



Indo-German Workshop on Innovative Charging Technologies for Heavy Duty Vehicles February 18, 2021

Scientific Session: E-Highways – Regulatory Framework

*Projekt AMELIE:
Financing and Billing ERS*

Financing and Billing ERS – AMELIE: Partners/ Questions

Partners: Siemens Mobility GmbH, Institut for Climate protection, Energy and Mobility e. V. (IKEM)

(1) Which kind of conditions exist concerning the financing and billing?

a) in regard to the regulative framework

b) in regard to technical solutions

(2) What are the key issues concerning the European interoperability of ERS?

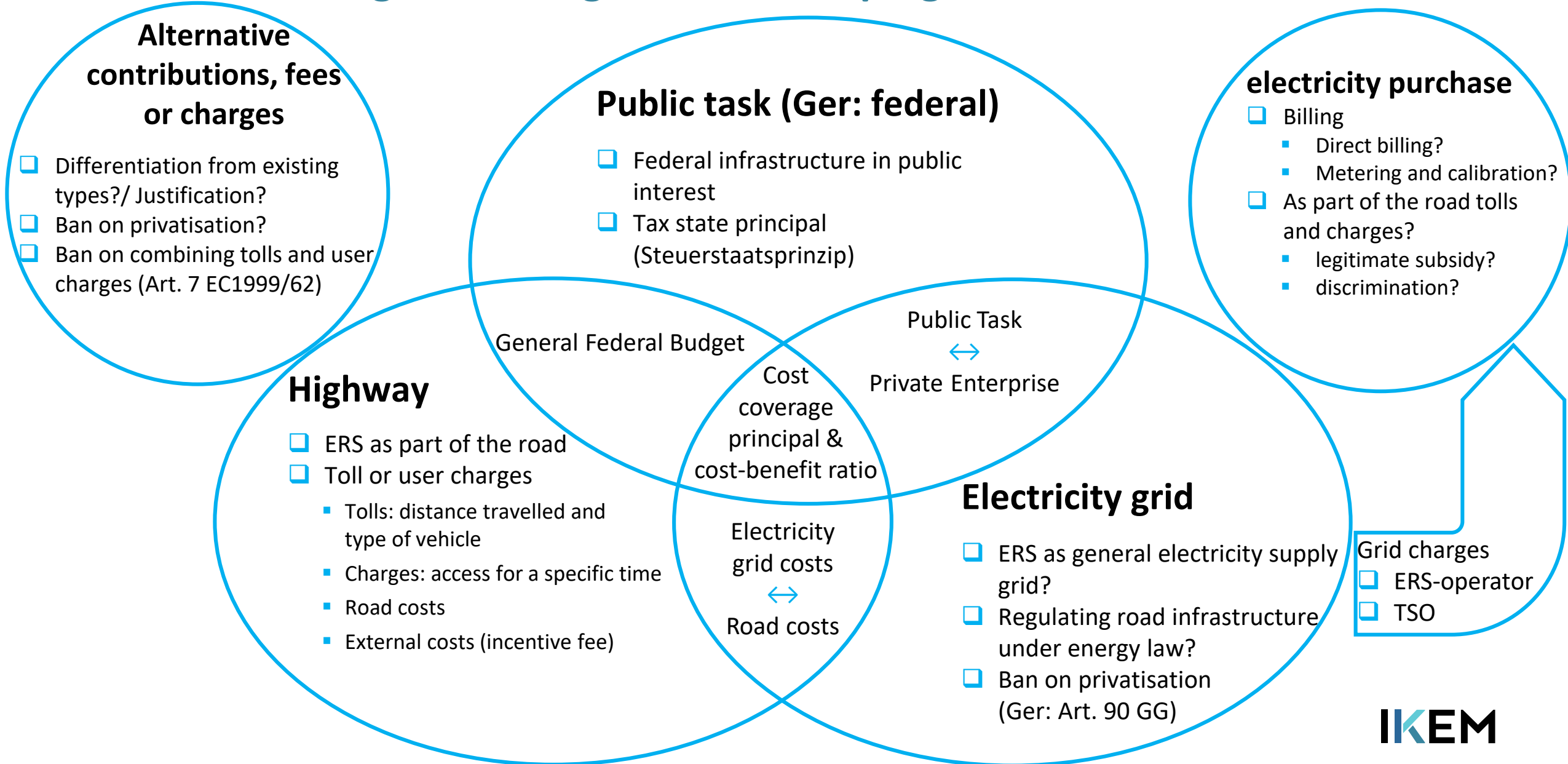
a) in regard to regulation and strategy

b) in regard to technical standardisation

➔ *IKEM Working Paper: https://www.ikem.de/wp-content/uploads/2020/12/20201216_WP_Electric-Road-Systems_EN.pdf*

(3) Which stakeholders and sectors have to be considered to support ERS in general and to discuss the results of (1) and (2)?

Financing and Billing ERS – Developing a stakeholder model



Financing and Billing ERS – Developing a stakeholder model

Alternative contributions, fees or charges

- ❑ Differentiation from existing types?/ Justification?
- ❑ Ban on privatisation?
- ❑ Ban on combining tolls and user charges (Art. 7 EC1999/62)

Public task (Ger: federal)

- ❑ Federal infrastructure in public interest
- ❑ Tax state principal (Steuerstaatsprinzip)

electricity purchase

- ❑ Billing
 - Direct billing
 - Metering and calibration
- ❑ As part of the road tolls and charges

General Federal Budget

Highway

- ❑ ERS as part of the road
- ❑ Toll or user charges
 - Tolls: distance travelled and type of vehicle
 - Charges: access for a specific time
 - Road costs
 - External costs (incentive fee)

Outside the electricity grid

- ❑ Billing for energy consumption
- ❑ No grid charges

Grid charges

- ❑ ERS-operator
- ❑ TSO

Level 1a (tariff route)

- Electricity billing according to tariff routes
- Data collection by toll system operator/transfer to mobility providers (adapt § para. 3 BFSTrMG!)
- Official measurement of tariff routes, no onboard measurement
- Accompanying evaluation of billing models
- Otherwise like stage 2

Level 1b (Free electricity for ERS users)

