

## Efficient lighting

### Framework agreement on the procurement of indoor light sources and lamp starters



<b>Purchasing body:</b>	The Municipalities of Allerød and Fredensborg
<b>Contract:</b>	2 year framework agreement (with the possibility of two 12 month extensions) Contract awarded: January 2017
<b>Savings:</b>	<ul style="list-style-type: none"> <li>• 19 % CO<sub>2</sub> emissions saved (4.89 tonnes CO<sub>2</sub>/year)</li> <li>• 19 % energy savings (0.4 GWh/year)</li> <li>• Possible financial savings during a period of 15 years: 32 %</li> </ul>

#### SUMMARY

- 2 year framework agreement on the procurement of light sources and lamp starters.
- Completed by the Municipality of Allerød on behalf of the joint procurement community in which the Municipality of Fredensborg participates.
- The purpose of the tender has been to ensure a continuous replacement of present (conventional) sources of light with more energy and resource efficient alternatives.
- The contract has been awarded to Hoejager Belysning. Value of the contract: 2.2 million dkk (approx. 300,000 €).

## Procurement Approach

Allerød Municipality, in cooperation with the Municipality of Fredensborg, completed a framework agreement on light sources and lamp starters inside buildings owned by the municipalities.

The purpose of the tender was to provide the framework for the ongoing replacement of the current, partly conventional light sources, with more energy and resource efficient light sources, such as LED. This should be done at the lowest possible prices.

During the tender process, there was a focus on total cost of ownership (TCO), with offer price being assessed on TCO. The Danish Ministry of Environment and Food's tool for calculating the TCO price<sup>1</sup> was used and incorporated in the bill of quantities. The contract was thus awarded on the basis of an assessment of the total costs related to both acquisition and use of the light sources. The TCO period (expected lifetime for the products) was set at 15 years in accordance with the Ministry of the Environment and Food.

The tender was designed with reference to product categories – a list of the top-185 items, mainly selected on the basis of contracting authority's consumptions patterns for the past two years. The bill of quantities only outlined the requirements in terms of performance and function (socket size, lumen etc.) rather than defining a specific technology, which allowed tenderers to bid with new energy-saving products (e.g. LED) that matched the existing luminaire.

### Joint Procurement Community

The municipalities of Fredensborg and Allerød are both part of the North Sealand joint procurement community (IN) and the tender was completed on behalf of IN. The advantage of conducting a joint tender is among other things to:

- Reduce transaction costs associated with completing a tender for the participating municipalities.
- Achieve increased financial gain by offering "greater volume" while achieving better service and quality from the suppliers

#### PROCUREMENT INNOVATION - TCO

TCO price has been used as award criteria, which means the contract award is based on the total cost during the light sources lifetime and not just costs of acquisition.

### Market Engagement

Prior to the tender, there was dialogue with the market to identify the light sources and lamp starters currently available on the market. The dialogue also provided information on the development in relation to energy-saving and resource-efficient light sources and lamp starters.

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<sup>1</sup> Find the link to the tool in here:

[http://mst.dk/media/94901/miljoeministeriet\\_vaerktoej\\_tco\\_belysning\\_final\\_til-layout.xlsx](http://mst.dk/media/94901/miljoeministeriet_vaerktoej_tco_belysning_final_til-layout.xlsx) (English version)

## Tender specifications and Verification

### TECHNICAL SPECIFICATIONS

The offer is designed with reference to a list of product categories selected after historical consumption in the last 2 years, see annex 2. The list contains only the products' technical specifications, which means that the bidder can offer new sustainable products that fit the existing fixture.

A number of technical requirements for the different light sources are described:

- Size of the sockets
- Diameter and length for certain light sources (they have to fit into existing luminaires)
- Min. lumen
- Color temperature
- Color rendering

Values for the various technical specifications depend on the type of light source.

