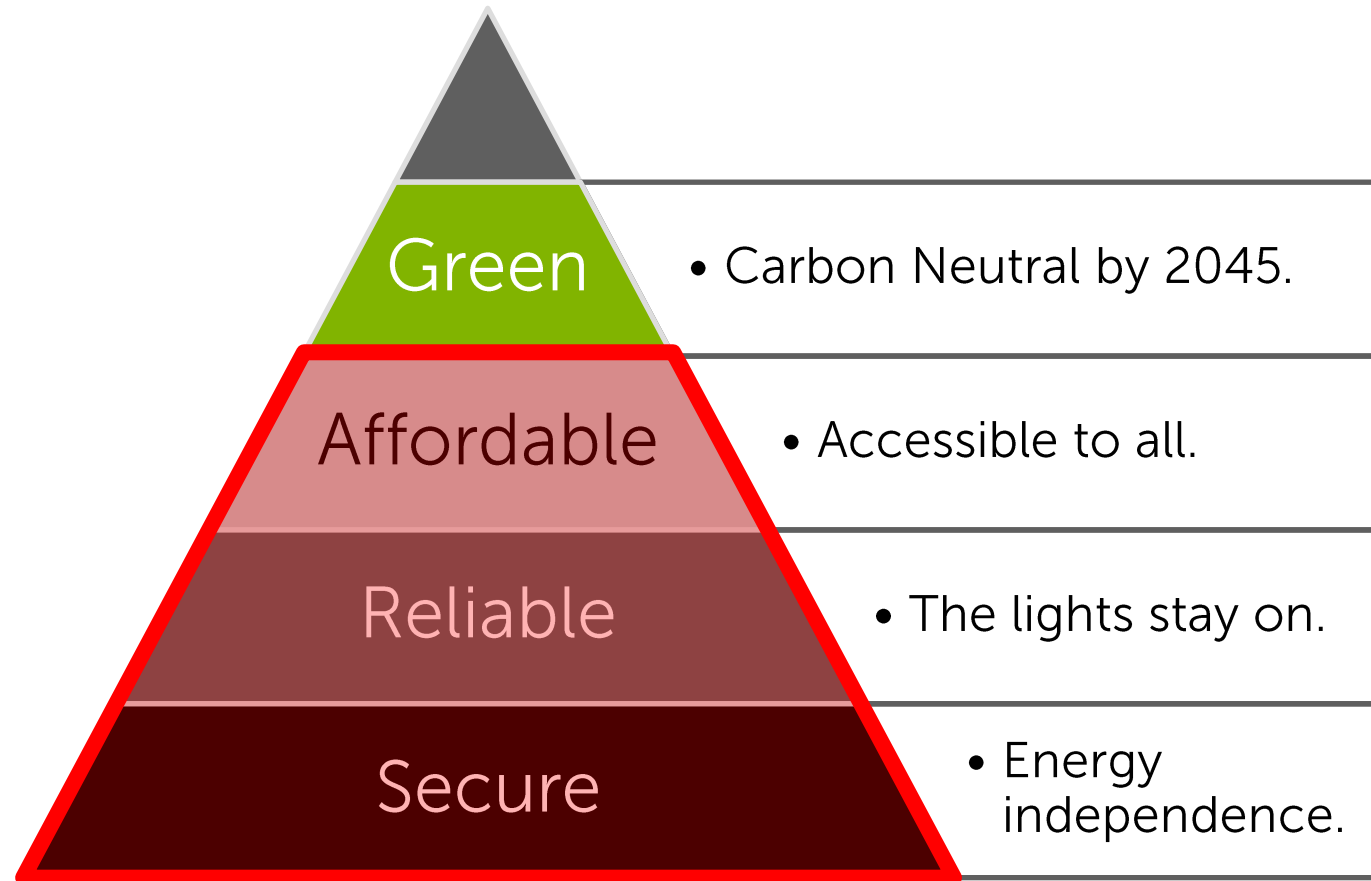
Engineering
Professor



Director of
Data & AI



Is the UK's energy policy on the right trajectory?



