Move2Grid 16/07 – 18/08

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Ein Unternehmen der ENERGIE STEIERMARK

an der Johannes Kepler Universität Linz

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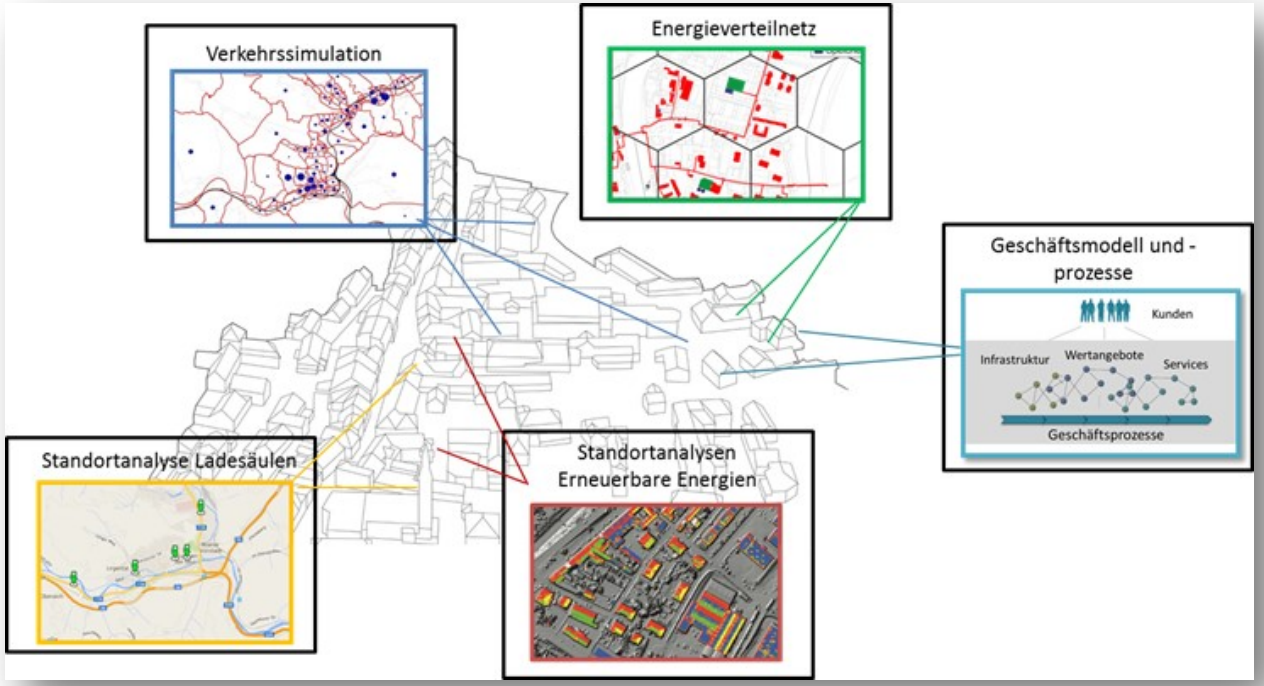
Prognose, Planung und Strategieberatung GmbH

High-level research question: Move2Grid

How can local, renewable resources support the supply of local electric mobility in the long term and how can it be integrated into the municipal distribution grid in a good technical and economical sense?

