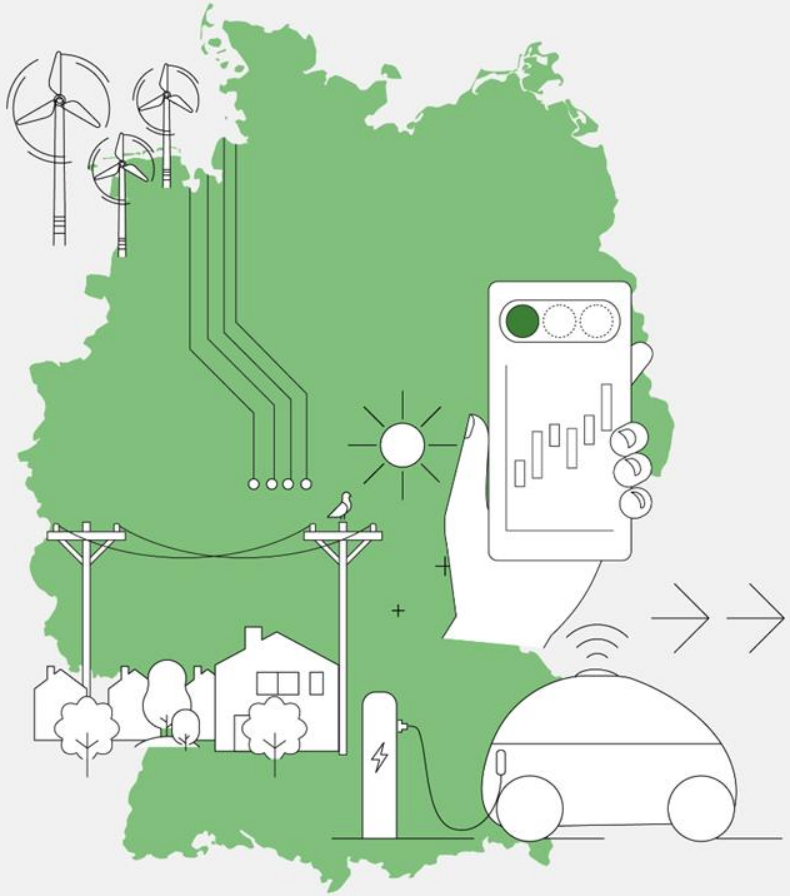

ENERGY INNOVATION BY UNTERNEHMER TUM

GRIDS & BENEFITS

GRID FEES FOR FUTURE: LOCAL, DYNAMIC AND TSO-DSO INTEGRATED

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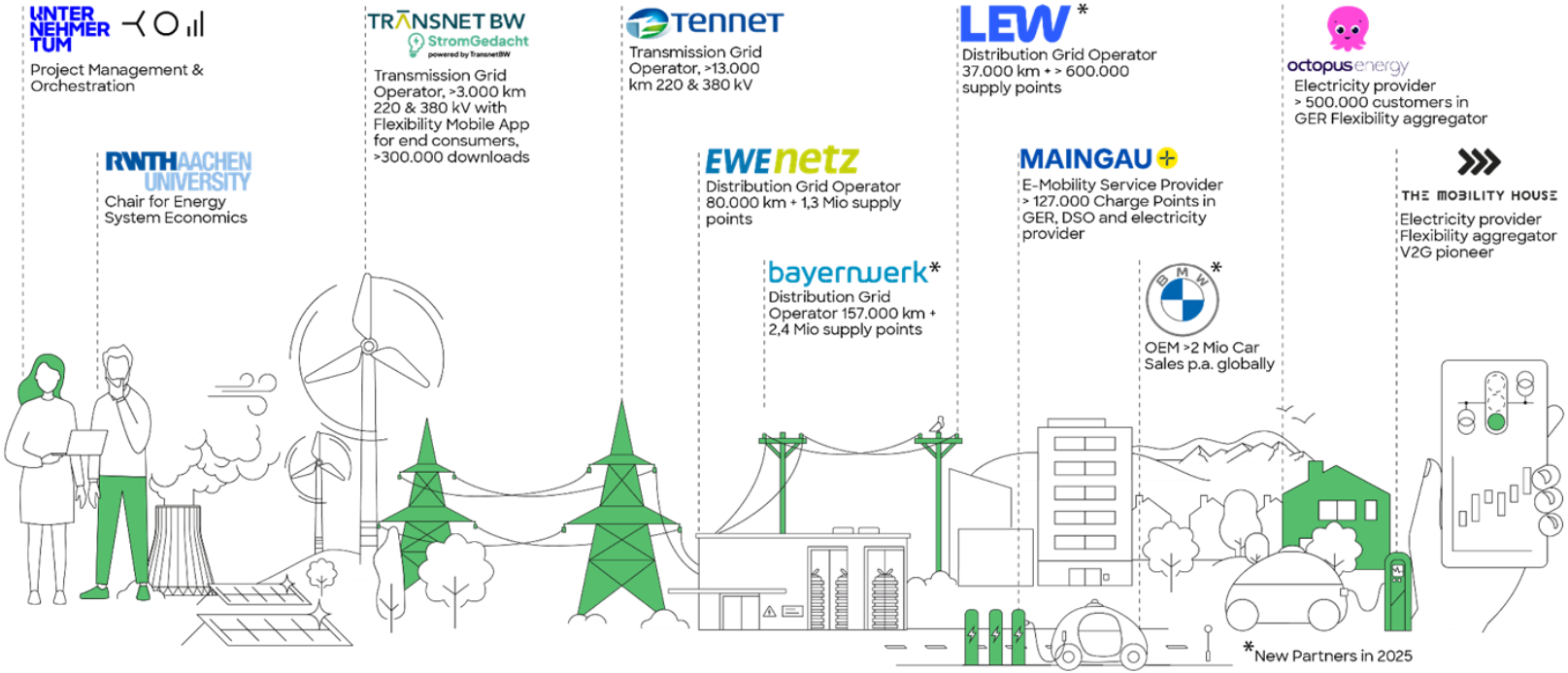
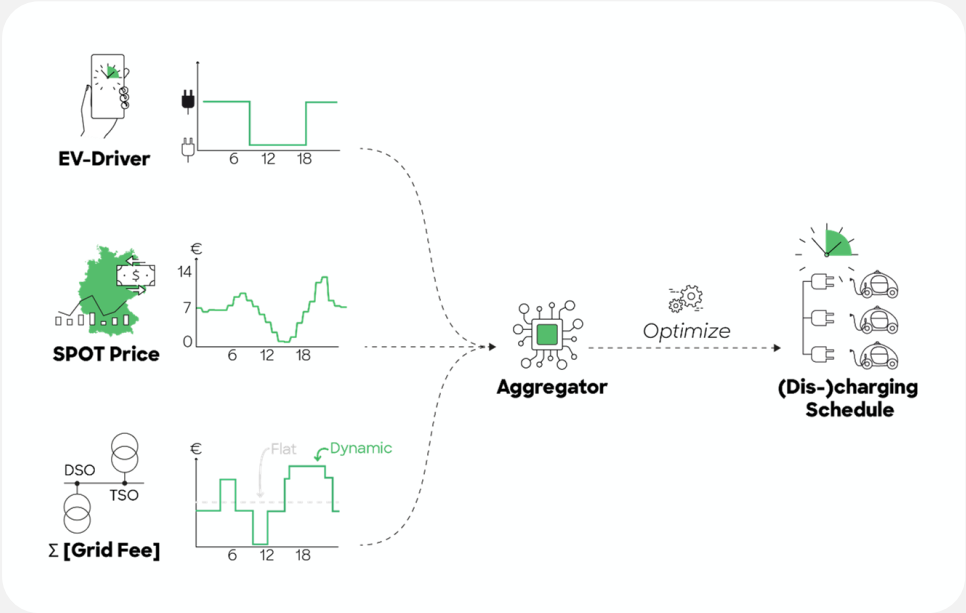
Dynamic network tariffs: from theory to practice in 10 months



How it works: Pilotprojekt, finanziert durch die beteiligten Unternehmen, Phase 1: 6 Monate (2024), Phase 2: 10 Monate (2025), zweiwöchentliche 3h-Workshops

We aim to implement and test dynamic grid fees in order to make real world observations



[WHAT] Leverage flexibility of EV drivers

[HOW] through financial incentives, that represent both, **wholesale prices** and **available grid capacity**

