

**TBA**  
**TBA**

Attn: TBA

By email to: TBA

Date: TBA

Your ref: TBA

Our ref: RE19232

Dear Sirs,

**Award of contract for the supply of 70kw AC Power Supply** Following your tender for the supply of 70kw AC Power Supply to UKRI, we are pleased to award this contract to you.

This letter (Award Letter) and its Schedule(s) set out the terms of the Contract between:

- (1) **United Kingdom Research and Innovation**, a statutory corporation whose registered office is at Polaris House, North Star Avenue, Swindon, England, SN2 1FL ("**UKRI**"); and
- (2) TBA, a business with its trading address at TBA (the "**Supplier**").

Unless the context otherwise requires, capitalised expressions used in this Award Letter have the same meanings as in the terms and conditions of contract set out in Schedule 1 to this Award Letter (the "**Conditions**"). In the event of any conflict between this Award Letter and the Conditions, this Award Letter shall prevail. Please do not attach any Supplier terms and conditions to this Award Letter as they will not be accepted by UKRI and may delay conclusion of the Contract.

For the purposes of the Contract, UKRI and the Supplier agree as follows:

**Term**

- 1 Commencement Date: Friday 22<sup>nd</sup> May 2020
- 2 Expiry Date: Monday 30<sup>th</sup> August 2021

**Description of Goods and/or Services**

- 3 The Specification of the Goods and/or Services to be delivered is as set out in Schedule 2.
- 4 The Services shall be performed at ISIS Accelerator Division, Rutherford Appleton Laboratory, Harwell Campus, Didcot, OX11 0QX.
- 5 The Goods shall be Delivered in accordance with the following instructions:

**Delivery Address**

ISIS Dipole Test Area,  
Rutherford Appleton Laboratory,  
Harwell Campus  
Didcot,  
OX11 0QX.

### **Date of Delivery**

TBC

### **Charges & Payment**

- 6 The Charges for the Goods and/or Services shall be as set out in Schedule 3.
- 7 All invoices should be sent, quoting a valid purchase order number (PO Number) provided by UKRI, to: [finance@uksbs.co.uk](mailto:finance@uksbs.co.uk).
- 8 To avoid delay in payment it is important that the invoice is compliant and that it includes a valid PO Number, PO Number item number (if applicable) and the details (name and telephone number) of your UKRI contact (i.e. Contract Manager). Non-compliant invoices will be sent back to you, which may lead to a delay in payment. If you have a query regarding an outstanding payment please contact our Accounts Payable section either by email to [finance@uksbs.co.uk](mailto:finance@uksbs.co.uk) or by telephone 01793 867004 between 09:00-17:00 Monday to Friday.

### **Supplier's Limit of Liability**

- 9 The Limit of Liability of the Supplier under this Contract shall be: 125% of the total Charges paid and payable to the Supplier under this Contract.

### **Notices**

- 10 The address for notices of the Parties are:

#### **UKRI**

Polaris House,  
North Star Avenue,  
Swindon, England,  
SN2 1FL  
Attention: TBA  
Email: TBA

#### **Supplier**

TBA  
Attention: TBA  
Email: TBA

### **Liaison**

- 11 For general liaison your contact will continue to be TBA or, in their absence, [scientificresearch@uksbs.co.uk](mailto:scientificresearch@uksbs.co.uk).

We thank you for your co-operation to date, and look forward to forging a successful working relationship resulting in a smooth and successful supply of the Goods and/or Services. Please confirm your acceptance of the award of this contract by signing and returning the enclosed copy of this letter to Mary Cheston at [Mary.Cheston@uksbs.co.uk](mailto:Mary.Cheston@uksbs.co.uk). No other form of acknowledgement will be accepted. Please remember to quote the reference number above in any future communications relating to this contract.

Yours faithfully,

Signed for and on behalf of **United Kingdom Research and Innovation**

Signature: .....

Name: .....

Position: .....

Date: .....

We accept the terms set out in this Award Letter and the Schedule(s).

Signed for and on behalf of **TBA**

Signature: .....

Name: .....

Position: .....

Date: .....

Terms and Conditions of Contract for Goods and/or Services

**1 INTERPRETATION**

1.1 In these terms and conditions:

- "Award Letter" means the letter from UKRI to the Supplier printed above these terms and conditions;
- "Central Government Body" means a body listed in one of the following sub-categories of the Central Government classification of the Public Sector Classification Guide, as published and amended from time to time by the Office for National Statistics:
- (a) Government Department;
  - (b) Non-Departmental Public Body or Assembly Sponsored Public Body (advisory, executive, or tribunal);
  - (c) Non-Ministerial Department; or
  - (d) Executive Agency;
- "Charges" means the charges for the Goods and/or Services as specified in the Award Letter;
- "Commencement Date" means the date for the start of the Contract as set out in the Award Letter;
- "Confidential Information" means:
- (a) all confidential information and data which is acquired from or made available (directly or indirectly) by the Disclosing Party or the Disclosing Party's representatives however conveyed or presented, including but not limited to any information or document relating to the Disclosing Party's business, affairs, operations, budgets, policies, processes, initiatives, plans, product information, pricing information, technical or commercial know-how, trade secrets, specifications, strategies, inventions, designs, software, market opportunities, personnel, customers or suppliers (whether relating to this Contract or otherwise) either orally, in writing, or in whatever form obtained or maintained;
  - (b) any information or analysis derived from the Confidential Information;
  - (c) anything marked as confidential and any other information notified by or on behalf of the Disclosing Party to the Receiving Party as being confidential;
  - (d) the existence and terms of this Contract and of any subsequent agreement entered into in relation to this Contract;
  - (e) the fact that discussions and negotiations are taking place concerning this Contract and the status of those discussions and negotiations; and
  - (f) any copy of any of the information described in (a), (b), (c), (d) or (e) above, which shall be deemed to become Confidential Information when it is made. For the purposes of this definition, a copy shall include, without limitation, any notes or recordings of the information described in (a), (b), (c), (d) or (e) above (howsoever made);
- "Contract" means the contract between (i) UKRI and (ii) the Supplier constituted by the Supplier's

countersignature of the Award Letter and includes the Award Letter and Schedules;

"Data Protection Legislation"	means, for the periods for which they are in force, all laws giving effect or purporting to give effect to the GDPR, the Data Protection Act 2018, or otherwise relating to data protection, including the Regulation of Investigatory Powers Act 2000, the Telecommunications (Lawful Business Practice) (Interception of Communications) Regulations 2000 (SI 2000/2699), the Electronic Communications Data Protection Directive (2002/58/EC), the Privacy and Electronic Communications (EC Directive) Regulations 2003 (SI 2426/2003) and all applicable laws and regulations relating to the processing of personal data and privacy, including where applicable the guidance and codes of practice issued by the Information Commissioner, in each case as amended or substituted from time to time;
"Data Subject"	shall have the same meaning as in the Data Protection Legislation;
"Date of Delivery"	means that date by which the Goods must be Delivered to UKRI, as specified in the Award Letter.
"Deliver"	means hand over the Goods to UKRI at the address and on the date specified in the Award Letter, which shall include unloading and any other specific arrangements agreed in accordance with Clause 6. Delivered and Delivery shall be construed accordingly.
"Disclosing Party"	means a Party that makes a disclosure of Confidential Information to another Party;
"EIR"	means the Environmental Information Regulations 2004 (or if applicable the Environmental Information Regulations (Scotland) 2004);
"Expiry Date"	means the date for expiry of the Contract as set out in the Award Letter;
"FOIA"	means the Freedom of Information Act 2000 (or if applicable the Freedom of Information (Scotland) Act 2002);
"GDPR"	means: <ul style="list-style-type: none"><li>(a) the General Data Protection Regulations (Regulation (EU) 2016/679); or</li><li>(b) any equivalent legislation amending or replacing the General Data Protection Regulations (Regulation (EU) 2016/679);</li></ul>
"Good Industry Practice"	means all relevant practices and professional standards that would be expected of a well-managed, expert service provider performing services substantially similar to the Services or substantially similar to the Goods provided to customers of a substantially similar size and nature as UKRI;
"Goods"	means the goods to be supplied by the Supplier to UKRI under the Contract;
"Information"	has the meaning given under section 84 of the FOIA;
"Intellectual Property Rights"	means: <ul style="list-style-type: none"><li>(a) copyright, rights related to or affording protection similar to copyright, rights in databases, patents and rights in inventions, semi-conductor topography rights, trade marks, rights in Internet domain names and website addresses and other rights in trade names, designs, know-how, trade secrets and other rights in Confidential Information;</li></ul>

- (b) applications for registration, and the right to apply for registration, for any of the rights listed at (a) that are capable of being registered in any country or jurisdiction; and
  - (c) all other rights having equivalent or similar effect in any country or jurisdiction;
- "Limit of Liability" means the limit of liability identified in the Award Letter;
- "Party" the Supplier or UKRI (as appropriate) and "Parties" shall mean both of them;
- "Personal Data" means the personal data (as defined in the Data Protection Legislation) which relates to or originates from UKRI, or any of UKRI's employees, contractors or customers and which is processed by or on behalf of the Supplier under this Contract;
- "Personal Data Breach" shall have the meaning given in the Data Protection Legislation;
- "Purchase Order Number" means UKRI's unique number relating to the order for Goods and/or Services to be supplied by the Supplier to UKRI in accordance with the terms of the Contract;
- "Receiving Party" means a Party to which a disclosure of Confidential Information is made by another Party;
- "Request for Information" has the meaning set out in the FOIA or the EIR as relevant (where the meaning set out for the term "request" shall apply);
- "Services" means the services to be supplied by the Supplier to UKRI under the Contract;
- "Specification" means the specification for the Goods and/or Services to be supplied by the Supplier to UKRI (including as to quantity, description and quality) as specified in the Award Letter;
- "Staff" means all directors, officers, employees, agents, consultants and contractors of the Supplier and/or of any sub-contractor of the Supplier engaged in the performance of the Supplier's obligations under the Contract;
- "Staff Vetting Procedures" means vetting procedures that accord with good industry practice or, where requested by UKRI, UKRI's procedures for the vetting of personnel as provided to the Supplier from time to time;
- "Term" means the period from the Commencement Date to the Expiry Date as such period may be extended or terminated in accordance with the terms and conditions of the Contract;
- "TUPE" means the Transfer of Undertakings (Protection of Employment) Regulations 2006 as amended or replaced from time to time;
- "VAT" means value added tax in accordance with the provisions of the Value Added Tax Act 1994; and
- "Working Day" means a day (other than a Saturday, Sunday, public holiday or 27, 28, 29, 30 and 31 December) when banks in London are open for business.

