Request for Quotation

For

Engineering, Procurement, Construction and Commissioning ("EPCC") of a District Cooling System ("DCS") for SembCorp Industries Limited ("SCI") for the Supply of Chilled Water by SCI to Fusionopolis of JTC Corporation ("JTC")

At

One-North, Singapore

0	2 April 07	TSJ/OJH/TPC	TPC/ST	Samir / ND	For the purpose of soliciting contractually binding proposal
REV	DATE	PREPARED	CHECKED	APPROVED	DESCRIPTION

OWNER:

SembCorp Utilities Pte Ltd
51 Sakra Avenue
Singapore 627872

PROJECT SITE:

One-North, Singapore

DRAWING/DOCUMENT TITLE:

Request for Quotation

DOCUMENT NO.	REV	SHEET
SCI/FUP-DCS/PD/RFQ-001	0	

CONTENTS

1.0 PURPOSE

1.1 SembCorp Industries Limited ("SCI") has, in response to a Request for Proposal ("RFP JTC") by JTC Corporation ("JTC") to develop, build and own a district cooling system to supply chilled water services to Fusionoplis 2A ("F2A") at One-North, Singapore, secured and accepted the award.

Refer to Appendix 1 for details of RFP JTC.

1.2 In this connection, the purpose of this Request for Quotation ("RFQ") is to invite experienced turnkey engineering contractors to submit their quotations in respect of the engineering, procurement, construction and commissioning ("EPCC") of a district cooling system ("DCS") based on the requirements described in this RFQ.

1.3 Information contained in the aforesaid RFQ shall be the basis for EPCC Contractor to submit a Base Proposal and nothing shall be deemed to change or supplement this basis except for revisions to these requirements issued by SCI.

1.4 EPCC Contractor who wishes to submit Alternative Proposal is required to submit a Base Proposal which shall comply fully with the RFQ requirements. The Alternative Proposal may use materials, designs and process that are different from those specified in this RFQ and to the extent where the proposed DCS life-cycle cost, operability and maintainability could be optimized, and can be accommodated and sited within any physical constraints of the proposed building, but must functionally meet SCI's commitments to JTC.

1.5 EPCC contractor shall submit lump-sum proposal in hard-copy and soft-copy of 3 sets each into a tender box located at 2nd floor by :

Thursday, 8 May 08, 12pm

to :

SembCorp Utilities Pte Ltd
51 Sakra Avenue, Jurong Island
Singapore 627894

Attention: Mr Ooi Gunn Kar
Senior Manager
Material & Services Department

1.6 Any clarifications on the RFQ may be sent to the above-named person via electronic mail: ooi.gunnkar@sembcorp.com or facsimile: (65) 6267 5686 with copy distributed to Mr Thong Poh Chong via electronic mail: thong.pohchong@sembcorp.com or facsimile : (65) 6267 5712

2.0 TECHICAL REQUIREMENTS

2.1 Plant Capacity

EPCC Contractor shall propose in the Base Proposal, and Alternative Proposal if any, a DCS of 3 options each based on the following demands at each phase for F2A, F2B and Future.

Option	Demand (RT) at Phase			Remarks
	F2A	F2B	Future	
1	7500	NIL	NIL	
2	7500	2500 (Provision only)	NIL	F2A proposal shall take into account and provides for DCS capacity expansion to meet subsequent demand for F2B phase. However, SCI reserves the right to exercise provision under F2B phase at a later stage.
3	7500	2500 (Provision only)	#	F2A proposal shall take into account and provides for DCS capacity expansion to meet subsequent demands for F2B and Future phases. However, SCI reserves the right to exercise provisions under F2B and Future phases at later stages.

EPCC Contractor shall propose optimum plant capacity to meet future demand. EPCC Contractor with the best optimized provisions to meet demand for Future phase will be favourably considered.

2.2 Proposed DCS Design

EPCC Contractor shall propose a DCS design based on the requirements as specified in this RFQ. Specifically, Appendices 2A through 9 inclusive jointly constitute the RFQ's Basic Design Engineering ("BDE") document which shall be adhered to. In areas

or matters where EPCC Contractor is unable to abide by as specified in the BDE or RFQ, EPCC Contractor shall notify SCI specifically under a deviation list and to provide optimum workable solutions.

In particular, the proposed DCS design must take into account building space, orientation, structural provisions and layout as described in Appendices 5 and 6.

EPCC Contractor may deviate from basic design provided under Appendices 4 and 7, if justified to the extent where the overall DCS's life-cycle cost, operability and maintainability could be optimized, subject to the limits and constraints illustrated in Appendices 5 and 6.

EPCC Contractor may wish to deviate from the recommended list of spare parts described in Appendix 8, perhaps distinguishing essential and non-essential spare parts with a view to balance both operating requirements to meet SCI's commitments to JTC while optimizing spare part inventory cost at the outset.

- Appendix 1 JTC RFP
- Appendix 2A Chilled Water Temperatures
- Appendix 2B Chilled Water Load Profile
- Appendix 3 Scope of EPCC Works Demarcation
- Appendix 4 DCS Process Flow Drawings
- Appendix 5 DCS Plant Layout Drawings
- Appendix 6 DCS Equipment Loading Data & Drawings
- Appendix 7 Major Equipment List
- Appendix 8 Recommended List of Spare Parts
- Appendix 9 Cooling Tower : Computational Fluid Dynamics ("CFD") Simulation
- Appendix 10 Deliverable List

2.3 Scope of EPCC Works

2.3.1. Introduction

Clause 2.3 Scope of EPCC Works describes the works required to be carried out by EPCC Contractor for the proposed DCS.

