

# Status update HSL

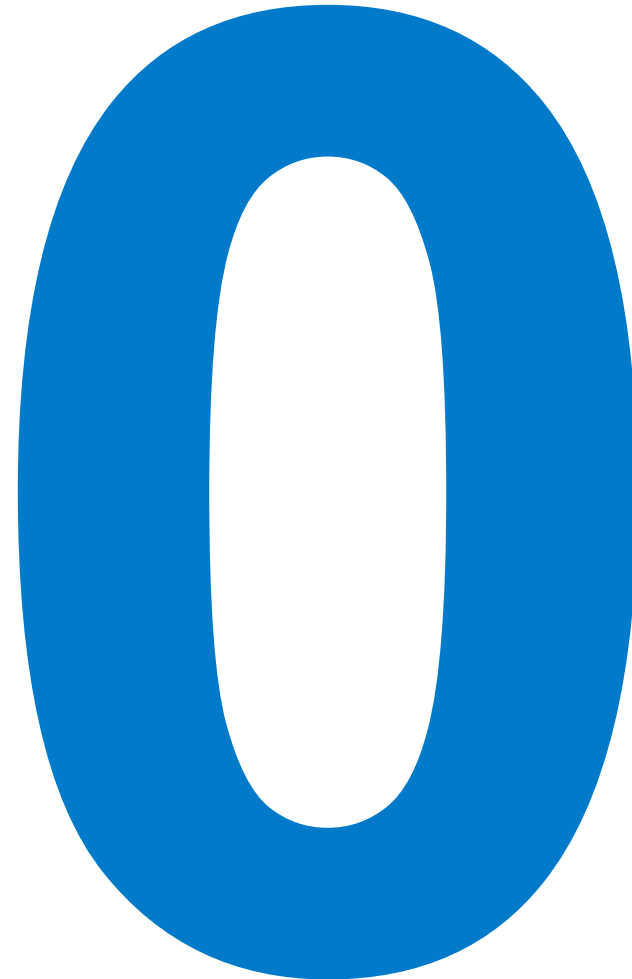
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28.8.2019

# Using electricity as an energy source



- Rail services run on electricity: the metro and trams run on hydro, solar and wind power and commuter trains on hydro power.
- **By 2025, 30% of buses on HSL's services will be electric.**
- In autumn 2019, 30 new fully electric buses were launched and another five will follow in February 2020.
- Using electricity as an energy source produces zero local emissions.

