

## Electric buses

### 3 urban electric buses for Gabrovo



|                         |   |
|-------------------------|---|
| <b>Purchasing body:</b> | Gabrovo Municipality  |
| <b>Contract:</b>        | <p>Delivery of 3 new electric buses (length 12 m +/- 1),<br/>         delivery and implementation of charging stations</p> <p>Published on 23.11.2017</p> <p>Cancelled, to be re-published in 2018.</p> |
| <b>Savings:</b>         | <ul style="list-style-type: none"> <li>• Expected reduction of CO<sub>2</sub> emissions - 45 tCO<sub>2</sub>/a</li> <li>• Expected primary energy savings – 0.247 GWh/a</li> </ul>                      |

#### SUMMARY

- Supply contract for 3 urban electric buses, length 12 m (+/- 1)
- Delivery and implementation of charging stations (charging infrastructure)
- No specific technology is chosen, suppliers are free to propose any type.
- Total budget up to 1,396,000 EUR (excl. VAT)
- Procurement process cancelled due to incomplete documentation from bidders – will be relaunched later in 2018

## Procurement Approach

The implementation of the "*Gabrovo Sustainable Urban Transport Development*" project started in 2017, with the financial support of the "*Regions in growth*" Operational Program 2014-2020, co-financed by the European Union through the European Regional Development Fund (ERDF). The project aims to achieve more sustainable urban transport through numerous measures – including the purchase of environmental friendly road vehicles. The financing is provided jointly by the municipal budget and the ERDF. The annually drawn up air quality analyses of Gabrovo municipality show that the main pollutants are nitrogen oxides, dust and fine dust particles emitted by transport and solid fuels used for heating, underscoring the need for such a project within the municipality.

An initial review of the available funds showed that the amount was insufficient to replace all existing buses with electric ones. Analysis showed that only three of the new buses can be electric and the three others will be using CNG. This document presents only the approach used for the electric buses.

The tender was published on 23 November 2017 and was to have been awarded according to the most economically advantageous offer (optimal price/quality ratio).

Unfortunately due to incomplete tender documentation (insufficient translation of documents, wrong calculation of specific parameters) the tender process had to be cancelled. The municipality intends to publish the tender again later in 2018, with further clarification provided to bidders in advance on how to provide comprehensive information according to the requirements set.

### Needs Analysis and Market Engagement

During the development of the tender specifications, external experts were assigned to analyse the specific requirements of Gabrovo public transport and propose a roadmap for achieving sustainable urban transport within the town. Various technologies (types of buses) were investigated and analyses for the application of these technologies in terms of the specific conditions of the town and the financial resources available were made. A demonstration has been organised and carried out for more than a month in a real operating environment with an electric bus using an ultracapacitor characterised by fast charging and short mileage.

#### PROCUREMENT INNOVATION

This is only the second tender for purchase of electric buses in Bulgaria, published just 3 months after the first one.

The approach of this specific tender is also innovative, allowing competition between different technologies for charging of the busses.

## Performance/Output Based Specifications (POBS)

Based on the analysis of the operating conditions of the new buses - duration, daily mileage, break time between routes, the elaborated technical specification is based on covering the public transport needs without restricting the different types of battery charging technologies which can be proposed by bidders. Minimum technical requirements for the buses were also included in the specification in order to achieve the optimal price/quality ratio. Using this approach expanded the list of potential suppliers as both of the most common technologies (battery electric buses and capacitors buses) were proposed by the bidders.

Based on the [Best Practice Report for Performance / Output Based Specifications](#) (POBS) report, developed under the SPP Project, the following characteristics of this approach can be found in this tender:

- The products are aimed at satisfying the functional needs for daily routes, as the supplier should provide the necessary infrastructure.
- The technical specifications set minimum requirement for the supplied buses in order to avoid compromises with the quality due to sufficient differences of the price of the different charging infrastructures in both technologies.
- The emphasis is placed on what is to be performed rather than how to perform it.

In most tenders the technology is initially determined by the procurers and the charging infrastructure is described in the tender documents. In this specific case the bidders are obliged to provide the charging infrastructure but there are no limitations on the technology used. The preliminary research showed that both technologies would be applicable in this case.

## Tender specifications and Verification

### TECHNICAL SPECIFICATIONS

- 2 axle buses with length 12 m (+/- 1m), category M3, full electric
- Total number of passengers: 80 + 1
- Engine power: min 100 kW
- Energy storage: min 250 km with one charge (full charge for less than 5 hours) or min 20 km with one charge (charge for the next 20 for less than 10 min)

### AWARD CRITERIA

- Energy consumption - max. 20 points
- Warranty period - max. 25 points
- Technical characteristics - max. 5 points
- Price - max 50 points

## A regional approach to SPP

During the development of the tender documentation, Gabrovo procurers worked together with the experts from "Stolichen avtotransport" Jsc (100 % owned by Sofia municipality). Both Sofia and Gabrovo are members of the Bulgarian SPP network, established by the SPP Regions project, and are part of the Transport working group.