The following abbreviations have been used:

- SCU : SembCorp Utilities Pte Ltd; a wholly owned subsidiary of SCI
- EPCC Contractor : Engineering, Procurement, Construction and Commissioning Contractor for the scope of work defined in this RFQ
- HSE : Health Safety & Environment
- CS : Carbon Steel
- SS : Stainless Steel
- GA : General Arrangement Drawing
- C&S : Civil and Structure
- C&I : Controls & Instrumentation
- API : American Petroleum Institute
- ASME : American Society of Mechanical Engineers
- QRA : Quantitative Risk Assessment
- HAZOP : Hazard and Operability Review
- ANSI : American National Standards Institute
- FAT : Factory Acceptance Test
- SAT : Site Acceptance Test

2.3.2. Design Codes and Standards

The latest edition of the following international codes and standards in addition to local standards applicable to DCS shall be used:

- ASME Section II
- ASME Section VIII Div.1
- ASME B31.3 Process Piping
- ASME B31.5 Refrigeration Piping and Heat Transfer components
- API Standards
- TEMA
- Cooling Tower Institute (CTI)
- Instrument Society of America (ISA)
- National Electrical Manufacturers Association (NEMA)
  - Industrial Control Standards & Enclosures
- Fluid Controls Institute (FCI)/ANSI
  - 70.2, Quality Control Standard for Control Valve Seat Leakage
- American National Standards Institute (ANSI)

- B16.5, Steel Pipe Flanges & Flange Fittings
- B16.10, Face-to-Face Dimensions of Valves

- National Electrical Code (NEC)
  - NFPA 70, General Electrical Standard
  - Article 500, Hazardous Area Classification

The above is the minimum list of codes and standards. If any additional standards are used, EPCC Contractor shall highlight the same in their proposals. In case of conflict between International and Singapore standards, Singapore standards shall be used. Also, EPCC Contractor needs to seek prior approval from SCI for using any old revisions of such standards.

2.3.3. EPCC Contractor's Scope Of Work

EPCC Contractor shall carry out detailed engineering, procurement, installation, construction, testing & commissioning of the DCS plant as defined under the BDE document. Scope shall include all the necessary mechanical, piping, electrical, control & instrumentation and civil & structural as described in this RFQ.

EPCC Contractor shall check AutoCAD drawings provided to get the lengths of the pipe lines and instrument and electrical cables in this scope of work.

2.3.4. Minimum Information Requirement Along With Quotation

EPCC Contractor, as a minimum, shall provide the following information along with the quotation

- Scope of work and supply
- P&ID, plot plan and necessary drawings to describe scope of work and design philosophy
- Performance Guarantee
- Commercial proposal with detailed breakdown price list
- 2 year operations spare parts list
- Project management team organization chart
- Site access, lay down and storage area requirement including construction utilities requirement
- List of excluding and comments to RFQ

2.3.5 General

EPCC Contractor shall treat this scope of work in conjunction with the attached drawings and documents. Attached documents and drawings are integral part of the project. There is a possibility that certain details and outlines in the scope of work which may not be explicitly indicated on the attached drawings & documents or vice versa.

EPCC Contractor shall be responsible for engineering, procurement, supply, construction, testing, commissioning and handover of all the activities related to the scope of work. This being an EPCC scope of work, SCI shall not be reviewing all the drawings in details. SCI's review and approval of drawings and documents shall not be used as the basis for errors and omissions in the drawings. Any re-work resulting from deficiency, mistake or errors in engineering documents shall be accountable by EPCC Contractor and at EPCC Contractor's cost. EPCC Contractor shall not use SCI's reviews and approvals of documents as reasons and basis for acceptance of mistakes.

EPCC Contractor shall be responsible for surveying, engineering design, supplying materials, installation, testing for the entire scope of work covered under this RFQ. EPCC Contractor shall field verify the entire scope prior to submission of quotation. All dimensions indicated on the drawings are preliminary and conceptual only. EPCC Contractor shall be responsible for finalizing details and dimensions during detail engineering.

All drawings produced by EPCC Contractor (including electronic copies) during the course of the project shall be SCI's property. EPCC Contractor shall not forward these drawings, including electronic copies, to any third party without SCI's approval. EPCC Contractor shall submit the electronic copies to SCI as and when requested. At the end of the project, EPCC Contractor shall provide as-built copies of all drawings including electronic copies.
EPCC Contractor shall comply with all safety requirements throughout the duration of project.

EPCC Contractor shall provide performance guarantees for the proposed DCS. To achieve Mechanical Completion, EPCC Contractor shall carry out all necessary tests to prove that the system

is performing as per design. Supply of equipment, consumables, instrumentation (with necessary calibration) etc to carry out these tests is included in EPCC Contractor's scope of work. EPCC Contractor shall submit the proposed testing methodologies and procedures with acceptance criteria in the quotation.

2.3.5.1 Process

EPCC Contractor shall perform detailed engineering package including P&ID updating to suit equipment vendors' detailed requirements. All supporting process calculations shall be submitted for the approval.

EPCC Contractor shall finalize design parameters with SCI before performing process design. EPCC Contractor shall be responsible for the correctness of these documents and comply fully with SCI's requirements. Any conflicting requirements shall be resolved by EPCC Contractor and submitted to SCI for approval prior to commencement. Under no circumstances shall EPCC Contractor deviate from approved final P&IDs without the prior approval of SCI.

In order to ensure fitness for intended use, it is essential that the greatest care be exercised to produce a complete, safe, economical, and workable arrangement to SCI's satisfaction.

