M+W GROUP

NORTECH

M+W

AFD WATER STEAM CYCLE DESIGN SCOPE OF WORK

TECHNICAL & COMMERCIAL PROPOSAL

Document Number: E-MW-0214-NTS-PM-TCO-0001

Nortech Solutions Ltd Project No. E-MW-0214

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A2	05/08/2015	ALL	ISSUED FOR APPROVAL	~~SDN~~	KSN	IBD	KSN		BBU

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NORTECH
Integrated Engineering Solutions

For the attention of: **David Pearce**

Date: **5th August 2015**

Subject: **AFD – Water Steam Cycle Design Scope of Work**

Dear David,

We enclose our offer which we consider meets your requirements. As requested we have developed a lump sum cost for the WSC Design Consultant Design Services.

We are confident that we have understood and interpreted your requirements correctly, but please feel free to contact either myself, Bryan Bunn or Keith Stephenson directly if you have any queries or require any further clarifications.

Finally, we would like to thank you for considering Nortech for this opportunity and can confirm our full commitment to M+W on an ongoing basis.

Yours sincerely

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1. INTRODUCTION

M+W are contracted to provide their client SITA with an EFW Gasification facility, it will be designed to receive waste feedstock, pre-treat the feedstock and convert it into a gas using a patented (gasification) system, which is burnt to provide energy in the form of steam to:

- Produce electricity for export to the grid
- Meet the parasitic load of the plant

The Gasification Facility will include the following main areas:

- Gasification process (incl. steam boiler and flue gas cleaning systems)
- Steam Turbine Generator
- Air Cooled Condenser
- Water Steam Cycle (WSC) System
- Chemical Systems
- Emissions and Syngas monitoring
- Balance of plant (incl. heat exchangers, compressed air and water treatment plant)
- All electrical and control systems and instrumentation, including centralized control room;

Preliminary work has been carried out by M+W UK for the WSC system, including preparation of PFD, Thermoflex models (Mass & Energy balance), preliminary P&IDs and specifications for the following:

- Steam turbine generator (STG)
- Air-cooled condenser,
- Boiler feedwater pumps,
- Deaerator and feedwater tank.

The above preliminary design information is provided to Nortech for information only.
Nortech is to satisfy itself as to the completeness of these documents and identify potential interfaces to avoid any scope gaps.

Nortech is required to develop the WSC process design to approved for design (AFD), including the preparation of P&IDs for HAZOP/SIL studies (plus update after completion of these studies), and the production of design specifications for the procurement of the following typical process packages / equipment. Nortech shall coordinate the technical interdependencies (of the sub-contract packages) throughout the water steam cycle including, for example, input and output process parameters STG, ACC and deaerator.

- M+W UK STG specification and MAN Turbo quotation and other information to be reviewed and validated
- M+W UK Air Cooled Condenser specification (including ejector station, condensate tank, condensate pumping, etc.)
- M+W UK Boiler Feed Water Pumps specification

- M+W UK Dearator and Feed Water Tank
- Condensate Return Pumps
- WSC Sampling System
- PRDS Systems
- Boiler Blow down System
- Interconnecting piping including all necessary valves, instrumentation and ancillaries etc.

Nortech shall develop Thermoflex models for the WSC based on, but not limited to, the scenarios listed in Appendix B.

Nortech shall provide design for a complete system design for the functional requirements of water and steam cycle based on experience and best practice. In doing so, Nortech shall liaise with M+W UK for establishing the definitive battery limits and scope limits (including the production of a Terminal Point Schedule).

The work will be performed in line with the M+W / SITA requirements as detailed in the following documents.

- SWM Gas ER 1 - Generalities rev03
- SWM Gas ER 2 - Mechanical rev04
- SWM Gas ER 3 - Electrical rev03
- SWM Gas ER 4 - Control + Instrumentation rev03
- SWM Gas ER 5 - Civils and Building rev01

2. TECHNICAL PROPOSAL

2.1 Process Engineering

The Approved for Design stage of the project will be Process Engineering lead with input from the other discipline engineering teams as required to confirm the SITA Employer Requirements (ER's) are adhered to.

The proposed work flow for this project will commence with a full re run of the Thermoflex Heat and Mass Balance model confirming the duty requirements of the Main Plant Items. The effect of the thermoflex requirements of the model will be assessed on the Main Plant Item specifications. The thermoflex model will be the reference document for the detail subsequently developed in this project. For clarity, all calculations for thermal and hydraulic duty of equipment will use the output of the theromflex model.

