**Version Control**

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<td>London Borough of Hounslow</td>
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<tr>
<td>Author(s)</td>
<td>Paul Burnett</td>
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<tr>
<td>Date Created</td>
<td>17th January 2015</td>
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<td>Last Updated</td>
<td>29th January 2015</td>
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**Revision Control Summary**

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<th>Release Date</th>
<th>Summary of Changes</th>
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<td>WIM Solar PV v2</td>
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<td>Financial model corrected to account to reflect fluctuations in financing cost &amp; capital cost altered to reflect inclusion of timers for forklift charger controls</td>
<td>Section 2.0 Commercial Appendices – Business Case (Project Calculator)</td>
<td>Reduction in capital cost Change in Business Case</td>
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<tr>
<td>WIM Solar PV v3</td>
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<td>Inclusion of DC Battery Storage Option</td>
<td>Section 2.0 Commercial Appendices – Business Case (Project Calculator)</td>
<td>Increase in capital cost Improvement in system benefits Improvement in Business Case</td>
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**Document Authors**

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<th>Secondary Contact</th>
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<tbody>
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1.0 Overview

Imtech have been appointed as an Energy Services Company (ESCo) to all of the London Boroughs within the West London Alliance including the London Borough of Hounslow via the GLA’s Re:Fit Framework. The London Borough of Hounslow has previously identified the Western International Market as an opportunity for the development of Solar Photo Voltaic (PV) panels. Solar PV panels are eco-friendly electric generators. They convert sunlight into electrical energy, have no moving parts, put out zero emissions and require very little maintenance. They generate free electricity and are eligible for government incentives which create not only a sustainable opportunity but an investable one.

Western International Market will be a unique solar PV installation in the UK because of its size and the way the power is distributed to its existing tenants. London Borough of Hounslow currently buys it power from Laser, and this passes through 3 x meters on the site. The tenants have checking meters within their units, which are noted on a monthly base, and the tenants are billed accordingly. With the introduction of a Solar PV system, nothing changes for the tenants as far as billing and cost of electricity. The only thing that changes is where the power comes from as a large proportion will now come via decentralised energy (Solar PV), meaning during the day, it will purchase less power from Laser (currently 10.29 pence per unit). This would mean that London Borough of Hounslow would see savings of £125,968.91 in the first year from the Laser Bill. London Borough of Hounslow would also receive government incentive payments via the Feed In Tariff (FIT) for every unit of power produced from the PV modules, this would be £97,591.03 in the first year.

The other big feature for the system will be the use of black framed LG modules that are market leaders in solar PV module production. We have chosen this design based on some key factors:

- Warrantees and guarantees (modules come with 25 years, SMA inverters will be extended to 20 years)
- Aesthetics (Black framed LG modules)
- Performance (LG modules have an efficiency of 17.1%)
- Breakdown Cover (24H monitoring system installed)

1.1 About Imtech

Imtech is one of the UK and Ireland’s largest and most successful broad-based technical services providers. Our 3400 employees deliver high quality solutions for national and international customers through our extensive network of offices.

Our low carbon proposition is based on an integrated model that creates solutions to meet the needs of today whilst reducing the demand on the natural environment for tomorrow. Low Carbon Solutions is not a single business unit, its proposition spans the complete organisation and is led by a central specialist development team that draws upon the delivery expertise from across the group. This approach capitalises on the strength in breadth and depth of Imtech UK’s operations and provides a holistic ultra-low carbon technical asset management service.
Imtech became an accredited MCS renewable energy installer back in 2008 and have undertaken a significant amount of Solar installations since then and in 2013 alone Imtech supplied and installed 17,000 Solar PV panels on behalf of their clients, the equivalent of 3 full size football pitches.

Imtech’s work streams and business solutions are illustrated below:

- Engineering Services
- Technical Facilities Management
- Systems Integration
- Water, Waste and Energy
2.0 Commercial

The total capital cost to design, supply and install the complete solar PV system is £2,050,000 excl VAT.

The cost breakdown is as follows;

1. Supply of materials, plant and equipment   £1,706,524.00
2. Provision of Labour incl BWIC       £211,136.85
3. Project & Site Management          £79,369.36
4. Design incl planning and structural         £52,949.79
   TOTAL:-                                  £2,050,000.00

This price specifically excludes the following;

   a) GVA Consultancy Fees (assumed by London Borough of Hounslow)
   b) Building Control Fees (assumed by London Borough of Hounslow)
   c) CDM Co-ordinator (assumed by London Borough of Hounslow)
   d) Assumes site office will be provided free of charge

During recent meetings we have discussed a number of options to increase the amount of energy consumed on site from the panels and therefore reduce the grid export. The provision of timers on the forklift chargers has now been included within this proposal which we estimate that the addition of this item will reduce the currently predicted export to 20%. A final option has now been included within this updated proposal which is the inclusion of the DC Battery Storage product (Solar Ready) and we compare below the business case, which we estimate that the addition of this item will reduce the currently predicted export to 9%.