1.2 In these terms and conditions, unless the context otherwise requires:

- (a) references to numbered clauses are references to the relevant clause in these terms and conditions;
- (b) any obligation on any Party not to do or omit to do anything shall include an obligation not to allow that thing to be done or omitted to be done;

- (c) the headings to the clauses of these terms and conditions are for information only and do not affect the interpretation of the Contract;
- (d) any reference to an enactment includes reference to that enactment as amended or replaced from time to time and to any subordinate legislation or byelaw made under that enactment; and
- (e) the word 'including' shall be understood as meaning 'including without limitation'.

## 2 **BASIS OF CONTRACT**

- 2.1 The Award Letter constitutes an offer by UKRI to purchase the Goods and/or Services subject to and in accordance with the terms and conditions of the Contract.
- 2.2 The offer comprised in the Award Letter shall be deemed to be accepted by the Supplier on receipt by UKRI of a copy of the Award Letter countersigned by the Supplier.

## 3 **SUPPLY OF GOODS AND SERVICES**

- 3.1 In consideration of UKRI's agreement to pay the Charges, the Supplier shall supply the Goods and/or Services to UKRI subject to and in accordance with the terms and conditions of the Contract.
- 3.2 In supplying the Goods and/or Services, the Supplier shall:
  - (a) co-operate with UKRI in all matters relating to the supply of Goods and/or Services and comply with all UKRI's instructions; and
  - (b) comply with all applicable laws.
- 3.3 The Supplier shall supply the Goods in accordance with the Specification. The Supplier warrants, represents, undertakes and guarantees that the Goods supplied under the Contract shall:
  - (a) be free from defects (manifest or latent), in materials and workmanship and remain so for 24 months after Delivery;
  - (b) be of satisfactory quality (within the meaning of the Sale of Goods Act 1979) and comply with any applicable statutory and regulatory requirements relating to the manufacture, labelling, packaging, storage, handling and delivery of the Goods;
  - (c) conform with the specifications (including the Specification), drawings, descriptions given in quotations, estimates, brochures, sales, marketing and technical literature or material (in whatever format made available by the Supplier) supplied by, or on behalf of, the Supplier;
  - (d) be free from design defects; and
  - (e) be fit for any purpose held out by the Supplier or made known to the Supplier by UKRI expressly or by implication, and in this respect UKRI relies on the Supplier's skill and judgement. The Supplier acknowledges and agrees that the approval by UKRI of any designs provided by the Supplier shall not relieve the Supplier of any of its obligations under this clause 3.3.
- 3.4 In supplying the Services, the Supplier shall:
  - (a) perform the Services with all reasonable care, skill and diligence in accordance with good industry practice in the Supplier's industry, profession or trade;

- (b) use Staff who are suitably skilled and experienced to perform tasks assigned to them, and in sufficient number to ensure that the Supplier's obligations are fulfilled in accordance with the Contract;
- (c) ensure that the Services shall conform with all descriptions and specifications set out in the Specification;
- (d) not do or allow anything to be done that would, or would be likely to, bring UKRI into disrepute or adversely affect its reputation in any way; and
- (e) provide all equipment, tools and vehicles and other items as are required to provide the Services.

#### **4 TERM**

- 4.1 The Contract shall take effect on the date specified in the Award Letter and shall expire on the Expiry Date, unless it is otherwise extended in accordance with the provisions of the Award Letter or terminated early in accordance with the terms and conditions of the Contract.

#### **5 CHARGES, PAYMENT AND RECOVERY OF SUMS DUE**

- 5.1 The Charges for the Goods and/or Services shall be as set out in the Award Letter and shall be the full and exclusive remuneration of the Supplier in respect of the supply of the Goods and/or Services. Unless otherwise agreed in writing by UKRI, the Charges shall include every cost and expense of the Supplier directly or indirectly incurred in connection with the supply of the Goods and/or performance of the Service.
- 5.2 All amounts stated are exclusive of VAT which shall be charged at the prevailing rate. UKRI shall, following the receipt of a valid VAT invoice, pay to the Supplier a sum equal to the VAT chargeable in respect of the Goods and/or Services.
- 5.3 The Supplier shall invoice UKRI as specified in the Contract. Each invoice shall include such supporting information required by UKRI to verify the accuracy of the invoice, including the relevant Purchase Order Number and a breakdown of the Goods and/or Services supplied in the invoice period.
- 5.4 In consideration of the supply of the Goods and/or Services by the Supplier, UKRI shall pay the Supplier the invoiced amounts no later than 30 days after verifying that the invoice is valid and undisputed and includes a valid Purchase Order Number. UKRI may, without prejudice to any other rights and remedies under the Contract, withhold or reduce payments in the event of unsatisfactory performance.
- 5.5 If UKRI fails to consider and verify an invoice in a timely fashion the invoice shall be regarded as valid and undisputed for the purpose of clause 5.4 after a reasonable time has passed (which shall be no less than 14 calendar days).
- 5.6 If there is a dispute between the Parties as to the amount invoiced, UKRI may reject the invoice in its entirety. The Supplier shall not suspend the supply of the Goods and/or Services unless the Supplier is entitled to terminate the Contract for a failure to pay undisputed sums in accordance with clause 18.5. Any disputed amounts shall be resolved through the dispute resolution procedure detailed in clause 21.
- 5.7 Where the Supplier enters into a sub-contract, the Supplier shall include in that sub-contract:
  - (a) provisions having the same effects as clauses 5.3 to 5.6 (inclusive) of this Contract; and



- (b) a provision requiring the counterparty to that sub-contract to include in any sub-contract which it awards provisions having the same effects as clauses 5.3 to 5.7 (inclusive) of this Contract.
  - (c) In this clause 5.7, "sub-contract" means a contract between two or more suppliers, at any stage of remoteness from UKRI in a subcontracting chain, made wholly or substantially for the purpose of performing (or contributing to the performance of) the whole or any part of this Contract.
- 5.8 If any sum of money is recoverable from or payable by the Supplier under the Contract (including any sum which the Supplier is liable to pay to UKRI in respect of any breach of the Contract), that sum may be deducted unilaterally by UKRI from any sum then due, or which may come due, to the Supplier under the Contract or under any other agreement or contract with UKRI. The Supplier shall not be entitled to assert any credit, set-off or counterclaim against UKRI in order to justify withholding payment of any such amount in whole or in part.

## 6 DELIVERY

- 6.1 The Supplier shall Deliver the Goods to UKRI on or by the Date of Delivery. Unless otherwise agreed in writing by UKRI, Delivery shall be on the date and to the address specified in the Award Letter. Delivery of the Goods shall be completed once the completion of unloading the Goods from the transporting vehicle at the Delivery address has taken place and UKRI has signed for the Delivery.
- 6.2 Any access to UKRI's premises and any labour and equipment that may be provided by UKRI in connection with Delivery of the Goods shall be provided without acceptance by UKRI of any liability in respect of any actions, claims, costs and expenses incurred by third parties for any loss or damages to the extent that such loss or damage is not attributable to the negligence or other wrongful act of UKRI or its servant or agent. The Supplier shall indemnify UKRI in respect of any actions, suits, claims, demands, losses, charges, costs and expenses, which UKRI may suffer or incur as a result of or in connection with any damage or injury (whether fatal or otherwise) occurring in the course of Delivery or installation to the extent that any such damage or injury is attributable to any act or omission of the Supplier or any of his sub-Suppliers.
- 6.3 Delivery of the Goods shall be accompanied by a delivery note which shows the Purchase Order Number and the type and quantity of the Goods and, in the case of part Delivery, the outstanding balance remaining to be Delivered.
- 6.4 Unless otherwise stipulated by UKRI in the Award Letter, Deliveries shall only be accepted by UKRI on Working Days and during normal business hours.
- 6.5 Where (i) the Supplier fails to Deliver the Goods or part of the Goods or (ii) the Goods or part of the Goods do not comply with the provisions of clause 3, then without limiting any of its other rights or remedies implied by statute or common law, UKRI shall be entitled:
- (a) to terminate the Contract;
  - (b) to require the Supplier, free of charge, to deliver substitute Goods within the timescales specified by UKRI;
  - (c) to require the Supplier, free of charge, to repair or replace the rejected Goods, or to provide a full refund of the Charges of the rejected Goods (if paid);
  - (d) to reject the Goods (in whole or part) and return them to the Supplier at the Supplier's own risk and expense and UKRI shall be entitled to a full refund on those Goods or part of Goods duly returned;

- (e) to buy the same or similar Goods from another supplier; and
- (f) to recover any expenses incurred in respect of buying the goods from another supplier which shall include but not be limited to administration costs, chargeable staff time and extra delivery costs.

## 7 **PROPERTY AND GUARANTEE OF TITLE**

7.1 Without prejudice to any other rights or remedies of UKRI, title and risk in the Goods shall pass to UKRI when Delivery of the Goods is complete (including off-loading and stacking).

7.2 The Supplier warrants that:

- (a) it has full clear and unencumbered title to all the Goods;
- (b) at the date of Delivery of any of the Goods it shall have full and unrestricted right, power and authority to sell, transfer and deliver all of the Goods to UKRI; and
- (c) on Delivery UKRI shall acquire a valid and unencumbered title to the Goods.

## 8 **STAFF**

8.1 If UKRI reasonably believes that any of the Staff are unsuitable to undertake work in respect of the Contract, it may, by giving written notice to the Supplier:

- (a) refuse admission to the relevant person(s) to UKRI's premises;
- (b) direct the Supplier to end the involvement in the provision of the Goods and/or Services of the relevant person(s); and/or
- (c) require that the Supplier replace any person removed under this clause with another suitably qualified person and procure that any security pass issued by UKRI to the person removed is surrendered,

and the Supplier shall comply with any such notice.

8.2 The Supplier shall:

- (a) ensure that all Staff are vetted in accordance with the Staff Vetting Procedures and if requested, comply with UKRI's Staff Vetting Procedures as supplied from time to time;
- (b) ensure that no person who discloses that he/she has a conviction that is relevant to the nature of the Contract, relevant to the work of UKRI, or is of a type otherwise advised by UKRI (each such conviction a "**Relevant Conviction**"), or is found by the Supplier to have a Relevant Conviction (whether as a result of a police check, the Staff Vetting Procedures or otherwise) is employed or engaged in the provision of any part of the supply of the Goods and/or Services;
- (c) if requested, provide UKRI with a list of the names and addresses (and any other relevant information) of all persons who may require admission to UKRI's premises in connection with the Contract; and
- (d) procure that all Staff comply with any rules, regulations and requirements reasonably specified by UKRI.

9 **TUPE**

- 9.1 The Supplier warrants that the provision of the Goods and/or Services shall not give rise to a transfer of any employees of the Supplier or any third party to UKRI pursuant to TUPE.

10 **ASSIGNMENT AND SUB-CONTRACTING**

- 10.1 The Supplier shall not without the written consent of UKRI assign, sub-contract, novate or in any way dispose of the benefit and/ or the burden of the Contract or any part of the Contract. UKRI may, in the granting of such consent, provide for additional terms and conditions relating to such assignment, sub-contract, novation or disposal. The Supplier shall be responsible for the acts and omissions of its sub-contractors as though those acts and omissions were its own.