### AWARD CRITERIA

- The economically most advantageous offer based on the lowest TCO price<sup>2</sup> for light sources and lowest price for lamp starters (since it was not possible to use the TCO calculation model for lamp starters, these were evaluated exclusively on the purchase price).

### VERIFICATION

The Danish Ministry of Environment and Food's tool for calculating the TCO price was used and incorporated in the bill of quantities.

## A regional approach to SPP

The tender was completed in cooperation with the Municipality of Fredensborg. Tasks related to the tender were coordinated and distributed between the participating municipalities in accordance with the procedure for cooperation in the purchasing community IN. Allerød Municipality was in charge of the tender and was responsible for the tender documents and the completion of the tender.

## Results

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<sup>2</sup> For more information about the calculation method and which exact costs are included see:  
[http://mst.dk/media/94901/miljoeministeriet\\_vaerktoej\\_tco\\_belysning\\_final\\_til-layout.xlsx](http://mst.dk/media/94901/miljoeministeriet_vaerktoej_tco_belysning_final_til-layout.xlsx) (English version)

## Environmental impacts

In accordance with the purpose one of the results achieved in the tender was that the winning bidder offered more energy-efficient light sources than the conventional light sources used to date. LED has replaced halogen - just as the bidder has offered different LED light sources to replace fluorescent lamps. In addition, the bidder has proposed a fluorescent tube that lasts 3-4 times longer than regular fluorescent lamps.

The awarded contract makes it possible to save up to 19 % of energy and CO<sub>2</sub> emissions during a period of 15 years, see table below.

**Table 1: Environmental savings**

Tender	Consumption (kWh/year)	CO <sub>2</sub> emissions (tonnes)		Primary Energy consumption (GWh)	
		Year	Life time	Year	Life time
<b>Baseline</b>	77,997	25.65	384.73	0,19	2.92
<b>Green tender</b>	63,119	20.76	311.34	0,16	2,37
<b>Savings</b> <b>19 %</b>	<b>14,878</b>	<b>4.89</b>	<b>73.39</b>	<b>0.04</b>	<b>0,56</b>

### CALCULATION BASIS

- CO<sub>2</sub>-emissions of the Danish electricity mix set at 0.329 kg/kWh
- For primary energy consumption a PEF (Primary Energy Factor) of 2.5 was assumed for electricity and 1.1 for RES<sup>3</sup>.
- Life time: 15 years
- Calculation 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 [www.sppregions.eu](http://www.sppregions.eu)

<sup>3</sup> Source: Ecofys, Development of the Primary Energy Factor of Electricity generation in the EU-28 from 2010-2013, 2015

## Financial impacts

With the tender Allerød Municipality has achieved a financial saving of 32 % based on the overall TCO price during a time period of 15 years.

## Contract management

A start-up meeting was held with the supplier, where expectations for the future co-operation were discussed.

Regular status meetings will be held with the supplier and the individual light sources will be routinely checked. Checking light sources is generally difficult because the life span of light sources depends on several factors, i.a. how often the light source is switched on / off, light sensor, room temperature, etc. It can therefore be difficult to hold the supplier accountable for the promised product life span.

Allerød Municipality keeps records of each light source to keep track of whether it achieves the expected product life span.

## Lessons learned

TCO calculations are essential for finding the cheapest product over time. The TCO calculation showed that cheap light sources (purchase price) over time could be much more expensive than light sources with higher purchase prices because the cheapest light sources are more expensive in use.