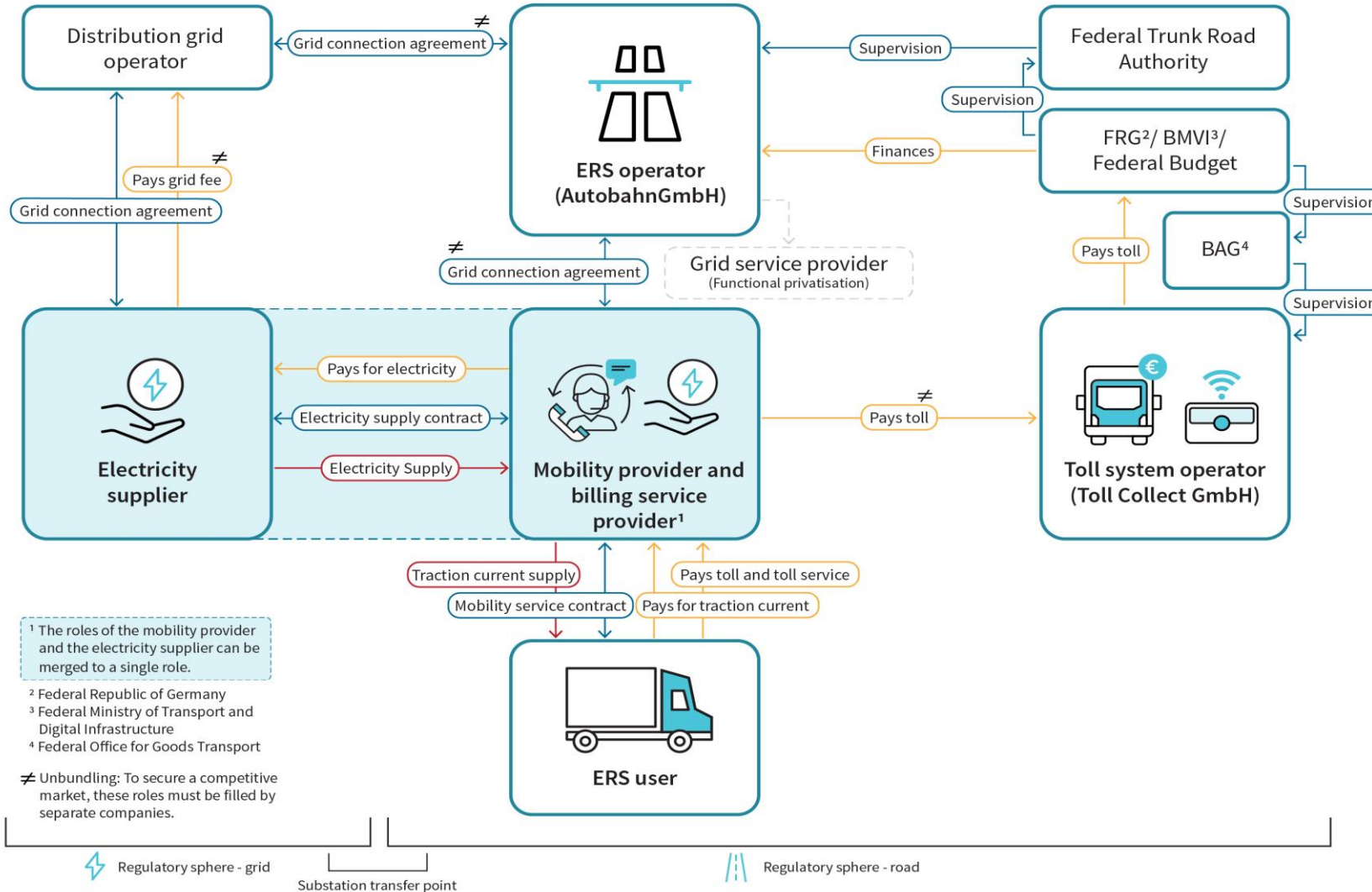
- No billing of electricity consumption to ERS users
- Electricity supply by Autobahn GmbH (financed from the federal budget)
- Accompanying evaluation of billing models
- Otherwise like stage 2

Level 2

- Inclusion of the costs of the ERS infrastructure and network operation in the road costs calculation
- Apportionment via the toll and to all freeway users subject to the toll (polluter-pays principle)
- Mobility service is billed to ERS users according to individual consumption (mobility provider)
- Unit for measuring and billing electricity expected to be kWh with on-board meter conforming to calibration regulations

Financing and Billing ERS – Stakeholder model

Single Point of Contact: National Variant 1



- Stakeholder model as the target image of consistent regulation at all levels of regulation
- The regulation proposed by IKEM for Europe and Germany allows for different variants of the stakeholder model that can be implemented according to the needs of the market
- Here only one variant of stakeholder model is presented as an example for the discussion
- Further reading (German): [Akteursmodell für die Finanzierung und Abrechnung elektrischer Straßensysteme \(ERS\)](#)