EPCC Contractor's activities and deliverables shall include, but not be limited to the followings:

- Review of design documents and drawings provided in the RFQ
- Update P&IDs
- Prepare and update process data sheets for all process items, instrumentation, fitting such as valves, etc.
- Confirm material of construction
- Review suppliers' data

EPCC Contractor shall ensure that all operating modes are considered and that the systems, including equipment and controls, can operate satisfactorily. This will include, but not be limited to phased nature of loads, turndown and future expansion.

2.3.5.2 Mechanical

EPCC Contractor shall be fully responsible for design, selection, engineering, manufacturing, inspection, testing (FAT & SAT), supply, erection, commissioning and successful hand-over of all mechanical equipment included in this scope of work.

EPCC Contractor's scope of work includes:

- Submit complete set of data sheet, P&IDs, outline and cross-section drawings.
- Select material of construction.
- Painting and sea-worthy type packing.
- Spare parts and consumables for commissioning and start up.
- Special tools for erection, operation and maintenance, if any.
- Inspection and testing plans including Production, FAT, SAT etc.
- Companion flanges with nuts, bolts and gaskets for all connections.
- Receiving, unloading and safe storage and preservations of equipment at site prior to installation. Pumps shall be stored as per manufacturer's standards.
- Submit listings of spare parts for two years of normal operation with detailed breakdown prices.

EPCC Contractor shall coordinate, expedite and resolve any problems with his sub-vendors. EPCC Contractor shall also guarantee and be entirely responsible for the design, satisfactory performance and operation of the complete unit and any other appurtenances included in the scope of supply.

EPCC Contractor shall be responsible for ensuring that all relevant information and documentation are passed on to his sub-suppliers, since all such information pertaining to the equipment or components being supplied by the sub-vendor may not necessarily be repeated in the relevant section of the requisition.

Painting shall be as per manufacturer's standard. EPCC Contractor shall submit his standard painting specification for SCI's review and approval during detailed engineering.

EPCC Contractor shall be responsible for preparing a detailed installation procedure that is in line with vendor's requirements. In case where vendors' representatives and support services are required for the installation and commissioning of the equipment, same is included in EPCC Contractor's scope of work.

All items such as valves, instruments, shall be provided with SS tagging.

2.3.5.3 Piping

EPCC Contractor shall be fully responsible for surveying, engineering and design, supplying materials, installation, testing and commissioning of all piping & fittings in the EPCC Contractor's scope of work. Appendix 4 DCS Process Flow Drawings indicate only the major utilities systems. EPCC Contractor shall consider all other associated piping necessary for the operation of the systems in the lump-sum cost.

All dimensions indicated on the drawings are preliminary and conceptual only. EPCC Contractor shall be responsible for design the general equipment layout during detail engineering.

Any civil and structure supports required for supporting any pipelines are included in EPCC Contractor's scope of work. All pipelines, equipments, valves and instruments covered under this scope of work shall be tagged.

EPCC Contractor's scope includes but shall not be limited to the followings:

- Development of piping GA drawings and isometrics for the systems.
- All valves shall be installed on platform or ground for easy access.
- Adopt SCI's Project Drawing Template for generation of drawings.
- All drawings shall be numbered according to SCI's Drawing Numbering Procedures. EPCC Contractor shall contact SCI for allocation of drawing numbers. SCI will not accept or review any drawings without SCI drawing numbers.

- In case of structural problems, SCI may request EPCC Contractor to modify piping to reduce undue loading on such structures.
- All pipe supports including spring hangers, intermediate supports, structural members, etc along with necessary civil and structural foundation as required to adequately support the piping systems and in compliance with Code ASME B31.5.
- Pipe stress analysis in this project shall be based on ASME B31.5 by CAESAR II.
- Inspection, Testing (Non-Destructive Test) and Hydro testing as specified in Specification for Fabrication and Testing of Piping.
- Submit Inspection & Test plans for SCI approval prior to starting any construction activities.
- All NDT requirements including radiography (if any) for scope under this contract is included in EPCC Contractor's scope.
- Flushing & cleaning of all pipelines and piping network before commissioning is included in EPCC Contractor's scope. Cleanliness criteria for flushing & cleaning shall be submitted to SCI for approval.
- Scaffolding work, materials and machines required for scope under this contract is included in EPCC Contractor's scope.
- Testing and commissioning.
- Submit complete data sheets for valves, etc (If applicable).
- Painting of piping and structure as specified in Painting and Protective Coating Specification.
- Providing loading data and diagrams for all pipelines under his scope of work. Format of loading data shall be agreed between SCI and the EPCC Contractor.
- EPCC Contractor shall participate in all safety walk-down, audits, etc to be arranged by SCI throughout the course of the project. These include PCCSR, PSSR etc.
- Tagging of all valves, instruments, equipment and lines covered under the scope of work.

The EPCC Contractor shall provide his own third party inspection agency to carry out all necessary inspections to meet the requirements of Local Authorities and to facilitate registrations and approvals.

The costs of all inspections shall be borne by EPCC Contractor. Furthermore, inspection by SCI's representatives shall in no way

relieve EPCC Contractor of his responsibility for quality assurance and delivery commitments.

2.3.5.4 Civil & Structure

Procurement and construction of all civil and structure activities shall form part of EPCC Contractor's scope of work. EPCC Contractor shall be responsible for procurement, construction and testing of all new structures, foundations and re-enforcement required for supporting the new pipes and instruments.

The bidder shall also include in his quotation, the costs for all enabling works, surveying and such other necessary works.

EPCC Contractor shall be responsible for providing maintenance and operations platforms, including foundations, for operation of valve and instruments. Maintenance and operation platforms are not required for future valves. All platforms for normal service shall be designed for 2 kN/m2. EPCC Contractor shall use grating on all platforms. Use of checker plate is not allowed.