### CONTACT

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**Ministry of Environment  
and Food of Denmark**  
Environmental  
Protection Agency

## 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 of energy contracting	Denmark					
CO <sub>2</sub> -emissions per kWh electricity (kg/kWh)	0,329	If you know your own rate, enter it on the sheet "General Assumptions".				
Lifetime of the measures implemented in the course of the contract	15	years				

  

INPUT DATA				
Energy source	Baseline		Green tender	
	Current annual energy consumption		Expected annual energy consumption	
Electricity, conventional	77 997	kWh	63 119	kWh
Electricity, green		kWh		kWh
Heating oil		l		l
Natural Gas		m <sup>3</sup>		m <sup>3</sup>
Wood pellets		kg		kg
Wood		kg		kg
District heating		kWh		kWh
Coal Briquette		kg		kg
Lignite high quality		kg		kg
Lignite low quality		kg		kg
Coke/Anthracite		kg		kg

SAVINGS			
Expected results	Savings (Baseline / Green tender)		
	Per year	Per lifetime	Percentage
Primary energy savings, (GWh)	0,04	0,6	19,08%
Reduction of CO <sub>2</sub> emissions, (t CO <sub>2</sub> )	4,89	73,39	19,08%

## Annex 2 – Tender specifications

### Historical data

ID	Produkt group	Product description	socket	diameter (mm)	length (mm)	Min. Lumen	Color temp	Ra value	Number of hours per day	Number of days per year	Price of labor for replacement of light source	Estimated consumption per year
XX	XX		XX	XX	XX	XX	XX	XX	9	220	100	10
3	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G23	27	138	400	3000	80-89	9	220	100	15
7	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G23	27	168	600	3000	80-89	9	220	100	116
8	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G23	27	238	900	4000	80-89	9	220	100	20
9	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G23	27	238	900	2700	80-89	9	220	100	7
12	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G24d-1	27	138	900	3000	80-89	9	220	100	5
13	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G24d-2	27	153	1200	2700	80-89	9	220	100	5
14	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G24d-2	27	153	1200	3000	80-89	9	220	100	60
15	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G24d-2	27	153	1200	4000	80-89	9	220	100	5
17	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	G24d-3	27	172	1800	3000	80-89	9	220	100	35
18	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	G24q-1	27	131	900	2700	80-89	9	220	100	20
21	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	G24q-2	27	146	1200	3000	80-89	9	220	100	70
22	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	G24q-3	27	165	1800	2700	80-89	9	220	100	15
23	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	G24q-3	27	165	1800	3000	80-89	9	220	100	60
25	Flourscent lamp	Kompakt Flourscent lamp, 2 stifter with built-in starter	GX24d-3	42	138	1800	2700	80-89	9	220	100	10
27	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter uden built-in starter	GX24q-2	42	116	1200	2700	80-89	9	220	100	7