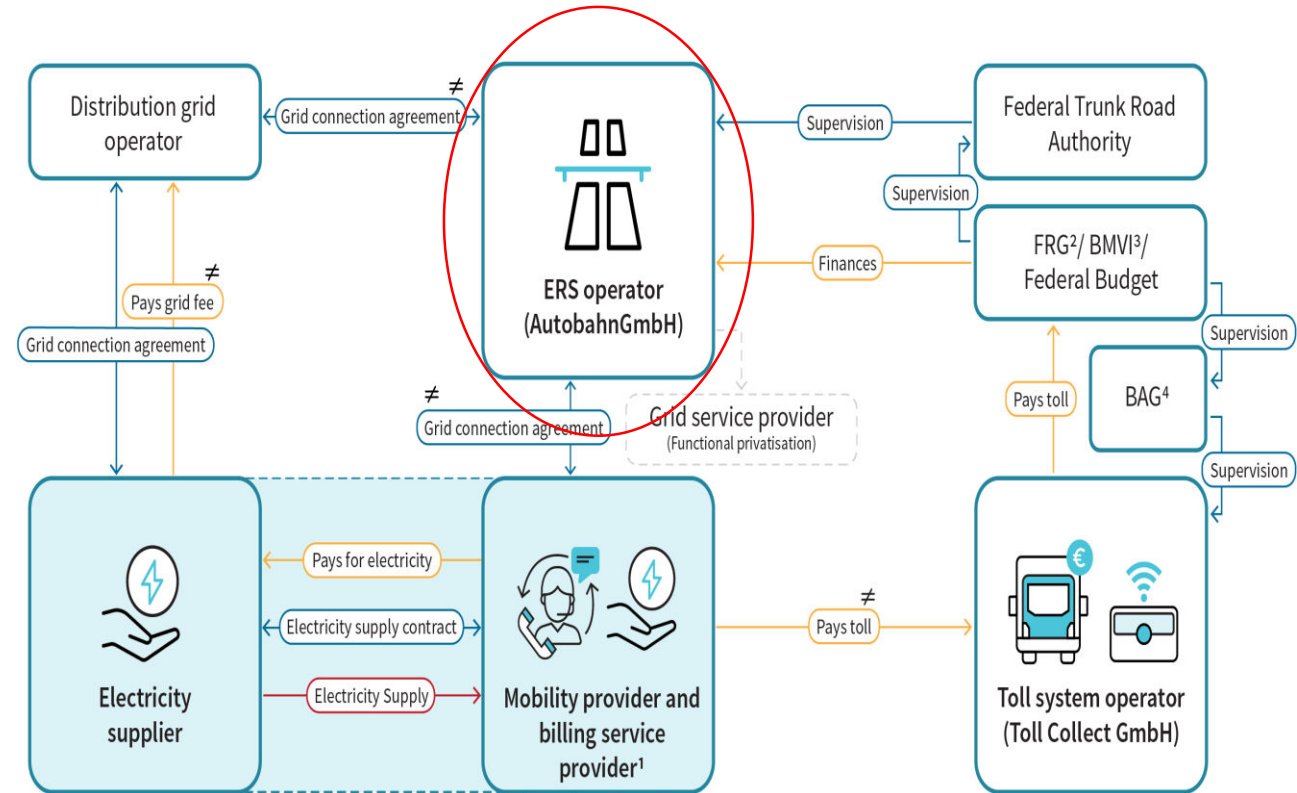
National Version I: ERS-Operator (Autobahn GmbH)

Vision: ERS as a competitive market for mobility services

The traction current is not a public service, it is offered on a public marketplace provided by the federal government

All costs for building, operating and utilization of the marketplace are compensated by toll revenues