2.1 Business Case

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See appendices section for detailed analysis (project calculator)
3.0 Construction Methodology & Implementation

3.1 Site location

The works are located on the WIM on both the roof of the Produce and Flower Halls.

With works being undertaken at during the day the site team will utilise the VMU forecourt for materials deliveries, waste away and parking.

If larger areas are required for bulk deliveries this will be agreed with the WIM site management team in advance.

Whilst working on site we will set up a set file which will contain the following:

- Site signing in point
- Fire plan
- H&S / RAMS file
- Copies of relevant insurances
- Point of works risk assessments
- Suggestions / Improvements Page
We will also leave a first aid box and fire pt on site for the duration of the works at each work location.

Temporary lighting & power, will be provided to allow works to continue in safe manner if required.

Once the site is set up it is envisaged that the majority of works will be undertaken during the day, this will include any noisy works and deliveries.

**Site Hours**

Our site hours will be:
- Day time – 10am till 7pm (tbc)
- Weekends – As required, hrs as above.
- Night works – No night time works.

**Deliverables**

- Site set up / delineation
- Logistics Plan
- H&S plan
- Fire plan

### 3.2 Panel Selection

When selecting the panel (LG) for this project business cases where run with other panels e.g. Sunpower and Trina. On a production and rate of return basis the LG panel was most desirable for this project. In addition to the above the LG warranties etc are also in line with the lifecycle of the FIT.

- *Please refer to appendices for the performance data on each panel type.*

**Storage**

Materials will be delivered on a just in time basis and stored either outside the VMU or at a location agreed with the council.

Pallets will then be lifted (by crane) up onto the maintenance gantry to the point of work of each team.

**Deliverable**

- Storage plan / strategy

### 3.3 Protection of the works

With the majority of the works being delivered to site for assembly in their finished state, temporary protection of the works will be kept to a minimum. In the main, protection of the works will be managed by the site delineation barriers and restricted access into the works area.

**Deliverable**

- Zero damage to finished works
3.4 Waste away
All construction waste will be neatly stored on site and placed in the buildings skips on a daily basis.

Deliverable
- Waste receipts & Re use data

3.5 Access to the works / Working at height
It is important that all works are accessed in a safe manner.

Access up onto the service gantry’s will be via the existing staircases. Once on the gantry’s access onto the roof will be by way of a scaffold stair. Once on the roof operatives will utilise the existing man safe system. In addition to the above edge protection will be provide to all working areas.

Also training records will be retained on site for any operatives using access equipment e.g PASMA training etc.

Deliverable
- Training records, Plant records & weekly inspection checks

3.6 Undertaking the works

Programme
We would confirm our programme for these works as 12 weeks with a weeks site set up and decommissioning at either end of the programme (14 weeks in total) comprising:

When considering our programme
- Site set up = 1 week.
- Team 1 = 50KW per week for 12 weeks
- Team 2 = 50KW per week for 12 weeks
- Team 3 = 50kw per week for 12 weeks
- Upon completion of the works decommissioning will take week.

The work sequence for each gang will be as follows:
- Mounting
- Panels
- Electrical containment and Cabling
- Site & Mount Invertor
- Visual Inspection
- Final connection
- Test and Commission with DNO connections engineer.

During mobilisation a detailed programme will be produced for each gang in tandem with a pictorial representation which will show weekly productivity targets to be met.
Long Lead Items
Panels = 6-8 weeks  
Invertors = 6-8 weeks  
Mounting systems = 2-3 weeks

Turnaround & approval times
We would confirm that we have allowed maximum 1 week duration for all client approvals.

Last Planner
A last planner will be produced on a weekly basis to ensure programme adherence & weekly marked up programmes will be issued.

This will also be done for the manufacture of the panels & invertors, thereby ensuring all parties are kept up to date with progress.

Deliverables
- Programme  
- Weekly programme updates / lookaheads  
- Timely delivery of the project.

3.7 Quality
Imtech will develop a project quality plan. In line with our Project Delivery procedure a detailed ITP will be produced for each work activity. As the works are completed the ITP will be reviewed and updated accordingly. The ITPs will be reviewed regularly to ensure adherence to our quality procedures.

Deliverable  
- Project ITP

3.8 Health & Safety
All works will be undertaken in accordance with the procedures set out within our project H&S plan (see attached draft). All personnel will be inducted, suitably trained, and work in accordance to approved RAMS. Weekly recorded H&S inspections will be undertaken at each location and issued for information.

