

MAE TUEN HYDROPOWER PROJECT

CHIANGMAI PROVINCE

CONTRACT C2

ELECTRO-MECHANICAL EQUIPMENT

VOLUME 3

BID FORMS, SCHEDULES OF QUANTITIES



PANYA CONSULTANTS CO., LTD.

JULY 2013

MAE TUEN HYDROPOWER PROJECT

CONTRACT C2

**SUPPLY AND INSTALLATION OF
ELECTRO-MECHANICAL POWER PLANT EQUIPMENT**

VOLUME 3 : BID FORMS, SCHEDULES OF QUANTITIES

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SECTION 1
BID FORM

SECTION 1 - BID FORM

Department of Alternative Energy Development and Efficiency
17, Rama 1 Road, Patthumwan
Bangkok 10330,
Thailand

Gentlemen :

Bid for Contract_____

In compliance with your Invitation to bid for the total of the works under the above contract, we the undersigned hereby bid and offer to well and faithfully furnish all materials, machineries and equipments, to complete the several works named, shown, described, or referred to in the Drawings, Specification, Schedules of Quantities, Conditions of Contract and Bidding Documents and to supply and provide all plant, equipment, materials, labor, and other things requisite for or incidental to the said works, in strict accordance with the said Drawings, specification, Schedules of Quantities, Conditions of Contract and Bidding Documents for the sum of :

Baht
.....
.....(Baht) or such other sum as may be ascertained in accordance with the said Conditions and Specification.

If we receive a written notice of the acceptance of this bid within 120 days after the date of opening of the bids, we agree that we within 30 days thereafter (or such extended time as may be approved by the Department) will execute a Contract in accordance with the form shown in the Bidding Documents and submit a Performance Bond of the form equally shown in the Bidding Documents in a sum of 10 percent of the Contract amount.

We acknowledge receipt of the following Addenda to the Bidding Documents :

Addendum No.	Dated
.....	
.....	
.....	
.....	
.....	

A Bid Bond in the amount of Baht is forwarded herewith.

Enclosed are the priced Schedules of Quantities which have been filled in and signed by the undersigned. Dated this day of, 20

Authorized Signature of Bidder

Bidder
Address
Telephone No.
Witness

BID BOND FORM

Date

.....(name of Bank) situated at
.....

hereinafter called the Bank hereby agrees to make a Bid Guarantee to the Department of Alternative Energy Development and Efficiency hereinafter called the Department, on the following terms;

1. That the Bid of (Bidder)
..... (hereinafter called the Bidder, is made in agreement with the invitation from the Department to bid for the construction of Contract C2, Electro-mechanical Power Plant Equipment.

Project in accordance with the conditions set forth by the Conditions of Contract, Specification, Drawings and all other Bid Documents prescribed for this work.

In submitting the Bid, the Bidder agrees to furnish a Bid Guarantee through the Bank amounting to Bath written words)
(฿).

2. The Bank hereby agrees to be a Guarantor for the Bid Guarantee for the sum of the above amount in the name of the Administration.
3. When the Bidder has submitted the Bid as stated under 1 above, but does not abide by the conditions of the Bid or any stipulation of the Invitation to Bid, the Bank agrees to pay the sum of Baht written words (฿).
4. This Bid Guarantee becomes effective from (date) to (date) (The period of guarantee shall in no case be less than one hundred and twenty (120) days and shall commence from the date of opening the Bid as set forth in the Invitation to Bid).

In witness whereof, the authorized representative of the Bank has hereunto signed and sealed this Guarantee.

GUARANTOR

WITNESS

.....
(.....)

.....
(.....)

Title
.....
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Title
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Office
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(.....)

Title
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Office
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.....