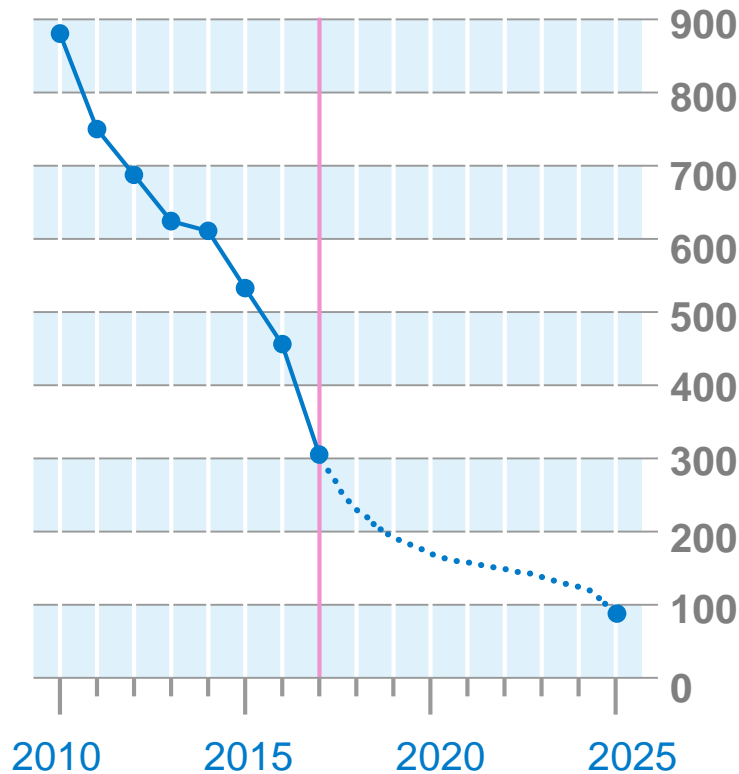


g CO<sub>2</sub>

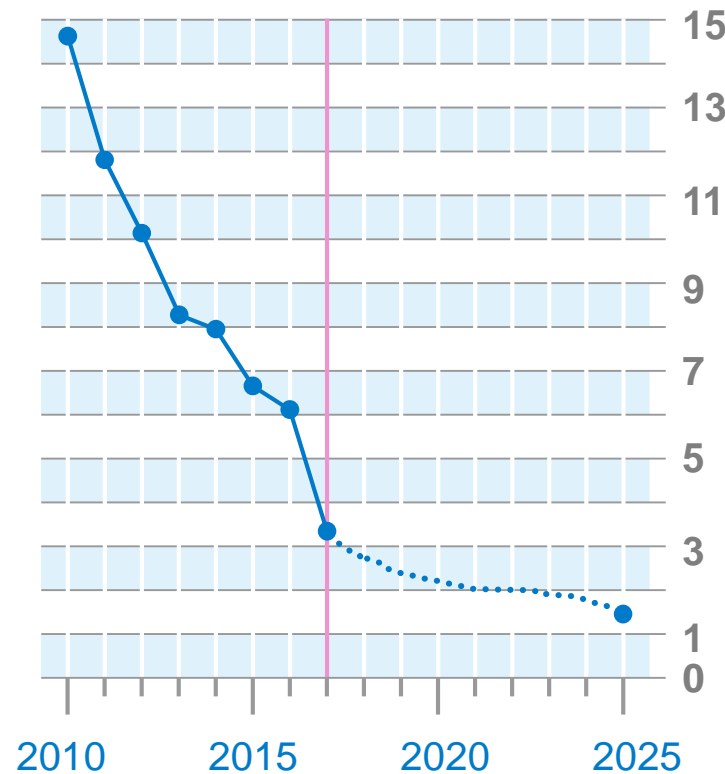
# Local and carbon emissions, tons per year



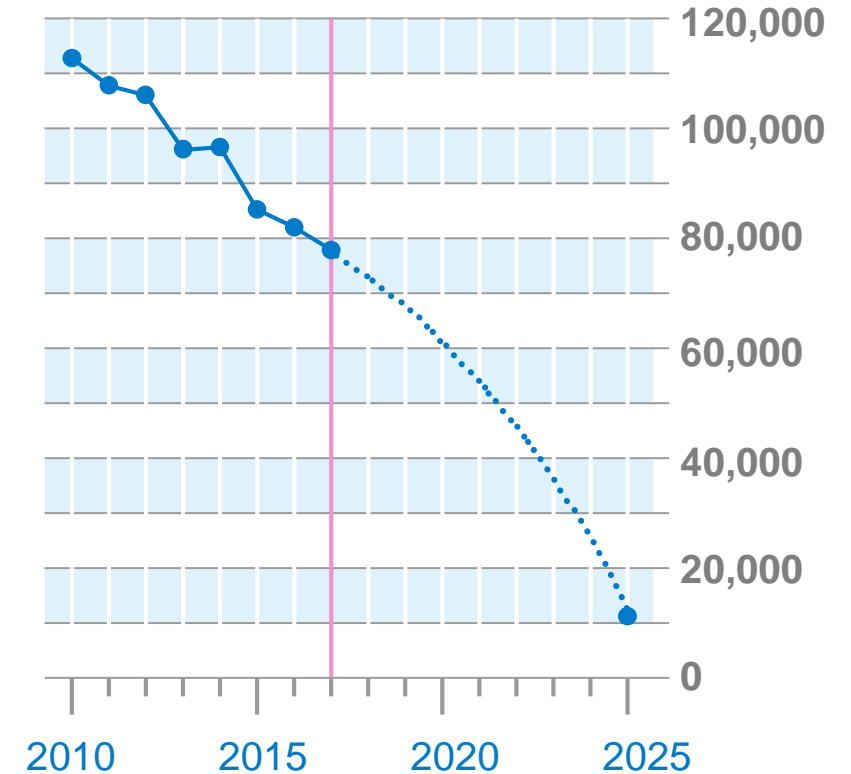
## NO<sub>x</sub>, nitrogen oxides



## PM, fine particles



## CO<sub>2</sub> carbon dioxide



# HSL Bussiliikenteen päästötavoite

Our target is to reduce local emissions and carbon dioxide emissions by more than 90 percent by 2025 from 2010 levels.