- 10.2 Where UKRI has consented to the placing of sub-contracts, the Supplier shall, at the request of UKRI, send copies of each sub-contract, to UKRI as soon as is reasonably practicable.

- 10.3 UKRI may assign, novate, or otherwise dispose of its rights and obligations under the Contract without the consent of the Supplier provided that such assignment, novation or disposal shall not increase the burden of the Supplier's obligations under the Contract.

11 **INTELLECTUAL PROPERTY AND INDEMNITY**

- 11.1 All Intellectual Property Rights in any materials provided by UKRI to the Supplier for the purposes of this Contract shall remain the property of UKRI but UKRI hereby grants the Supplier a royalty-free, non-exclusive and non-transferable licence to use such materials as required until termination or expiry of the Contract for the sole purpose of enabling the Supplier to perform its obligations under the Contract.

- 11.2 The ownership of all Intellectual Property Rights in any materials created or developed by the Supplier pursuant to the Contract or arising as a result of the provision of the Goods and/or Services shall vest in UKRI. If, and to the extent, that the ownership of any Intellectual Property Rights in such materials vest in the Supplier by operation of law, the Supplier hereby assigns ownership of such Intellectual Property Rights to UKRI by way of a present assignment of future rights that shall take place immediately on the coming into existence of any such Intellectual Property Rights all its Intellectual Property Rights in such materials (with full title guarantee and free from all third party rights).

- 11.3 UKRI hereby grants the Supplier a royalty-free, non-exclusive and non-transferable licence to use any Intellectual Property Rights in the materials created or developed by the Supplier pursuant to the Contract and any Intellectual Property Rights arising as a result of the provision of the Goods and/or Services as required until termination or expiry of this Contract for the sole purpose of enabling the Supplier to perform its obligations under the Contract

- 11.4 Without prejudice to clause 11.2, the Supplier hereby grants UKRI a perpetual, royalty-free, irrevocable and non-exclusive licence (with a right to sub-license) to use any Intellectual Property Rights vested in or licensed to the Supplier on the date of the Contract or during the Term to the extent not falling within clause 11.2 including any modifications to or derivative versions of any such Intellectual Property Rights, which UKRI reasonably requires in order to exercise its rights and take the benefit of the Contract including the Goods and/or Services provided.

- 11.5 The Supplier shall indemnify, and keep indemnified, UKRI in full against all cost, expenses, damages and losses (whether direct or indirect), including any interest, penalties, and reasonable legal and other professional fees awarded against or incurred or paid by UKRI as a result of or in connection with any claim made against UKRI for actual or alleged infringement of a third party's intellectual property arising out of, or in

connection with, the supply or use of the Goods and/or Services, to the extent that the claim is attributable to the acts or omission of the Supplier or any Staff.

- 11.6 UKRI shall promptly notify the Supplier of any infringement claim made against it relating to any Goods and, subject to any statutory obligation requiring UKRI to respond, shall permit the Supplier to have the right, at its sole discretion to assume, defend, settle or otherwise dispose of such claim. UKRI shall give the Supplier such assistance as it may reasonably require to dispose of the claim and shall not make any statement which might be prejudicial to the settlement or defence of the claim.

## 12 RECORDS

12.1 If required by UKRI, the Supplier shall:

- (a) attend progress meetings with UKRI at the frequency and times specified by UKRI and shall ensure that its representatives are suitably qualified to attend such meetings; and
- (b) submit progress reports to UKRI at the times and in the format specified by UKRI.

12.2 The Supplier shall keep and maintain until 6 years after the end of the Contract, or as long a period as may be agreed between the Parties, full and accurate records of the Contract including the Goods and/or Services supplied under it, and all payments made by UKRI. The Supplier shall on request afford UKRI or UKRI's representatives such access to those records as may be reasonably requested by UKRI in connection with the Contract.

## 13 CONFIDENTIALITY, TRANSPARENCY AND PUBLICITY

13.1 Subject to clause 13.2, each Party shall:

- (a) treat all Confidential Information it receives as confidential, safeguard it accordingly and not disclose it to any other person without the prior written permission of the disclosing Party; and
- (b) not use or exploit the Disclosing Party's Confidential Information in any way except for the purposes anticipated under the Contract.

13.2 Notwithstanding clause 13.1, a Party may disclose Confidential Information which it receives from the other Party:

- (a) where disclosure is required by applicable law or by a court of competent jurisdiction;
- (b) to its auditors or for the purposes of regulatory requirements;
- (c) on a confidential basis, to its professional advisers;
- (d) to the Serious Fraud Office where the Party has reasonable grounds to believe that the other Party is involved in activity that may constitute a criminal offence under the Bribery Act 2010;
- (e) where the Receiving Party is the Supplier, to the Staff on a need to know basis to enable performance of the Supplier's obligations under the Contract provided that the Supplier shall procure that any Staff to whom it discloses Confidential Information pursuant to this clause 13.2(e) shall observe the Supplier's confidentiality obligations under the Contract; and
- (f) where the Receiving Party is UKRI:

- (i) on a confidential basis to the employees, agents, consultants and contractors of UKRI;
- (ii) on a confidential basis to any Central Government Body, any successor body to a Central Government Body or any company to which UKRI transfers or proposes to transfer all or any part of its business;
- (iii) to the extent that UKRI (acting reasonably) deems disclosure necessary or appropriate in the course of carrying out its public functions; or
- (iv) in accordance with clause 14.

and for the purposes of the foregoing, references to disclosure on a confidential basis shall mean disclosure subject to a confidentiality agreement or arrangement containing terms no less stringent than those placed on UKRI under this clause 13.

13.3 The Parties acknowledge that, except for any Information which is exempt from disclosure in accordance with the provisions of the FOIA, the content of the Contract is not Confidential Information and the Supplier hereby gives its consent for UKRI to publish the Contract in its entirety to the general public (but with any Information that is exempt from disclosure in accordance with the FOIA redacted) including any changes to the Contract agreed from time to time. UKRI may consult with the Supplier to inform its decision regarding any redactions but shall have the final decision in its absolute discretion whether any of the content of the Contract is exempt from disclosure in accordance with the provisions of the FOIA.

13.4 The Supplier shall not, and shall take reasonable steps to ensure that the Staff shall not, make any press announcement or publicise the Contract or any part of the Contract in any way, except with the prior written consent of UKRI.

**14 FREEDOM OF INFORMATION**

14.1 The Supplier acknowledges that UKRI is subject to the requirements of the FOIA and the EIR and shall:

- (a) provide all necessary assistance and cooperation as reasonably requested by UKRI to enable UKRI to comply with its obligations under the FOIA and the EIR;
- (b) transfer to UKRI all Requests for Information relating to the Contract that it receives as soon as practicable and in any event within 2 Working Days of receipt;
- (c) provide UKRI with a copy of all Information belonging to UKRI requested in the Request for Information which is in its possession or control in the form that UKRI requires within 5 Working Days (or such other period as UKRI may reasonably specify) of UKRI's request for such Information; and
- (d) not respond directly to a Request for Information unless authorised in writing to do so by UKRI.

14.2 The Supplier acknowledges that UKRI may be required under the FOIA and the EIR to disclose Information concerning the Supplier or the Goods and/or Services (including commercially sensitive information) without consulting or obtaining consent from the Supplier.

14.3 Notwithstanding any other provision in the Contract, UKRI shall be responsible for determining in its absolute discretion whether any Information relating to the Supplier or the Goods is exempt from disclosure in accordance with the FOIA and/or the EIR.

**15 PROTECTION OF PERSONAL DATA AND SECURITY OF DATA**

- 15.1 In this Clause 15, the terms, "processes", "data controller" and "data processor" shall have the same meanings given to them under Data Protection Legislation.
- 15.2 The Parties acknowledge that for the purposes of Data Protection Legislation, UKRI is the data controller and the Supplier is the data processor of any Personal Data.
- 15.3 The Supplier shall and shall procure that its staff and sub-contractors shall comply with all Data Protection Legislation in relation to any Personal Data processed.
- 15.4 Without limiting Clauses 15.2 and 15.3, the Supplier shall at all times (and shall ensure that at all times its staff):
- (a) process Personal Data only in accordance with the documented instructions received from UKRI and during the Term of this Contract. The Supplier shall immediately inform UKRI if, in the Supplier's opinion, an instruction from UKRI infringes the Data Protection Legislation or any other applicable law;
  - (b) ensure that any person to whom it provides the Personal Data is subject to appropriate confidentiality obligations;
  - (c) disclose any Personal Data only on a need to know basis to staff directly concerned with the provision of the Goods and/or Services;
  - (d) not transfer or direct the transfer of any Personal Data to any third party or process or direct the processing of Personal Data outside of the European Economic Area in each case without UKRI's prior written consent (which consent may be subject to conditions as directed by UKRI);
  - (e) keep all Personal Data confidential, and have in place now and shall on a continuing basis take all reasonable appropriate technical and organisational measures to keep all Personal Data confidential and secure and to protect against unauthorised or unlawful processing, accidental loss, destruction, damage, alteration, disclosure or access;
  - (f) upon request by UKRI, promptly do such other acts in relation to the Personal Data, or any part thereof, as UKRI shall request to enable UKRI to comply with its obligations under the Data Protection Legislation;
  - (g) notify UKRI promptly (and at least within 24 hours) if it receives a request from a Data Subject or a complaint relating to a Data Subject and promptly provide UKRI with all such data, information, cooperation and assistance as is required by UKRI in order to respond to and resolve the request or complaint within any applicable time frames;
  - (h) provide such information and allow for and contribute to audits, including inspections, conducted by UKRI or an auditor mandated by UKRI, as is reasonably necessary to enable UKRI to satisfy itself of the Supplier's compliance with this Clause 15 and the Data Protection Legislation
  - (i) on termination or expiry of this Contract, and at any other time on UKRI's request, either return or destroy (as elected by UKRI) the Personal Data (including all copies of it) and confirm in writing that it has complied with this obligation; and
  - (j) notify UKRI without undue delay on becoming aware of any Personal Data Breach and promptly following notification, provide such data, information and assistance as is required by UKRI in order for UKRI to notify the Personal Data Breach to the

Information Commissioner and/or Data Subject(s) and otherwise fulfil its obligations under Data Protection Legislation.