SECTION 2
PRICE SCHEDULES AND DATA

SECTION 2 - PRICE SCHEDULES AND DATA

SCHEDULE OF QUANTITIES AND PRICES

NOTES

- (1) The Schedule shall be read in conjunction with the Instructions to Bidders. Conditions of Contract, Specification and Drawings.
- (2) The quantities given in the Schedule are estimated and provisional and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Department and valued at the rates and lump sums quoted in the Schedule where applicable, and otherwise at such rates and lump sums as the Department may fix within the terms of the Contract.
- (3) The rates and lump sums in the Schedule shall, include all plant, transportation, labour, materials, erection, maintenance, supervision, office work, insurance, profit, together with all general risks, liabilities and obligations set out or implied in the Contract.
- (4) A rate or lump sum shall be entered against each Item in the Schedule, whether quantities are stated or not. The cost of Items against which the Contractor has failed to enter a rate or lump sum shall be deemed to be covered by the Contract Price.
- (5) The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the Schedule, and where no Items are provided shall be deemed to be distributed amongst the rates and lump sums for the related Items of work.
- (6) General directions and descriptions of work and materials are not necessarily repeated in the Schedule. Reference to the relevant Clauses of the Conditions of Contract, Specification and Drawings shall be made when entering prices against each Item in the Schedule.
- (7) The Sections of the Schedule are numbered in accordance with corresponding sections of the Specification. The Items in each Section of the Schedule shall be read in conjunction with the measurement and payment Clauses in the relevant Sections of the Specification.
- (8) If there is a discrepancy between the rate and the Total Price entered for any Item in the Schedule, the rate will be taken as correct.

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SCHEDULE 1 - MANUFACTURERS AND SUB-CONTRACTORS

PART (A) - MANUFACTURERS

The manufacturer of any component or sub-contractor for any item of Plant shall not be changed from that stated in this Schedule without the approval of the Department.

Ref. No.	Description of Component of Plant	Name and Address of Sub-Contractor and Place of Manufacture and Testing

MAE TUEN HYDROPOWER PROJECT

CONTRACT C-2

SCHEDULE 1 - MANUFACTURERS AND SUB-CONTRACTORS

PART (B) - SUB-CONTRACTORS

The manufacturer of any component or sub-contractor for any item of Plant shall not be changed from that stated in this Schedule without the approval of the Department.

Ref. No.	Description of Component of Plant	Name and Address of Sub-Contractor and Place of Manufacture and Testing

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 2 - GUARANTEED PERIODS

The work listed below and described in the clause references shown shall be completed within the stated guaranteed periods in days from the Date of Acceptance.

Each item below marked '*' is subject to liquidated damages as provided for in Clause C4.07 (Volume 1)

The guaranteed period shall be accomplished by program of work Clause C4.05 (Volume 1)

Clause (Volume 1)	Work	Guaranteed Period
C4.06 (4) (a)	Supply of Drawings and Information	
C4.06 (4) (b)	Supply of Drawings and Information	
C4.06 (4) (c)	Supply of Drawings and Information	
C4.06 (4) (d)	Supply of Drawings and Information	
C4.05 (3)	Installation and handing over of pipe-work and anchor bolts for draft tubes to be embedded in first stage concrete Installation and handing over of anchor bolts for powerhouse crane Installation and handing over of spiral casing, spiral casing anchor bolts and inlet valve anchor bolts Installation and handing over of generator anchor bolts and baseplate	
C4.05 (4)	* Delivery to Site	18 months
	* Taking Over	24 months

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 3 - Summary of Prices

Item No.	Details	Total Price (Baht)
1	Total Price of Equipment	
2	Total Price of Spare Parts	
3	Total Price of Maintenance Tools and Instruments*	
4	Price of Factory Tests	
5	Price of Erection	
6	Price of Field Performance Tests	
	SUB - TOTAL	
	VAT 7%	
GRAND TOTAL BID PRICE		

Note : * The Bidder shall breakdown the price of Maintenance Tools and Instruments as specified in Clause S 1.05 of Volume 2 in Schedule 6

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 4 - SUMMARY PRICES OF EQUIPMENT**

Item No.	Details	Total Price (Baht)
1	Turbine and Governor	
2	Inlet Valve	
3	Mechanical Auxiliary Equipment	
4	Generator and Auxiliaries	
5	AC Station Service Transformers & Switchboards	
6	Transformer Terminal Cubicles, Generator Terminal Cubicles, Bus Ducts and Neutral Cubicles	
7	DC Station Services	
8	Control, Protection and Alarm System	
9	Main Transformer	
10	Line Protection and Switchyard Equipment	
11	Communication System	
12	Grounding System	
13	Electrical Auxiliary Equipment	
SUB - TOTAL		