The Telegraph

'Dunkelflaute' sends wind power generation plummeting in UK and Germany

Meteorological phenomenon is highlighting the difficulties of transition to renewable energy

Published 05 November 2024

6:35pm GMT



WORLD

Spain and Portugal begin recovering from a massive blackout. Here's what to know

APRIL 28, 2025 · 7:32 PM ET






Energy bills to rise more than £200 a year as Iran war impacts UK households

POLITICS | ENERGY BILLS | OFGEM | IRAN | ⌚ Wednesday 27 May 2026 at 10:15pm

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20 Years of Open Data

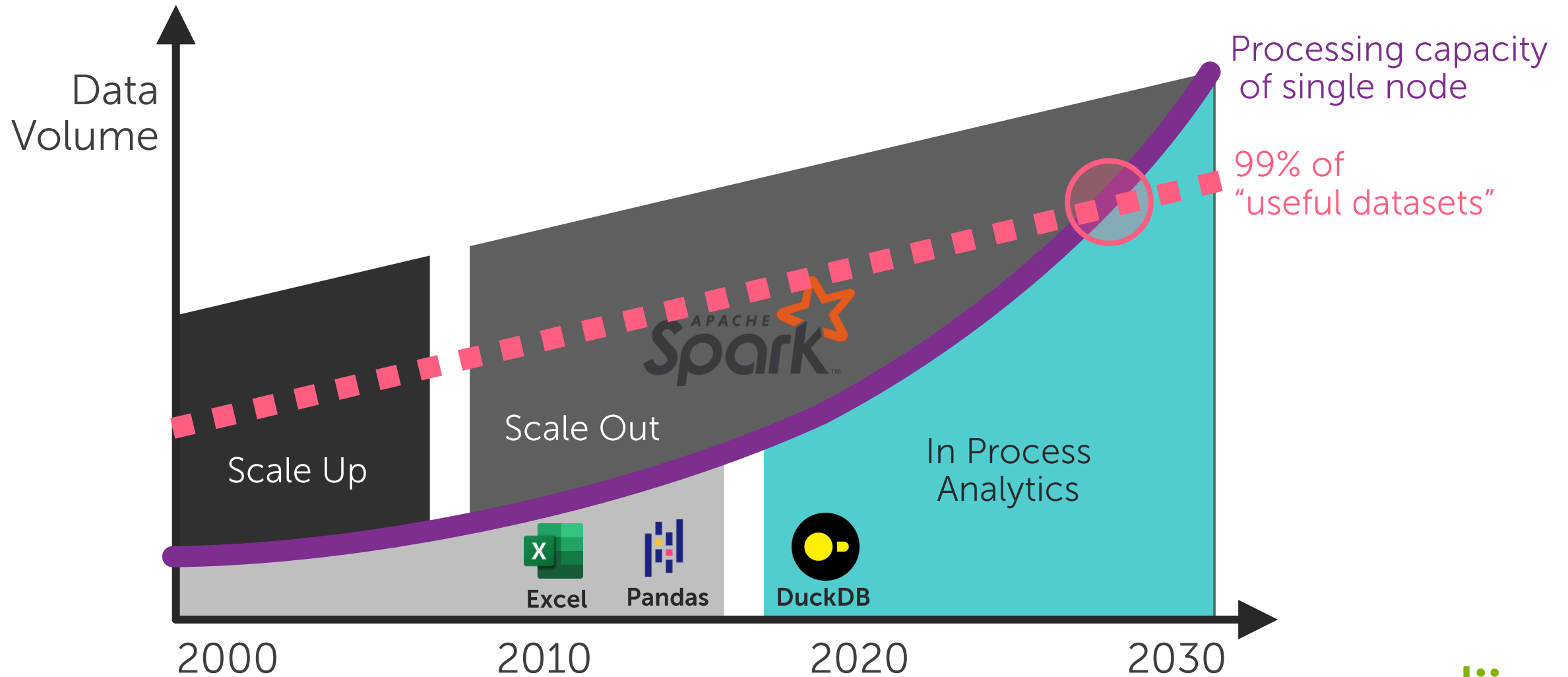
	UK electricity market data: gas, nuclear, wind, solar, storage etc.	REST API JSON payload 50M rows per year	5GB
	Historical weather data across 133 weather stations.	FTP CSV Files 1.2M rows per year	
	Renewable locations database: wind, solar, biomass, storage.	Excel Spreadsheet ~3000 rows	