29	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter uden built-in starter	<b>GX24q-3</b>	<b>42</b>	<b>131</b>	<b>1800</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>7</b>
30	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter uden built-in starter	<b>GX24q-3</b>	<b>42</b>	<b>147</b>	<b>2400</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>22</b>
31	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter uden built-in starter	<b>GX24q-4</b>	<b>42</b>	<b>168</b>	<b>3200</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>17</b>
33	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	<b>2G11</b>	<b>38</b>	<b>230</b>	<b>1200</b>	<b>2700</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>10</b>
37	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	<b>2G11</b>	<b>38</b>	<b>533</b>	<b>4800</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>9</b>
38	Flourscent lamp	Kompakt Flourscent lamp, biax, 4 pins, u/ built-in starter	<b>2G11</b>	<b>43,8</b>	<b>538,8</b>	<b>3500</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>5</b>
39	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	<b>2G10</b>	<b>79</b>	<b>165</b>	<b>1700</b>	<b>4000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>5</b>
40	Flourscent lamp	Kompakt Flourscent lamp, 4 stifter without built-in starter	<b>2G10</b>	<b>79</b>	<b>217</b>	<b>2800</b>	<b>2700</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>5</b>
44	Flourscent lamp	Kompakt Flourscent lamp, 2D, 2 stifter withinbygget starter	<b>GR8</b>	<b>140</b>	<b>140</b>	<b>1050</b>	<b>2700</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>69</b>
45	Flourscent lamp	Flourscent lamp	<b>G13</b>	<b>26</b>	<b>438</b>	<b>1000</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>15</b>
47	Flourscent lamp	Flourscent lamp	<b>G13</b>	<b>26</b>	<b>590</b>	<b>1350</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>170</b>
49	Flourscent lamp	Flourscent lamp	<b>G13</b>	<b>26</b>	<b>1200</b>	<b>3350</b>	<b>2700</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>12</b>
52	Flourscent lamp	circular Flourscent lamp	<b>G10q</b>	<b>29</b>	<b>305</b>	<b>2250</b>	<b>4000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>6</b>
54	Flourscent lamp	circular Flourscent lamp	<b>G10q</b>	<b>29</b>	<b>406</b>	<b>2900</b>	<b>4000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>6</b>
55	Flourscent lamp	circular Flourscent lamp	<b>2GX13</b>	<b>16</b>	<b>300</b>	<b>3200</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>6</b>
57	Flourscent lamp	Flourscent lamp, T5	<b>G5</b>	<b>16</b>	<b>288</b>	<b>410</b>	<b>4000</b>	<b>&lt;80</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>17</b>
58	Flourscent lamp	Flourscent lamp, T5	<b>G5</b>	<b>16</b>	<b>288</b>	<b>400</b>	<b>3000</b>	<b>&lt;80</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>12</b>
63	Flourscent lamp	Flourscent lamp, T5	<b>G5</b>	<b>16</b>	<b>1149</b>	<b>2600</b>	<b>2700</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>15</b>
65	Flourscent lamp	Flourscent lamp, T5	<b>G5</b>	<b>16</b>	<b>1149</b>	<b>4450</b>	<b>3000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>26</b>
67	Flourscent lamp	Flourscent lamp, T5	<b>G5</b>	<b>16</b>	<b>1449</b>	<b>3300</b>	<b>4000</b>	<b>80-89</b>	<b>9</b>	<b>220</b>	<b>100</b>	<b>15</b>



ID	Produkt group	Product description	socket	diameter (mm)	length (mm)	Min. Lumen	Color temp	Ra value	Number of hours pr. day	Number of days per year	Price of labor for replacement of light source	Estimated consumption per year
71	Halogen	Standard, dimmable	E27	-	-	700	-	-	9	220	100	72
72	Halogen	Standard, dimmable	E27	-	-	915	-	-	9	220	100	52
76	Halogen	Krone	E27	-	-	700	-	-	9	220	100	5
77	Halogen	candle, dimmable	E14	-	-	405	-	-	9	220	100	15
78	Halogen	tubeformet, dimmable	E27	-	-	1060	-	-	9	220	100	10
79	Halogen	tubeformet, dimmable	E27	-	-	1200	-	-	9	220	100	16
80	Halogen	Stiftsocket	G4	-	-	130	-	-	9	220	100	32
81	Halogen	Stiftsocket	G4	-	-	300	-	-	9	220	100	55
82	Halogen	Stiftsocket	G4	-	-	100	-	-	9	220	100	9
83	Halogen	Stiftsocket	G4	-	-	90	-	-	9	220	100	10
84	Halogen	Stiftsocket	GY6,35	-	-	580	-	-	9	220	100	20
85	Halogen	Stiftsocket	GY6,35	-	-	900	-	-	9	220	100	20
86	Halogen	Stiftsocket	GY6,35	-	-	860	-	-	9	220	100	5
87	Halogen	Stikben	G9	-	-	460	-	-	9	220	100	10
ID	Produkt group	Product description	socket	diameter (mm)	length (mm)	Min. Lumen	Color temp	Ra value	Number of hours pr. day	Number of days per year	Price of labor for replacement of light source	Estimated consumption per year
89	LED	Standard	E14	-	-	245	2700	80-89	9	220	100	75
91	LED	Standard	E27	-	-	470	2700	80-89	9	220	100	43