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 4 - PRICES OF EQUIPMENT

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
1	<u>Turbine and Governor</u>				
	(1) Francis Turbine	2	Set		
	(2) Hydraulic Governing System	2	Set		
	(3) PLC Governor Cubicle	2	Set		
	Sub - Total				
2	<u>Inlet Valve</u>				
	(1) Inlet Valve and Bypass Valve	2	Set		
	Sub - Total				
3	<u>Mechanical Auxiliary Equipment</u>				
	(1) Unit Cooling Water System	2	Set		
	(2) Compressed Air System (If Applicable)		LS		
	(3) Air conditioning and Water Drainage system	1	Lot		
	(4) Portable Fire Extinguishers		LS		
	(5) Overhead Travelling Crane	1	Set		
	(6) Diesel-Driven Standby Electric Power System	1	Set		
	Sub - Total				
4	<u>Generator and Auxiliaries</u>				
	(1) Generator with Flywheel	2	Set		
	(2) Oil Lubrication System	2	Set		
	(3) Excitation System	2	Set		
	Sub - Total				
5	AC Station Service Transformers & Switchboard				
	(1) Station Service Transformer 100kVA	1	Set		
	(2) AC Distribution Board	1	Set		
	(3) Motor Control Center Panels	1	Set		
	Sub - Total				

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 4 - PRICES OF EQUIPMENT

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
6	Transformer Terminal Cubicle, Generator Terminal Cubicles, Bus Ducts and Neutral Cubicles				
	(1) Transformer Terminal Cubicle	2	Lot		
	(2) Generator CB and CT, PT Cubicle	2	Set		
	(3) Generator Neutral Cubicles	2	Set		
	(4) Station Service DS Cubicle	1	Set		
	(5) Bus Tie Circuit Breaker Cubicle	1	Set		
	Sub - Total				
7	<u>DC Station Services</u>				
	(1) Battery Cells with Rack, 200 AH	1	set		
	(2) Battery Charger	1	set		
	(3) DC Distribution Panel Board	1	set		
	Sub - Total				
8	<u>Control, Protection and Alarm System</u>				
	(1) Control, Protection and Alarm Equipment	1	Lot		
	Sub - Total				
9	<u>Main Transformer</u>				
	(1) Main Transformer	2	Set		
	Sub - Total				
10	22kV Line Protection and Switchyard Equipment				
	(1) 22kV Drop Out fuse	6	Sets		
	(2) 22kV Lightning Arrester	6	Sets		
	(3) 22kV Voltage Transformer	6	Sets		
	(4) 22kV Current Transformer	6	Sets		
	(5) 22kV Disconnecting Switch	1	Set		
	(6) 22kV SF6 Circuit Breaker	1	Set		
	(7) 22kV Protection Cubicle	1	Set		
	Sub - Total				

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CONTRACT C-2
SCHEDULE 4 - PRICES OF EQUIPMENT

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
11	<u>Communication System</u>				
	(1) Communication System	1	Set		
	Sub - Total				
12	<u>Ground System</u>				
	(1) Ground System		LS		
	Sub - Total				
13	<u>Electrical Auxiliary Equipment</u>				
	(1) Cable Trays and Support	1	lot		
	(2) Conduit, Boxes and Fitting	1	lot		
	(3) HV and MV Cable	1	Lot		
	(4) 750 V Wire and Cable	1	lot		
	(5) Control Cable	1	lot		
	(6) Station Clocks	4	sets		
	(7) Water Level Transmitter (Forebay)	1	set		
	Sub - Total				

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SCHEDULE 5 - PRICES FOR SPARE PARTS

The spare parts for the Plant shall include those specified below plus the additional recommended spare parts which shall be listed individually for each item.

The spare parts listed below shall be supplied in accordance with Clause S1.06 of Volume 2.

The prices for recommended spare parts shall not be included in the prices stated in Schedule 3.