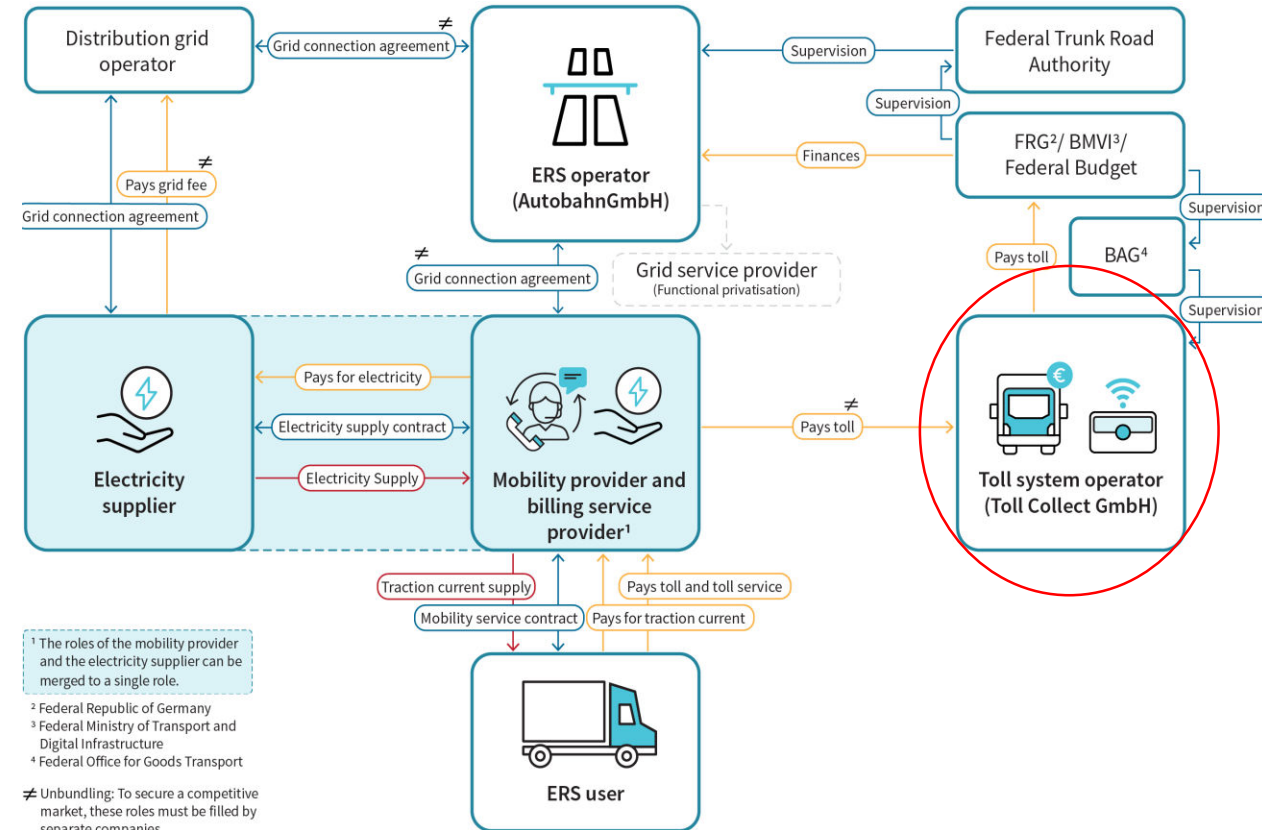
- ERS operator has a monopoly, therefore unbundling is needed, mobility provider \neq ERS operator
- Prohibition of privatization (Art. 90 Abs. 1 Satz 1 GG und § 5 Abs. 2 InfrGG)
- Functional privatization -> state delegates tasks with regard to mains operation to a private entity without any property rights being transferred