2001: 50 man months , £500K

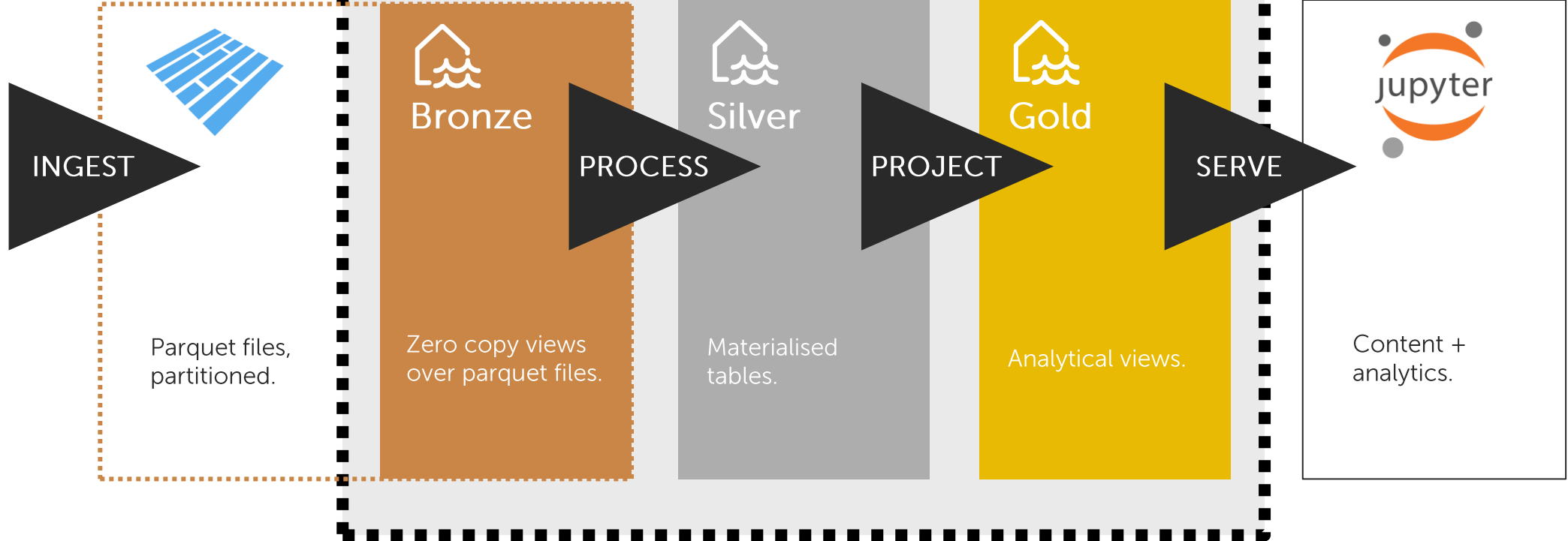


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2026: approaching the data singularity