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Part for Item 1(a) Turbines and Governors</u>				
1.1	Shear pin	2	sets		
1.2	Rotating runner seals	2	sets		
1.3	Fixed runner seals	2	sets		
1.4	Wearing plates for turbine	2	sets		
1.5	Guide vane bushes and sleeves	2	sets		
1.6	Guide vane	2	pieces		
1.7	Shaft sleeves and seals	2	sets		
1.8	Complete set of governor actuator (If required)	1	set		
1.9	Wearing parts for governor regulating valves and pilot valve	1	set		

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
1.10	Replacable parts for unloader valve	1	set		
1.11	Governor oil pump and motor	1	set		
1.12	Piston and gland packings for guide vane servomotor	2	sets		
1.13	Packing seals and gaskets for the turbines, governors,	1	set		
1.14	Motor or solenoid for each type and size of electrically operated valve	1	set		
1.15	Limit switch of each type	1	set		
1.16	Temperature, level, pressure, and flow relays of each type	1	set		
1.17	Valves, complete of each size and type used of 50 mm. nominal bore and below including control valves and their actuators	2	sets		
1.18	Printed circuit card of each type	1	set		
1.19	1 auxiliary relay of each kind	1	set		
1.20	1 control device of each kind	1	set		
Total for Item 1 (a)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for</u> <u>Item 1(b) Turbines and Governors</u> (To be Completed by Bidder)				
Total for Item 1 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Part for Item 2(a)</u>				
	<u>Inlet Valves</u>				
2.1	Packing seals and gaskets	2	sets		
2.2	Motor or solenoid for each type and size of electrically operated valve	2	sets		
2.3	Limit switch of each type	2	sets		
Total for Item 2 (a)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for</u> <u>Item 2(b) Inlet Valves</u> (To be Completed by Bidder)				
Total for Item 2 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Parts for Item 3(a)</u> <u>Mechanical Auxiliary Equipment</u>				
3.1	Cooling water strainer	1	set		
3.2	Replaceable parts for reducing valve and relief valve (if fitted)	1	set		
3.3	Air compressor valves	1	set		
3.4	Air compressor piston rings and bearings	1	set		
3.5	Air compressor gaskets	1	set		
3.6	Air filters for air conditioning plant	1	set		
3.7	1 set of lined shoes for each brake crane	1	lot		
3.8	1 set of brushes complete with brush holder for each wound rotor motor	1	lot		
3.9	Inserts for collectors for longitudinal travel	1	set		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 5 - PRICES FOR SPARE PARTS**

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
3.10	1 complete contactor of each size and type	1	lot		
3.11	1 limit switch of each type	1	lot		
3.12	1 set of piston ring, oil ring	1	lot		
3.13	1 set of fuel injection valve	1	lot		
3.14	Diesel packing and spring	1	lot		
3.15	Diesel bearing metal	1	lot		
3.16	Generator bearing metal	1	lot		
3.17	Generator collector ring brush and brush holder	1	lot		
3.18	Motor for cooling water motorized valve	1	set		
Total for Item 3 (a)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for</u> <u>Item 3(b) Mechanical Auxiliary Equipment</u> (To be completed by Bidder)				
Total for Item 3 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Spare Spart for Item 4(a) Generator and Ancillaries</u>				
4.1	Stator coil (including insulation material, wedge, and other necessary materials for coil replacement)	12	coils		
4.2	Field coil (including necessary materials for coil replacement)	1	pair		
4.3	Generator bearing metals of each type	1	set		
4.4	Temperature relay, vapor pressure type thermometer and other relays	1	set		
4.5	Valves of each kind	1	set		
4.6	Speed signal generator	1	set		
4.7	O-rings for oil and water circuits of the bearings	1	set		
4.8	Limit switch of each type	1	set		
4.9	1 current transformer of each type and rating	1	lot		