All platforms shall be provided with 200mm wide toe-plate, mid rail and top rail. Cage ladders shall be provided for all ladders exceeding 2.0m in height.

All steel structures shall be galvanized. All nuts and bolts shall be quoted with AMT 48 HB for environment protection. As far as practical, structure shall be bolted.

During erection, EPCC Contractor shall be responsible for maintaining structures in a stable condition and ensuring no part of any structures shall be over-stressed or distorted during the erection activities. All temporary propping and bracing, tack welding & other temporary work necessary shall be EPCC Contractor's responsibility.

Materials for all structural steelwork shall comply with BS 4360, BS 7668, BS EN 10029, NS EN 10113, BS 10155 and BS 10210, as appropriate. When structural steels complying with other Specifications are offered by EPCC Contractor, their performance

requirements as listed shall comply with those specified in the mentioned standards. This shall be demonstrated by testing in accordance with the requirement stipulated.

Performance requirements for structural steel	**Performance requirements indicated as:**
Yield Strength	Yield Stress
Minimum tensile strength	Minimum tensile stress
Notch toughness value	Average minimum charpy energy at specified temperature
Ductility	Elongation in a specified gauge value
Weld ability	Maximum carbon equivalent value
Quality of finished steel	Complying with BS 7668

Structural steel sections shall in general comply with BS 4: Part 1, BS 1449: Part 1, BS 2994, BS 4848: Part 2 and part 4, BS 6363 and others, as when approved by SCI.

All structural steels, before and after fabrication, shall be stored, handled and transported by approved means to avoid excessive stresses, deformation, damage and risk of corrosion. Such steels shall be stored clear of ground on concrete or timber floor under cover or well protected from the effects of weather unless agreed by SCI.
Proposals for substitution of alternative sections and sizes for members shown on drawings may be considered by SCI, provided no extra cost is incurred. A list of proposed substitutions with sketches and revised joints and other details must also be submitted at the same time.

Fabrication shall in general be carried out in accordance with BS 5950: Part 2, Addendum No. 1 to BS 449: Part 2 for buildings and BS 5400: Part 3 and part 6 for bridges unless otherwise specified by SCI.

All steel shall be fabricated from new sections and in such manner that they are not bent, twisted or damaged.

Full size templates necessary for fabrication when required shall be prepared by the EPCC Contractor and subject to SCI's approval. Cutting of steelwork may be by shearing, cropping, sawing or machine flame cutting. All cut edges shall be dressed to a neat workman like finish, and shall be free from distortions.

Members and components of rolled and built sections shall be checked for tolerances in accordance with BS 5950 unless otherwise specified and approved by SCI. Unless special protection is provided for by other means, the interior of any hollow section or a fabricated member shall be sealed to prevent ingress of water.

Assembly and erection of structural steelwork shall be carried out in accordance with BS 5950, Addendum No.1 to BS 449: Part 2 for buildings and BS 5400: Part 3 and part 6 for bridges unless otherwise specified by SCI. EPCC Contractor shall submit to SCI at least 4 weeks prior to erection, the detailed method and sequence of erection, temporary works, details of plant and equipment and their inspection certificates and all relevant drawings and calculations duly endorsed by a Professional Engineer, for approval. EPCC Contractor shall ensure that the structure is not subject to excessive deflection or stress during erection. SCI approval shall not relieve the EPCC Contractor of his responsibility for ensuring safe and proper execution of the erection work.

Unless otherwise specified, all structural works steelwork shall be fabricated, assembled and erected to the accuracy provisions of BS 5606.
All metal on metal welding shall be done in accordance with AWS D1.1. Spot welding of cold formed steel sections shall also conform to the requirements outlined in the above standard. All butt weld shall be full penetration unless noted otherwise. All fillet welds shall be 6 mm continuous unless noted otherwise. All weld shall be chipped free of slag.

Electrodes shall be approved types conforming to AWS D1.1 and shall be kept in a dry store in unbroken packets. The general

procedures for shop and site welds and other details shall be submitted in writing, in accordance with AWS D1.1, to SCI for approval before fabrication.

EPCC Contractor shall provide gauges necessary for the measurement of weld sizes. All welds shall be visually inspected as per AWS D1.1. All non-destructive testing shall be as per AWS D1.1. Any weld with defects greater than the maximum permitted as in the Code shall be liable to rejection.

EPCC Contractor shall prepare Inspection and Test Plan. Plan shall be approved by SCI prior to implementation. Tests shall be carried out by Testing Agencies, accredited by PSB. Records of all weld examinations are to be kept and made available for SCI's review.

Ordinary bolts and nuts shall comply with BS 3692, BS 4190 and BS 4933. All ordinary bolts shall be fitted with washers and nuts complying with BS 4320. Nut shall be at least of the strength grade appropriate to the grade of the bolt used. Tapered washers shall be used where necessary.

The use of high strength friction grip bolts and associated nuts and washers complying with BS 4395 shall be in accordance with BS 4604. Other types of friction grip fasteners may also be used subject to the approval of SCI, provided they have mechanical properties not inferior to bolts complying with BS 4395 and provided they are capable of being reliably tightened to the minimum shank tension specified in BS 4604.

Bolt assemblies in externally exposed locations are to be galvanized in accordance with BS 729. In addition to all other testing requirements, galvanized grade 8.8 bolts and galvanized HSFG bolts shall be tested for head soundness according to Appendix D9 of BS 3692 and also subject to supplementary tensile testing to confirm their mechanical properties. Each test is to be carried out on 1% of the total number in each batch of galvanized bolts.

