



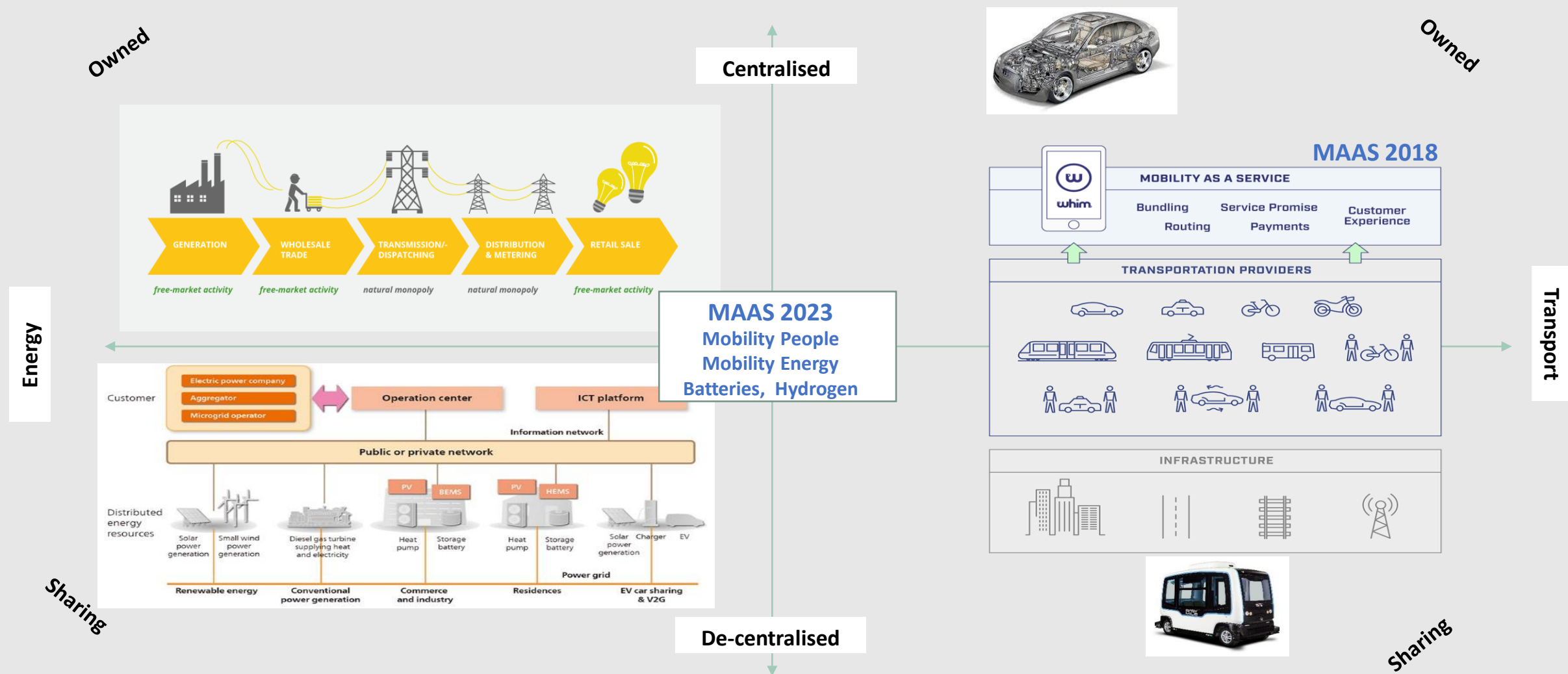
# 5 tips to deploy large scale E-buses

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UITP Global Summit, June 12<sup>th</sup>, 2019



# Convergence between Transport and Energy has only just begun



# Summary - Situation Dutch Market



- 1. Challenge(s)**
- 2. Solution(s)**
- 3. Result**
- 4. Conclusion**
- 5. Questions**



# The biggest challenges implementing E-bus fleet (challenge)

- Different schedule planning because of the limited range of battery Buses
- Realization of the grid connection on time
- The charging infrastructure
- Battery Technology
- Training for drivers and mechanics



# Connexxion's E-bus deployment: Bus, Charger, Infra (Solution)

## ■ Integrated approach across entire business

- Operational: Fleet, Scheduling, Rostering
- Technical: Bus, Battery, Chargers, Infra
- Procurement & Maintenance

## ■ Procure Buses in 2 phases for AML, ZOB & NH

## ■ 1<sup>st</sup> Phase: Procure, Install, Operate and Learn

## ■ 2<sup>nd</sup> Phase: Reduce Costs, Increase efficiency (Smart Charging, Onsite storage, Procurement)



# Successful implementation of ZOB, AML & NHN *(Result)*

- **Phase 1 ZOB: 43 VDL 18 Meter E-buses, 1 Depot**
  - 10 x 300 kW Fast, 22x 30 kW Depot, 10mVA Grid
- **Phase 1 AML: 100 VDL 18 Meter E-buses, 4 Depots**
  - 14 MW worth of grid connections
- **Phase 1 Noord Holland (Ongoing): 2 contracts**
  - Noord Holland Noord: 83 Buses, Haarlem IJmond: 16 Buses
  - Combination of BYD & VDL Bus, Depot Chargers AC 80 kW and DC 60 kW
- **Phase 2: ZOB, AML & H-IJ**
  - Combined Purchase of 200 Buses & Infrastructure
- **(Total electric Kms driven, CO2 reduction)**





# 5 tips to implement large scale Zero Emission (Bus & Infra)



- PTO goes from *managing* partner -> *innovative* partner
- PTO goes from *line responsible* -> *system responsible*
- PTO's must develop *energy management expertise*, which can lead to substantial cost reductions
- The charging infrastructure is part of a system (bus and charger). Ownership should preferably lie with the PTO's
- KEY is partnerships: Work with PTA, Municipalities, Energy Providers, Transmission & Network Providers, Suppliers

# Questions?







**Thanks for your attention!**

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