The existing project P&ID's for the project are then to be reviewed and recreated to an intelligent P&ID format. The existing drawings will be referenced as a guide only. Line sizes, valves and ancillary equipment (filter, traps, vents etc.) will be confirmed. Expected vendor equipment detail is to be added with all boundary and termination points.

An Equipment List will be developed to include all the main plant items. This will have all the high level process data for the initial equipment specification.

The detailed specifications, at present in draft form, will be subject to a multi-disciplinary review and amended as required. Nortech Solutions will take full responsibility for the further development of these packages. The specifications will fully take into account the SITA ER's. All changes and amendments to the specifications are to be confirmed and advised to M&W; specifically the packages that are to be reviewed and or developed by NTS are:

- Steam Turbine Generator (Draft package already created, it is understood that discussions with vendor is advanced NTS will pick up this communication)
- Air Cooled Condenser specification (including ejector station, condensate tank,
- Boiler Feed Water Pumps – Draft package already created, to be reviewed and validated.
- Dearator + Feed Water Tank Vessels - Draft package already created, to be reviewed and validated.
- CCW Dry Coolers + Pump Set Package – Not yet created to be developed by consultant.
- Condensate Return Pumps – Not created may be within the Air cooled condenser package (TBC with vendor).
- WSC Sampling System - Not yet created to be developed by consultant
- PRDS Valve

Vendors will be approached with the initial equipment specifications or catalogue data used where appropriate. Preliminary dimensions, power loads and other utility requirements can then be collated. This information will be incorporated into a consumption table for power, instrument air and cooling water.

A preliminary operating and control philosophy will be developed. This will be in a form that can be incorporated into the functional design specification for the site control system. Data will be collected on the COSHH requirements of this part of the process facility. This is expected to cover mainly the chemical dosing system for the water to steam cycle.

In order to allow operating and maintenance issues at the HAZOP to be answered efficiently a basic general arrangement layout of the equipment will be created. This will use as relevant vendor data as applicable.

To allow for an efficient HAZOP, Nortech will produce input data for and participate in the HAZID processes and the process SIL assessment.

Nortech will provide one engineer for attendance at the HAZOP. The actions will be collated by M&W and issued to Nortech as deemed appropriate. Where required the P&ID's will be marked up with changes. It is assumed that all HAZOP actions will be completed during the approved for construction design phase of the project. Nortech are not providing a HAZOP chair or scribe but individuals can be made available upon request.

2.2 Mechanical Engineering

The Mechanical Engineer will review existing equipment specifications and data sheets and ensure compliance with the Process Engineering / SITA ER's, revising documentation as appropriate to an Approved for Design status.

2.3 Piping Engineering

The Piping Engineer will review the existing P&ID's, equipment specifications and data sheets and ensure compliance with the Process Engineering / SITA ER's. Line Lists and preliminary Primary Piping routes will be developed to an Approved for Design status.

2.4 Electrical Engineering

The Electrical Engineer will review existing equipment specifications and data sheets and ensure compliance with the Process Engineering / SITA ER's. Preliminary Single Line diagrams, specifications, data sheets and load schedules will be developed to an Approved for Design Status.

2.5 Control & Instrument Engineering

The Control & Instrument Engineer will review existing P&ID's, equipment specifications and data sheets and ensure compliance with the Process Engineering / SITA ER's and have input into the Control Philosophy Document.

2.6 Civil & Structural Engineering

Excluded as defined in Deliverables Schedules provided with your tender enquiry.

3. CLARIFICATIONS & EXCLUSIONS

- All project meetings that require in person attendance to take place with M&W will be at the M&W offices in Chippenham U.K.

- We assume all native format documentation will be issued to us at contract award.

- The Thermoflex model output is the basis of all subsequent design on the Water Steam Cycle. At award of this contract we expect to receive the confirmed data to re run the model.. Any subsequent changes to this input data will need to be formally reissued to ourselves at which time an assessment of the impact on the project, to date, of this reissue will be performed by us. Where this reissue of the Thermoflex model input data causes reiteration of design, or creates an addition to the original design scope, this will be classed as a variation and will require Nortech's Change Notification to be approved by M+W before incorporation of the impact into the AFD design being produced.

