

Bright ideas.  
Sustainable change.

# Electric vehicles & charging infrastructure

from strategy to implementation

The partner for sustainable change

# Electric vehicles & charging infrastructure

## Electrifying the transport sector

Communities around the world are setting ambitious goals for carbon neutrality. For example, Denmark has set a goal of 70% emissions reductions by 2030, while Finland aims to be carbon neutral by 2035. These ambitions require immediate action to effect changes in the way we live and adapt.

Such changes include looking to electrification of the transport sector. We know from experience that this is one of the most difficult areas to have an impact.

Conversion of vehicle fleets from fossil fuels to electricity is part of the solution. Fortunately, our experience leading this transition makes us an excellent partner in addressing the pressing questions you may be facing, such as:

- How can we attract more people to switch to electric vehicles?
- How do we responsibly replace our vehicle fleets with electric vehicles over a reasonable time frame?
- How many charging stations are required, and what is the ideal phasing?
- Where should charging stations be locations, and what systems should be supported?
- How can we understand the additional loads new charging infrastructure will have on the existing electricity grid?

- What investments are needed, and who should make them?
- What requirements must we make in connection to procuring charging infrastructure and services?

## Proven know-how, context-specific solutions

Ramboll has unmatched international experience and expert knowledge about what it takes to restructure transport fleets and smartly roll out charging infrastructure. Our teams have previously advised:

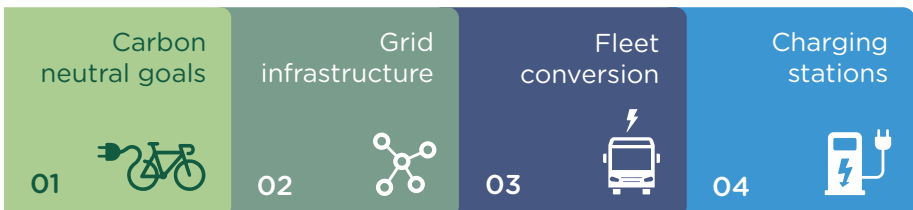
- Regions and municipalities
- Special interest organizations
- Utilities and agencies
- Private companies
- Housing associations

We have deep knowledge of the entire process from the initial strategic ideas to the final implementation, and we understand that each community requires a bespoke plan that serves them best based on their specific needs.

That is why we tailor solutions to achieve the best value for your priorities. Our efforts have resulted in many successfully transitioning communities, and we want to do the same for you.

Ramboll expertise from strategy...

...to implementation



**Infographic:** Our world-leading expertise in EV technology makes Ramboll your partner for sustainable change from strategic goal setting to final implementation of charging infrastructure.

## Carbon neutral goals



Examples of services:

- CO<sub>2</sub> reduction inventories
- Future scenario planning, including resulting charging station needs
- Directly linking goals and vision plans to specific fleet transition and charging infrastructure requirements
- Establishing KPIs for ongoing monitoring

### CO<sub>2</sub> calculations based on GPS, Denmark

Ramboll has developed an algorithm based on GPS data from TomTom that estimates the amount of traffic on all roadways in a municipality or other jurisdiction. When combined with traffic model calculations (via macro-modeling) we are then able to forecast future CO<sub>2</sub> emissions for different traffic scenarios.

[Read more](#) →

## Grid Infrastructure



Examples of services:

- Electrical engineering consultancy
- Grid add-on project planning
- Local-to-regional grid connections
- Cable specifications, routing, and plans
- Voltage drop calculations
- System impact study for charging stations

### EV charging network, Sweden

We provided Vattenfall, Sweden's largest power supplier, with network design services for Västra Ursvik, a new central city development in Sundbyberg municipality to provide housing for around 7 000 residents.