National Version I: Toll System Operator




Vision: ERS as a competitive market for mobility services

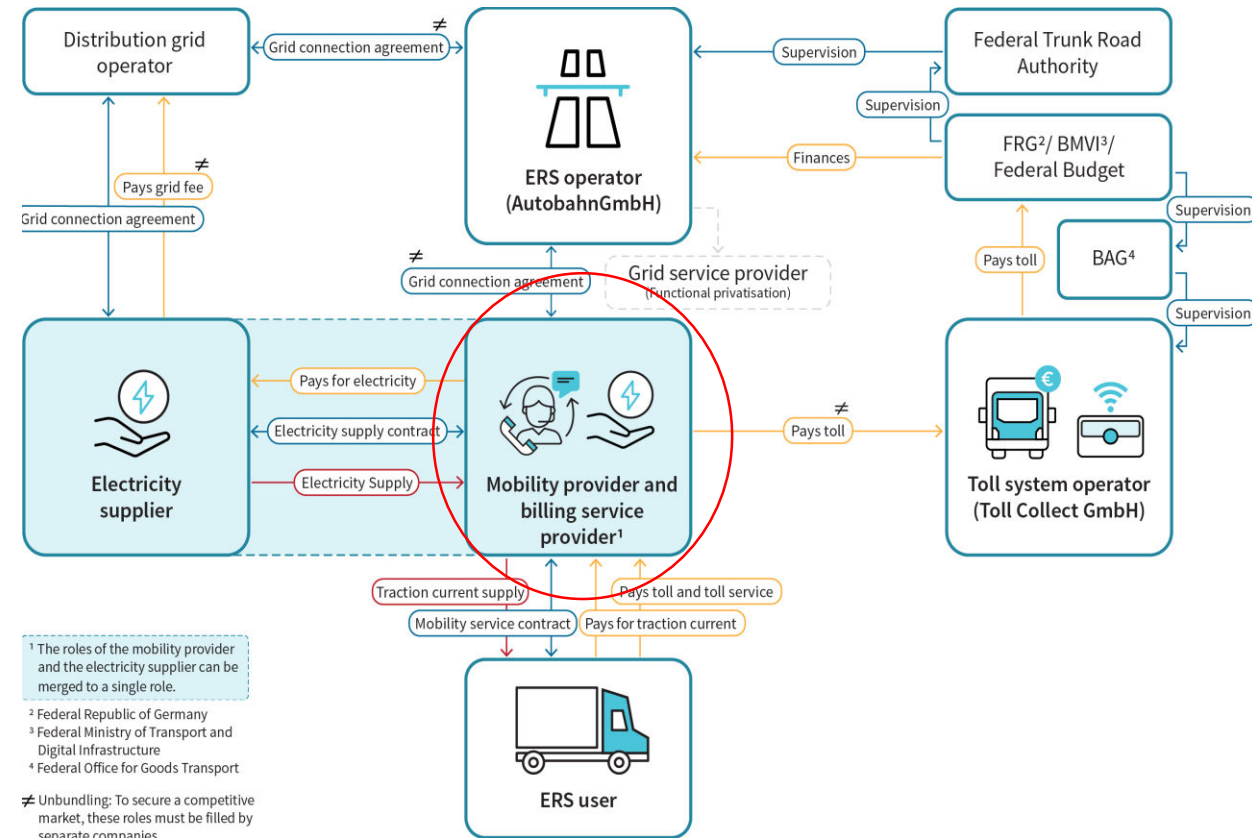
- ▮ Toll operator is a private entrusted body (Toll Collect GmbH)
- ▮ If toll operator aims at procuring contracts and providing billing services, the operator has to offer these in a non-discriminatory way for all mobility providers
- ▮ Toll operator has to elucidate
 - acts as a broker
 - user can switch between mobility providers