**16 LIABILITY**

- 16.1 UKRI shall not be responsible for any injury, loss, damage, cost or expense suffered by the Supplier if and to the extent that it is caused by the negligence or wilful misconduct of the Supplier or the Staff or breach by the Supplier of its obligations under the Contract. The Supplier shall not be responsible for any injury, loss, damage, cost or expense suffered by UKRI if and to the extent that it is caused by the negligence or wilful misconduct of UKRI or by breach by UKRI of its obligations under the Contract.
- 16.2 Subject always to clause 16.5 and 16.6 in no event shall either Party be liable to the other Party for any:
- (a) loss of profits;
  - (b) loss of business;
  - (c) loss of revenue;
  - (d) loss of or damage to goodwill;
  - (e) loss of savings (whether anticipated or otherwise); and/or
  - (f) any indirect, special or consequential loss or damage.
- 16.3 Subject always to clause 16.5 and 16.6, the aggregate liability of the Supplier in respect of all defaults, claims, losses or damages howsoever caused, whether arising from breach of the Contract, the supply or failure to supply of the Goods and/or perform the Services, misrepresentation (whether tortious or statutory), tort (including negligence), breach of statutory duty or otherwise shall in no event exceed the Limit of Liability.
- 16.4 Subject to clause 16.5, the aggregate liability of UKRI in respect of all defaults, claims, losses or damages howsoever caused, whether arising from breach of the Contract, misrepresentation (whether tortious or statutory), tort (including negligence), breach of statutory duty or otherwise shall in no event exceed a sum equal to the Charges.
- 16.5 Nothing in the Contract shall be construed to limit or exclude either Party's liability for:
- (a) death or personal injury caused by its negligence or that of its Staff;
  - (b) fraud or fraudulent misrepresentation by it or that of its Staff;
  - (c) breach of any obligation as to title implied by section 12 of the Sale of Goods Act 1979 or section 2 of the Supply of Goods and Services Act 1982; or
  - (d) any other matter which, by law, may not be excluded or limited.
- 16.6 The Supplier's liability under the indemnities in clauses 11.5, 15 and 20.3 shall be unlimited.
- 16.7 The Supplier shall effect and maintain an adequate level of insurance cover in respect of all risks that may be incurred by it in the performance of this Contract. On request from UKRI, the Supplier shall provide UKRI with copies of the insurance policy certificates and details of the cover provided.

17 **FORCE MAJEURE**

Neither Party shall have any liability under or be deemed to be in breach of the Contract for any delays or failures in performance of the Contract which result from circumstances beyond the reasonable control of the Party affected. Each Party shall promptly notify the other Party in writing when such circumstances cause a delay or failure in performance and when they cease to do so. If such circumstances continue for a continuous period of more than 30 days, either Party may terminate the Contract by written notice to the other Party.

18 **TERMINATION**

18.1 UKRI may terminate the Contract in whole or in part at any time before the Goods and/or Services are provided with immediate effect by giving the Supplier written notice, whereupon the Supplier shall discontinue the provision of the Goods and/or Services (in whole or in part as applicable). UKRI shall pay to the Supplier:

- (a) such Charges or that part of the Charges for Goods which have been Delivered to UKRI or, on the deemed date of service of the notice of cancellation, are already in transit and the costs of materials which the Supplier has purchased to fulfil the order for the Goods and which cannot be used for other orders or be returned to the supplier of those materials for a refund; and/or
- (b) such Charges or that part of the Charges for Services provided and a fair and reasonable portion of the Charges for work-in-progress in performing the Services at the time of termination,

but UKRI shall not be liable for any loss of anticipated profits or any consequential loss and the Supplier shall have a duty to mitigate its costs and shall on request provide proof of work-in-progress claimed.

18.2 UKRI may terminate the Contract at any time by notice in writing to the Supplier to take effect on any date falling at least 1 month (or, if the Contract is less than 3 months in duration, at least 10 Working Days) later than the date of service of the relevant notice.

18.3 Without prejudice to any other right or remedy it might have, UKRI may terminate the Contract by written notice to the Supplier with immediate effect if the Supplier:

- (a) (without prejudice to clause 18.3(e)), is in material breach of any obligation under the Contract which is not capable of remedy;
- (b) repeatedly breaches any of the terms and conditions of the Contract in such a manner as to reasonably justify the opinion that its conduct is inconsistent with it having the intention or ability to give effect to the terms and conditions of the Contract;
- (c) is in material breach of any obligation which is capable of remedy, and that breach is not remedied within 30 days of the Supplier receiving notice specifying the breach and requiring it to be remedied;
- (d) undergoes a change of control within the meaning of section 1124 of the Corporation Tax 2010, unless UKRI has given its prior written consent to the change of control or does not raise an objection within 6 months of the Supplier's written notice to UKRI that a change of control has occurred;
- (e) breaches the provisions of clauses 8.2, 13, 14, 15 and 19;
- (f) becomes insolvent, or if an order is made or a resolution is passed for the winding up of the Supplier (other than voluntarily for the purpose of solvent amalgamation



or reconstruction), or if an administrator or administrative receiver is appointed in respect of the whole or any part of the Supplier's assets or business, or if the Supplier makes any composition with its creditors or takes or suffers any similar or analogous action (to any of the actions detailed in this clause 18.3) in consequence of debt in any jurisdiction; or

- (g) fails to comply with legal obligations in the fields of environmental, social or labour law.
- 18.4 The Supplier shall notify UKRI as soon as practicable of any change of control as referred to in clause 18.3(d) or any potential such change of control.
- 18.5 In addition to the Supplier's statutory rights, the Supplier may terminate the Contract by written notice to UKRI if UKRI has not paid any undisputed invoice within 90 days of it falling due.
- 18.6 Termination or expiry of the Contract shall be without prejudice to the rights of either Party accrued prior to termination or expiry and shall not affect the continuing rights of the Parties under clauses 2, 3.2, 3.3, 8, 11, 12.1, 13, 14, 15, 16, 18.7, 19.4, 20.3, 21 and 22.9 and any other term or condition of the Contract that either expressly or by implication has effect after termination.
- 18.7 Upon termination or expiry of the Contract, the Supplier shall:
- (a) give all reasonable assistance to UKRI and any incoming supplier of Goods and/or Services; and
  - (b) return all requested documents, information and data to UKRI as soon as reasonably practicable.

## 19 COMPLIANCE

- 19.1 The Supplier shall promptly notify UKRI of any health and safety hazards which may arise in connection with the performance of its obligations under the Contract. UKRI shall promptly notify the Supplier of any health and safety hazards which may exist or arise at UKRI's premises and which may affect the Supplier in the performance of its obligations under the Contract.
- 19.2 The Supplier shall:
- (a) comply with the reasonable requirements of UKRI's security arrangements;
  - (b) comply with all UKRI's health and safety measures;
  - (c) notify UKRI immediately in the event of any incident occurring in the performance of its obligations under the Contract on UKRI's premises where that incident causes any personal injury or damage to property which could give rise to personal injury;
  - (d) perform its obligations under the Contract in accordance with all applicable equality law and UKRI's equality and diversity policy as provided to the Supplier from time to time;
  - (e) take all reasonable steps to secure the observance of clause 19.2(d) by all Staff; and
  - (f) supply the Goods and any packaging in accordance with UKRI's environmental policy as provided from time to time.

- 19.3 The Goods shall be packed and marked in a proper manner and in accordance with any instructions specified in the Award Letter, any statutory requirements and any requirements of the carriers. All packaging materials shall be considered non-returnable. The Supplier shall indemnify UKRI against all actions, suits, claims, demands, losses, charges, costs and expenses which UKRI may suffer or incur as a result of, or in connection with, any breach of this clause 19.3.
- 19.4 If notified by UKRI, the Supplier shall comply with, and shall ensure that its Staff shall comply with, the provisions of:
- (a) the Official Secrets Acts 1911 to 1989; and
  - (b) section 182 of the Finance Act 1989.

## 20 PREVENTION OF FRAUD AND CORRUPTION

- 20.1 The Supplier shall not offer, give, or agree to give anything, to any person an inducement or reward for doing, refraining from doing, or for having done or refrained from doing, any act in relation to the obtaining or execution of the Contract or for showing or refraining from showing favour or disfavour to any person in relation to the Contract.
- 20.2 The Supplier shall take all reasonable steps, in accordance with Good Industry Practice, to prevent fraud by the Staff and the Supplier (including its shareholders, members and directors) in connection with the Contract and shall notify UKRI immediately if it has reason to suspect that any fraud has occurred or is occurring or is likely to occur.
- 20.3 If the Supplier or the Staff engages in conduct prohibited by clause 20.1 or commits fraud in relation to the Contract or any other contract with the Crown (including UKRI) UKRI may:
- (a) terminate the Contract and recover from the Supplier the amount of any loss suffered by UKRI resulting from the termination, including the cost reasonably incurred by UKRI of making other arrangements for the supply of the Goods and/or Services and any additional expenditure incurred by UKRI throughout the remainder of the Contract; or
  - (b) recover in full from the Supplier any other loss sustained by UKRI in consequence of any breach of this clause.

## 21 DISPUTE RESOLUTION

- 21.1 The Parties shall attempt in good faith to negotiate a settlement to any dispute between them arising out of or in connection with the Contract and such efforts shall involve the escalation of the dispute to an appropriately senior representative of each Party.
- 21.2 If the dispute cannot be resolved by the Parties within one month of being escalated as referred to in clause 21.1, the dispute may by agreement between the Parties be referred to a neutral adviser or mediator (the "**Mediator**") chosen by agreement between the Parties. All negotiations connected with the dispute shall be conducted in confidence and without prejudice to the rights of the Parties in any further proceedings.
- 21.3 If the Parties fail to appoint a Mediator within one month, or fail to enter into a written agreement resolving the dispute within one month of the Mediator being appointed, either Party may exercise any remedy it has under applicable law.

## 22 GENERAL

- 22.1 Each of the Parties represents and warrants to the other that it has full capacity and authority, and all necessary consents, licences and permissions to enter into and perform

its obligations under the Contract, and that the Contract is executed by its duly authorised representative.

- 22.2 The Supplier warrants and represents that during the Term it shall not accept work from other sources that will in any way impair or affect its ability to provide the Goods and/or Services and comply with the terms of this Contract.
- 22.3 The Supplier must make sure that neither it nor any of its Staff or sub-contractors are placed in a position where there is or may be an actual conflict, or a potential conflict, between their interests or the interests of its Staff or sub-contractors and the Supplier's obligations under this Contract. You must disclose to us the particulars of any conflict of interest that arises.
- 22.4 A person who is not a party to the Contract shall have no right to enforce any of its provisions which, expressly or by implication, confer a benefit on him or her, without the prior written agreement of the Parties.
- 22.5 The Contract cannot be varied except in writing signed by a duly authorised representative of both the Parties.
- 22.6 The Contract contains the whole agreement between the Parties and supersedes and replaces any prior written or oral agreements, representations or understandings between them. The Parties confirm that they have not entered into the Contract on the basis of any representation that is not expressly incorporated into the Contract. Nothing in this clause 22.6 shall exclude liability for fraud or fraudulent misrepresentation.
- 22.7 Any waiver or relaxation either partly, or wholly of any of the terms and conditions of the Contract shall be valid only if it is communicated to the other Party in writing and expressly stated to be a waiver. A waiver of any right or remedy arising from a breach of contract shall not constitute a waiver of any right or remedy arising from any other breach of the Contract.
- 22.8 The Contract shall not constitute or imply any partnership, joint venture, agency, fiduciary relationship or other relationship between the Parties other than the contractual relationship expressly provided for in the Contract. Neither Party shall have, nor represent that it has, any authority to make any commitments on the other Party's behalf.
- 22.9 Except as otherwise expressly provided by the Contract, all remedies available to either Party for breach of the Contract (whether under the Contract, statute or common law) are cumulative and may be exercised concurrently or separately, and the exercise of one remedy shall not be deemed an election of such remedy to the exclusion of other remedies.
- 22.10 If any provision of the Contract is prohibited by law or judged by a court to be unlawful, void or unenforceable, the provision shall, to the extent required, be severed from the Contract and rendered ineffective as far as possible without modifying the remaining provisions of the Contract, and shall not in any way affect any other circumstances of or the validity or enforcement of the Contract.