[Read more](#) →

## Fleet conversion



Examples of services:

- Strategic planning for fleet transition
- Conversion mapping and phasing for cars, vans, trucks, trains, and busses
- Charging requirements and procedures
- Capital and operational expense estimations

### Bus fleet conversion, Norway

Ramboll has assisted several major municipal bus fleet operators with their planing, phasing, and execution of a transition from diesel to electric busses. Our work includes analyses on reductions in CO<sub>2</sub> emissions, noise and local pollution, as well as the reduction in operating expenses.

[Read more](#) →

## Charging Stations



Examples of services:

- Analysis of local grid capacity
- Construction, planning, design, and supervision of installations
- Expert advice for real-time clarifications and decision-making during execution stage
- Analysis of electricity supply capacity including communications with electricity

### EV station development, Denmark

In Denmark alone we have helped more than 15 municipalities making strategies on EV charging infrastructure. For example, in Odense, we assisted with an analysis to assess how many publicly available EV charging stations are needed in which districts.

[Read more](#) →



## Carbon neutral goals

# CO<sub>2</sub> calculations based on GPS, Denmark

Ramboll developed an algorithm based on GPS data to estimate the amount of traffic on all roadways in an area for the municipality of Kolding, Denmark. These estimates make it easier to estimate the impacts of mobile-source CO<sub>2</sub> reduction strategies, such as fleet transition horizons.

The algorithm combines traffic counts on the network with the GPS probes at the same locations divided in 8 different road classes because of different representation in the GPS data. The representation varies between approximately 10% on the smallest roads up to 30% on highways.

The dependency between traffic counts and probes are used to estimate the traffic on road segments only with probes. In addition to the estimated traffic GPS data also describe the average speed on each segment divided into time periods.

On top of the estimated traffic and speed from the GPS data we have also developed a calculation method for CO<sub>2</sub> emissions on the total road network - a baseline calculation for the road traffic emissions (CO<sub>2</sub> equivalence).

The method includes correlation between speed and emission, engine consumption, vehicle composition, weather/temperature, cold start, etc.

Combined with traffic model calculations (macro-modelling) we are able to calculate scenarios for the future CO<sub>2</sub> emissions for different traffic scenarios - eg. changes in vehicle composition to more electric cars, more cycling in the city centre, new city developments, new infrastructure, etc.

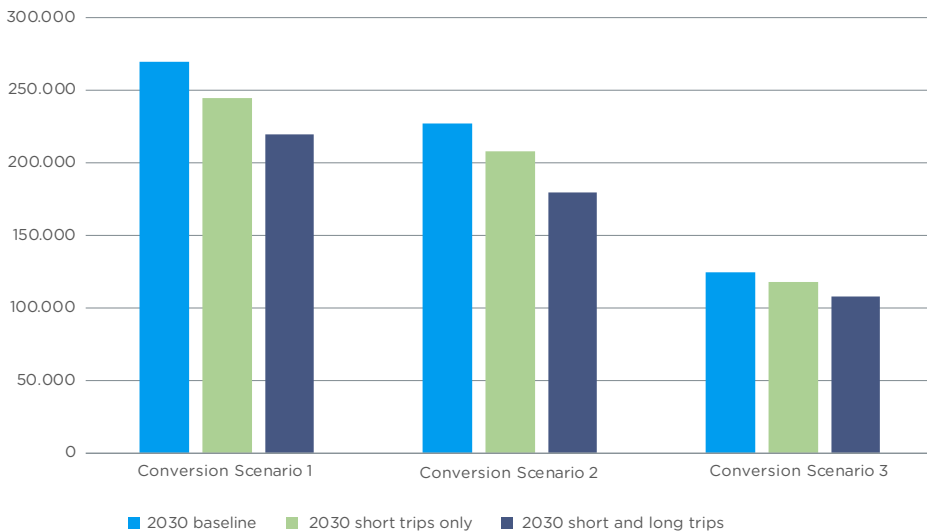


Chart: Tonnes of CO<sub>2</sub> emissions for fleet conversion scenarios targeting short and long trips



Grid infrastructure

# EV charging network, Sweden

**We provided Vattenfall, Sweden's largest power supplier, with network design services for Västra Ursvik, a new central city development in Sundbyberg municipality to provide housing for around 7.000 residents.**

The project is an integration of a large-scale EV charging network while accelerating the green energy transition in Stockholm.