## Results

### Environmental impacts

As the tender was cancelled and no winner was chosen, the calculations of the expected savings were made using a conservative approach for the average energy consumption of the new electric buses.

Table 1: Environmental savings green tender compared to benchmark and conventional solutions

| Tender                            | Consumption<br>(l/yr)<br>(kWh/yr) | CO <sub>2</sub> emissions<br>(tCO <sub>2</sub> /year) | Primary Energy<br>consumption<br>(GWh/year) |
|-----------------------------------|-----------------------------------|---|---|
| Benchmark (existing diesel buses) | 68,796 l                          | 189.5   | 0.688                                       |
| Green tender (electric buses)     | 176,400 kWh                       | 144.5   | 0.441                                       |
| Expected savings                  |                                   | 45.0 (24%)  | 0.247 (36%)                                 |

#### CALCULATION BASIS

- Average fuel (diesel) consumption of the existing buses: 39 l/100km
- Average electricity consumption of the new buses: 100 kWh/100km
- CO<sub>2</sub> emissions factor for electricity: 0.819 kg/kWh
- CO<sub>2</sub> emissions factor for diesel: 2.755 kg/l
- Primary energy factor for electricity: 2.5
- *The calculation has been conducted using the tool developed in the GPP 2020 project ([www.gpp2020.eu](http://www.gpp2020.eu)), and adjusted in the SPP Regions project ([www.sppregions.eu](http://www.sppregions.eu)). The detailed calculations can be found in Annex 1 of the present document.*

## Financial and social impacts

When the existing diesel buses are replaced with new electric ones, the fuel expenses of the municipality will be reduced by approximately 50,000 EUR/yr, depending on diesel and electricity prices. All new buses were required with high technical standards for comfort, safety and air-conditioning leading to an improvement in the service offered to passengers.

## Market response

Three bidders submitted their proposals. Two of them proposed battery electrical buses and one of them capacitors buses.

While the tender process was open, all bidders sent the municipality additional questions for clarification of the tender conditions. The municipal experts published the answers of these questions quickly. Unfortunately, after a detailed review of the submitted proposals, it was found that none of the bidders was eligible for signing the contract. There were errors or missing values within officially translated documents. Furthermore, one of the bidders calculated the specific torque using the wrong values, while another calculated the specific power again using the wrong values. The methodology for calculation of these values was clearly described by the municipal experts and sent to all bidders.

## Lessons learned and future challenges

After the review of the technical documentation the tender was cancelled and will be published again in the coming months. The price offers were not opened by the expert commission of the municipality and overall rating of the proposals was not elaborated. However, based on the received documents it can be stated that both technologies were applicable (battery electric buses and capacitors buses ) in this specific case and if, after republishing the tender, it is successful, the results will show the main advantages and disadvantages of the different types of buses.

Although the clarifications were quite clear, the bidders were not able to develop their proposals with the needed quality. During the next publication of the tender, the municipal team together with EcoEnergy experts will focus on an information campaign for the future bidders in order to avoid similar mistakes.

CONTACT

**Desislava KOLEVA** ([desislava@gabrovo.bg](mailto:desislava@gabrovo.bg))

**Todor POPOV** ([t.popov@gabrovo.bg](mailto:t.popov@gabrovo.bg))

**Gabrovo Municipality**

tel +359 885 251 828

[www.gabrovo.bg](http://www.gabrovo.bg)



## Annex 1 - Calculation of environmental savings

Calculations made using the tool developed within the GPP 2020 project ([www.gpp2020.eu](http://www.gpp2020.eu)), and refined within the SPP Regions project. Available on the SPP Regions website.