## 23 NOTICES

- 23.1 Any notice to be given under the Contract shall be in writing and may be served by personal delivery, first class recorded or, subject to clause 23.3, e-mail to the address of the relevant Party set out in the Award Letter, or such other address as that Party may from time to time notify to the other Party in accordance with this clause.
- 23.2 Notices served as above shall be deemed served on the Working Day of delivery provided delivery is before 5.00pm on a Working Day. Otherwise delivery shall be deemed to occur

on the next Working Day. An email shall be deemed delivered when sent unless an error message is received.

23.3 Notices under clauses 17 and 18 may be served by email only if the original notice is then sent to the recipient by personal delivery or recorded delivery in the manner set out in clause 23.1.

## 24 **GOVERNING LAW AND JURISDICTION**

24.1 The validity, construction and performance of the Contract, and all contractual and non-contractual matters arising out of it, shall be governed by English law and shall be subject to the exclusive jurisdiction of the English courts to which the Parties submit.

## 1. PREFACE

### 1.1 The ISIS Main Magnet System

The ISIS Facility, which is sited at the Rutherford Appleton Laboratory (RAL), is the world's most productive pulsed neutron source. Intense bursts of neutrons are produced at 20ms (50 Hz) intervals when a heavy metal target is bombarded by a high-energy (800 MeV) proton beam from a synchrotron accelerator releasing neutrons by the process of spallation.

The production of the high energy protons may be split up into five stages:-

- The generation of H<sup>+</sup> ions with energies of 665 keV.
- The acceleration of the H<sup>+</sup> ions to 70 MeV using a linear accelerator.
- The stripping of the electrons from the H<sup>+</sup> ions to produce protons at 70 MeV.
- The acceleration and bunching of the protons to 800 MeV in the synchrotron ring.
- The delivery of the protons to one of two heavy metal targets.
- The protons are, after extraction from the synchrotron ring, directed along a beamline and delivered to a heavy metal target.

While in the synchrotron the particle beam is steered and focused by means of electromagnets – the “Main Magnets”. These are a mix of dipole and quadrupole magnets and are powered in series by a superimposed AC and DC current. The synchrotron main magnets are subject to occasional failures and in this case are taken out to a separate repair and test area, where they may be rebuilt and then tested under power.

### 1.2 The Test Area

After any repair work has been carried out on a magnet, it is necessary to test it by energising it at full power to verify correct functioning. The test area therefore requires a power feed capable of exactly reproducing the current waveform supplied to the synchrotron magnets while in service. This specification provides detailed information for the requirement of an AC power supply system, which together with an existing DC Bias power supply will provide the current in the magnet(s) under test.

## 2. GENERAL

### 2.1 Circuit Description

This Specification describes the detailed requirements of a complete power supply system required to make up the AC losses in the magnets under test. The system consists of a 70kW highly stabilized AC power supply unit.

The required magnet current has both DC and AC components. The waveform is of the form:  $I_{\text{Magnet}} = I_{\text{DC}} + I_{\text{AC}} \cdot \cos\omega t$ , this is shown in *Figure 2: Main Magnet Current*. The system is operated at typical values of,  $I_{\text{DC}} = 662\text{A}$ ;  $I_{\text{AC}} = 400\text{A}$ ;  $\omega = 50\text{Hz}$ . The AC and DC components of this current are supplied by two separate power supplies. The DC power supply already exists and does not form part of this requirement.

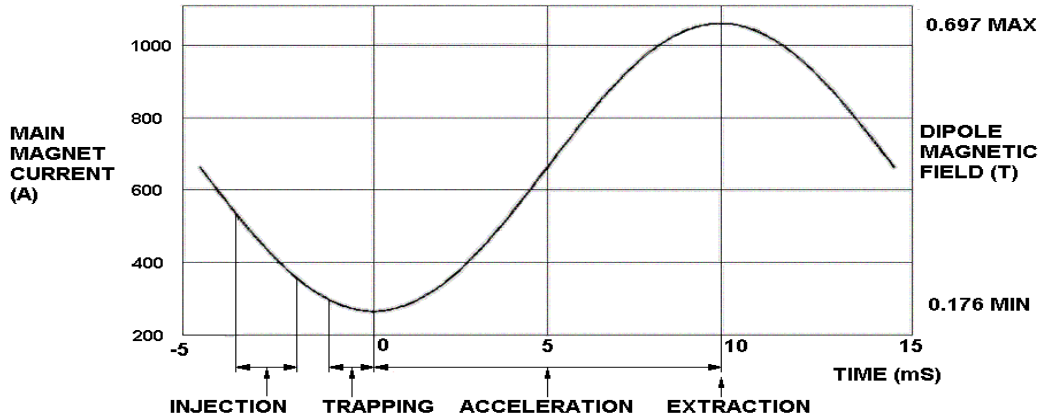


Figure 1: Main Magnet Currents

The superimposed currents are achieved by means of a “Resonant magnet circuit” which is described in the next section.

## 2.2 Power Requirement

The losses in a single superperiod are of the order 56kW, of these about 48kW are dissipated in the dipole magnet. The 70kW requirement for the power supply has been chosen as it represents 56kW plus a 25% margin. It may be noted that in most instances the load will be a single dipole magnet.

Note that in section 4.3 the product of the maximum current and voltage is more than the specified 70kW. Due to the nature of the load circuit it is possible that either the maximum voltage or current might be reached but not sustained simultaneously.

## 2.3 The Resonant Magnet Circuit

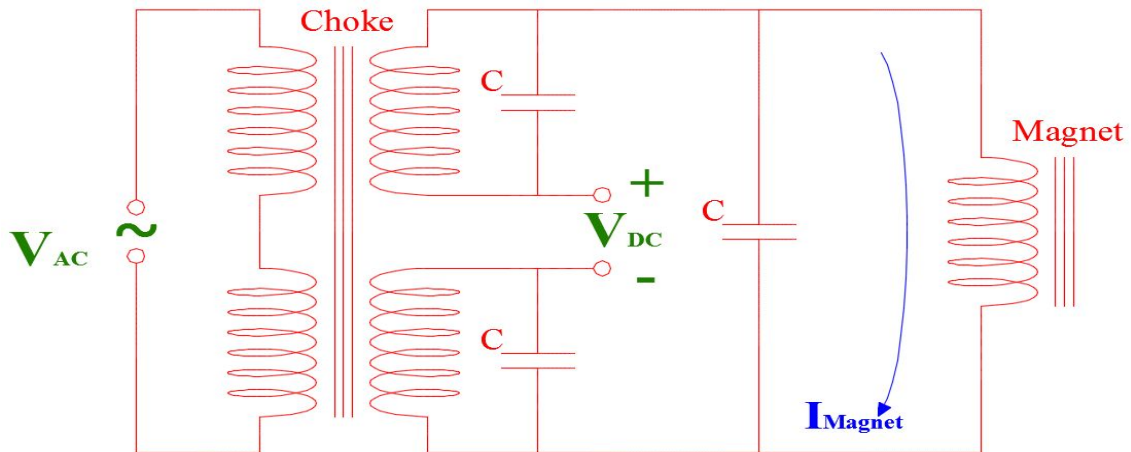


Figure 2: Resonant magnet circuit

The Resonant magnet circuit is a configuration of choke, capacitors and a magnet which allow separate AC and DC power supplies to power a single magnet. A simple version is shown in *Figure 3: Resonant magnet circuit*. The DC goes directly to the magnet via a choke winding whereas the AC power supply excites the choke via an auxiliary, low power winding which sets up a resonance between the choke and capacitors C1 and C2, this in turn makes C3 and the magnet resonate. Careful control of the AC power supply via a feedback loop allows the magnet AC current to be precisely controlled.

## 2.4 Frequency

The power supply will output a 50Hz sinusoidal waveform; this will be phase-locked to an external 50Hz, differential TTL square-wave control signal (100mA max). The supplier must take care to ensure that the nominal 50Hz of the incoming mains does not interfere with the output of the power supply.

N.B. the 50Hz control signal to which the output is locked will come from the ISIS timing system and is not related to the frequency or phase of the incoming mains.

## 2.5 Circuit Start-up procedure

During normal running the power factor of the magnet circuit seen from the AC power supply is usually high 0.95 or better. However, when running up from cold it may be considerably worse; in the region of 0.5 and the power supply must be able to cope with this. If this is the case, and the AC power supply is not able to supply the full operational current then the system is allowed time to warm up on a lower current setting.

It is established procedure to run the circuit up slowly, this is to reduce thermal stresses on the choke and magnet and also helps to reduce inrush currents. The DC power supply is run up in stages until it is at full current, and then the AC is switched on and given a staged run-up. This procedure may take place over several minutes or a few hours if the circuit is starting from cold. The power supplies are required to remain stable at the lower settings during this process. It should be noted that it may take up to 24 hours for the circuit to fully stabilise and during this time the power factor can be variable and relatively poor.

## 2.6 The Magnet

An ISIS superperiod consists of four magnets connected in series: a dipole, two large quadrupoles and one small quadrupole. In most cases the test area will only be running a single dipole but is possible that any of the superperiod magnets, or a combination of them, might be tested. In each case the capacitor bank would be retuned in order to maintain the 50Hz resonance but the load seen by the power supply will differ, both in current and voltage. The parameters of the different magnets are given below in *Table 1: Magnet parameters*.

Magnet	Inductance	DC Resistance
Dipole	143mH	112mΩ
Large quadrupole	10mH	8 mΩ
Small quadrupole	3mH	3 mΩ
Full Superperiod	166mH	131 mΩ

Table1: Magnet parameters

## 2.7 The Choke

In order to understand and model the behaviour of the circuit the inductance matrix of the choke is given below: #1 and #2 are the two right-hand windings as shown in *Figure 3: Resonant magnet circuit*. #3 and #4 are the auxiliary winding to which the AC power supply is connected. Although it appears from the schematic that the “choke” is a transformer there is only partial similarity with a transformer. In this device the auxiliary windings are a low-voltage and low-current winding and the main windings (#1 and #2) operate at a higher voltage and current due to the circuit resonance.

winding	#1	#2	#34s
#1	64.055mH	15.275mH	17.223mH
#2	15.275mH	64.055mH	17.223mH
#34s	17.223mH	17.223mH	7.656mH

Windings #3 and #4 are connected in series so they are combined as #34 on the inductance matrix above.