All holes shall be drilled or sub-punched and reamed. Holes of ordinary bolts shall not be more than 2mm greater in diameter than the bolt for bolts not exceeding 24mm diameter and not more than 3mm

for bolts over 24mm diameter, unless otherwise specifically required by the design. Holes for friction grip bolts shall be in accordance with BS 4604. Holes shall be formed by drilling and all burrs shall be removed before assembly. Holes for fitted bolts or pins shall have a diameter equal to or not more than 0.15mm of the nominal diameter of the bolts or pin.

When a sealed hollow member is holed by a fastener or pin, provision shall be made to prevent ingress of moisture to the interior of the member. If not known on the Drawings, the EPCC Contractor is to propose the method on the Shop Drawings.

The length of bolts is to be such that at least one clear thread shows above the nut after tightening, and at least one thread plus the tread run out is clear between the nut and the unthreaded shank of the bolts.

EPCC Contractor shall provide adequate facilities and bear the cost of everything necessary for SCI's Engineer and his representative to inspect any part of the steelwork during fabrication and construction. In the event of defective materials or poor workmanship, SCI may instruct the EPCC Contractor to carry out load test to any part of the steel structure. In general, the test shall be carried out in accordance with Appendix A of BS 449: Part 2, or as specified by SCI. The cost of tests that demonstrate defective materials or poor workmanship shall be fully borne by the EPCC Contractor.

All structural steelworks, including welds and connections shall be protected against corrosion in the manner specified in BS 5493 and where applicable BS 7361. All structural steel work shall be Hot-dip galvanized; zinc coating shall be according to BS 729. Any damage to the galvanizing due to welding shall be repaired by re-painting to the damaged portion with galvanizing paint approved by SCI.

2.3.6 Acceptance Criteria

During the course of the detailed engineering, EPCC Contractor has to provide acceptance criteria along with test procedures. Test runs shall be carried out for appropriate durations and standards appropriate for the intended purpose that are in line to applicable standards for DCS. Test runs shall be carried out to prove all the guarantee parameters.

All as-built documentation shall be handed over (both electronic format & hard copy). All the punch-list items are to be duly completed to the satisfaction of SCI.

2.3.7 Submission To Authorities / Government For Approvals

EPCC Contractor shall be responsible for all the Government approvals and submissions related to the above scope of work. The scope of work on submission involves the preparation of all necessary drawings and documentations for submission to the relevant authorities for clearances and approvals for the Engineering, Procurement, Construction and Commissioning to ensure the due completion of the proposed work scope under this RFQ.

EPCC Contractor shall undertake all applications for permits, including JTC, NEA, URA, BCD, CSC, MOM and TOP (where applicable).

2.3.8 Waivers / Deviations

EPCC Contractor shall be responsible for obtaining formal waivers from the scope of work. EPCC Contractor will highlight the deviations from the scope of work in the quotation. In case no deviations are listed in the quotation, it will be assumed that EPCC Contractor shall comply with all of SCI's requirements listed in this RFQ. In case any portion of the scope of work is not clear, EPCC Contractor shall clarify the same with SCI prior to submission of quotation. Any assumptions in this regard, shall be at EPCC Contractor's own risk.

During the course of the project, EPCC Contractor shall be responsible for maintaining a log of all the approved waivers. No waiver shall be considered approved unless signed by SCI.

The scope of works shall not be deemed to have changed in case EPCC Contractor's drawings submitted do not show some part of the works as called for on this specification and the attached RFQ drawings, unless categorically agreed to in writing before contract award. The EPCC Contractor shall not be entitled to any extra claim

on account of his having misinterpreted, misjudged or over looked any aspect as called for in this RFQ.

It is not the intent to specify completely herein all details of design and constructions of the works involved under this RFQ. EPCC Contractor's quoted price shall include for all minor details of construction, which are obviously and fairly intended, and which may not have been specifically referred to in these documents but are essential for the satisfactory completion of the works. All works shall conform, in all respects to high standards of engineering, design and workmanship. Design and construction shall conform in every respect to local regulations governing such works and to stipulations of recognized international standards.

2.3.9 Deliverables

EPCC Contractor shall be responsible for generating their own "Project drawing list" based on deliverables according to the SCI's Deliverable List attached (APPENDIX 10), complete with but not limited to the following information included:

a) Document number according to SCI numbering procedure;
b) Document title;
c) Document current revision status;
d) Planned issue for approval date;
e) Actual issued for approval date;
f) Planned issue for construction/design date;
g) Actual issued for construction/design date

SCI's Deliverable List shall be considered as a minimum requirement for EPCC Contractor's documents and engineering design activities. In case EPCC Contractor has any comments on the Deliverable List, he will highlight them with the bid document. SCI shall not accept any deviation from the Deliverable List after the award of contract. After finalizing EPCC Contractor's Deliverable List, EPCC Contractor shall submit all drawings and documents for SCI's review as stipulated. SCI shall not accept or review any drawings before the EPCC Contractor's Deliverable List is finalized.

EPCC Contractor shall submit as-built documentation as part of the as-built dossier according to the Deliverable List attached. EPCC

Contractor shall submit the proposed layout and index of as-built dossier for SCI's review and approval. As-built dossier shall be at least divided into following sections:

a) Table of Content
b) See Deliverable List

EPCC Contractor shall ensure that all documentations in the as-built dossier are accurate. SCI shall cease further review and reject EPCC Contractor's as-built dossier, if more than one discrepancy is noted.