| Location                               | Bulgaria  | CO <sub>2</sub> -emissions per kWh (kg CO <sub>2</sub> /kWh) | 0,819                                   |                               |   |   |   |                           |                 |  |
|--|---|--|---|-------------------------------|---|---|---|---------------------------|-----------------|--|
| <b>Input</b>                           | % Green electricity for Electro engine (if any) |  | 0%                                      |                               | % Green electricity for Electro engine (if any)           |   | 0%                                      |                           |                 |  |
|  | <b>Baseline</b>                                 |  |   |                               | <b>Green tender</b>                                       |   |   |                           |                 |  |
|  | Quantity of vehicles                            | Average distance per vehicle per year (km/yr)                | Kind of fuel                            | Amount of fuel per 100 km     | Quantity of vehicles                                      | Average distance per vehicle per year (km/yr) | Kind of fuel                            | Amount of fuel per 100 km |                 |  |
|  | Standard Engine - fuel 1                        | 3  | 58 800                                  | Diesel                        | 39,0  | l/100 km                                      | Petroleum                               | l/100 km                  |                 |  |
|  | Standard Engine - fuel 2                        |  |   | Diesel                        | l/100 km  |   | Diesel                                  | l/100 km                  |                 |  |
|  | Electro Engine                                  |  |   | Electricity                   | kWh/100km   | 3   | 58 800                                  | Electricity               | 100,0 kWh/100km |  |
|  | Hybrid Engine                                   |  |   |                               |   |   |   |                           |                 |  |
|  | Electricity (combined test cycle)               |  |   | Electricity                   | kWh/100km   |   |   | Electricity               | kWh/100km       |  |
|  | Fuel (combined test cycle)                      |  |   | Petroleum                     | l/100 km  |   |   | Diesel                    | l/100 km        |  |
|  | <b>TOTAL</b>                                    | <b>3</b>   | <b>58 800</b>                           |                               |   | <b>3</b>                                      | <b>58 800</b>                           |                           |                 |  |
| <b>Total consumption and emissions</b> | <b>Baseline</b>                                 |  |   |                               | <b>Green tender</b>                                       |   |   |                           |                 |  |
|  | Annual fuel consumption                         | Energy consumption (GWh/yr)                                  | CO <sub>2</sub> -emissions per year (t) |                               | Total amount of fuel during the life time of the vehicles | Energy consumption (GWh/yr)                   | CO <sub>2</sub> -emissions per year (t) |                           |                 |  |
|  | Standard Engine - fuel 1                        | 68 796   | l                                       | 189                           | 0   | l   | 0,00                                    | 0                         |                 |  |
|  | Standard Engine - fuel 2                        | 0  | l                                       | 0,69                          | 0   | l   | 0,00                                    | 0                         |                 |  |
|  | Electro Engine                                  | 0  | kWh                                     | 0,000                         | 176 400   | kWh   | 0,441                                   | 144,47                    |                 |  |
|  | Hybrid Engine                                   |  |   |                               |   |   |   |                           |                 |  |
|  | Electricity (combined test cycle)               | 0  | kWh                                     | 0                             | 0   | kWh   | 0,00                                    | 0                         |                 |  |
|  | Fuel (combined test cycle)                      | 0  | l                                       | 0                             | 0   | l   | 0,00                                    | 0                         |                 |  |
|  | <b>TOTAL</b>                                    |  |   | <b>0,688</b>                  | <b>189,500</b>  |   | <b>0,441</b>                            | <b>144,472</b>            |                 |  |
|  | <b>Savings</b>                                  | <b>Total savings (Baseline / Green tender)</b>               |   |                               |   |   |   |                           |                 |  |
| Energy savings (GWh/yr)                |   | CO <sub>2</sub> -savings (t/yr)                              | % of energy savings                     | % of CO <sub>2</sub> -savings |   |   |   |                           |                 |  |
| Standard Engine - fuel 1               |   | 0,69   | 189                                     | 100%                          | 100%  |   |   |                           |                 |  |
| Standard Engine - fuel 2               |   |  |   |                               |   |   |   |                           |                 |  |
| Electro Engine                         |   | -0,44  | -144                                    | #DIV/0!                       | #DIV/0!   |   |   |                           |                 |  |
| Hybrid Engine                          |   |  |   |                               |   |   |   |                           |                 |  |
| Electricity (combined test cycle)      |   | 0,00   | 0                                       | #DIV/0!                       | #DIV/0!   |   |   |                           |                 |  |
| <b>TOTAL FOR THE PROJECT</b>           | <b>0,247</b>                                    | <b>45,028</b>  | <b>36%</b>                              | <b>24%</b>                    |   |   |   |                           |                 |  |

## About SPP Regions

SPP Regions is promoting the creation and expansion of 7 European regional networks of municipalities working together on sustainable public procurement (SPP) and public procurement of innovation (PPI).

The regional networks are collaborating directly on tendering for eco-innovative solutions, whilst building capacities and transferring skills and knowledge through their SPP and PPI activities. The 42 tenders within the project will achieve 54.3 GWh/year primary energy savings and trigger 45 GWh/year renewable energy.

### SPP REGIONS PARTNERS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649718. The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.