PRIVATE EV CHARGING SESSIONS
CREATED USING ALBATROSS & ANYLOGIC EV FLEX MODEL

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GENERATING EV CHARGE SESSIONS FOR PRIVATE CHARGING

- For GO-e, one of the assets to look into for grid impact is EV charging, both public and private charging. For public charging there are some datasets available (e.g. through ELaadNL), but for private charging this is more difficult, as the datasets with private charging sessions that are shared with ELaadNL cannot be used within GO-e due to legal restrictions, and other sources such as charging service providers do not share this kind of data for free.
- Therefore GO-e needed to find a different approach for private charging sessions as input for:
  - Calculating the impact on the grid.
  - Calculating the flexibility of EV available for congestion management (or other flexibility usage)

- Peter Hogeveen developed an agent-based model (in AnyLogic) to calculate the amount of EV flex in neighbourhoods, based on ALBATROSS data.
  - Changing this model to output charge session data, would give is the required input for our simulations

ALBATROSS
AS INPUT FOR EV FLEX CALCULATIONS

- ALBATROSS is an activity and travel demand model, based on the MON2009 dataset. It generates a synthetic population and their activities such as shopping, leisure and working and associates that activity with a modality to get there, such as walking, bike or car. These travel patterns are area-dependent (difference between 'Randstad' and rural area) and uses a 4-digit postal code as input (PC4). It uses a computational process approach using (27) decision trees using CHAID-induction. A scheduling engine uses these decision trees to generate the patterns.
- ALBATROSS predicts patterns for a day, but Pim Labee (PhD, TU/e) extended this to a typical week. Peter Hogeveen used this as input to calculate the flexibility with his agent-based model.
- The advantage of the MON2009 dataset, compared to ODiN, is that in ODiN only one person is tracked, while in MON2009 the activities of a whole household (+partner) is captured.
- The MON2009 dataset is 'old', but it seems that travel patterns are not changed during the recent years (with the exception of the Corona period). More detailed data (e.g. PC6) is very difficult; due to GDPR access to more detailed information is problematic. Additionally Car-sharing is not part of this model.
- What does impact ALBATROSS is the age composition of the people in the dataset, as older people have different travel patterns compared to younger ones. As our country is 'graying', this has impact for the 2030 scenario.

MON: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderzoek-verplaatsingsgedrag-en-mobiliteitsonderzoek-nederland
ODiN: https://www.cbs.nl/nl-nl/longread/rapportages/2022/onderweg-in-nederland--odin---2021-plausibiliteitsrapportage

EV FLEX MODEL
AGENT-BASED MODEL IN ANYLOGIC

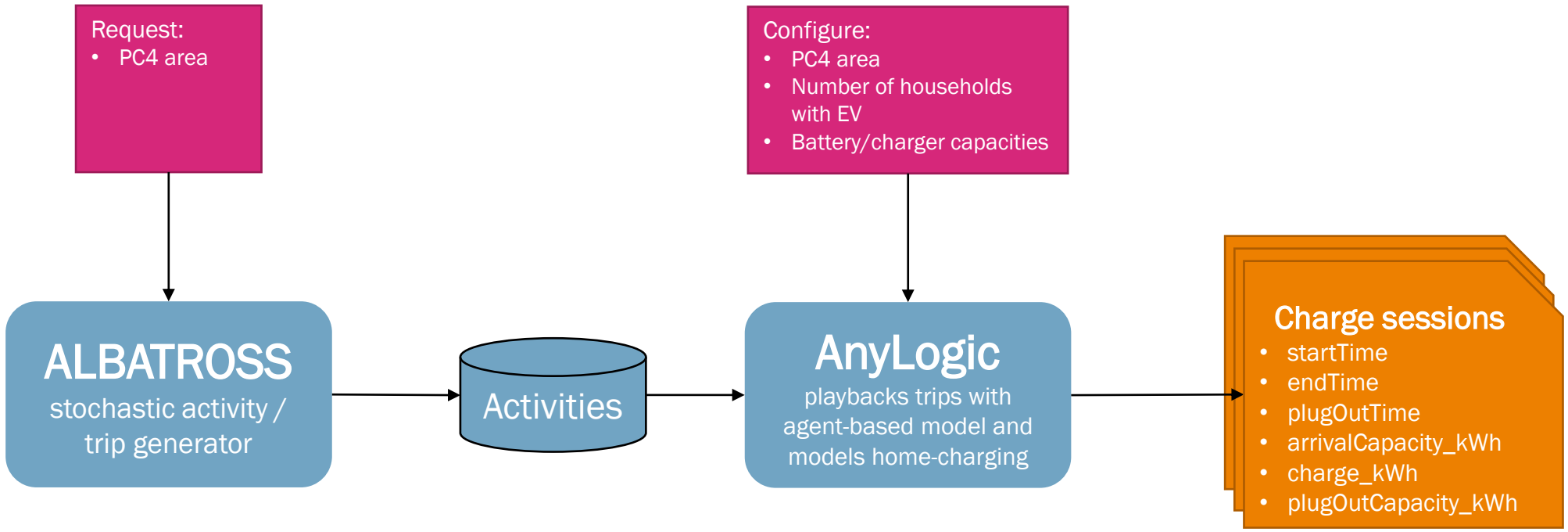
- Peter uses ALBATROSS because for flex calculations you want to know when people are at home (and can charge) and there are currently no other datasets that can model charging behaviour at home.
- The charging behaviour is a probability distribution based on the SOC after a trip has finished and the car arrives at home. The lower the SOC, the higher the chance that someone wants to charge. This probability distribution of charging is calibrated on Elaad data.
- There is no S-curve in charging. Charge power of home charge pole is randomly distributed between 4 and 11 kW, and is always charging at it maximum power.
- According to Peters analysis a typical car is used for 6-7.000 km of trips per year, this is less than average (13.000, or 22.000 for business car), mainly because ALBATROSS only models short trips, and not long distance trips such as a holiday trip. Therefore it seems that ALBATROSS does not account for all activities. For our current goal, private charging in the build environment it is not that problematic (e.g. fast charging in France is not of interest for congestion in a neighbourhood in NL).
- ALBATROSS data has a few issues, sometimes two activities are overlapping for two partners of a household, and both need the (only) car. In that case, Peter shifts one of the activities to the future.
- Trips go from one PC4 to another PC4, but distances between them are not in the database (was too large), but the length of the activity is provided by ALBATROSS. Therefore an average speed of 60km/h (1 km/minute) is used. This is for cities a bit too high, and for highway driving too low. This distance is subsequently used for calculating the energy consumption for a trip.

ALBATROSS DATA SET
OTHER OBSERVATIONS AND ASSUMPTIONS

- A few observations on the data quality are relevant:
  - Long distances are missing, total car distance is about 7000 km/year (as mentioned)
  - Some trips of a household overlap (these are shifted such that they are executed consecutively).
  - Many cars are only used three times a week

- This tool only generates a week of charge sessions
  - No seasonal influences

GENERATING PRIVATE EV CHARGING SESSIONS



CURRENT INPUTS

- PC4 **5501** Veldhoven – Cobbeek en Centrum (BU08610006)
  - *na-oorlogse rijtjeshuizen* archetype
  - PC4 and neighbourhood overlap
  - PC4 has an additional ‘groenstrook’

- PC4 **5621** Woensel-west
  - *na-oorlogse portiekwoningen* archetype

BU08610006

PC4 5501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