Initial situation: Lots of results in separated fields-of-research

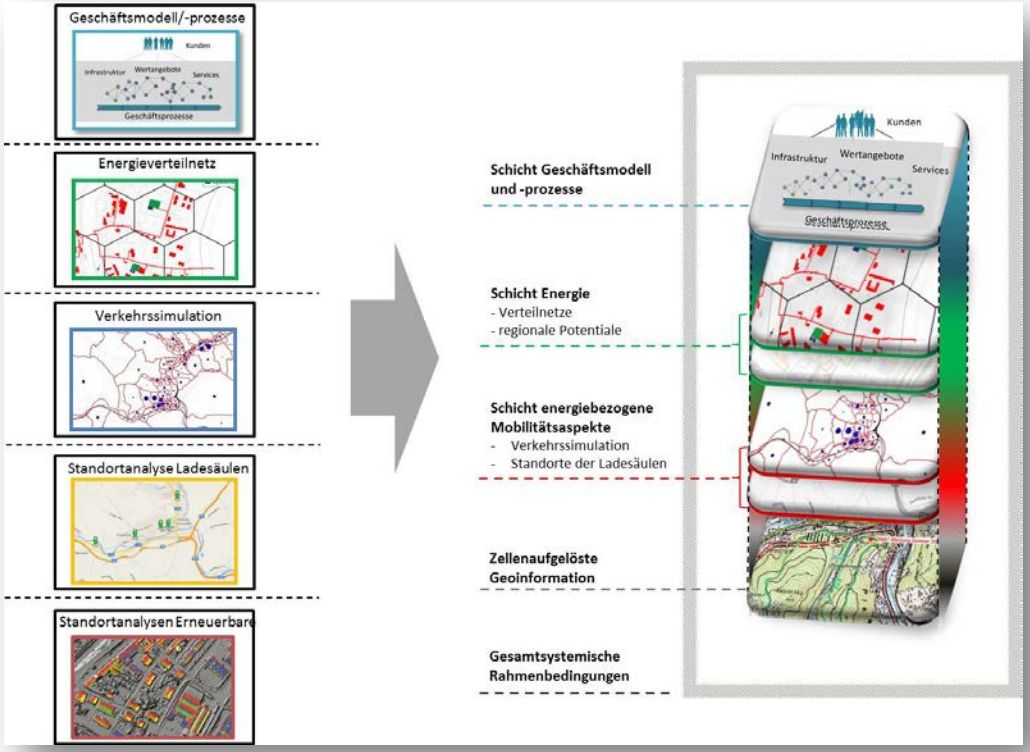
Conclusion:
High-level research question can only be answered if the relevant fields of research will be combined in a coordinated way.



High-level research target: Move2Grid

Connecting regional renewables with the requirements of future‘s E-mobility demand in order to:

- maximize the local use of local renewables
- optimize their implementation into the distribution grid
- maximize the locally achieved added-value



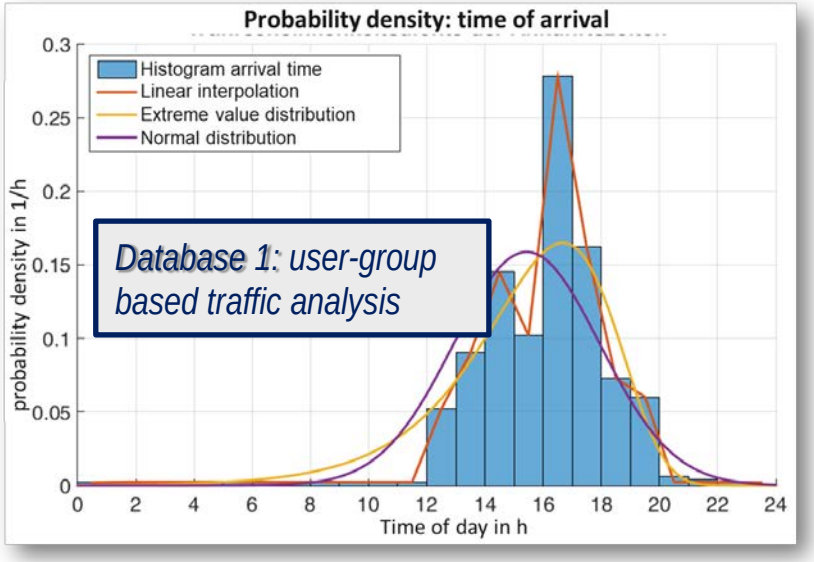
Methodology:
Interdisciplinary research combines results from separate fields-of-research into one co-simulation model.