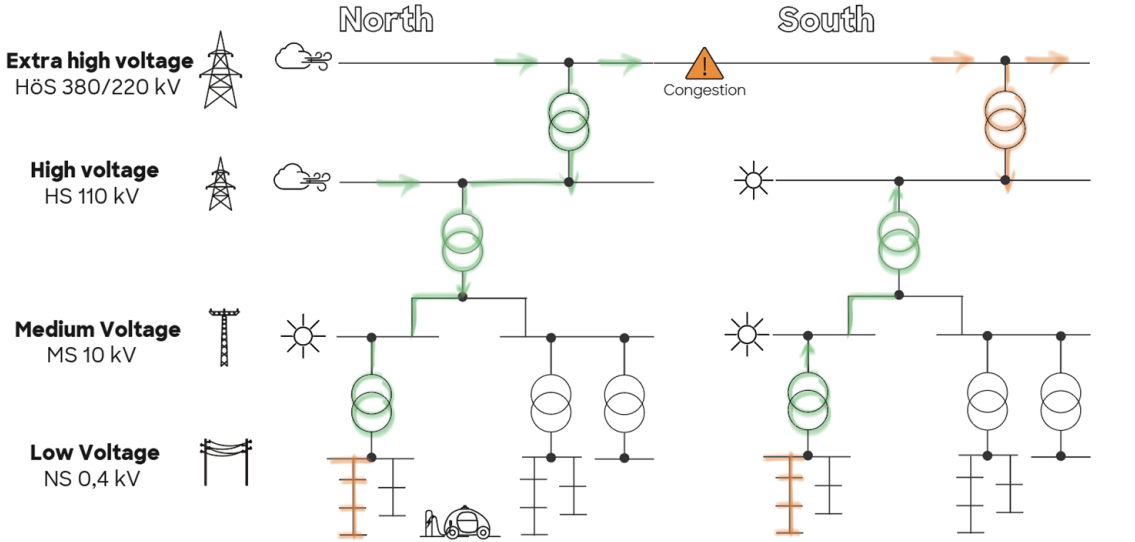
[WHY] to minimize cost

→ **of the electricity system** by enabling efficient grid expansion, reducing curtailment and congestion

→ **for EV drivers** by offering savings through market- and grid-friendly optimization of charging sessions

Define target concept → Build and test, what's already possible today → Learn

Stereotypical scenarios shape our priorities



- **Surplus renewable** generation in the **north** across high and medium voltage levels
- **Structural congestion** between north and south on transmission grid level
- **Surplus PV** across all DSO voltage levels in the **south** of germany
- In the **future**, EVs, heatpumps and small battery storage might cause **load-dependent congestion** on the low voltage level

Temporal granularity | Spatial granularity | DSO-TSO Integration | Price Spread

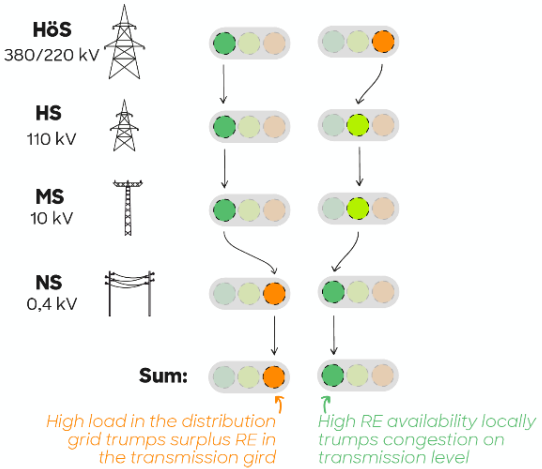
Dynamic network tariffs should provide high temporal and spatial resolution

To represent grid load across voltage levels, we move from a discrete logic to a dynamic continuous price signal

Traffic light system (2024)

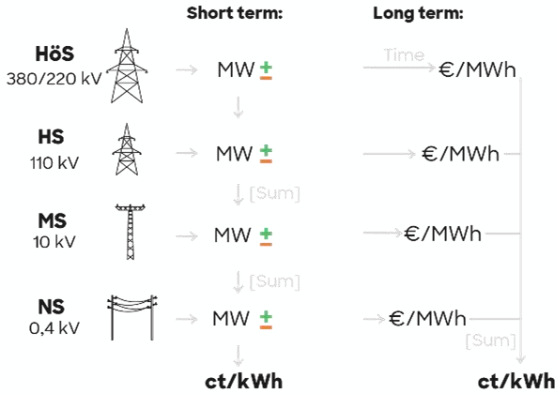
Additional load is...

- helping to reduce curtailment/ (-) redispatch / **Grid-friendly**
- not having any significant effect on the grid /**Default**
- likely worsens congestion / (+) redispatch /**Grid-stressing**



