Best Practice on TLP KO2

IN-USE ENERGY PROFILING - SIGNALLING EQUIPMENT

Overview:
Siemens Rail Automation (SRA) has set a target of 5% emission reduction for the Thameslink project on in-use energy baseline levels. LL09 annual in-use emissions have been calculated as 177,484 kg CO2-equivalent. Total project in-use emissions will be approximately 845,678 kg CO2-e.

Method:
To better direct our efforts and target the most energy intensive signaling equipment, a profile of each piece of kit was required. Power loadings (voltage amps) were obtained from SRA Power Engineers for each piece of equipment (see Figure 1) and a calculation was used to convert voltage amps (i.e. watts) to kilowatt hours, then kg CO2-e using DEFRA emission factor for the UK grid (0.49426).

This gave a list of what pieces of equipment consume the most individually, i.e. if you had one item of each piece of kit, which are the most energy intensive to run (see Figure 2). The AWS suppressor, point battery charger and EBI 400 track circuit TX are the top three consumers, and have therefore been selected as target areas for operational (Scope 2) emission reduction.

The next step was to determine which pieces of equipment are consuming the most on Thameslink. This involved obtaining the Bill of Materials to see how many of each piece of equipment was being ordered for the project, and multiplying quantities with kgCO2-e. See Figure 3 for a diagrammatic representation.

Meeting Objectives and Targets
This initiative aligns with the TLP Sustainability Strategy Objective 15 ‘to minimise the levels of carbon generated over the whole life of TLP’ and associated TLP Delivering Carbon Emissions Reduction Policy.
## Raw data