### 2.7.1 Other parameters:

- Main winding (each) Rdc: .....31.87mΩ
- Auxiliary winding Rdc: .....113.31mΩ
- Auxiliary winding
  - Nominal ..... 3.47kV
  - Nominal current ..... 30A
  - Maximum allowed current ..... 40A

The maximum allowed current in the auxiliary winding is 30A so the power supply will be set to an upper limit which will not be exceeded even if this means that the magnet current is below the required value.

In order to minimise the voltages on the auxiliary winding, the power supply will be bipolar so that the maximum voltage output will be approximately 1.7kV<sub>rms</sub> with respect to earth, connection as in *Figure 3: Resonant magnet circuit*, or half that if connected as per *Figure 4: Resonant magnet circuit separated auxiliaries*. If an output transformer is used, then the high-voltage winding must be centre-tapped and connected to earth.

## 2.8 Capacitors

The capacitor banks are tuned to give a circuit resonance as close to 50Hz as possible. However, this is done by adding or removing capacitors with the smallest available adjustment being 0.5μF (or about 25kVAr at full operating current), so there is usually some residual reactive power seen by the AC power supply. In order for the circuit to be resonant, in *Figure 2: Main Magnet Currents* the nominal values of capacitance would be C1 = C2 ≈ 127.7μF and C3 ≈ 70.9μF. However, it should be noted that these exact values of capacitance are difficult to achieve in practice. There is also some variation caused by ambient temperature.

## 2.9 Control

The power supply will be able to operate in either one of two modes as described below:

### Mode 1

The power supply is required to maintain a constant set current in the magnets and must use this rather than a direct measurement of its own output current as its main control parameter. There is a high-accuracy DDCT installed in the magnet (HV) circuit from which a 0-10V analogue signal is derived corresponding to the AC current in the magnets. This signal must be used by the power supply to control both level and stability of the magnet current. The exact value of the power supply output voltage is not critical other than for the effect it has on what is going on in the resonant circuit. It is not sufficient simply to stabilise the output of the power supply at a set level. The target magnet current setting will be given to the power supply either via front panel controls or remotely via an interface such as RS485 or Ethernet (to be confirmed at design review).

### Mode 2

The power supply will operate as a voltage source and will maintain a set output voltage according to a demand level supplied by an external control system. This may be sent as a digital command via RS485 or Ethernet, an analogue signal or a combination of the two. The bidder should propose their preferred means of achieving this and it will be discussed further at detailed design review.

If an analogue signal is used for the demand then it will be a level corresponding to an RMS output. In this mode of operation the power supply must be able to match the demand level with the precision described in section 4.3 AC Output requirements.

### 2.9.1 Interfaces to be provided:

- RS485/LAN for general communications
- RS232 for maintenance/diagnostics access
- Protocols will be discussed at design review

### 2.9.2 DCCT



The DCCT which will be used to measure the main magnet current is not part of this specification, the equipment which is used is the *LEM Current Transducer ITZ 2000-SB FLEX ULTRASTAB*. The datasheet is available via the following web-link:

[http://www.lem.com/docs/products/itz\\_2000-sb\\_flex\\_ultrastab.pdf](http://www.lem.com/docs/products/itz_2000-sb_flex_ultrastab.pdf)

## 2.10 Earth Leakage

The HV load circuit has its earth-leakage monitoring inside the DC Bias Power Supply. However, the AC power supply is galvanically isolated from HV circuit by the chokes. The auxiliary side of the chokes which are connected directly to the AC power supply therefore require an earth or neutral point defined by the centre point of the power supply output circuit. The power supply must be able to detect an earth-fault in this part of its load circuit and disconnect itself before any damage occurs to the power supply either through overvoltage or overcurrent.

The power-supply earth leakage detection must set be to trip at  $\pm 30\text{mA}$  of earth-current.

## 3. POWER SUPPLY SPECIFICATION

### 3.1 Introduction

The power supply must incorporate the following features:-

- Fed from a nominal AC,  $400\text{V}_{\text{RMS}}$ , 3-Phase, 50Hz sinusoidal supply.
- It must be based on proven technology, with evidence submitted as part of tender process.
  - Able to maintain stable AC magnet current with 0.005%, 50PPM maximum stability over an 8 hour period.
  - Temperature coefficient max 1ppm/ $^{\circ}\text{C}$
  - Soft start.
  - Galvanic isolation between AC inputs and AC output.
  - Noise rejection.
  - High efficiency.
  - High reliability.
  - Low maintenance and easy access.
  - Means of isolation for the Power Supply from the mains input.
  - Earthed enclosures.
  - All doors and easily removable panels which give access to high-voltage components must be interlocked so that the power supply is tripped off.
  - Electronic monitoring and protection with microprocessor based fault logging for maintenance diagnosis.
  - Facility for remote control and status monitoring.
  - Fully compliant with CE Marking.
  - RoHS compliant (Restriction of the Use of Certain Hazardous Substances) Refer to European Directive 2002/95/EC and subsequent amendments.
  - WEEE compliant (Waste Electronic and Electrical Equipment Regulations 2006). (Refer to Directive 2008/98/EC of the European Parliament and subsequent amendments).

Other relevant BS EN and / or IEC standards must be complied with; the following list is a guide but is not exhaustive:

BS EN 13849-1	Safety-related parts of control systems
BS EN 50160	Voltage characteristics of electricity supplied by public distribution systems
BS EN 55011	Industrial Scientific and Medical Equipment - Electromagnetic disturbance limits and methods of measurement
BS EN 61000	Electromagnetic compatibility (EMC)
IEC 60076-6	Reactors
IEC 60076-11	Power transformers
IEC 60146	Semiconductor converters

IEC 60204-1	Safety of Machines Electrical Equipment of Machines – General Requirements
IEC 60529	Degrees of protection provided by enclosures
IEC 60664-1	Insulation coordination for equipment within low voltage systems
IEC 60950-1	Information Technology Equipment – safety
IEC 61378	Converter transformers
IEC 61558-1	Safety of power transformers, power supplies, reactors and similar products
ISO 3864-2	International standards for safety symbols
ISO 9001	Quality management systems – requirements

*In all cases the latest versions and/or amendments of codes apply.*

### 3.2 AC Input requirements

3-Phase, 4-Wire, Sinusoidal form.

Continuous rating input RMS (Ph-Ph) Voltage.....	400V, +10% / -15%
Operating frequency .....	50Hz, ±2Hz
THD (including all harmonics up to the order 40).....	≤ 8%
Power factor.....	1 ≥ PF ≥ 0.8 (lagging)

### 3.3 AC Output requirements

Minimum continuous rating AC output Voltage.....	3300Vrms (± 1650Vrms)
Resistive connection to ground from mid-point(s) of output.....	Yes (1kΩ)
Minimum continuous rating AC output current.....	30A*
Minimum continuous performance power rating.....	70kW
Galvanic isolation from AC input circuit.....	Yes
Output range.....	0 to rated voltage*

*\*(To be consistent with Section 4.4 below).*

### 3.4 Resonant magnet circuit Parameters

Current Stability (any operating set level) .....	0.005% (50ppm)
Current stability as a function of temperature.....	1ppm/°C
Stable Current Operational Range.....	100A – 450A
Current set level range (in steps ≤ 0.05A) .....	0% to 100%
Ramp-up during start up (soft start) .....	Max 20 amps/second

### 3.5 Dimensions and Total Mass requirements

Total mass .....	To be advised by the tenderer
Floor loading.....	1.7 tonnes/metre <sup>2</sup> maximum
Maximum dimensions:	
Max Height.....	2.2 Metres
Max Width.....	3 Metres
Max Depth.....	1.8 Metres
Installation.....	Indoor mounted enclosure

### 3.6 Construction

Approximately 12.8m<sup>2</sup> (3.2m by 4m) will be made available for the power supply; this allows for operator and maintenance gangways etc. on all four sides.

Installation will be on a mezzanine floor, positioned using a gantry crane. Unloading and placement in the building will be carried out using a fork-lift truck. The power supply must be fitted with appropriate lifting eyes and be capable of being lifted from underneath. In order to make

handling practicable it may be necessary to manufacture and deliver the power supply in sections such that the following dimensions are not exceeded.

If more than one section is required then the power supply must be disassembled after factory testing and before shipment.

Maximum Section Width or Depth .....	2.5m
Maximum Section Weight .....	3 Tonnes

The details of lifting arrangements will be formalised at the design review stage prior to manufacture; assembly may be carried out either by the supplier or if preferred, by STFC (this will be agreed before delivery).

### 3.7 Environmental conditions

The power supply shall be able to operate under the following environmental conditions without any electrical, mechanical or performance degradation:

Maximum ambient temperature.....	+40 °C
Maximum daily average temperature.....	+35 °C
Minimum ambient temperature.....	0 °C
Storage temperature.....	-5 °C, + 40 °C
Relative humidity (Average value).....	≤ 75%
Relative humidity (Peak value).....	≤ 90%, non-condensing
Sealing level for closed areas.....	IP31 according to IEC 60529
Sealing level for ventilated .....	IP20 according to IEC 60529
Maximum altitude without de-rating.....	1000m above sea level
Audible noise.....	Less than 75 dBA @ 1 metre & full load and nominal voltage.

### 3.8 Insulation Test Levels

The AC, 3-Phase input must be **galvanically isolated** from the AC output voltage. The dielectric strength will be in compliance with IEC 60950-1 as a minimum.

- Between AC, 3-Phase, 400V<sub>rms</sub>, circuit and frame:  
3kV<sub>rms</sub> AC, 50Hz for 60 seconds.
- Between AC output circuit and frame:  
3kV DC, for 60 seconds.

### 3.9 Clearance and Creepage

The Clearance (Jump) and creepage distances will be present, between all live and exposed components and any earthed panels. These distances will be in compliance with BS EN 60950-1 and/or IEC/TR 60664-2-1, Pollution Degree 3.

### 3.10 Efficiency

At full load and nominal output voltage an efficiency of 92% or Greater is desirable

### 3.11 Power Supply Control System

The Control Electronics will be installed properly isolated from the power switches and will be fed by a separate power supply which will be compliant with IEC 60950-1.