- We have assumed use of M+W's thermoflex modelling facility and allowed for our Process lead visiting your offices in Chippenham for the duration necessary to undertake the exercise.

- We have assumed we can use our standard in house software to deliver these services and if successful would discuss any specific software required to satisfy M+W needs and how this would be reimbursed.

- Any specialist software requirements are excluded from our commercial proposal and will be assumed to be a pass through cost to M+W.

- We have assumed that all Procurement activities associated with this package will be undertaken by M+W directly once the technical information has been compiled.

4. COMMERCIAL PROPOSAL

Nortech is pleased to submit the following commercial offer for the work as outlined in Section 2 and 3 of this document.

4.1 Pricing

We offer to provide the WSC Design Consultant Design Services for a fixed price of £113,500 for the scope as clarified within this proposal. This is based upon Steve Donegan fulfilling the role of Delivery Manager.

*Should you prefer Julian Bourchier for this role our Lump sum price would increase by £6,500. The hourly rate for his specialist services would be £90 per hour for all hours worked as applicable to approved scope variations and normal and overtime working.

Should you also require Procurement support (refer to clarifications above) we would offer this support for an additional £10,000 lump sum.

4.2 Schedule of Rates

The following schedule of rates applies to all hours worked, whether normal time or overtime.

SCHEDULE OF RATES - HOME OFFICE (TEESSIDE)				
Bill Code	DESCRIPTION OF PERSONNEL	Lead	Senior	Discipline
A	PROJECT MANAGEMENT			
1	Project Manager	£72.50	£63.00	£59.00
2	Construction Manager	£72.50	£63.00	£59.00
3	Engineering Manager	£64.00	£57.00	£53.00
4	Project Controls Manager			
5	Project Engineer	£64.00	£57.00	£53.00
6	Construction Engineer	£64.00	£57.00	£53.00
7	Cost Engineer	£52.25	£48.25	£45.25
8	Planning Engineer	£52.25	£48.25	£45.25
9	Estimator	£52.25	£48.25	£45.25
10	Financial Controller			
11	Document Control Manager	£49.00	£45.00	£40.00

12	Document Controller	£28.00	£24.00	£21.00
13	Project Secretary			£20.00
14	Technical Clerk / Assistant			£16.50
B	ENGINEERING			
1	Structural	£59.75	£55.50	£52.00
2	Process & Tech Safety	£78.00	£67.00	£62.00
3	Piping	£59.75	£55.50	£52.00
4	Mechanical	£59.75	£55.50	£52.00
5	Electrical	£59.75	£55.50	£52.00
6	Instrumentation & Control	£59.75	£55.50	£52.00
7				
8	Pipe Stress	£72.00	£67.75	£59.00
9	Junior Engineer (all Disciplines)			£34.50
C	DESIGNERS			
1	Structural	£51.50	£47.50	£45.00
2	Piping	£51.50	£47.50	£45.00
3	Mechanical	£51.50	£47.50	£45.00
4	Electrical	£51.50	£47.50	£45.00
5	Instrumentation & Control	£51.50	£47.50	£45.00
6	Junior Designer (All Discipline)			£24.50
7	2D CAD Operator			£19.50
D	HSEQ			
1	HSEQ Manager			
2	HSEQ Engineer	£52.50	£49.00	£45.00
E	PROCUREMENT			
1	Procurement Manager	£64.00		
2	Procurement Engineer / Expeditor	£54.00	£49.00	£45.00

All approved disbursements will be charged at cost plus 5% in accordance with our standard terms

of engagement.

4.3 Validity

This offer is valid for 30 days from the date of this document.

4.4 Schedule

The schedule for delivery of the work is in accordance with the programme indicated within the enquiry reference PS-SZ-001A.

4.5 Terms and Conditions

We have reviewed the template for your proposed sub-consultancy agreement for these works which we generally find acceptable but would clarify that:

4.5.1 We do not expect to provide any process guarantees

4.5.2 We expect to limit the liability under this agreement to be no more than the value of our services.

4.5.3 Clause 6.1 Insurance requires indemnity insurance of not less than £5 million. Our standard professional indemnity insurance level is £1 million. Should you require us to raise our cover then an additional premium would be required with is not included in our Lump sum price. We have attached copies of our insurance policies in Appendix 1 for reference.

4.5.4 Schedule 2 Fee and Payment structure indicates a payment cycle of 45 days. We normally require payment within 30 days, which is the basis of our Lump sum price.