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
4.10	<u>Excitation System (all of each kind)</u>				
	- Breakers	1	set		
	- Silicon diode	6	set		
	- Thyristor	6	set		
	- printed circuit cards of each type	2	set		
	- Current transformers	1	set		
	- Relays	2	set		
	- Control motor	1	set		
4.11	<u>Miscellaneous Items</u>				
	- Auxiliary relays of each kind	1	lot		
Total for Item 4 (a)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 4(b) Generators and Ancillaries</u> (To be completed by Bidder)				
Total for Item 4 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Part for Item 5(a) AC Station Service Transformer and Ac Switchboard</u>				
5.1	3-22 kV fuse	1	set		
5.2	1 main and auxiliary contacts for air circuit breaker of each type	1	lot		
5.3	1 coils or motors for air circuit breaker of each type (closing and tripping)	1	lot		
5.4	1 current transformer of each type and rating	1	lot		
5.5	1 voltage transformer of each type and rating	1	lot		
5.6	2 fuse carriers of each type and size	1	lot		
5.7	1 protection relay of each type	1	lot		

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
5.10	1 auxiliary relay of each type	1	lot		
5.11	50 pieces of indicating lamp	1	lot		
5.12	1 no fuse breaker of each type	1	lot		
Total for Item 5 (a)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for</u> <u>Item 5(b) AC Station Service Transformer</u> <u>and Ac Switch board</u> (To be completed by Bidder)				
Total for Item 5 (b)					

MAE TUEN HYDROPOWER PROJECT
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SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Part for Item 6(a) Generator Terminal Cubicles, Bus Ducts, Neutral Cubicles</u>				
6.1	Generator circuit breaker	1	set		
6.2	Main and auxiliary contacts for generator circuit breaker	1	lot		
6.3	1 coil or motor for generator circuit breaker (closing and tripping)	1	set		
6.4	1 current transformer of each type	1	lot		
6.5	1 voltage transformer of each type	1	lot		
6.6	3 insulator for bus duct of each type	1	lot		
6.7	1 no fuse breaker of each type	1	lot		
6.8	2 fuse carriers of each type and size with replacement fuse	1	lot		
6.9	50 pieces of indicating lamp	1	lot		
Total for Item 6 (a)					

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SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 6(b)</u> <u>Generator Terminal Cubicles, Ducts and Switchgears</u> (To be completed by Bidder)				
Total for Item 6 (b)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Part for Item 7(a) DC Station Services</u>				
7.1	1 battery charger rectifier of each type	1	lot		
7.2	Battery	5	sets		
7.3	1 no fuse breaker of each type	1	lot		
7.4	2 fuse carriers of each type and size	1	lot		
7.5	2 replacement fuse cartridge for every fuse	1	lot		
7.6	20 pieces of indicating lamp	1	lot		
7.7	1 protective relay of each type	1	lot		
Total for Item 7 (a)					

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SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 7(b) DC Station Services</u> (To be completed by Bidder)				
Total for Item 7 (b)					

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SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Parts for Item 8(a) Control Protection and alarm</u>				
8.1	Each type of CPU module used	2	sets		
8.2	Each type of power supply module used	2	sets		
8.3	Each communication cards used	2	sets		
8.4	Each type of I/O cards used	2	sets		
8.5	Each type of AVR set used	1	sets		
8.6	Each type of relay used	1	sets		
Total for Item 8 (a)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 8(b) Control, Protection and Alarm Systems</u> (To be completed by Bidder)				
Total for Item 8 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Parts for Item 9(a) Main Transformers</u>				
9.1	Gaskets	1	set		
9.2	1 temperature, level, pressure and flow relay of each type	1	lot		
9.3	1 indicating instrument of each type including associated transducers	1	lot		
9.4	Breathing device	1	set		
9.5	1 thermostate at of each type	1	lot		
Total for Item 9 (a)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 9(b) Main Transformers</u> (To be completed by Bidder)				
Total for Item 9 (b)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Parts for Item 10(a) Line</u>				
	<u>Protection Equipment</u>				
10.1	2 lightning arrester	2	sets		
10.2	1 no-fuse breaker of each type	1	lot		
10.3	2 fuse carriers of each type and size with replacement fuse	1	lot		
10.40	40 pieces of indicating lamp	1	lot		
Total for Item 10 (a)					

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SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for Item 10(b) Line Protection Equipment</u> (To be completed by Bidder)				
Total for Item 10 (b)					

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CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Specified Spare Parts for Item 13(a)</u>				
	<u>Electrical Auxiliary Equipments</u>				
13.1	100 meters of spare cable (0.75 kV type)	1	lot		
13.2	Cable terminations of each type	1	lot		
13.3	1 no-fuse breaker of each type	1	lot		
Total for Item 11 (a)					

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 5 - PRICES FOR SPARE PARTS

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
	<u>Additional Recommended Spare Parts for</u> <u>Item 13(b) Miscellaneous Electrical</u> <u>Equipments</u> (To be completed by Bidder)				
Total for Item 11 (b)					

**MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 6 – PRICES OF MAINTENANCE TOOLS AND INSTRUMENTS**

Maintenance tools and instruments for all Plant shall be provided in accordance with Clause S1.05 of Volume 2.