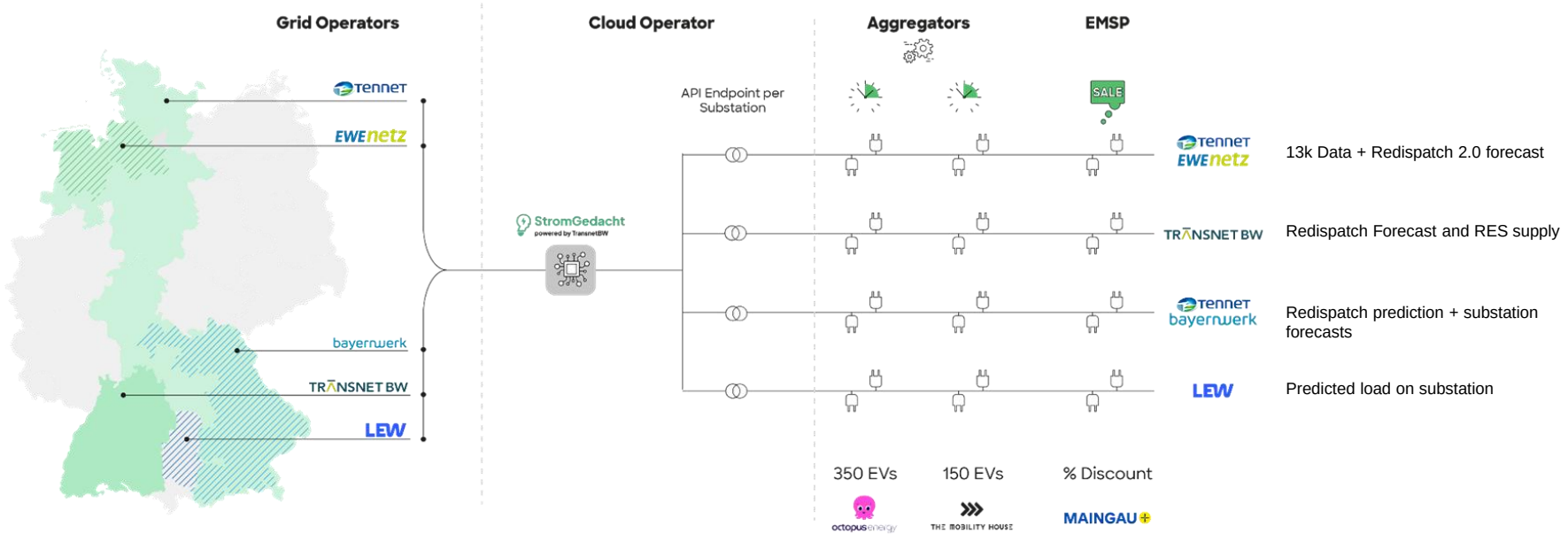
Dynamic, volumetric network tariff (2025)

Network tariff calculated based on predicted load. Tariffs are **increased** if predicted load exceedes capacity and **decreased** if surplus RES feed-in is otherwise curtailed.



Short term: *DSO aggregates demand and sets dyn. grid fee, carrying the risk for all coltage levels or* ***Long term:*** *Each grid level determines dyn. grid fee, which are then added up.*

We are building a pilot to test the feasibility and effectiveness of dynamic grid fees in a real world setting



Setting the right price: Additional considerations regarding cost-reflectiveness

Important learnings and our biggest challenges

- **Multiple goal functions**: Cost reflectiveness vs. cost recovery vs. incentives
- **Data** availability
- **Topographical** matching between substation and wallbox all but trivial
- Next conceptual step: integration with capacity pricing

GRIDS & BENEFITS

THANK YOU FOR YOUR ATTENTION!