3.0 PROPOSAL REQUIREMENTS

3.1 Submission Format

EPCC Contractor shall submit the following documents with their proposals based on the 3 options stated in Clause 2.1 of this RFQ:

- Detailed technical Write-up of design basis, philosophy and configuration of the proposed DCS System
- List of equipment and services included in the proposed scope of supply
- General arrangement drawings of equipment & piping, showing space and clearance requirements
- Design information and parameters of proposed DCS system
- PFD and P&IDs
- Equipment data sheet
- Electrical Single line diagrams
- Estimated Utilities Consumption
- Electrical Maximum Demand Load Calculation
- Process operation description (to be included in the proposed DCS operations and maintenance section)
- Project Execution Plan, which shall describe :
    - The methodology for executing the EPCC works including, but not limited to project scheduling, engineering review and control, procurement review and control, control and supervision during the development and field implementation stages, Professional Engineers (Qualified Persons) Endorsement and authority submission and approval, site progress control, cost control, administrative control, materials logistics plan, HSE control, QA/QC plan, etc.
    - Critical EPCC issues and proposed methods for addressing each issue.
    - Cost saving and schedule compression suggestions.

The appointed EPCC Contractor shall provide, but not limited to, all documents described in Appendix 10 at the appropriate stage as requested by SCI.

4.0 SCHEDULE OF DETAILS

EPCC Contractor shall provide details in accordance with the following Schedules: s

- Schedule 1 Cost Summary
- Schedule 2 Equipment Configuration
- Schedule 3 Service & Maintenance : Cost & Scope of Works

5.0 VALIDITY PERIOD

All quotations submitted shall be valid till 30 September 2008.

APPENDIX 1

REQUEST FOR PROPOSAL FOR DISTRICT COOLING SYSTEM (RFP JTC) : TERMS AND DATA SHEET

(Refer to Attachment)

NOTE:
The attachment serves as bidding document issued by JTC to invite interested utilities suppliers to submit their respective proposals to provide chilled water supply service to One-North based on a Build-Own-Operate ("B.O.O") basis.

SCI's acceptance of the award is based on the Terms and Data Sheet described in the RFP JTC. EPCC Contractor shall comply to the Terms and Data Sheets, where applicable and in connection with EPCC works.

APPENDIX 2A

CHILLED WATER TEMPERATURES

(Refer to Attachment)

APPENDIX 2B

CHILLED WATER LOAD PROFILE

(Refer to Attachment)

APPENDIX 3

SCOPE OF EPCC WORKS DEMARCATION

(Refer to Attachment)

APPPENDIX 4

DCS PROCESS FLOW DRAWINGS

(Refer to attachment)

	DOCUMENTS/ DRAWINGS			
Document / Dwg No	Description	Revision	Date	Remarks
P/SC/FS/M/001	Overall Piping Schematic Diagram	0	18-Feb-08	For reference only

APPENDIX 5

DCS PLANT LAYOUT DRAWINGS

	DOCUMENTS/ DRAWINGS			
Document / Dwg No	Description	Revision	Date	Remarks
SCI/FUP-DCS/PD/001	Basement 4 Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/002	Basement 3 Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/003	Basement 2 Plan Layout	11	7-Mar-08	For reference only
SCI/FUP-DCS/PD/004	Basement 1 Plan Layout	12	7-Mar-08	For reference only
SCI/FUP-DCS/PD/005	1st Storey Plan Layout	10	7-Mar-08	For reference only
SCI/FUP-DCS/PD/006	11th Storey Plan Layout	7	7-Mar-08	For reference only
SCI/FUP-DCS/PD/007	12th Storey Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/011	15th Storey Plan Layout	2	7-Mar-08	For reference only
SCI/FUP-DCS/PD/012	Concrete Plinth, Puddle Flange, Openings, Sleeves & Kerbs Schedule.	0	7-Mar-08	For reference only

DCS PLANT LAYOUT DRAWINGS (illustrating concrete plinths, openings & sleeves)

	DOCUMENTS/ DRAWINGS			
Document / Dwg No	Description	Revision	Date	Remarks
SCI/FUP-DCS/PD/001 (S)	Basement 4 Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/002 (S)	Basement 3 Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/003 (S)	Basement 2 Plan Layout	11	7-Mar-08	For reference only
SCI/FUP-DCS/PD/004 (S)	Basement 1 Plan Layout	12	7-Mar-08	For reference only
SCI/FUP-DCS/PD/005 (S)	1st Storey Plan Layout	10	7-Mar-08	For reference only
SCI/FUP-DCS/PD/006 (S)	11th Storey Plan Layout	7	7-Mar-08	For reference only
SCI/FUP-DCS/PD/007 (S)	12th Storey Plan Layout	9	7-Mar-08	For reference only
SCI/FUP-DCS/PD/011 (S)	15th Storey Plan Layout	2	7-Mar-08	For reference only
SCI/FUP-DCS/PD/012 (S)	Concrete Plinth, Puddle Flange, Openings, Sleeves & Kerbs Schedule.	0	7-Mar-08	For reference only

APPENDIX 6

DCS EQUIPMENT LOADING DATA & DRAWINGS

(Refer to attachment)

	DOCUMENTS/ DRAWINGS						
Document / Dwg No	Description	7-Nov-07	13-Nov-07	21-Nov-07	27-Nov-07	6-Dec-07	24-Dec-07
SCI/FUP-DCS/LD/001	Drawing List	-	0	-	1	-	2
SCI/FUP-DCS/LD/002	Basement 4_ Pipe Loading Data	-	0	-	0	-	0
SCI/FUP-DCS/LD/003	Basement 4_ Loading Calculation	-	0	-	1	-	2
SCI/FUP-DCS/LD/004	Basement 4_ Loading Plan For Chilled Water Tank	-	0	-	0	-	1
SCI/FUP-DCS/LD/005	Basement 4_ Loading Plan for Make-Up Pump & Pipe	-	0	-	1	-	2
SCI/FUP-DCS/LD/006	Basement 4_ Loading Plan for Diesel Pump & Pipe	-	0	-	0	-	1
SCI/FUP-DCS/LD/007	Basement 3 _ Loading Calculation & Loading Plan for LV MCC Room	-	0	-	1	-	2
SCI/FUP-DCS/LD/008	Basement 2_ Loading Calculation	-	0	-	1	-	2
SCI/FUP-DCS/LD/009	Basement 2_ Loading Plan for Chiller Plant Room, Heat Exchanger Room (Block A)	-	0	-	1	-	2
SCI/FUP-DCS/LD/010	Basement 2_ Loading Plan for Pipes Downhang At Basement 1 Soffit	-	0	-	1	-	2
SCI/FUP-DCS/LD/011	Basement 1_ Loading Calculation	-	0	-	1	-	2