The individual tools and appliances provided for each Item shall be listed below with the corresponding prices stated for each and the total prices shall be included against Item 3 in Schedule 1.

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
1	<u>Maintenance Tools and Instruments for all Items</u>				
1.1	Portable oil centrifuge unit (list to be provided below)				

MAE TUEN HYDROPOWER PROJECT
CONTRACT C-2
SCHEDULE 6 – PRICES OF MAINTENANCE TOOLS AND INSTRUMENTS

Maintenance tools and instruments for all Plant shall be provided in accordance with Clause S1.05 of Volume 2.

The additional recommended of maintenance tools and instruments shall be listed below and shall not be included in the prices stated in Schedule 1.

Item No.	Details	Quantity	Unit	Unit Rate Baht/Unit	Total (Baht)
2	<u>Additional Recommended of Maintenance Tools and Instruments for all Items</u> (list to be provided below)				
Total for Schedule 6					

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
1.1		<u>Item 1 - Turbine, Governors, Inlet Valves and Ancillaries</u> Reference list of Francis turbines, governors and inlet valves recently supplied.		
1.2		General arrangement of turbine, governor, inlet valve, and ancillaries relative to the station, with guaranteed dimensions.		
1.3		Sectional arrangement of turbine and inlet valve.		
1.4	S2.02 (Volume 2)	Curves of turbine output, efficiency and discharge at net head 72.71 m.		
1.5	S2.03 (Volume 2)	Description of governor including facilities provided and reference sources for governor actuator.		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
3.1	S5.01	<u>Item 3 - Mechanical Auxiliary Equipment</u> Drawings and description of unit cooling water system		
3.2	S5.07	Description of diesel-driven standby electric power system.		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
4.1		<u>Item 4 - Generator & Ancillaries</u> Reference list of hydro-generators recently supplied.		
4.2		General arrangement of generator relative to the station with guaranteed dimensions.		
4.3		Other drawings, catalogs, descriptions and photographs necessary to present a clear picture of the type and class of equipment proposed.		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
5.1		<u>Item 5 - Ac Switchboard</u> Manufacturer's literature describing of the following equipment offered : (1) Protection relays (2) Indication instruments and meters (3) Electrical devices		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
6.1		<u>Item 6 - Generator Terminal Cubicles, Bus Ducts and Neutral Cubicles</u> Description of generator circuit breaker construction and operation.		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
		<u>Item 7 - DC Station Service</u>		
7.1	S10.03	Description of batteries.		
7.2	S10.06	Description of battery chargers.		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
8.1		<u>Item 8 - Control, Protection and Measures</u> Manufacturer's literature describing each type of the following equipment offered : (1) Teletransducers and summators (2) Indication Instruments and meters (3) Electrical devices (4) Protection relays (5) Alarm system		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
9.1		<u>Item 9 - Transformers</u> General arrangement and description of main transformers		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
10.1		<u>Item 10 Line Protection Equipment</u> Drawings and description of Recloser		
10.2		Drawings and description of Electronic Controls		

MAE TUEN HYDROPOWER PROJECT**CONTRACT C-2****SCHEDULE 7 - DRAWINGS, ILLUSTRATIONS, TECHNICAL AND OTHER INFORMATION**

REF. NO.	SPEC. CLAUSE NO.	PARTICULARS OF DRAWINGS, ETC. REQUIRED	TITLES OF DESCRIPTIONS OF DRAWINGS, ETC. SUBMITTED BY BIDDER	REFERENCE
13.1		<u>Item 13 - Electrical Auxiliary Equipment</u> Drawings and description of cables.		
13.2		Description of HV cable end treating material.		