A designated working site foreman will be retained to manage the site at all times. Welfare will be provided in the existing on site welfare facilities, Whilst the nearest terminal toilet blocks are located close by. Both these facilities will be monitored and cleaned on a regular basis. No changing will be permitted on site. No eating will be permitted on site, other than in the welfare facility provided.
Deliverables
- RAMS
- Daily briefings
- Training records
- H&S inspections
- Attendance at H&S consultations
- Near miss reporting
- Point / place of works risk assessments

3.9 Environmental
Imtech strive to reduce the environmental impact of all works they undertake. Records of all waste generated will be provided.

Deliverables
- Waste receipts
- Sustainability records

3.10 Handover and integration
Our Handover manager will liaise closely with our production team & the Imtech and LBH team and will be responsible for the co-ordination & early production of the following Ssep Handover deliverables:

Deliverables
- H&S files
- As built information for each elemental work package
- As built drawings (these will be marked up by the installation teams and produced by project designer)
- Certification
- Specific Parts Information
- Asset Integration as required

3.11 Training, Familiarisation, & Witness Testing (with the Building Staff)
Whilst the works are being undertaken we will also invite the Building staff to undertake regular training & familiarisation visits as the works progress.

We will also produce a detailed Testing & Commissioning Programme to ensure the building management team are able to witness all relevant witness testing.

3.12 Learning & Feedback
Throughout the life of the project learning and feedback will continually underline everything we do.

We will look to record and learn from each activity we undertake and look to improve from this experience.
Learning & Feedback will be an agenda item for all team review meetings.

**Deliverable**
- Learning review upon completion of the work

### 3.13 Risk and Opportunity register

**Risks**
- Working in a live operational area
- Working at heights
- Transportation of heavy loads / logistics
- Working on & around M&E services
- Time – Long lead in items
- Approvals e.g. Planning etc

**Opportunities**
- Value engineering to Reduce cost / programme
- Energy storage = Solar Ready

**Deliverables**
- Risk & Opportunity workshop
- Detailed project risk register
- Updated risk register - Fortnightly

### 3.14 KPI’S

We have identified the following KPI’s as part of our project delivery strategy

1. Zero incidents or accidents.
2. Undertake weekly health & safety audits.
3. Cost plan adherence.
4. Programme adherence.
5. Quality – Zero snags / defects at the time of handover to the end user.

**Deliverables**
- Review and update of KPI’s in the weekly project review meetings
4.0 Clarifications, Assumptions & Exclusions

- We have made no allowance for asbestos removal, or any works or delays associated with asbestos.
- We have assumed client approvals will be made within a maximum 1 week period.
- We have assumed there are adequate M&E loads available.
- We have assumed the roof and gantries alike can take the load of the system and delivery loads. To be verified by our structural eng.
- No allowance has been made for the ongoing maintenance of the system.
- No allowance has been made for the CDMC role
- System production figures are based on statistical weather data.
- Whilst the panels etc come with performance guarantees we are not able to guarantee the performance of the weather.
- We have assumed a min of 30 day payments.
- Due to the high specialist material content a 60% deposit will be required, following by another 20% on commencement of the works, and the final 20% upon completion of the works.
Appendices

- Business Case (Project Calculator)
- LG Panel Specification
- LG Panel Guarantee
- Inverter Specification
- Panel Layout Sketch
# SAP calculations for PV Solar system

### SAP Details
- **Roof Orientation:** 90°
- **Roof Pitch:** 7°
- **Shading Factor (SI):** 0°
- **Feed in Tariff (Band):** 3000
- **Number of Panels (Watts):** 2
- **Iradiance Zone:** 1
- **Iradiance Level:** 106
- **Array size kWp:** 0.76

### Energy Rating Data
- **Assumed annual rate of inflation:** 4.77%
- **Annual increase in energy cost:** 67%
- **Percentage of export:** 0.79%
- **Annual Drop in System efficiency:** 0.79%
- **Imported electricity cost p/kWh:** 0.79%
- **Fit Rate p/kWh:** 0.79%
- **Export Rate p/kWh:** 0.79%
- **Total Size of system (kWp):** 0.79%

### Financial Analysis
- **Pay-Back Time in Years:** 5
- **System Life Benefit:** £18,256.14
- **IRR (Investment Return):** 14.87%

### CO 2 Emissions
- ** König's CO2 Saved Per Year:** 7,068.83
- ** Metric Tonnes of CO2 Saved Per Year:** 7.08

### Metric Tonnes of CO2 Saved Per Year

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**The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (wattage) from location to location and from year to year. This estimate is based on the government’s standard assessment procedure for energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee of performance.**