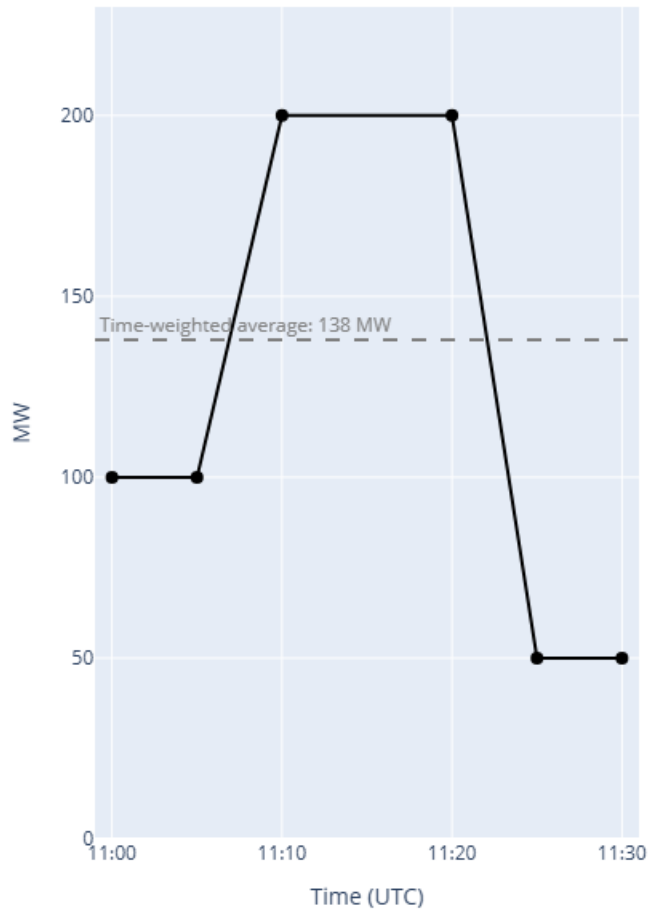


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Laptop | Cloud

Endjineering mindset: test driven development



Scenario: Applying time-weighted average to complex PN profile

Given the following Physical Notification data

settlement_date	settlement_period	time_from	time_to	level_from	level_to	national_grid_bm_unit
2024-12-16	23	11:00:00	11:05:00	100	100	T_CRUA-1
2024-12-16	23	11:05:00	11:10:00	100	200	T_CRUA-1
2024-12-16	23	11:10:00	11:20:00	200	200	T_CRUA-1
2024-12-16	23	11:20:00	11:25:00	200	50	T_CRUA-1
2024-12-16	23	11:25:00	11:30:00	50	50	T_CRUA-1

When I calculate Settlement Period average MW for Physical Notifications

Then the Settlement Period average result should match

national_grid_bm_unit	settlement_date	settlement_period	avg_mw
T_CRUA-1	2024-12-16	23	138