SCHEDULE 8 - GUARANTEED AND INFORMATIVE DATA

The Bidder shall fill in all the following lists of Guaranteed and Informative Data.

The Department reserves the right to reject any Bid which does not include all the pertinent lists duly filled by Bidder and all technical specification mentioned here shall comply with Volume - 2 of Bid Documents.

The following Guaranteed Data shall conform to the Technical Specifications and, when accepted by the Department shall prevail over the Technical Specifications.

The Department reserves the right to reject any Bid which include guaranteed Data not in accordance with Technical Specifications.

Informative Data are intended to give reference information and shall not prevail over the Technical Specifications.

1. TURBINE, GOVERNOR, INLET VALVE AND MECHANICAL AUXILIARY EQUIPMENT

(1) Turbines

- Type _____
- Manufacturer/ Country of Origin _____
- Rated Net Head _____ m
- Design Discharge (At Rated) _____ m³/sec
- Design Discharge (minimum) _____ m³/sec
- Rated Synchronous Speed _____ rpm
- Rated Turbine Output at rated head _____ kW
- Efficiency at rated net head and discharge _____ %

Efficiency at Partial Loads	100%	90%	80%	70%
Turbine Efficiency				

- Turbine Performance Curve submitted (Yes/ No) _____
- Maximum runaway speed _____ rpm
- Maximum momentary speed rise on rejection _____ %/ rpm
- Runner Mounted on Generator Shaft (Yes/ No) _____
- Runner Material _____
- Runner diameter _____
- GD² of rotating parts (Runner+Generator+Flywheel) _____ kg-m²
- Starting time of turbine from 0 to nominal speed no load _____
- Has the Bidder's manufacturer performed complete model test for the proposed turbine? (Yes/ No) _____
- (if yes, please indicate name of plants and main plant data) _____
- Plant and Owner Name _____
- Location and Contact Number _____
- Did the Bidder's manufacturer base the guarantees for this project on performed model test? (Yes/ No) _____
- (if yes, please indicate name of plants and main plant data) _____
- Plant and Owner Name _____
- Location and Contact Number _____
- Guaranteed off-cam runaway speed _____ rpm
- At the head _____ m
- At Flow _____ m³/sec
- Maximum speed rise and pressure rise during load rejection at net head of 29.44 m with flywheel weight _____ kg-m²

Load Rejection (%)	Speed Rise (<i>Dn</i>) (%)	Pressure Rise in Penstock (DP) (m) at penstock	Max. Pressure (Net Head + DP) at Penstock (m)
100			

- Dimensional drawings at Turbine Floor shall be attached with Bid showing the arrangement of spiral casing, generator, flywheel, etc. (Yes/ No) _____
- Guide Vane and Servomotor _____
- Number of Guide Vane _____
- Material of Guide Vane _____
- Number of Servomotor _____
- Total working pressure of servomotor (s) _____ kg-m
- Material of guide vane bearing bush _____
- Weight of Spiral Casing with Francis runner _____ ton
- Weight of Francis Runner _____ ton

(2) Governor

Governor PLC Cubicle

- Type/ Model _____
- Manufacturer/ Country of Origin _____
- Power Supply for PLC components _____ Vdc
- Power Supply Converter _____ Vdc - Vdc
- Controller Software Manufacturer/ Name _____
- Communication Method with Unit PLC _____
- Speed/frequency range of adjustment _____ %
- Control Cubicle type _____
- Cubicle Protection Class _____
- Touch Screen size _____
- Cubicle heater capacity _____ Watt

Governor Oil Pumping Unit

- Type/ Model _____
- Manufacturer/ Country of Origin _____
- Location of installation _____
- Capacity of each oil pump _____ l/min
- Protection and Insulation Class for motor _____
- Operating pressure range _____ bar
- Capacity of pressure tank _____ liter
- Grade of oil and type _____
- Cooling Radiator included (Yes/ No) _____

(3) Inlet Valve and Bypass Valve

- Type/ Model _____
- Manufacturer/ Country of Origin _____
- Inlet Valve Diameter _____ mm
- Valve Disc materials _____
- Disc Seat materials _____
- Inlet Valve Opening and Closing Methods _____
- a) Opening Method (Remote/ Local) _____
- b) Closing Method _____
- Bypass Valve diameter _____ mm