First: combining aspects from energy- and grid-planning with results from mobility-planning
Then: connecting technical results with regio-economically proven business-cases.

and…
validate everything by means of real-life data coming from a fleet-test

Mobility-research: Modelling of EV-load profiles

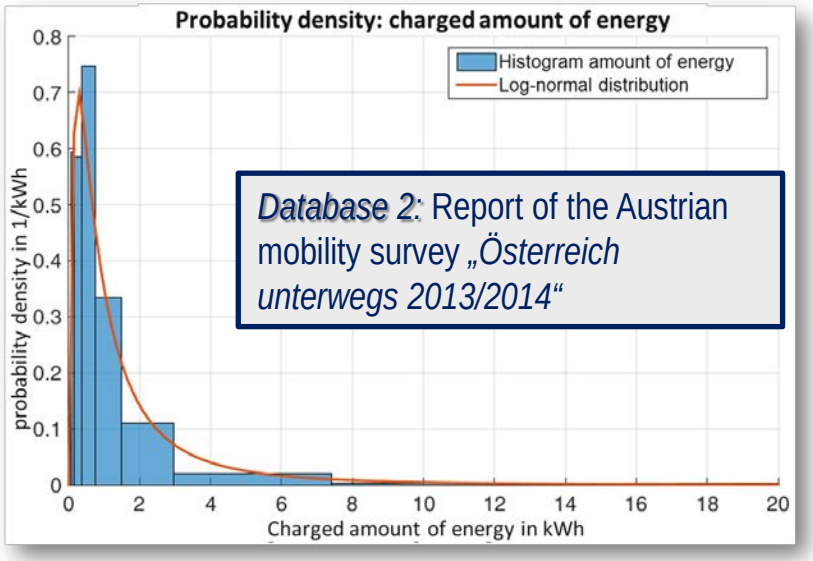
Target: Determination of the number of simultaneous charging EV in addition to their charging duration (amount of energy)



Database 1: user-group based traffic analysis

Difficulty: Different user-groups act differently

Considered user groups: households, working-places, shopping, etc…



Database 2: Report of the Austrian mobility survey *„Österreich unterwegs 2013/2014“*