Testable units of functionality

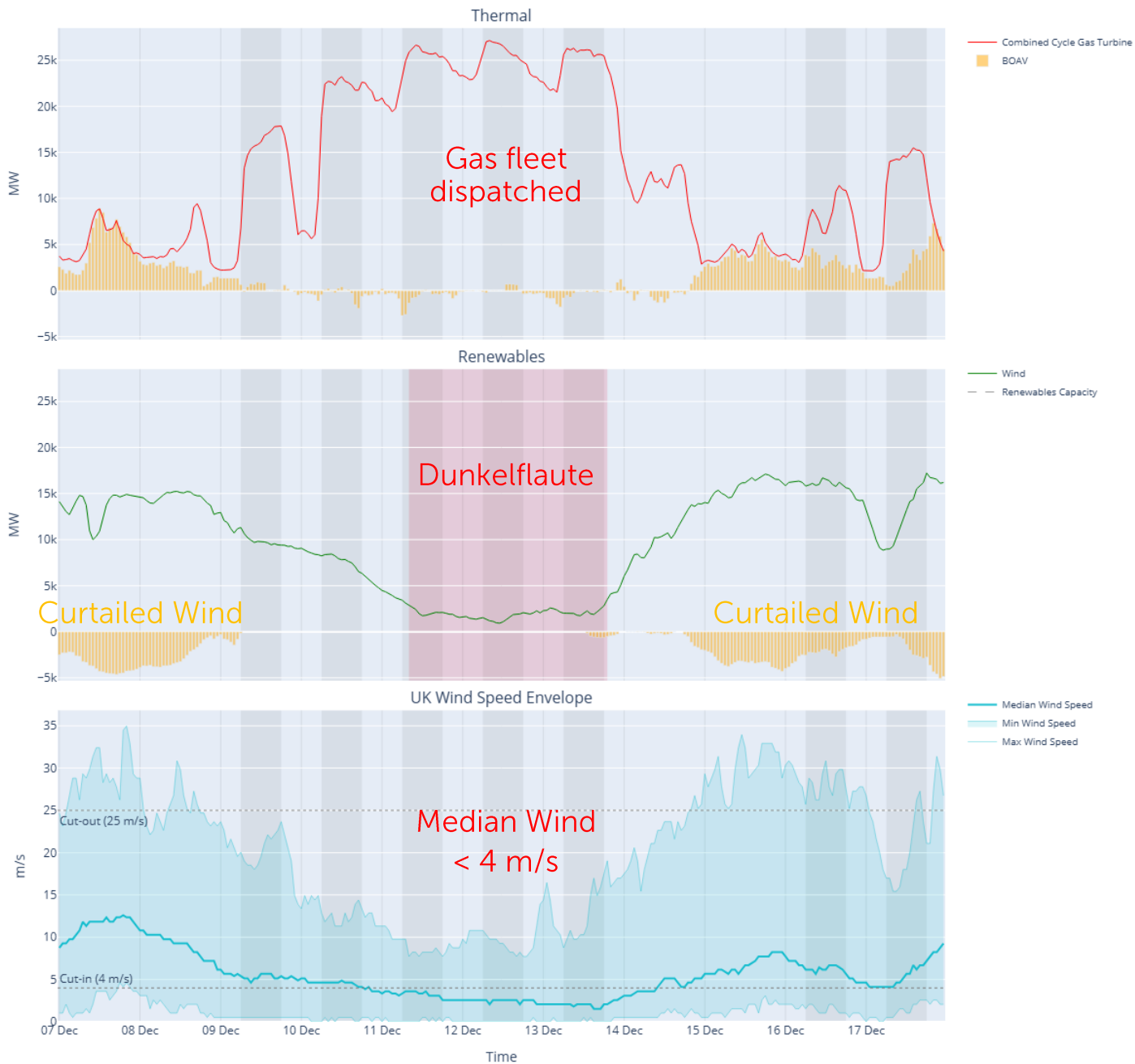
```
def calculate_sp_average_mw(self, rel: RelationType) -> RelationType:
    """Time-weighted average MW per BMU per settlement period.
    Point data (PN/MELS/MILS) can have multiple segments within a single SP,
    each with different durations. A segment's average power is
    (level_from + level_to) / 2. The SP average is weighted by segment duration.
    """
    return self.con.sql("""
        WITH segments AS (
            SELECT
                national_grid_bm_unit,
                settlement_date,
                settlement_period,
                (level_from + level_to) / 2.0 AS segment_avg_mw,
                EXTRACT(EPOCH FROM (time_to::TIMESTAMP - time_from::TIMESTAMP)) / 60.0 AS segment_minutes
            FROM rel
        )
        SELECT
            national_grid_bm_unit,
            settlement_date,
            settlement_period,
            (SUM(segment_avg_mw * segment_minutes) / SUM(segment_minutes))::INTEGER AS avg_mw
        FROM segments
        GROUP BY national_grid_bm_unit, settlement_date, settlement_period
    """)
```

Pipelines composed from functions

```
def pn_pipeline(self) -> RelationType:
    """Silver pipeline for PN: filter → SP avg → hourly."""
    rel = self.read_bronze('elexon', 'pn')
    rel = self.filter_demand_bmus(rel)
    rel = self.calculate_sp_average_mw(rel)
    rel = self.aggregate_bmu_hourly(rel)
    return rel

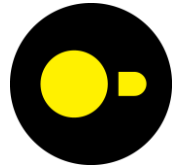
rel = self.pipeline()

self.con.execute(
    "CREATE OR REPLACE TABLE silver.pn AS SELECT * FROM rel"
)
```



Analysis of Dunkelflaute (koude donkere windstilte) 12th September 2024:

- grid operator aggressively fires up the fossil-fuel fleet
- gas was producing over 70% of the UK's electricity
- Energy prices spiked 10X
- Wind curtailed before and after Dunkelflaute!



DuckDB



50 man months, £500K



50 man hours

Large Team



Small Team

Capital intensive:
servers + licenses



Laptop + DuckDB

Socio-technical – data teams as innovation engines