The controller must be equipped with an internal CPU and incorporate the following features:

- Interactive interface, to allow local control, monitoring and indication of operational status, measurements and faults;
- Functional keyboard on the front panel for local set-up and configuration (this may be included in a touch-screen interface);
- AC output current and voltage indication on the front panel separate from the interactive interface. Resolution to be ≤ 1.0V for voltage and ≤ 0.1A for current;

- Analogue type AC input current and voltage indication on the front panel separate from the interactive interface. To be selectable between phases with a resolution of  $\leq 1.0V$  for voltage and  $\leq 1A$  for current;
- Remote/Local control mode selectable by switch on the front panel; no remote operation of any kind should be permitted when Local mode is selected (this includes remote reset). Power supply Start, Stop and Reset operation command via separate push-buttons;
- Load current demand and set-level facility via the interactive interface;

The control and protection of the power supply performed by the controller will comprise the following, as a minimum:

- Switching control of the power semiconductor devices.
- Monitoring and protection for the AC inputs.
- Regulation and protection of the AC output.
- Overload and short circuit protection of the AC input and DC output sides.
- 3-Phase input Failure (in the event of loss of one or more phases of the 3-phase input), so that no consequential damage to power supply components or the load occurs.
- Over-temperature and earth leakage protection (within power-supply).
- Monitoring of earth leakage in the load circuit, (see section 4c).
- Fault detection and handling, including logging of first fault.
- Communication handling and control.

On a detection of a fault, the controller will inhibit and lock out the power supply. Fault diagnostic information in terms of which sort of fault is present will be displayed locally and also remotely to the SCADA System. A local or remote manual reset will then be required to re-start the power supply.

A diagnostic facility must be provided to allow rapid and reliable identification of faults within the power supply. This should include making test points available to observe the rectifier bridge output Voltages, a single-ended BNC is the preferred connection.

The minimum operational information to be displayed on the power supply interface is assigned as follows:

- Unit self-test OK;
- Output AC OK (and within the tolerance range);
- Temperature and Over-temperature setting.
- Visual alarms.
- Display of measurements.
- Selected control mode (Local/Remote).
- Communication loss.
- External Interlocks (including which ones are active)

All operational functions available on the local front panel must also be available for remote control, configuration and monitoring by the SCADA System. Also, the following functions related to the power supply and/or to the load shall be available for monitoring from the Plant Control System.

- Emergency Stop/Power Off;
- Power supply Start/Stop operation (as mentioned earlier in this section);
- Load current demand set level;

Additional functions may be advised at a later Stage.

### 3.11.1 Communications and other interfaces

The following will be included for maintenance purposes and integration into the external SCADA system:

- An RS422/485 port or other equivalent to enable remote control of the power supply by the Plant Control System; the command set shall be made to allow remote control and monitoring.

- An RS232 or USB serial port or other equivalent to enable local connection with a portable PC for which the maintenance software must be provided;
- A Local Area Network connection (Ethernet) for remote monitoring and real time data acquisition; For this option, the Maintenance Software must be provided;
- Communications protocols will be agreed at design review.
- Connectors to be used will be agreed at design review.
- The power supply will have a pair of volt-free contacts which will close when the power supply is ON. These will be used by the external ISIS PLC system to provide an indication that the power supply is ON and working correctly. The +24V DC feed for these contacts will be sourced from the external ISIS PLC. These should have a normally open and a normally close contact.

### 3.11.2 External Interlocks

A minimum of 8 hard-wired inputs shall be provided for inclusion into the external interlocks system; the loss of any external interlock will cause the output of the power supply to be immediately switched off and disabled without the involvement of the CPU or other programmed devices. Other considerations are:

- The external interlocks connector within the power supply must use screw-type connectors suitable for terminating 16/0.2 wires. "Screwless" quick-connect type connectors must not be used.
- There will be two terminals for each external interlock; one will provide an extra-low voltage, preferably 24Vdc, which will be returned by the external control system to the second terminal. The external controller will have volt-free contacts which are closed when the interlock is good.

The external interlocks will be labelled:

- PLC Interlock 1
- PLC Interlock 2
- External Interlock 1
- External Interlock 2
- PPS1
- PPS2
- Magnet Emergency Off Button 1
- Magnet Emergency Off Button 2

External interlocks 1-4 (PLC and External) provide machine protection. These will comply with BS EN 13849-1 to at least Category 1.

External interlocks 5-8 (PPS and Magnet Emergency Off) provide personnel protection. This will comply with BS EN 13849-1 to at least Category 3.

### 3.12 Emergency Stop

An Emergency stop/Power off push-button will be provided with regard to the following:

- It shall be hard-wired and not dependent on the functioning of the control system.
- It shall be operative irrespective of the control mode selected.
- It shall remove power from and isolate the output of the power supply.
- Control system functionality, including identification of power supply status and external communications should be maintained during and after the pressing of the emergency stop.
- It must be placed in a prominent position close to the control panel but located such that accidental activation is prevented.

### 3.13 Software and Protocols

Maintenance and commissioning etc.: the power supply must be accessible via a service interface e.g. RS232 connected to a laptop computer for the purposes of adjustment, maintenance and fault diagnosis, any software required to carry out this function must be made available and form part of the overall package supplied.

Control: the power supply will be integrated into an existing control and monitoring system which is based on LabVIEW; any necessary drivers should also be included in the overall package supplied.

The required interfaces are detailed in section 4.12.1. If drivers or proprietary protocols are required these must be made available during the design review stage so that they can be integrated into ISIS control systems before on-site commissioning starts.

## 4. COOLING

It is preferred that the power supply will be air-cooled, either natural or forced. However, if the manufacturer cannot meet this, then a proposal that relies on water-cooling will also be considered. Cooling methods must be addressed in the tender documentation. If water-cooling is chosen then *Electrical components which are at risk of being exposed to water from leakage must be well protected.*

### 4.1 Air cooling

Where air cooling is used, the following applies:

- Bulk ambient air temperature 35 °C
- Max allowable power to be dissipated by air 10 kW
- Bulk air velocity for natural convection 0 m s<sup>-1</sup> (Still Air)

### 4.2 Water Cooling

If water is chosen then the power supply will be connected to the STFC water-cooling circuit. This will comprise demineralised water.

- The following must be considered when using demineralised water:-  
Copper Migration Rate = 853.92 x Current Leakage (grams/month).
- The locations, number and fitting types of the inlets and outlets of the power supply cooling water system are to be agreed between the supplier and STFC at the design review stage.
- The cooling water distribution to the power supply sub-systems will be comprised of quick-fit and self-sealing connections.
- Stainless Steel piping shall be used with minimum connections, to enhance reliability.
- Flexible crimped hoses will only be allowed for the quick-fit connections.
- The water flow of the power supply and the associated sub-sections shall be monitored by flow meters with a front-panel display showing flow-rate in litres/minute. These shall be connected to the internal interlocks system so that the power-supply will be tripped off should the flow-rate fall below a specified level. The specific type of flow meter used will be agreed between the supplier and STFC at the design review stage.
- Inlet and outlet water temperature's probes to be fitted and their readings displayed.
- A full list of materials in the water system must be supplied; this will include welding materials and joints.
- Maximum allowable pressure drop at maximum flow..... 3 bar

- Power supply test pressure (1 hour)..... 16 bar

### 4.3 Main features of STFC water-cooling systems:-

Demineralised water conductivity.....	< 10µS/cm
Maximum operating pressure.....	8 bar
Minimum available pressure drop.....	3 bar
Maximum inlet temperature.....	25°C
Maximum outlet temperature.....	40°C
Delta T.....	10-15°C
Available water flow for the power supply..... per Minute	Maximum 100 Litres

### 4.4 Fans

When forced air cooling is used all fans will be supplied by the power supply. The tenderer must include the following in their submission:

- Location of the inlets and outlets of forced air.
- Cooling fan redundancy.

### 4.5 Fan Maintenance Requirements and lubrication details

- Sealed ball bearing fans with a minimum design life expectancy of 20000 hours.

## 5. MECHANICAL DETAILS

- The power supply shall be modular for ease of handling and installation. It is preferred that the modules shall be based on standard 19" rack enclosures (or multiples thereof).
- The modules will be fitted indoors. The mounting arrangements to be agreed between STFC and the supplier(s).
- The supplier shall provide the modules with means for lifting and carrying in compliance with the relevant safety code, assuming that the equipment will be lifted by an overhead crane and/or a forklift when applicable. The supplier shall also provide directions and detailed drawings indicating all lifting points. (See notes in section 3e).
- Air cushions are being considered as a means of moving the equipment within the building which will impinge on the design of the undersides of the modules; this will be discussed during the design reviews.
- The equipment case must be painted on the inside and outside. If stainless steel is used, then only outside paint is required. The colour shall be agreed with STFC
- All fixings are to be metric.
- Warning labels on all external covers that conceals mains or higher voltage terminals. The labels will be in compliance to ISO 3864-2 and comprise the following:-
  - Triangular warning (Flash Sign) labels;
  - Voltage warning labels (indicating nominal voltage values);
  - Warning labels in International English. The warning will indicate the safe waiting time after switching off before attempting to access internal components.
- Identification labels in International English - Labels in IP20 enclosures are printed black on white. These are fixed in place using sealed stainless steel rivets. Labels mounted in IP31 enclosures should be either riveted or screwed and printed black on white.
- Rating plates will be mounted externally. These will exhibit details of the following:

- serial number
- equipment type number
- date of manufacture
- Input power, voltage, current, number of phases and frequency
- Output power, voltage and Current
- Cooling water requirements
- weight
- Semiconductors, power capacitors and electronic control measurement panels to be situated in a closed, ventilated compartment to IP31.
- As a preference copper busbars shall be used and insulated as necessary.
- Entries for the external input and output power conductors to be agreed between STFC and the supplier.
- Mechanical interlocks – refer to Section 9a).

## MATERIALS

### 5.1 Fire and Smoke

- The equipment should be designed to comply with the requirements of IEC 60204.
- A smoke audit should be provided indicating the likely products of combustion in the event of a fire.
- All materials should comply with WEEE (Waste Electronic and Electrical Equipment Regulations 2006); refer to Directive 2008/98/EC of the European Parliament.
- All materials used should comply with RoHS (Restriction of the Use of Certain Hazardous Substances); refer to European Directive 2002/95/EC and subsequent amendments.

### 5.2 Wound Components

All major wound components shall be insulated to class 200, and vacuum impregnated. For thermal design purposes all wound components will be assumed to be class 150. The manufacturer shall provide calculations to demonstrate that they have included the full effect of harmonic currents in their thermal design. Temperature monitoring devices should be incorporated into all major wound components and should form part of the internal interlocks of the power supply.

### 5.3 Capacitors

Any Electrolytic capacitors used in the design should be identified and a maintenance regime defined.

## 6. ISOLATORS AND SWITCHES

The following switches and isolators shall be fitted to the front of the power supply:

- Mains input isolator – this shall be lockable using padlocks or safety-hasps etc.
- Output isolator – this is to be fitted with an agreed Castell lock (section 10a).

## 7. SAFETY

The power supply must comply with IEC 61558-1 and IEC 60204. Safety is of paramount importance at all levels and a rigorous demonstration of safety is required by STFC, including risk assessment. The safety demonstration shall include but not be limited to the following:-

- The identification and resolution of hazards inherent in the design of the power supply.
- Interference with other plant systems / networks.
- Software - It may be the case that some of the failure modes involve software.