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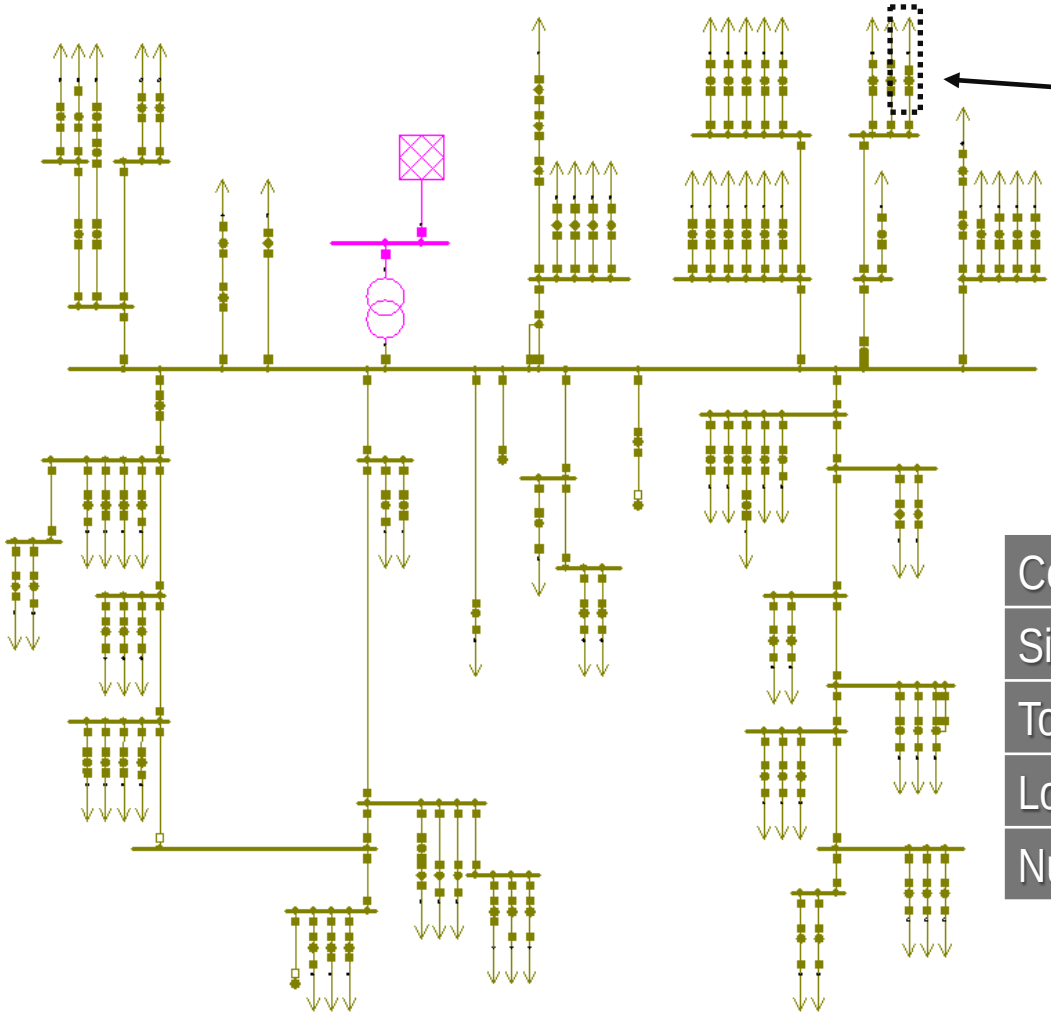
Example for Grid-modelling