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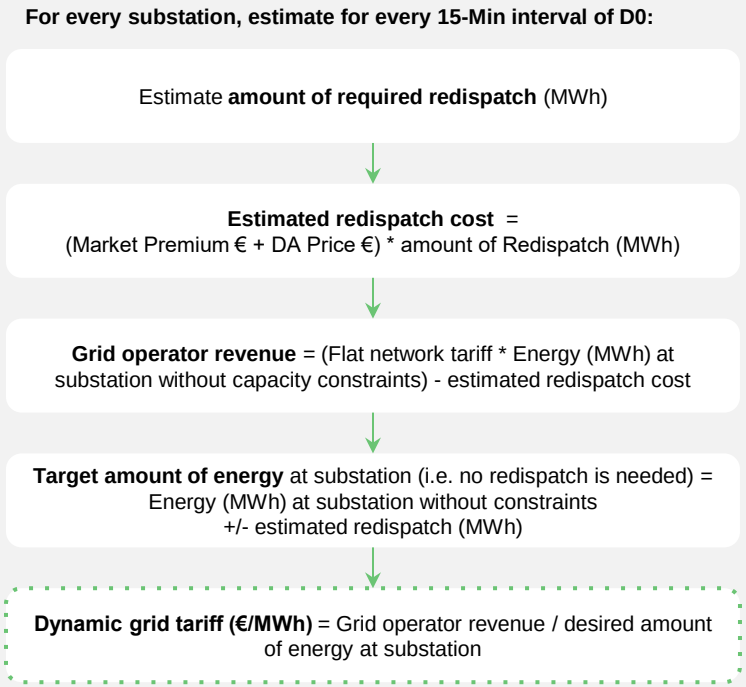
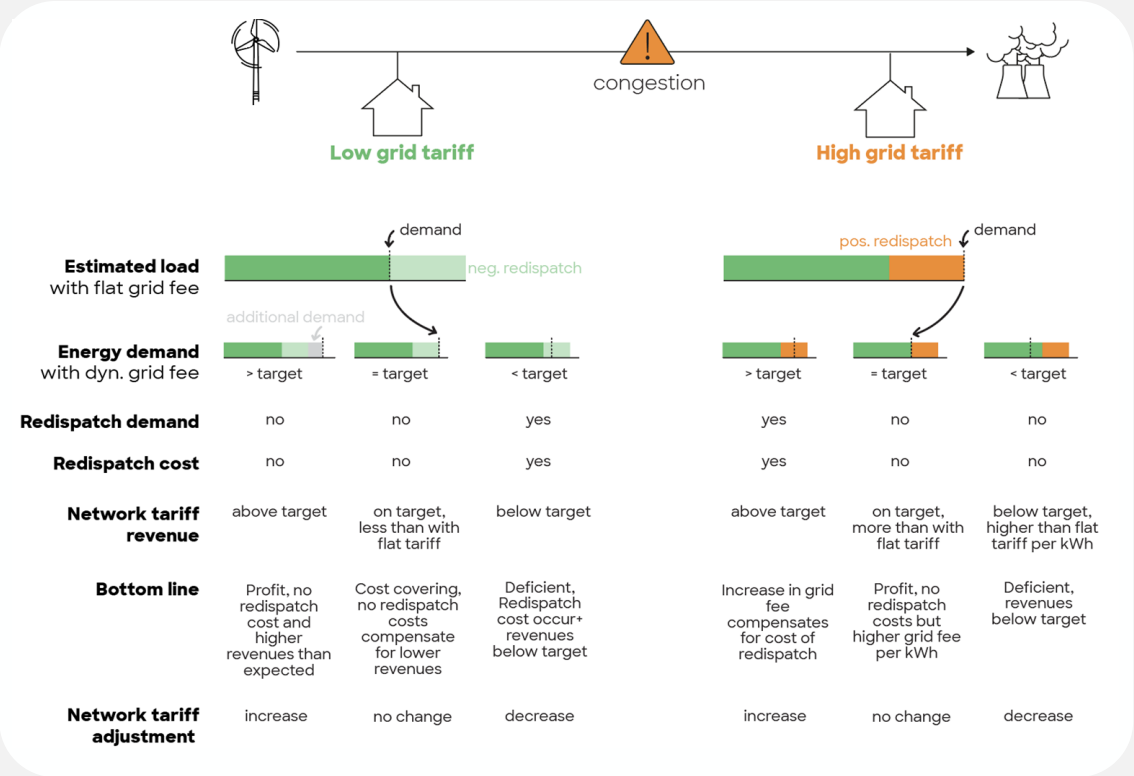
Setting the right price: Calculating dynamic grid fees based on redispatch forecasts

- In Engpass-freien Zeitfenstern fällt der “Standard Tarif” an, VNB nimmt [Arbeitspreis * Arbeit] ein. *Kann dieser in Zukunft niedriger sein als heute?*
- Ein Engpass verursacht Redispatch-Kosten
  - Heute Redispatch 2.0: [Mischpreis für energetischen Ausgleich (ID 1 72,5% und ReBAP 27,5%) + Ausfallarbeit (Marktprämie)]
    - **Mischpreis** lässt sich nicht prognostizieren, dh. DA Preis als Annäherung
  - Redispatch kann vermieden werden, wenn Verbrauch in **exakt der prognostizierten Höhe** des Redispatchbedarfs ansteigt bzw. sinkt
  - **Positiver Redispatch** (hinter dem Engpass): Netzentgelt wird erhöht um Verbrauch zu senken
  - **Negativer Redispatch** (vor dem Engpass): Netzentgelt wird gesenkt um Verbrauch zu erhöhen



Setting the right price: Cost recovery risks for grid operators



- Household consumption (EVs, storage, heat pumps) on low voltage levels is shifted but does not increase in absolute terms [true / false?]
- On higher voltage levels, absolute consumption increases (fuel switches, electrolysers) increase their consumption [true / false?]

Setting the right price: cost-reflectiveness vs. effective incentives