National Version I: Mobility provider and billing service provider

Vision: ERS as a competitive market for mobility services

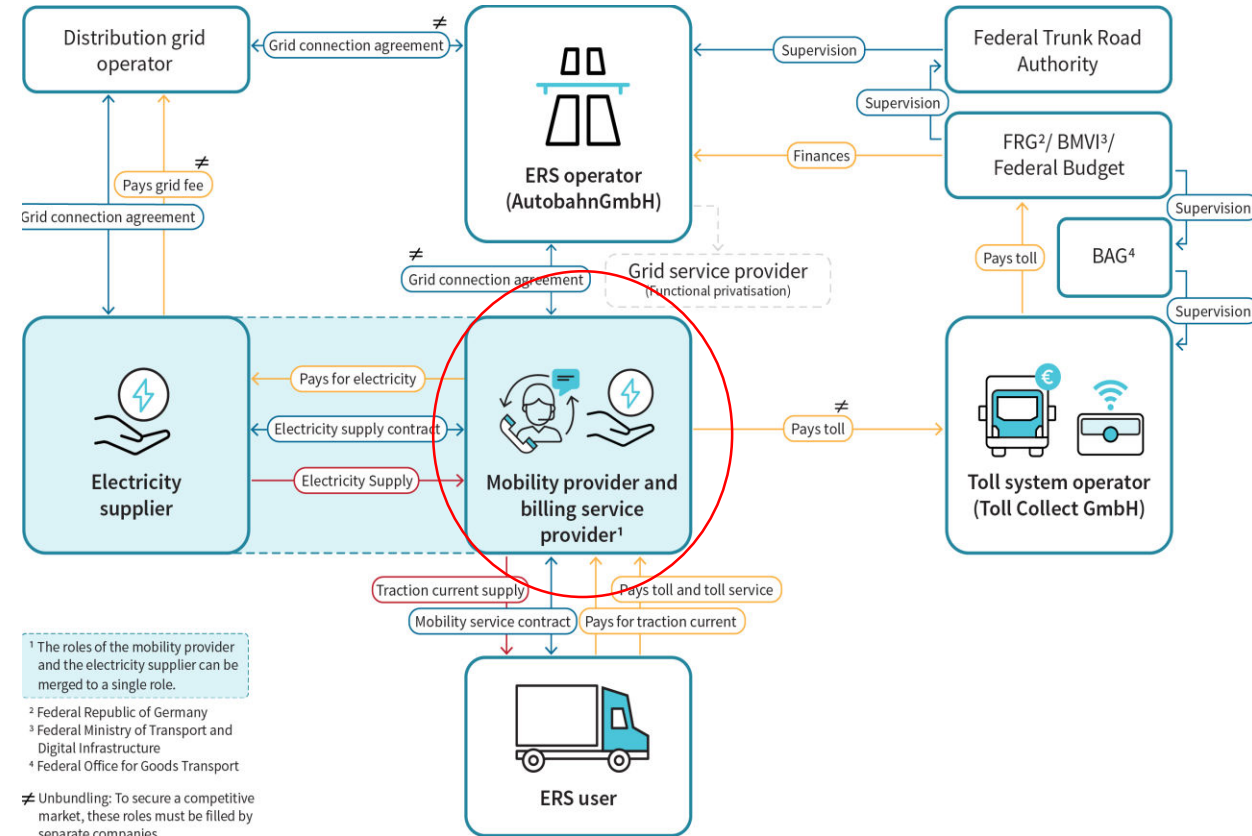
- 
 Mobility service includes supply of traction and charging current at ERS grid connection point at substation to the trucks pantograph
- 
 Multitude of mobility providers → competitive market
- 
 Billing service provider does not operate own OBU; data for toll charging provided by toll operator