Standard urban-area low-voltage grid supplied by a 630 kVA ONT

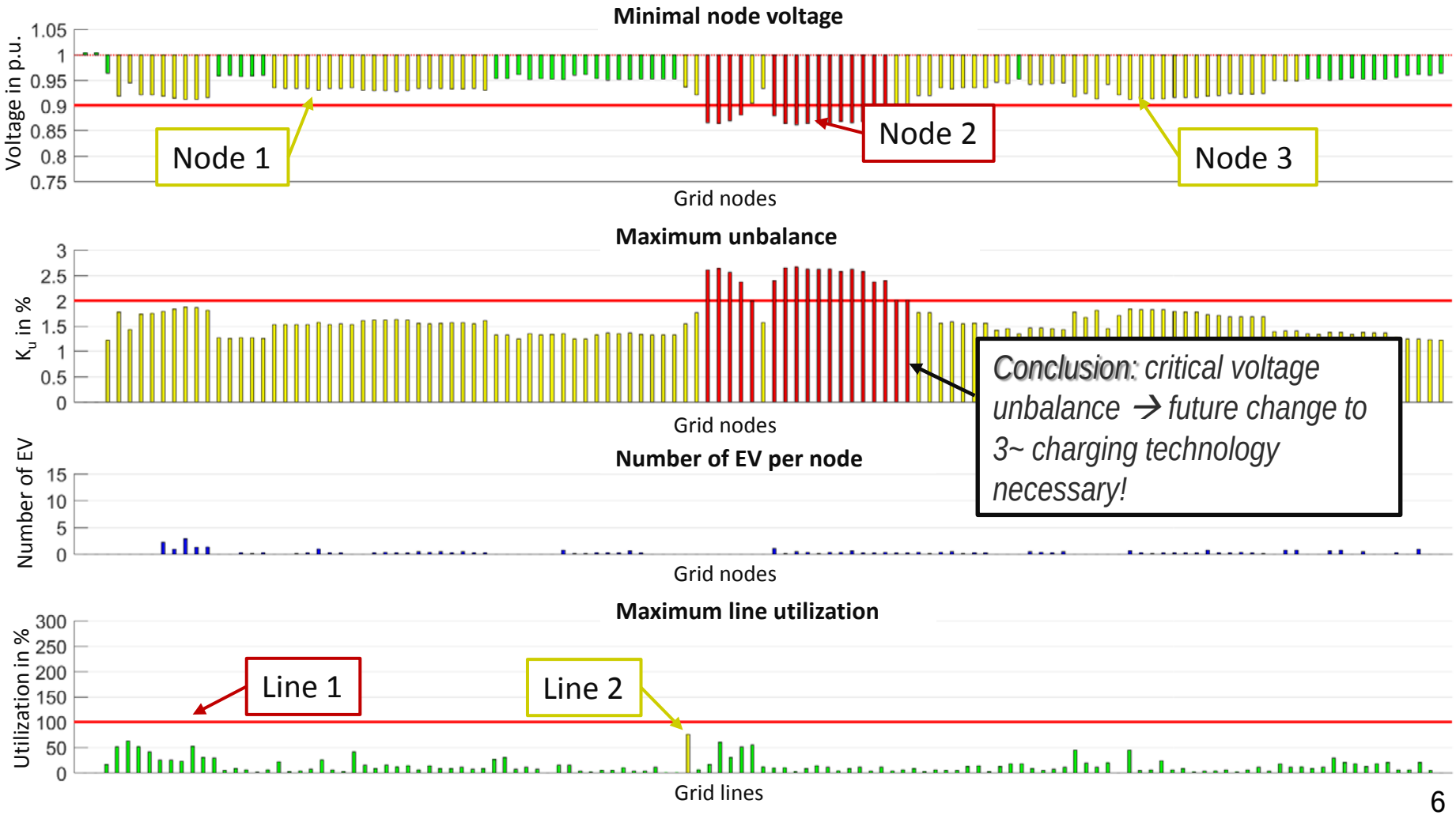


V	Household-load
EV	EV-load (single-phase wallbox)
PV	PV-generation
SP	Storage

Connections (POC's)	80
Single Consumer	303
Total lenght of lines	6.130 m
Load-density	10,4 W/m^2
Number of feeders	12 (+ 2 direct POC's)

Single-phase charging: all L1

Example-Results: 20 % EV-penetration



Conclusion: critical voltage unbalance → future change to 3~ charging technology necessary!

single-phase charging :
3,7 kW symmetrically distributed

Example-Results: 60 % EV-penetration

Conclusion 1: the integration of EV into urban low-voltage grids seems to be possible, as long as charging-power is low enough (3,7 kW)

Conclusion 2: some customers need sometimes higher charging-power (e.g. 11 kW): Perfect basis for new business-cases…

Example-Results: Business-models

Option 1: DSM-tariffs

grid supportive charging at home (charging with varying power, time-displaced charging)

Conclusion 2: some customers need sometimes higher charging-power (e.g. 11 kW): Perfect basis for new business-cases…

Option 2: power-bank

using self-produced PV-power for EV-charging at work

Conclusions

Sector-coupling requires interdisciplinary research

- Mobility planning provides the necessary database for real-life load profile modelling
- The prevention of critical unbalance requires the change to three-phase on-board charging technology

- Assuming that, the capacity of urban low-voltage grids to integrate future EV's is surprisingly high: First calculations found EV-penetration rates of 60 % as uncritical as long as charging power stays low.
- Future E-mobility acts as driver for new business-modes and tariffs: e.g. customer controlled charging-power.

…and outlook

A lot of more results will be provided by the final report

More details concerning renewables and EVs

EV-integration into medium-voltage grids

Regio-economical effects.

Thanks for your attention