SCI/FUP-DCS/LD/012	Basement 1_ Loading Calculation for Pipes Above DCS Plant & 6.6 kV Switchgear Room	-	0	-	0	-	1
SCI/FUP-DCS/LD/013	Basement 1_ Loading Plan for Heat Exchanger (Block B & Block C)	-	0	-	1	-	2
SCI/FUP-DCS/LD/014	1st Storey_ Loading Calculation & Loading Plan for DCS Power Supply Consumer Room	-	0	-	1	-	2
SCI/FUP-DCS/LD/015	11th Storey_ Loading Calculation	-	0	-	1	-	1
SCI/FUP-DCS/LD/016	11th Storey_ Loading Plan for Cooling Tower, Condenser Pipes & Make-up Tank	-	0	-	0	-	1

APPENDIX 7

MAJOR EQUIPMENT LIST

(Refer to attachment)

APPENDIX 8

RECOMMENDED LIST OF SPARE PARTS

(Refer to attachment)

APPENDIX 9

COOLING TOWER: COMPUTATIONAL FLUID DYNAMICS ("CFD") SIMULATION

(Refer to attachment)

NOTE:
EPCC Contractor shall obtain meteorological data from Singapore Meteorological Department to perform CFD analysis and associated engineering works.

APPENDIX 10

DELIVERABLE LIST

(Refer to attachment)

SCHEDULE 1

COST SUMMARY

Items	Descriptions	Phases (Demand)			
		F2A (7500 RT)	F2B (2500 RT)	Future	Total
1	**DCS Plant EPCC Work**				
1.1	Chiller & associated work				
	- Water-cooled chiller				
	- Brine chiller				
	- Chilled water pipework & associated work				
1.2	Cooling Tower & associated work				
	- Cooling Tower				
	- Make-up water tank, water filtration system, etc				
	- Condenser Water Pipework & associated work				
	- cooling water pumps				
1.3	Pump & associated work				
	- Pumps & associated work				
	- Make-up / Drain / Vent pipe work				
1.4	Chilled Water Storage Tank				
	- TES Tank				
	- Ice storage tank (IST) conversion				
	- Pumps for Brine Chiller, IST, etc				
	- Make-up tank, expansion tank, etc				
	- Heat exchanger for Brine & Associated work				
1.5	Central Automatic Control & Monitory System				
	- BMS equipment, work station, etc				
1.6	Electrical System				
	- Switchgear				
	- Transformer				
	- Cabling work				
1.7	Generator				
	- Generator				
	- Transformer				
	- Cabling work				
1.8	Plant Building M&E				

	- Qualified Person (QP) Services & DCS M&E design works				
	- M&E Services/Works installation				
	Sub-Total (1)				
2	**Customer Station**				
2.1	Metering Station				
	- Heat Exchanger				
	- Pipework				
2.2	Automatic Control & Monitoring System				
	- Control & Monitoring				
	Sub-Total (2)				
3	**Reticulation Pipe**				
3.1	Reticulation Pipeworks				
	Sub-Total (3)				
4	**Service & Maintenance Costs**				
	- Labour & Parts (after Defect Liability Period)				
5	**DCS Plant Civil & Building Work**	By Others	By Others	By Others	By Others
6	**Cooling Tower & Condenser Pipe Support**				
	Total Price				
	Discount				
	Firm & Fixed Lump Sum Price				
7	**Options**				
	- [To elaborate if applicable]				

SCHEDULE 2

EQUIPMENT CONFIGURATION

Item	Types Of Equipment	Descriptions	Phases			
			F2A	F2B	Future	Total
1	Electrical Centrifugal Chiller (ECC)	Capacity (RT)				
		MOC				
		Quantity				
		Chilled Water Temp (°C)				
		Cooling Water Temp (°C)				
		Refrrigerant Type				
		Brand/Country of Origin				
2	Electrical Centrifugal Brine Chiller (BTR)	Capacity, Charging/Direct Supply (RT)				
		MOC				
		Quantity				
		Temp (°C), Charging/Direct Supply				
		Cooling Water (°C)				
		Refrrigerant Type				
		Brand/Country of Origin				
3	Cooling Tower for ECC (CT)	Type (flow type/cell nos)				
		Capacity (Mcal/h)				
		Quantity				
		Cooling Water Temp , in/out (°C), c/w cold water basin				
		Design Wet BulbTemp (°C)				
		MOC				
		Ambient Temp (°C)				
		Brand/Country of Origin				
4	Cooling Tower for BTR (CT)	Type (flow type/cell nos)				
		Capacity (Mcal/h)				
		Quantity				
		Cooling Water Temp, in/out (°C), c/w cold water basin				
		Design Wet BulbTemp (°C)				