93	LED	Standard	E27	-	-	600	2700	80-89	9	220	100	25
94	LED	Standard	E27	-	-	806	2700	80-89	9	220	100	251
97	LED	Standard	E27	-	-	1105	2700	80-89	9	220	100	7
98	LED	Standard	E27	-	-	1300	2700	80-89	9	220	100	20
99	LED	Standard, dimmable	E27	-	-	1521	2700	80-89	9	220	100	70
100	LED	candle, dimmable	E14	-	-	250	2700	80-89	9	220	100	15
101	LED	candle, dimmable	E14	-	-	470	2700	80-89	9	220	100	24
102	LED	Globe	E27	-	-	200	2700	80-89	9	220	100	17
103	LED	Globe	E27	-	-	400	2700	80-89	9	220	100	49
105	LED	Krone	E14	-	-	250	2700	80-89	9	220	100	15
110	LED	Krone, dimmable	E27	-	-	470	2700	80-89	9	220	100	36
111	LED	Krone	E27			470	2700	90-99	9	220	100	10
112	LED	Krone, dæmobar	E27			810	2700	90-99	9	220	100	10
113	LED	Krone, dimmable	E27			1055	2700	90-99	9	220	100	10
115	LED	tube	G13	28	600	990	3000	80-89	9	220	100	20
116	LED	tube	G13	28	1200	1900	3000	80-89	9	220	100	24
117	LED	tube	G13	28	1200	2070	3000	80-89	9	220	100	5
120	LED	tube, T8	G13	28	1200	2300	3000	80-89	9	220	100	8
124	LED	Reflektor, light angel 110°	E14	-	-	430	3000	-	9	220	100	12
125	LED	Spot, Light scattering 36°	GU5,3	-	-	300	2700	80-89	9	220	100	40
128	LED	spot, Light scattering 38°	GU10	-	-	200	2700	80-89	9	220	100	46

129	LED	spot, Light scattering 40°	GU10	-	-	262	2700	90-99	9	220	100	36
130	LED	spot, Light scattering 40°	GU10	-	-	272	3000	90-99	9	220	100	25
132	LED	Spot, Light scattering 40°	E27	-	-	320	3000	80-89	9	220	100	15
133	LED	Spot, Light scattering 25°	E27	-	-	630	2700	80-89	9	220	100	11

ID	Produkt group	Product description	socket	diameter (mm)	length (mm)	Min. Lumen	Color temp	Ra value	Number of hours pr. day	Number of days per year	Price of labor for replacement of light source	Estimated consumption per year
149	Lavenergi sparepærer	Spiral	E14	-	-	470	2700	80-89	9	220	100	8
160	Lavenergi sparepærer	Kompakt Flourscent lamp, with built-in starter	E27	45	148	1140	2700	80-89	9	220	100	20
161	Lavenergi sparepærer	Kompakt Flourscent lamp, with built-in starter	E27	58	176	1440	2700	80-89	9	220	100	10
162	Lavenergi sparepærer	Kompakt Flourscent lamp, with built-in starter	E27	58	195	1940	2700	80-89	9	220	100	10
ID	Produkt group	Product description	socket	diameter (mm)	length (mm)	Min. Lumen	Color temp	Ra value	Number of hours pr. day	Number of days per year	Price of labor for replacement of light source	Estimated consumption per year
163	Starter	Radium starter (i enkelt drift) RS11 4-80W	-	-	-	-	-	-	-	-	-	165
164	Starter	RS51. Til dobbeltdrift 4-22W	-	-	-	-	-	-	-	-	-	63
165	Starter	T4 for 4-65 W Flourscent lamp i enkelt drift	-	-	-	-	-	-	-	-	-	61

Information for the bidder to fill in for all the product categories

Bidders item number	Name of producer	Unit	Price per unit	Number of pieces per unit	Watt	Lifetime (L70) (hours)	Price per unit	Price (whole period)	price	Total TCO price
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## 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



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