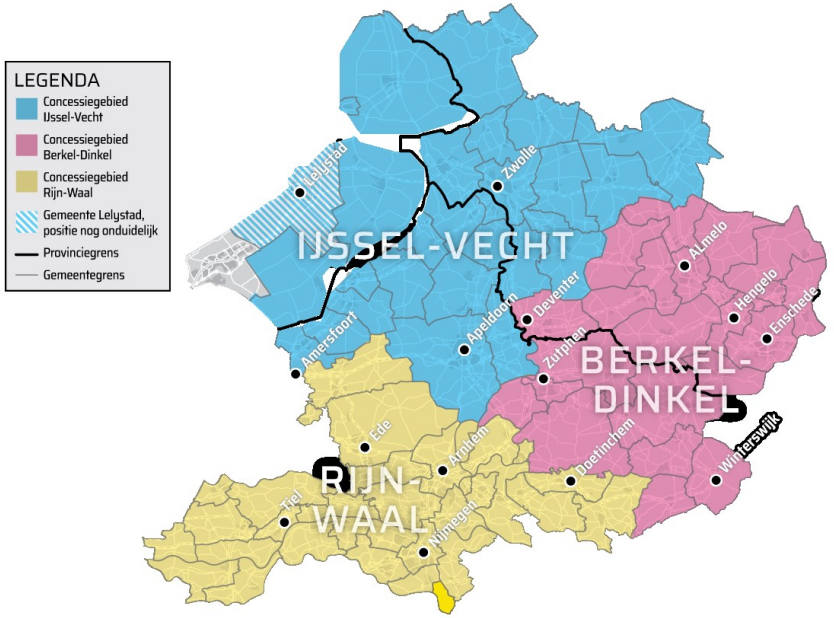
Energy challenges for ZE public bus transport in the eastern provinces



Gelderland

CleanMobilEnergy Conference

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Policy for sustainable bus transport

- **3 Eastern provinces working together as OV Oost**
  - 3 concession areas for buses and regional trains
- **Aim**
  - all public transport vehicles zero emissions (ZE) in 2030 (new purchases ZE from 2025) & on 100% renewable energy
  - while maintaining the current public transport service level
- **Ongoing procurement for IJssel-Vecht concession**
  - requirement for ZE buses in towns of Apeldoorn, Zwolle and Lelystad from day 1 (period Dec. 2020-Dec. 2030)
  - supportive measures in the government tender and the award model:
    - reference TCO modelled to validate feasibility of commercial timetable with OC stations and e-buses
    - substantially more award points for additional ZE buses in other towns and on regional lines
    - EUR 11.5 mio grant to speed up realization of energy infrastructure for OC
    - redeployment guarantees for vehicles and charging infrastructure (15 years)
    - Budget for ZE innovations (for the 3 concession areas)
  - **Indicative: 250 buses**

Energy challenges (1)

- **Getting enough renewable energy, preferably local**
  - Netherlands: 5,000 PT e-buses @ 80,000 km/a @ 1.25 kWh/km energy consumption need 500 GWh electricity
  - this requires 32 3MW wind turbines that produce 65% of the time, or 333,000 roofs covered with PV panels (10m^2 each with 150 kWh/m^2/a yield)
  - IJssel-Vecht: ~250 buses → ~5 MW windpower or 16.650 roofs
- **No staggering numbers, but how to get it to the chargers?**
  - usually: purchase Certificates of Origin from somewhere
  - ambition: start dedicated local/regional production for ZE buses
  - question: how local should it be? Really local is difficult for lack of space and competing demands

Energy challenges (2)