		MOC				
		Ambient Temp (°C)				
		Brand/Country of Origin				
5	Chilled Water Storage Tank (TES)	Type				
		Capacity (RTh)				
		Quantity				
		Medium				
		Volume (m^3)				
		MOC				
		Dimensions (m)				
6	Ice Storage Tank (IST) (Conversion from existing TES)	Type				
		Capacity (RTh)				
		Quantity				
		Medium				
		Volume (m^3)				
		MOC				
		Dimensions (m)				
7	Heat Exchanger for customer - Tower A	Type				
		Quantity				
		Primary Temp, in/out (°C)				
		Secondary Temp, in/out (°C)				
		MOC				
		Capacity (RT, % allowance for future expansion)				
		Brand/Country of Origin				
8	Heat Exchanger for customer - Tower B	Type				
		Quantity				
		Primary Temp, in/out (°C)				
		Secondary Temp, in/out (°C)				
		MOC				
		Capacity (RT, % allowance for future expansion)				
		Brand/Country of Origin				
9	Heat Exchanger for customer - Tower C	Type				
		Quantity				
		Primary Temp, in/out (°C)				
		Secondary Temp, in/out (°C)				
		MOC				

		Capacity (RT, % allowance for future expansion)					
		Brand/Country of Origin					
10	Make Up Water Tank for CT	Capacity (m^3)					
		Quantity					
		MOC					
		Dimensions (m)					
11	Heat Exchanger for BTR (For Direct Supply Line)	Type					
		Quantity					
		Primary Temp, in/out (°C)					
		Secondary Temp, in/out (°C)					
		MOC					
		Capacity (RT)					
		Flow Rate (m3/h)	Br				
			Chw				
		Brand/Country of Origin					
12	Heat Exchanger for IST (For Discharge Line)	Type					
		Quantity					
		Primary Temp, in/out (°C)					
		Secondary Temp, in/out (°C)					
		MOC					
		Capacity (RT)					
		Flow Rate (m3/h)	Br				
			Chw				
		Brand/Country of Origin					
13	22KV SwitchGear	Type					
		Quantity					
		Max Voltage					
		Rated Frequency					
		Incoming					
		Bus Section					
		Outgoing					
		Brand/Country of Origin					
14	6.6KV SwitchGear	Type					
		Quantity					
		Max Voltage					
		Rated Frequency					
		Incoming					
		Bus Section					
		Outgoing					
		Brand/Country of					

15	6.6KV Standby Generator	Origin				
		Rated Voltage				
		Raged Frequency				
		Rated Capacity (kVA)				
		Quantity				
		Brand/Country of Origin				
16	Transformer for 6.6KV SwitchGear	Type				
		Capacity (MVA)				
		Rated Frequency				
		Quantity				
		Brand/Country of Origin				
17	Transformer for 400V SwitchGear	Type				
		Capacity (MVA)				
		Rated Frequency				
		Quantity				
		Brand/Country of Origin				
18	Transformer for 400V Generator SwitchGear Panel	Type				
		Capacity (MVA)				
		Rated Frequency				
		Quantity				
		Brand/Country of Origin				
19	Brine Pump for IST	Type				
		Flow Rate, charging (m^3/h)				
		Flow Rate, direct (m^3/h)				
		Quantity				
		Brand/Country of Origin				
20	Primary Chilled Water Pump-for EC	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
21	Primary Chilled Water Pump for HEX	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
22	Secondary Chilled Water Pump	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
23	Cooling Water Pump for BEC	Type				
		Flow Rate (m^3/h)				
		Quantity				

		Brand/Country of Origin				
24	Cooling Water Pump for EC	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
25	Cooling Water Pump for Genset	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
26	Make-up Water Pump for Cooling Water System	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
27	Make-up Water Pump for Chilled Water System	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
28	Make-up Water Pump for Chilled Water System	Type				
		Flow Rate (m3/h)				
		Quantity				
		Brand/Country of Origin				
29	Oil Supply Pump for GenSet	Type				
		Flow Rate (m^3/h)				
		Quantity				
30	Make-up Water Transfer Pump for Cooling Water System	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
31	Basic Sweeper Unit	Type				
		Flow Rate (m^3/h)				
		Quantity				
		Brand/Country of Origin				
32	Pressurized Tank	Type				
		Dimension (m) /Volume (m3)				
		Quantity				
33	Chemical	Type				

	Dosing Unit for Chilled Water System	Chemical				
		Quantity				
		Brand/Country of Origin				
34	Chemical Dosing Unit for Cooling Water System	Type				
		Chemical				
		Quantity				
		Brand/Country of Origin				
35	Chemical Dosing Unit for Cooling Water System	Type				
		Chemical				
		Quantity				
		Brand/Country of Origin				
36	Fuel Oil Tank	Type				
		Capacity				
		Quantity				
37	Day Tank	Type				
		Capacity				
		Quantity				

SCHEDULE 3

SERVICE & MAINTENANCE COST

S/No	Description	Phase (Capacity Demand RT)		
		F2A (7500)	F2A+F2B (10000)	F2A+F2B+Future
		S$	S$	S$
1	Maintenance			
	- Chiller			
	- Cooling Tower			
	- Pumps			
	- Heat Exchanger			
	- Automatic Control System			
	- Electrical System			
	- Emergency Genset System			
	- Service Platform			
	- Spare Parts & Consumables			
	Sub Total			
2	Preventive Maintenance Cost after Deflect Liability Period (12 months), if undertaken by EPCC Contractor			
	Year 1			
	Year 2			
	Year 3			
	Year 4			
	Year 5			
	Year 6			
	Year 7			
	Year 8			
	Year 9			
	Year 10			

SCOPE OF SERVICE & MAINTENANCE

S/No	Item	Description		
		Parts	Consumables	Labour
1	Chiller			
2	Pump			
3	Cooling Tower			
4	Transformer			
5	Starter Panel			
6	MCC, EMSB			
7	Central Monitoring & automatic control			
8	Escalation			
9	Ice thermal storage system			