We took part in the project from start to construction. Additionally, we took into account the integration to the city from local grid design and power transmission to regional grid connection.

The project also includes the installation of approximately 700 charging points for electric vehicles added to the electricity need for the housing connections in an area, where a power deficiency exists. This introduces a multitude of complexities and the need for us to verify that involved construction companies make the right decisions for the grid.

The project includes grid planning for the integration of the charging stations with focus on capacity and optimization of the grid.

## Services in short

- Electrical Engineering Consultancy
- Project planning
- Local grid to regional grid connection
  - Connection to 24 kV grid
  - System analysis for connection to 132 kV station
- 12 kV / 400 V substation design
- Cable design
  - Power transmission to houses
- Voltage drop calculation
- System study for vehicle charging stations
  - Impact of 700 charging stations on the grid
  - Capacity calculations
  - EV user analysis



**Image:** Visualisation showing final development of Västra Ursvik



Fleet conversion

# Bus fleet conversion, Norway

**Ramboll has assisted several major municipal bus fleet operators with their planning, phasing, and execution of a transition from diesel to electric busses. Our work includes analyses on reductions in CO2 emissions, noise and local pollution, as well as the reduction in operating expenses.**

We have worked together with Bodø and Drammen municipalities to help study the feasibility of shifting from diesel to electric bus service.

In Bodø, we helped perform a study and used route planning tools and simulations of electric buses to advise on how to best realise the shift. Furthermore, we assisted the client in applying for government funding for investment in charging infrastructure for the electric buses.

In Drammen, we likewise used route planning tools and simulations to estimate the operational costs and capital costs of a large roll-out of electric buses. Here, we served as an advisor for Brakar, the company responsible for public transport in the area, in relation to investments in charging

infrastructure. This will help enable a faster transition to an electric model and thus have a positive impact on the level of emissions and noise in the area.

In our capacity as an expert organisation within electric infrastructure, route planning and electric bus energy consumption, we were also able to advise the municipality in applying for government funding. Drammen applied for NOK 1.8 million to facilitate the shift from diesel to electric buses.

## Sustainability benefits

- Reduced CO<sub>2</sub> emissions from public transport
- Reduced noise
- Reduced local pollution
- Lower operating expenses



Image: Electric bus, Elbuss in Mortensrud, Norway



Charging stations

# EV station development, Denmark

**In Denmark alone we have helped more than 15 municipalities making strategies on EV charging infrastructure. For example, in Odense, we assisted with an analysis to assess how many publicly available EV charging stations are needed in which districts.**

It is important to have the geographical, infrastructural and political frameworks in mind when planning charging infrastructure. Therefore, our work involves, amongst other things, uncovering the context to support the political objectives of the project. This includes a memorandum based on a scenario analysis that describes what future can be expected in the changeover of the car fleet, as well as what requirements are imposed on the charging infrastructure in Odense Municipality. In addition, we estimate how great a CO<sub>2</sub> reduction is associated with different scenarios.

The new charging infrastructure will support the changeover of the future car fleet. In the analysis work, we clarify where the Danish