## 7.1 Castell system (mechanical interlocks)

The ISIS main magnet power supplies are included in a Castell™ system which ensures that they are in a safe condition before access can be gained to any downstream area. This may cover isolator switches and “earth-dump” systems if fitted. The power supply and filter must be designed in such a way that Castell locks are easily fitted to any control which has a bearing on personnel safety. The details of the locks and mounting will be discussed in more detail during the design review.

## 7.2 Power supply enclosures

All doors and easily removable panels that give access to hazardous voltages shall incorporate interlock switches such that the power supply is tripped off when they are open.

## 8. TESTING

The completed power supply shall be tested at both the manufacturer's works and after installation at STFC Rutherford Appleton Laboratory. The satisfactory completion of both of these tests shall be considered to be Contractual Milestones.

Payment Milestones-

SW to provide payments milestones- proposed milestones=

30% 1<sup>st</sup> payment at sign off of detailed design

30% 2<sup>nd</sup> payment at delivery of major component at the supplier's site

30% Factory acceptance and sign off of factory test

10% site acceptance and satisfactory sign off of training.

### 8.1 Factory Testing

The completed power supply and filter should undergo a rigorous factory testing program before acceptance by STFC, and the points listed below should be included in the test program. Any full test programme will be reviewed and agreed during the design reviews and will be agreed prior to manufacture. *The manufacturer must ensure that the electrical supply to the test laboratory is adequate for these tests, 70kw.*

If the power supply has been manufactured in complete sub-assemblies, these tests shall apply to each sub-assembly.

- Short Circuit Test (Running conditions will be discussed during design review).
- Full Voltage Test into no connected load.
- Full current test into reduced load
- Trip off supply while running at full power.

### 8.2 Site Acceptance Testing

After the installation at STFC Rutherford Laboratory has been completed to the satisfaction of all parties, the Power Supply will be tested in two stages.

- The first stage will be with the power supply isolated from the resonant magnet circuit. The tests will prove that the installation has been satisfactorily completed. The Test Programme will be agreed at a Design Review before manufacture begins, but they shall include a Short Circuit Test at full current and an Open Circuit Test at Full Voltage. Details will be discussed with the winning bidder.

The second stage will be with the Dipole Test Circuit properly connected. The Test Program will be agreed after the factory tests have been completed but will include a 24 hour test at the nominal working current with full magnet AC excitation. These tests should demonstrate the design values of the power supply stability.

- Acceptance test dates will be scheduled to fit with the ISIS Operational and shut down schedule. Acceptable dates for these tests will be provided by STFC.

The details of the tests and schedule will be discussed more fully during the design review.

## 8.3 EMC

The equipment will be designed and tested to meet, as a minimum, the following or equivalent:-

- Radiated Emissions (BS EN 55011)
- Conducted Emissions (BS EN 55011)
- Electrostatic Discharge (IEC 61000-4-2)
- Radiated RF Immunity (IEC 61000-4-3)
- Fast transient burst (IEC 61000-4-4)
- Surge Immunity (IEC 61000-4-5)
- Conducted RF immunity (IEC 61000-4-6)

## 9. DESIGN REVIEWS

The supplier should carry out design reviews for the following.

- Supplier technical specification (in response to this document);
- This must include details on the proposed design topology for the power supply with calculations demonstrating compliance with the specification.
- Simulated waveforms.
- Thermal calculations.
- Interface drawings (Mechanical and Electrical) including dimensions.
- Power and control circuit schematic.
- Equipment layout / detail assembly (including dimensions).
- Routine test specification.
- Type test specification.
- Documentation (please see Section 16).
- Software for control and maintenance (see section 4m).

Following a design review, the project/design shall not proceed until that stage of the design reviews is approved by STFC and closed. The supplier shall provide STFC with all documentation and drawings related to any design review 2 weeks prior to that design review.

The approval of the detailed design by STFC in any design review shall not relieve the supplier of any responsibility for meeting the final specifications of the contract.

## 10. PROJECT PLAN, PROJECT REVIEWS AND CONTACTS

The supplier shall prepare a project plan for evaluation by STFC. This should be in International English and show the following as a minimum:

- Design reviews schedule.
- Routine, Type test schedule (for witness).
- Likely achievable delivery date which shall be within 18 months from placement of order.

Regular progress review meetings shall be held between the supplier and STFC at all stages in the contract. STFC will nominate a Project Engineer who will act on its behalf and be responsible for all official communications with the supplier.

The supplier shall name a Project Manager and Lead Engineer who shall direct the design, manufacture, testing and delivery of the power supply.

## 11. PRODUCT SUPPORT

The supplier is to allow engineering time to support during commissioning, on site at STFC.

## 12. TRAINING

The supplier is to provide comprehensive training with respect to the power and control circuits, operation, configuration and maintenance of the power supply. The supplier should prepare a training schedule plan for evaluation by STFC. As stated in the milestone payments.

## 13. DOCUMENTATION AND DRAWINGS

All documentation and drawings shall be provided as electronic copies in International English. For hard copies, the documentation shall be in A4 or in specific format requested by STFC. All drawings shall be in “\*.dwg” or .pdf format.

All documentation and drawings shall become the property of STFC and will comprise the following:

- Power supply technical specification.
- Design calculations such as thermal, mechanical and electrical design.
- Routine test specification.
- Routine, Type test report.
- EMC report.
- Mechanical and Electrical interface drawings.
- Power and control schematics.
- Control block diagram.
- Power and control wiring drawings.
- Detail assembly and items list of the power supply.
- Operation manual, comprising at least:
  - Installation / Wiring guidelines.
  - Configuration and set-up procedures.
  - Interface display and control description.
  - Fault management description.
  - Fault response description (i.e. the operator’s response and behaviour to a fault).
- Corrective maintenance and preventive maintenance document (Maintenance manual).

This to include:-

- Wiring diagrams (Power and Control) and the 3D model of the power supply detail assembly.
- Circuit diagrams of all control modules and circuit boards showing all component values and device types.
- Circuit operational descriptions with drawings / sketches etc. as necessary to allow maintenance technicians / engineers to rapidly understand the function of circuits to component level.
- Spare parts list and recommended quantities for a minimum 20 year operational life.
- Special tools list (if required).
- Smoke audit.

*NB, Intellectual Property; IP rights will remain with the manufacturer and will not be disclosed by STFC to 3<sup>rd</sup> parties.*

## 14. QUALITY ASSURANCE SYSTEM

The manufacturer shall employ a quality assurance system to ISO-9001 to ensure the quality of the final product and the traceability of the individual components and materials. All documentation and markings shall be in International English.

## 15. PACKAGING, SHIPPING AND DELIVERY

All packaging, insurance and shipping costs to STFC site shall be made entirely at the expense of the supplier / manufacturer. The latter shall ensure proper protection of the power supply against

any damage from severe environment conditions, handling and transportation to STFC site. The total weight of each package shall be clearly displayed on the outside.

Delivery of the power supply and other items to STFC site shall be to an agreed schedule. The delivery of the power supply shall be made during STFC working hours and following a minimum of 2 weeks prior notice.

All deliveries must occur during normal working delivery hours at STFC; 9am to 4pm. If delivery notice is not provided or is attempted outside the above hours, STFC reserves the right to refuse delivery. Any increase in delivery charges due to a refused delivery will be incurred by the manufacturer.

## 16. WARRANTIES

The supplier shall provide a warranty period of twenty-four months minimum, covering the power supply and components, for all faults related to defective parts or manufacturing process. This period shall start after the commencement of satisfactory commissioning.

## 17. SPARES

The manufacturer during the acceptance phase of the project must provide STFC with a detailed list of suggested spares. Once agreed, these may be purchased by STFC as part of the contract.

## 18. TENDER RESPONSE

The following shall be included in the tender documentation:

- Price
- Proposed delivery period from acceptance of tender
- General description of the power supply Statement of compliance with the whole specification indicating which parts (if any) that the bidder cannot exactly comply with. This should address this specification point by point so that there is no ambiguity over compliance.
- Outline drawings
  - Mechanical layout
  - dimensions
  - Estimated weight
- Topology
- Space requirements
- Cooling requirements
- Electrical supply requirements
- Outline schedule including milestones
  - Suggested design reviews
- Design calculations
  - Thermal
  - Wound components
  - Efficiency
- Available test facilities at manufacturer's premises and ability to comply with section 11a).
- Previous relevant power supply experience.
- Previous relevant accelerator experience.

## 19. APPENDICES

Appendix A ISIS Main Energy Storage Chokes

**The following data is copied from a choke rating plate:**

Rated 50Hz voltage main windings.....16kV

Rated 50Hz voltage to ground.....8kV

*Figure A2: Choke Connections*

Insulation level .....	
.....28kV/50Hz/1min	
Rated inductance .....	160mH
Rated DC current .....	662A
AC current level superimposed .....	318.2A
Totalled rms current .....	734.5
S/C reactance .....	1005mΩ
Winding ratio main: auxiliary .....	4.5 : 1
Rated 50Hz voltage auxiliary windings .....	1778V
Auxiliary winding rms current each .....	42A
S/C reactance .....	12.41mΩ
Standards .....	IEC 60289
Number of phases .....	one
Total losses .....	55.7kW
Decrease of incremental inductance .....	≤4%
Equivalent power rating .....	14.5MVA
Total mass .....	26950kg

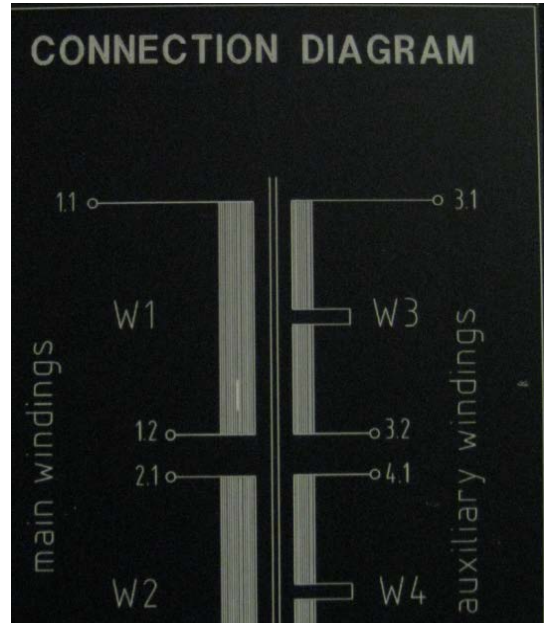


Figure A3: ISIS New Choke Room with Chokes in Situ



1 The Suppliers shall provide the Goods and/or Services in accordance with this Schedule

**Schedule 3- Charges**

- 1 The Charges for the Goods and/or Services shall be as set out in this Schedule
- 2 The charge of the goods shall be: TBA