Additionally we propose the following payment milestones for this project:

Milestone	%
Award of Contract	30
Completion of Hazop Review	30
Balance on Handover of Design Documentation	40

5. KEY PERSONNEL & RESOURCES

Our resource profile for these services is in Appendix 2. The CV's for our principal engineers are included in Appendix 3.

Name	Role
Steve Donegan or Julian Bourchier*	Delivery Manager
Keith Stephenson	Engineering Manager
TBA	CAD Support
Steve Donegan	Process
Shaheeb Shan	Mechanical
Anthony O'Rourke	Piping
Adrian Hall	Electrical
Craig Cowley	Control & Instrumentation
Steve Wake	Civil & Structural

Steve Donegan – Delivery Manager/ Lead Process Engineer

Steve is a highly experienced chemical engineer with over 25 years in both engineering and operational roles. He was integral to both the fermentation processes installed by CPI at Wilton and consulted on many of the biotechnology and renewable projects undertaken by CPI. Recently he was involved with Plaxica leading their engineering and operational delivery programs. This has included the technology selection and definition of a program of works to prove the scalability and economic viability of the process.

Julian Bourchier – Optional Delivery Manager*

Julian has a PhD from Leeds University and is a Chartered Engineer and Member of the Energy Institute with over 25 years of experience in Process Engineering and delivering projects. Julian has worked for both large engineering design organisations and end customers.

Should Julian be your preferred option for this role we would refer you to Section 4.1 for the impact to our pricing.

Keith Stephenson – Engineering Manager

Keith has extensive worldwide experience for major companies over 35 years. He has worked on projects for ICI, Aramco, BNFL, Akzo Nobel, Huntsman, Petroplus, SABIC and Sembcorp. Keith has filled various roles in the Petrochemical, Oil & Gas (onshore and offshore), Nuclear, Biochemical and Utility sectors from Designer, Engineer to Manager of Contracts, Projects and Engineering.

Shaheeb Shan – Mechanical Engineer

Shaheeb is a professional Mechanical Engineer with a range of technical experience gained within key EPC projects over a number of North Sea Assets. He is competent in offshore & onshore mechanical package management to client specifications and international codes & standards.

Shaheeb has a proven ability to manage and complete projects to the highest standard, with a meticulous attention to detail and within agreed deadlines. He has seven years' experience accumulated within the Oil & Gas industry consisting of both greenfield and brownfield projects.

Anthony O'Rourke – Piping/Stress Engineer

Anthony is an experienced piping/stress engineer having worked in a range of sectors including hydrocarbons, petrochemicals, offshore and onshore oil & gas, and nuclear sectors. He has substantial experience relating to the design of utilities pipework such as LP, IP and HP steam systems, natural gas, cooling/chilled water, having worked for clients such as Sembcorp Utilities and Sellafield UK.

Adrian Hall – Electrical Engineer

Adrian is an experienced electrical engineer who has worked across a range of sectors including, Oil & Gas, Power, Renewables, Chemical, Petro Chemical. He has substantial experience relating to the design, development and delivery of a number of power plants ranging from 30MV to 600MV in capacity.

Craig Cowley – Instrument & Control Engineer

Craig is a highly experienced Charted Control and Instrumentation engineer with over 30 years' experience in the engineering and design business. He has a degree in Instrumentation and Control (Hons), plus Technis Certificate in Reliability and Functional Safety. He started his career initially as an Instrument technician then moved into engineering and design. Craig has experience in the UK, both offshore, onshore, and overseas. Typical projects include; Feasibility Studies and Option Analysis, Conceptual Front End Design Studies for both brown and greenfield sites, Outlining Control and Safety Trip System Requirements and Turnkey Projects.

Steve Wake – Civil/Structural Engineer

Steve has over 20 years' experience in Civil and Structural engineering with emphasis on work within the Petro chemical industry. Steve has taken a lead role in all aspects of engineering project execution from conceptual design, detailed design, construction supervision, commissioning, operational maintenance, turnarounds, decommissioning and demolition of top tier COMAH chemical plants. Steve has taken a lead role on substantial civil and structural design packages on medium sized brown field projects within the chemical, pharmaceutical and water industry.

6. APPENDICES

Appendix 1 - Insurances

Appendix 2 - Resource Profile

Appendix 3 – CVs