National Version I: Mobility provider and billing service provider

Vision: National Single Point of Contact (SPoC) for ERS-User

- Service providers offer fuel card services that combine many services for shipping companies
- Concept of fuel card services and SPoC is complemented by mobility services for ERS



Financing and Billing ERS – Developing a stakeholder model

Regulation of Electric Road Systems (ERS) needs a stakeholder model including assignment of tasks such as financing, planning, construction, operation and maintenance of the ERS infrastructure as well as the billing of the infrastructure and traction current costs.

- ✓ Will the ERS be part of a public road?
→ Run by public road operator (GER: Autobahn GmbH)
- ✓ Does the public road operator have the expertise to run an electric facility?
→ GER: Private expertise for network operation through functional privatization
- ✓ Are there any financial instruments for road infrastructure (Tolls or user charges) and for utilities for electricity grids? Which of these instruments suit the operation of ERS best?
→ GER: Financing of ERS infrastructure only via the toll (no double financing via network charges) and removal from the network regulation of energy law
- ✓ Which stakeholders of the current road and electricity system could play a role with regard to ERS as well?
→ GER: Toll system operator, electricity suppliers and EETS operators are already on the market and bring the expertise for billing
- ✓ How can a competitive market for electricity distribution via the ERS be created?
→ GER: energy law provides a pattern where different electricity suppliers compete as a single point of contact for the customer within a monopoly but highly regulated electricity grid. ERS can copy this regulation and adjust it to the systems needs.

Indo-German Comparison

- Will the ERS be part of a public road?
→ Road regulation and stakeholders in India?
- Does the public road operator have the expertise to run an electric facility?
→ Regulation of the electricity grids and stakeholders in India
- Are there financing instruments for roads (Road Toll or user charges) and for provision of an electricity grid? Which of these instrument suits the operation of ERS best?
→ Financing instruments for roads and electricity grids in India?
- Which stakeholders of the current road infrastructure and electricity market could play a role for ERS?
- How can we ensure a competitive market for electricity supply with regard to ERS?
- How will the stakeholder model for ERS look like in India?

IKEM Working Paper

**Models for the development of
electric road systems in Europe**

4 EN 2020

Hartwig | Bußmann-Welsch | Lehmann

IKEM Working Paper

**Leitbilder für den Aufbau
von elektrischen Straßen-
systemen in Europa**

4 DE 2020

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