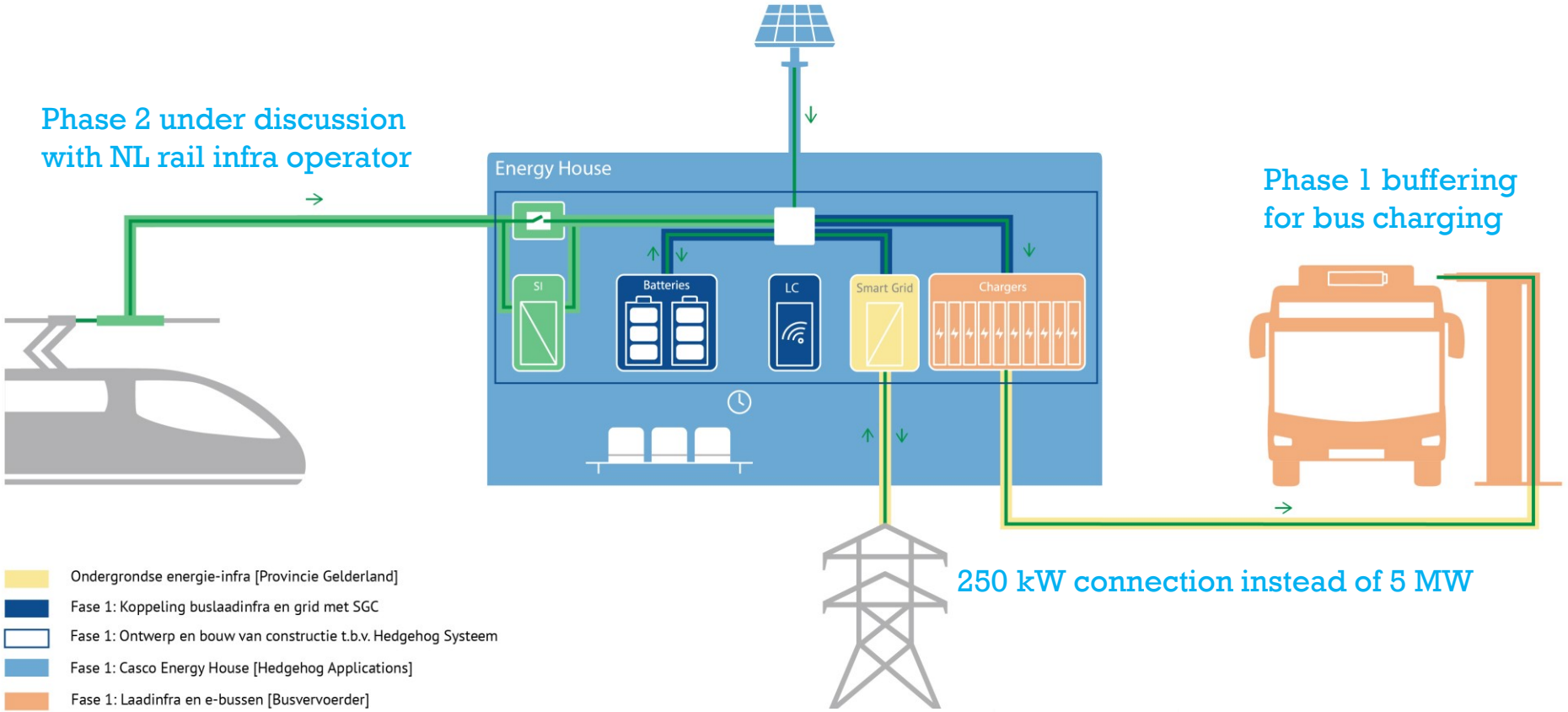
- **Getting the right charging facilities ready in time**
  - who is in charge: bus operator (as was)? Provinces? Third party?
  - bus operator can start after contracting, leaving just ±15 months
  - provinces can start earlier but (in the Netherlands) this is not their core business; Dutch PTA's are reluctant to develop (transport) themselves
  - third parties (infra providers, energy companies, …) are interested but it is difficult to involve them under PT concession conditions; however a new value chain is developing with possible new roles
- **Approach taken**
  - province started preparations for OC (site studies, aligning with grid operators and municipalities, getting quotes, start permitting, etc.)
  - operator gets grant for OC realization (site works, chargers, poles), is required to use the facilities that are prepared, and takes over the realization works after contracting
  - no support for depot charging as operators can arrange that themselves; hydrogen via JIVE2

Energy challenges (3)

- **Dealing with electric grid congestion and lead times**
  - grid operators warn for grid congestion: (too) many users and/or suppliers on one sub-station (e.g. countryside solar plants)
  - usually not actual congestion (electron flows) but administrative congestion (contracted capacities)
  - connecting (many) OC or depot chargers in one site is not always possible without grid reinforcements → long lead times for works (a.m. due to shortage of qualified staff) and expensive (with "hidden" societal costs)
- **PTA and Energy providers both have a societal obligation**
  - so need to work together to improve output and reduce (societal) costs
- **Need for alternative solutions**
  - combining energy buffering and smart energy management

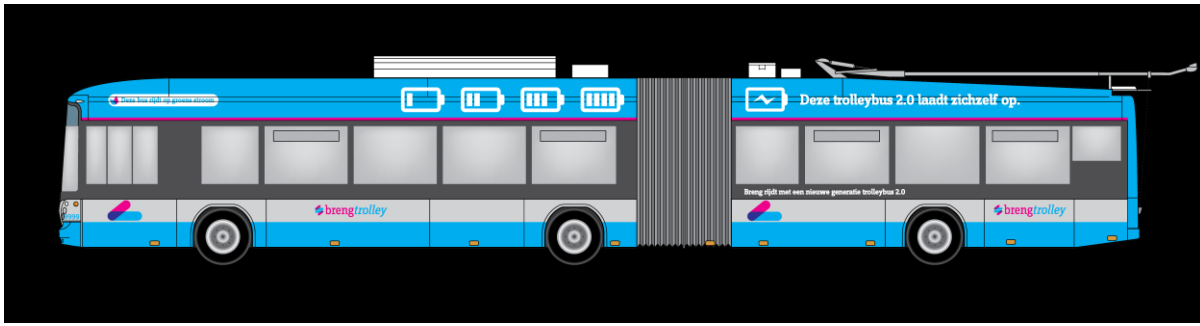
Pilot Apeldoorn

Status: being prepared for start of IJssel-Vecht as an initiative under the newly formed ZE transport innovation fund Gelderland by local firm Hedgehog Applications and partners



PROVINCIE FLEVOLAND provincie Gelderland provincie Overijssel

Energy challenges (3b)



- **An alternative bus charging technology that avoids power spikes to the grid is in-motion charging**
  - catenaries receive power from substations connected to regular electric grid; power supply is quite evenly distributed
  - Arnhem trolley fleet comprises ±40 articulated buses (18m)
  - next step is battery-trolleybus a.k.a. Trolley 2.0
  - Arnhem retrofitted two trolleybuses with battery packs for test-driving: distances of >25 km can be covered on battery power before recharging "under wire"

Provincie Flevoland provincie Gelderland provincie Overijssel

Questions?