1350 bussia

| Bus Emissions category                              | 2010    | 2011    | 2012    | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020  | 2021  | 2022   | 2023   | 2024   | 2025 target | 2030 target |
|---|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|-------|-------|--------|--------|--------|-------------|-------------|
| Euro I  | 1 %     |         |         |        |        |        |        |        |        |        |       |       |        |        |        |             |             |
| Euro II   | 31 %    | 18 %    | 14 %    | 7 %    | 3 %    | 1 %    | 0,3 %  | 0,1 %  |        |        |       |       |        |        |        |             |             |
| Euro III  | 29 %    | 26 %    | 26 %    | 23 %   | 17 %   | 12 %   | 5 %    | 3,3 %  | 1,6 %  |        |       |       |        |        |        |             |             |
| Euro IV   | 7 %     | 7 %     | 7 %     | 7 %    | 6 %    | 4 %    | 2,7 %  | 0,4 %  | 0,3 %  |        |       |       |        |        |        |             |             |
| Euro V  | 4 %     | 4 %     | 4 %     | 4 %    | 4 %    | 4 %    | 1,4 %  | 0,5 %  | 0,4 %  |        |       |       |        |        |        |             |             |
| EEV   | 28 %    | 45 %    | 47 %    | 54 %   | 55 %   | 55 %   | 52 %   | 41,0 % | 34,0 % |        |       |       |        |        |        |             |             |
| EEV / energy-efficient                              |         |         | 1 %     | 5 %    | 6 %    | 6 %    | 6 %    | 6,3 %  | 8,1 %  |        |       |       |        |        |        |             |             |
| Retrofit EEV -> euro VI                             |         |         |         |        |        | 1 %    | 3,4 %  | 3,4 %  | 3,6 %  |        |       |       |        |        |        |             |             |
| Hybrid EEV + euro VI                                |         |         | 0,2 %   | 0,2 %  | 0,5 %  | 0,5 %  | 0,5 %  | 0,6 %  | 0,6 %  |        |       |       |        |        |        |             |             |
| Plug in hybrid ?                                    |         |         |         |        |        |        |        |        |        |        |       |       |        |        |        |             |             |
| Euro VI   |         |         |         |        | 6 %    | 13 %   | 24,1 % | 39,0 % | 45,2 % |        |       |       |        |        |        |             |             |
| Euro VI energy-efficient                            |         |         |         |        | 2 %    | 4 %    | 4,0 %  | 5,0 %  | 5,5 %  |        |       |       |        |        |        |             |             |
| Euro VII ?  |         |         |         |        |        |        |        |        |        |        |       |       |        |        |        |             |             |
| Electricbuses %                                     |         |         |         |        | 0,2 %  | 0,3 %  | 0,4 %  | 0,4 %  | 0,7 %  | 3,0 %  | 5,0 % | 8,0 % | 13,0 % | 17,0 % | 23,0 % | 30 %        | 50 %        |
| Electricbuses pieces                                |         |         |         |        |        |        |        |        | 10     | 45     | 50+   |       |        |        |        | 400         |             |
| Requirement on biofuels                             |         | 6 %     | 6 %     | 6 %    | 6 %    | 8 %    | 10 %   | 12,0 % | 15,0 % | 18,0 % |       |       |        |        |        |             |             |
| 100% biofuels.                                      |         | 1 %     | 4 %     | 7 %    | 15 %   | 26 %   | 28 %   | 30,0 % | 33,6 % |        |       |       |        |        |        | 100 %       |             |
| 2nd gen. biofuels constitute 100% from 2020 onwards |         |         |         |        |        |        |        |        |        |        |       |       |        |        |        |             |             |
| Emissions   | 2010    | 2011    | 2012    | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2018   |       |       |        |        |        | 2025        |             |
| Nox, tons   | 879,42  | 749,05  | 686,60  | 623,51 | 610,03 | 531,92 | 455,58 | 304,67 | 240,00 | -73 %  |       |       |        |        |        | -92 %       | Reduction   |
| PM, tons  | 14,60   | 11,79   | 10,12   | 8,26   | 7,94   | 6,64   | 6,11   | 3,34   | 2,67   | -82 %  |       |       |        |        |        | -95 %       | Reduction   |
| CO <sub>2</sub> , tons                              | 112 795 | 107 832 | 106 059 | 96 225 | 96 600 | 85 215 | 82 025 | 77 896 | 69320  | -39 %  |       |       |        |        |        | -90 %       | Reduction   |