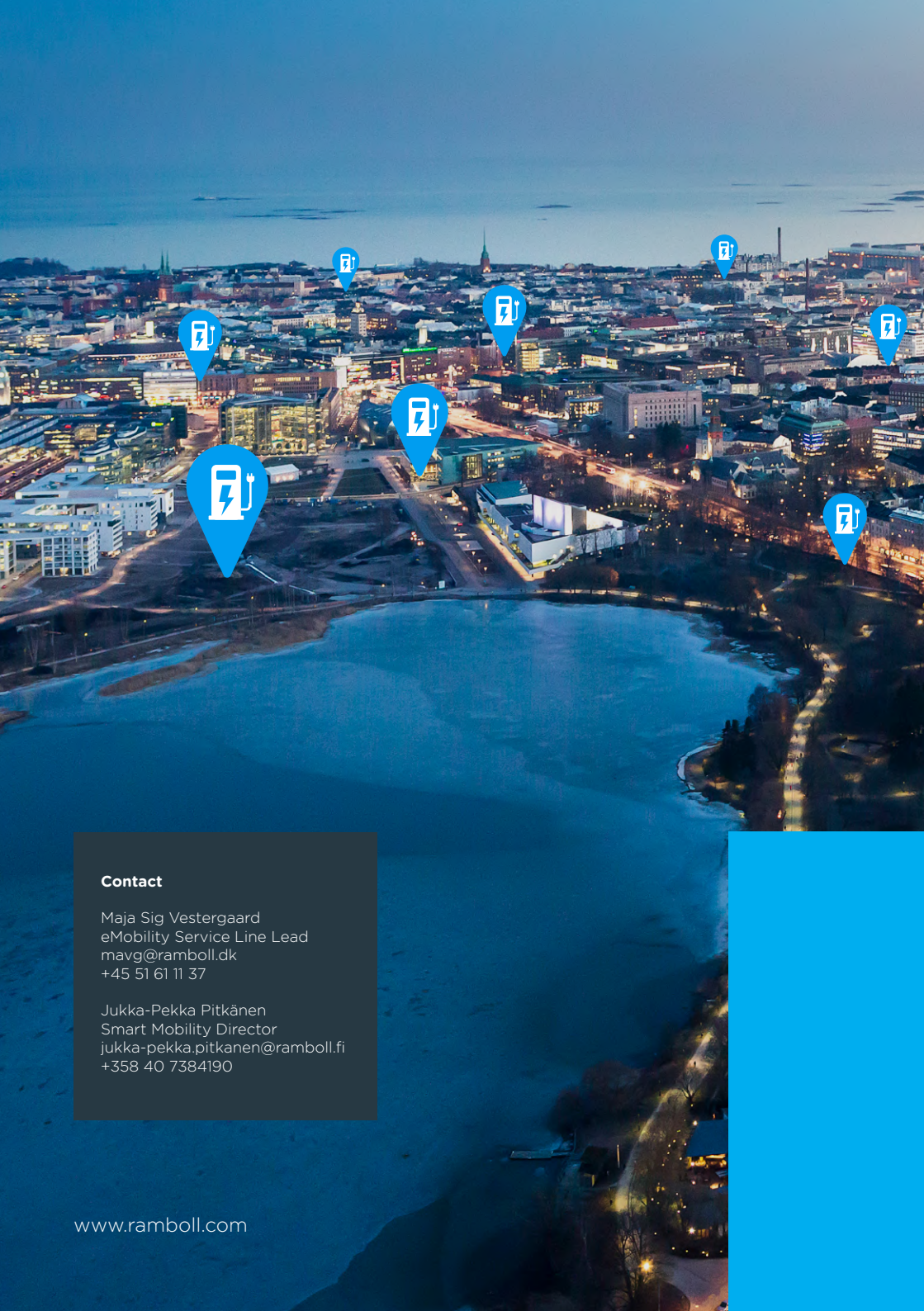
Charging Station requirements<sup>1</sup> for Odense Municipality as the building owner are valid as of January 1, 2025. We will likewise estimate how great the future demand for publicly available charging infrastructures will be at the district level.

Another significant purpose of the preliminary analysis is to clarify what role Odense Municipality should play in the roll-out of the charging infrastructure. We examined the interest in setting up charging infrastructure in Odense among charging operators and how many housing associations and companies can be expected to set up EV charging stations.

Odense Municipality will be able to use the preliminary analysis as a guideline for where there is a need for the municipality to support the roll-out of the charging infrastructure and how this can be done. Thus, the preliminary analysis will be an initial management tool in future work with the roll-out of the charging infrastructure in Odense.



<sup>1</sup> EU law: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0802&qid=1641802763889>



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