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>(a) Power consumption (VA = watt)</th>
<th>(b) kWh (a*18/1000)</th>
<th>(c) kWh per year (b*365)</th>
<th>(d) kgCO2-e per day (c*0.49426)</th>
<th>(e) kgCO2-e per year (d*365)</th>
<th>(f) Quantity ordered - Thameslink</th>
<th>kg CO2-e per year (e*f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS Suppressor (Green) NEW VORTOK STYLE</td>
<td>295.0</td>
<td>5.3</td>
<td>1,938.2</td>
<td>2.6</td>
<td>958</td>
<td>121</td>
<td>115,912</td>
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<tr>
<td>Point Battery Charger (5A)</td>
<td>220.0</td>
<td>4.0</td>
<td>1,445.4</td>
<td>2.0</td>
<td>714</td>
<td>0</td>
<td>0</td>
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<tr>
<td>EBI 400 Track Circuit TX</td>
<td>180.0</td>
<td>3.2</td>
<td>1,182.6</td>
<td>1.6</td>
<td>585</td>
<td>780</td>
<td>455,919</td>
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<tr>
<td>AWS (Green) NEW VORTOK STYLE</td>
<td>140.0</td>
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<td>919.8</td>
<td>1.2</td>
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<td>252</td>
<td>114,564</td>
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<tr>
<td>LED Position Light Junction Indicator (PLJI)</td>
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<td>887.0</td>
<td>1.2</td>
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<td>47</td>
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<tr>
<td>LED Shunt (Independent Position Light)</td>
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<td>394.2</td>
<td>0.5</td>
<td>195</td>
<td>192</td>
<td>37,409</td>
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<tr>
<td>CDRA</td>
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<td>1.1</td>
<td>394.2</td>
<td>0.5</td>
<td>195</td>
<td>34</td>
<td>6,624</td>
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<tr>
<td>LED Limit of Shunt (LOS)</td>
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<td>1.1</td>
<td>394.2</td>
<td>0.5</td>
<td>195</td>
<td>2</td>
<td>390</td>
</tr>
<tr>
<td>LED Subsidiary (PL)</td>
<td>60.0</td>
<td>1.1</td>
<td>394.2</td>
<td>0.5</td>
<td>195</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LED Standard Alphanumeric Route Indicator</td>
<td>55.0</td>
<td>1.0</td>
<td>361.4</td>
<td>0.5</td>
<td>179</td>
<td>19</td>
<td>3,393</td>
</tr>
<tr>
<td>LED Miniature Alphanumeric Route Indicator</td>
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<td>1.0</td>
<td>361.4</td>
<td>0.5</td>
<td>179</td>
<td>14</td>
<td>2,500</td>
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<tr>
<td>LED Banner Repeater</td>
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<td>114</td>
<td>9</td>
<td>1,023</td>
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<tr>
<td>Signal 4 Aspect (LED)</td>
<td>30.0</td>
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<td>197.1</td>
<td>0.3</td>
<td>97</td>
<td>303</td>
<td>29,518</td>
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<tr>
<td>Signal 3 Aspect (LED)</td>
<td>30.0</td>
<td>0.5</td>
<td>197.1</td>
<td>0.3</td>
<td>97</td>
<td>12</td>
<td>1,169</td>
</tr>
<tr>
<td>Equipment Type</td>
<td>(a) Power consumption (VA = watt)</td>
<td>(b) kWh (a*18/1000)</td>
<td>(c) kWh per year (b*365)</td>
<td>(d) kgCO2-e per day (c*0.49426)</td>
<td>(e) kgCO2-e per year (d*365)</td>
<td>(f) Quantity ordered - Thameslink</td>
<td>kg CO2-e per year (e*f)</td>
</tr>
<tr>
<td>--------------------------------</td>
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<td>---------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Signal 1 Aspect (LED)</td>
<td>30.0</td>
<td>0.5</td>
<td>197.1</td>
<td>0.3</td>
<td>97</td>
<td>4</td>
<td>390</td>
</tr>
<tr>
<td>LOD unit</td>
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<td>197.1</td>
<td>0.3</td>
<td>97</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Signal 2 Aspect (LED)</td>
<td>30.0</td>
<td>0.5</td>
<td>197.1</td>
<td>0.3</td>
<td>97</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 x Case lamps/Loc Heater</td>
<td>24.0</td>
<td>0.4</td>
<td>157.7</td>
<td>0.2</td>
<td>78</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Points Machines/Relays</td>
<td>20.0</td>
<td>0.4</td>
<td>131.4</td>
<td>0.2</td>
<td>65</td>
<td>15</td>
<td>974</td>
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<tr>
<td>1 x TFM (Signal or Points)</td>
<td>18.0</td>
<td>0.3</td>
<td>118.3</td>
<td>0.2</td>
<td>58</td>
<td>0</td>
<td>0</td>
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<tr>
<td>EBI 400 Track Circuit RX</td>
<td>15.0</td>
<td>0.3</td>
<td>98.6</td>
<td>0.1</td>
<td>49</td>
<td>810</td>
<td>39,455</td>
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<tr>
<td>TPWS TSS &amp; OSS</td>
<td>12.0</td>
<td>0.2</td>
<td>78.8</td>
<td>0.1</td>
<td>39</td>
<td>279</td>
<td>10,872</td>
</tr>
<tr>
<td>TPWS TSS</td>
<td>12.0</td>
<td>0.2</td>
<td>78.8</td>
<td>0.1</td>
<td>39</td>
<td>109</td>
<td>4,247</td>
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<tr>
<td>Buffer Stop OSS (Miniature)</td>
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<td>0.2</td>
<td>78.8</td>
<td>0.1</td>
<td>39</td>
<td>2</td>
<td>78</td>
</tr>
<tr>
<td>Track Circuit Interrupter</td>
<td>6.0</td>
<td>0.1</td>
<td>39.4</td>
<td>0.1</td>
<td>19</td>
<td>10</td>
<td>195</td>
</tr>
<tr>
<td>DLM pairs</td>
<td>4.0</td>
<td>0.1</td>
<td>26.3</td>
<td>0.0</td>
<td>13</td>
<td>34</td>
<td>442</td>
</tr>
</tbody>
</table>
Figure 2. In-use Energy Profiling - Equipment specific (if you ordered one piece of each equipment, largest to smaller consumers)

- AWS Suppressor (Green) NEW VORTOK STYLE
- Point Battery Charger (5A)
- EBI 400 Track Circuit TX
- AWS (Green) NEW VORTOK STYLE
- LED Position Light Junction Indicator (PLJI)
- LED Shunt (Independent Position Light)
- CDRA
- LED Limit of Shunt (LOS)
- LED Subsidiary (PL)
- LED Standard Alphanumeric Route Indicator
- LED Miniature Alphanumeric Route Indicator
- LED Banner Repeater
- Signal 4 Aspect (LED)
- Signal 3 Aspect (LED)
- Signal 1 Aspect (LED)
- LOD unit
- Signal 2 Aspect (LED)
- 2 x Case lamps/Loc Heater
- Points Machines/Relays
- 1 x TFM (Signal or Points)
Figure 3. In-use Energy Profiling - Thameslink in-use emission profile (taking into consideration number of units ordered)