# Number of e-buses in operation/ delivered/possible



| Current e-bus status   | Year 2018 | Autumn | February | January  | Autumn   | Autumn   | Autumn   | Autumn   | January  | Autumn   | Autumn   | TOTAL       |
|--|-----------|--------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|
| Number of e-buses in operation / coming<br>23.08.2019 PS / HSL | 2018      | 2019   | 2020     | 2021     | 2021     | 2021     | 2021     | 2022     | 2023     | 2023     | 2024     | number      |
|  |           |        |          | round 49 | round 50 | round 51 | round 52 | round 53 | round 54 | round 55 | round 56 |             |
| Linkker  | 10        |        |          |          |          |          |          |          |          |          |          |             |
| VDL Citea SLE-129 E  |           | 2      | 5        |          |          |          |          |          |          |          |          |             |
| Yutong   |           | 33     |          |          |          |          |          |          |          |          |          |             |
| e-mini   |           |        |          |          |          |          | 7        |          |          |          | 16       | <b>23</b>   |
| 2 -axle 12 m   |           | 33     |          | 9        | 38       | 27       | 20       | 6        |          | 10       | 30       | <b>173</b>  |
| 2 -axle 13 m   | 10        | 2      | 5        |          |          |          |          | 73       | 20       | 140      |          | <b>250</b>  |
| Bogie 15 m   |           |        |          |          |          |          |          |          |          | 30       |          | <b>30</b>   |
| Articulated 18m  |           |        |          |          | 12       | 27       |          | 25       | 24       | 50       | 20       | <b>158</b>  |
| Electricbuses pieces   | 10        | 45     | 50       | 59       | 109      | 163      | 190      | 294      | 338      | 568      | 634      | <b>634</b>  |
| Electricbuses %  | 1 %       | 3 %    | 4 %      | 5 %      | 8 %      | 13 %     | 15 %     | 23 %     | 26 %     | 44 %     | 49 %     | <b>49 %</b> |
| Total number of buses  | 1300      |        |          |          |          |          |          |          |          |          |          |             |

# Charging infrastructure now



→ *Infrastructure in place as charging stations and preparations in depots, bus stops and terminals*

Cities:

- 6 chargers in end stops
- 2 charger, 4 charging points in terminal, (main railway station)

Operators:

- 40 depot chargers in six locations



Malminkartano  
02/2018



**Leppävaara CaaS**  
11/2019

Koskela  
3/2017



Vuosaari  
8/2019

Ruskeasuo  
1/2017



Tapiola 2015, Siirretty Friisilään

Hakaniemi  
02/2018



Friisilä 02/2018



4 p. 04/2018  
Railway station



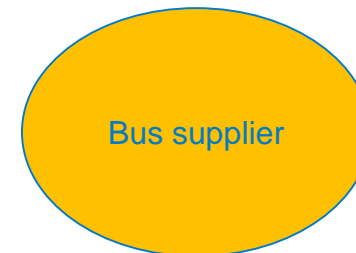
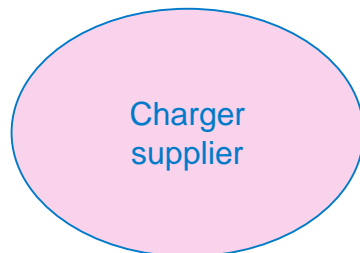
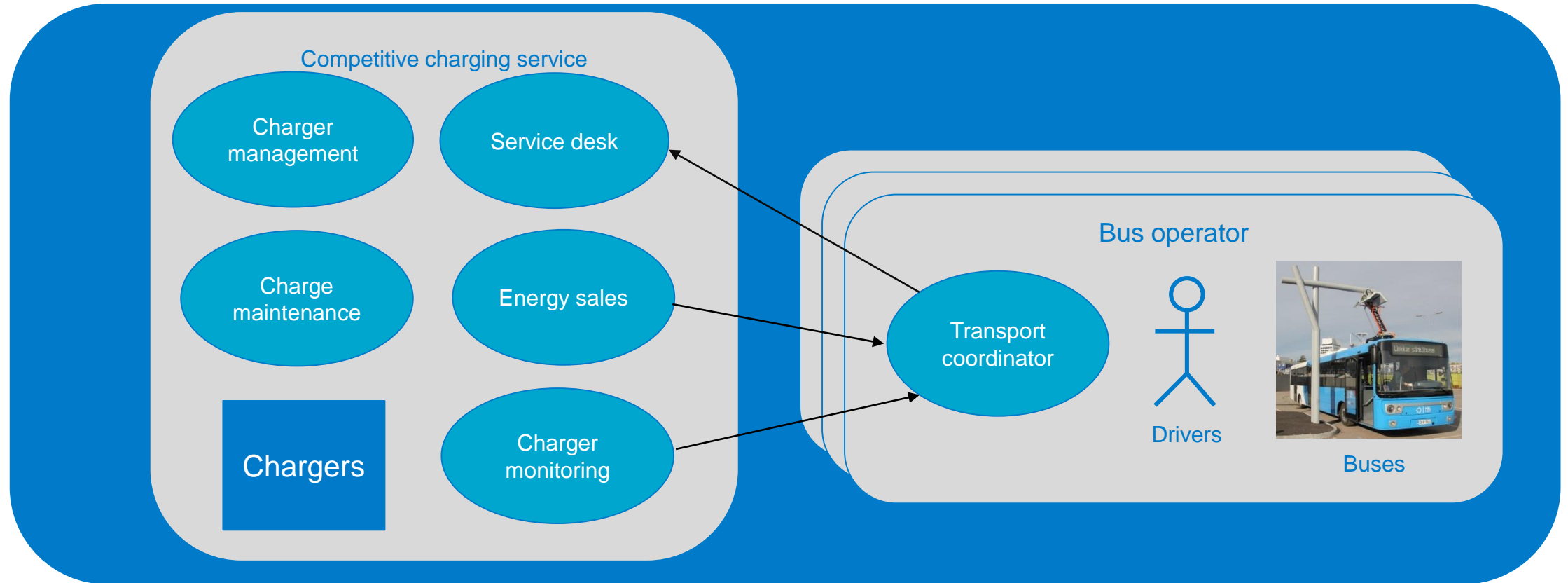
Charging stations

# Charging infrastructure

- Arranging charging
  - Only main terminals
  - End stops of trunklines
  - Operators are responsible depot charging
  
- Charging as a Service, CaaS
  - cities organize locations/facilities



# Charging as a Service



# Commercial tendering of CaaS



- CaaS in Leppävaara bus terminal
- Tendering/negotiation process summer 2018
- There were three competitors
  - Destia/ABB
  - Heliox
  - PlugIt
- The Winner was PlugIt Finland

# First commercial implementation

## Espoo, Leppävaara



# 1/2

- First commercial tenders with eBuses in august 2018
- Operation starts in 8/2019 and 1/2020
  - 11-14 months to deliver the buses and prepare for the operation
  - 25 to Leppävaara feeder lines
  - 10 to Kerava feeder lines

# First commercial implementation

## Espoo, Leppävaara

2/2



→ Challenges of ebus availability and price level in Europe

- There are still too few manufacturers
- Price level is too high

=>The entry of non-European manufacturers into the market

Thank You!