- Bypass Valve Opening and Closing Methods
 - a) Opening/ Closing by motor (Remote) _____ Vdc
 - b) Opening/ Closing by valve (Local/ Manual) _____

(4) GENERATOR AND AUXILIARIES

4.1 Generator

- Type _____
- Manufacturer _____
- Country of Origin _____
- Rated Output Capacity at rated Voltage, Speed and P.F. _____ kW
- Synchronous Speed _____ rpm
- Rated Voltage Generator Terminals _____ kV
- Power Factor _____ p.u.
- Frequency _____ Hz
- Cooling Method _____
- Protection Class _____
- Insulation Class _____
- Short Circuit Ratio (not less than) _____ p.u.
- Bearing
 - Type of bearing _____
 - Bearing Material _____
 - Bearing Cooling Method _____
 - Bearing Mounting at Generator Housing (Yes/ No) _____
 - Francis Runner Mounted at Generator Shaft (Yes/ No) _____
 - Bearing Lubricating Oil System Drawing submitted (Yes/ No) _____
- Noise level, not greater than _____ dB
- Generator Reactances at rated output and voltage
 - a) Direct axis, transient reactance, saturated (X'd) _____
 - b) Direct axis, transient reactance, unsaturated (X'd) _____
 - c) Direct axis, sub-transient reactance, saturated (X''d) _____
 - d) Direct axis, sub-transient reactance, unsaturated (X''d) _____
 - e) Synchronous reactance, saturated (Xd) _____
 - f) Synchronous reactance, unsaturated (Xd) _____
 - g) Negative Sequence reactance, saturated (X2) _____
 - h) Negative Sequence reactance, unsaturated (X2) _____

The efficiency of the Generator at different output loads for 0.8 and 1.0 power factor

Rated Output	At 0.8 P.F.	At 1.0 P.F.
100%		
75%		
50%		
25%		

Values for 100 % percent rated output and 0.8 p.f. shall be considered as guaranteed rated efficiency.

Weight of generator with Flywheel and Rotor exciter _____ ton

4.2 Excitation System

- Type/ Model _____
- Nominal voltage at rated load and power factor _____ (V dc)
- Nominal output at rated load and power factor _____ (kW dc)
- Output current at no load and rated voltage _____ (A dc)
- Current at rated load and power factor _____ (A dc)
- Current at maximum reactive load and zero power factor overexcited _____ (A dc)

- Current at maximum reactive load and zero power factor underexcited
- Spare capacity above nominal output _____ (%)
- Burden imposed by excitation system
 - On potential transformer _____ (VA)
 - On current transformer _____ (VA)

Excitation System Rectifier Assembly

- Continuous rated output _____ (kW)
- Rated terminal voltage _____ (V)
- Rated output current _____ (A)
- Ceiling output current _____ (A)

Diode/ Thyristor

- Make and type of diode / thyristor _____
- Number of bridge arms and diodes / thyristor in series _____
- Number of bridge arms in parallel _____
- Method of cooling _____

Excitation Transformer with cubicle (if necessary)

- Manufacturer _____
- Type/ Model _____
- Transformer rated capacity _____
- Rated voltage, HV and LV winding _____ V
- Type of conductor _____
- Insulation Class _____

(5) AC STATION SERVICE TRANSFORMER AND AC SWITCH BOARD

- 5.1 Station Service Transformer
 - Type/ Model _____
 - Manufacturer/ Country of Origin _____
 - Rated Capacity _____ kVA
 - Impedance based on nominal voltage _____ %
 - Insulation Class _____
 - No load losses at 75°C _____ Watt
 - Load losses at 75°C _____ Watt
 - Sound Level _____ dBA
- 5.2 AC Switchboard
 - Type/ Model _____
 - Manufacturer/ Country of Origin _____
 - Country _____
 - Rated Capacity _____ V
 - Protection Class _____
 - Control Power Supply _____ Vdc
- 5.3 Main Circuit breaker
 - Type/ Model _____
 - Manufacturer/ Country of Origin _____
 - Rated Breaking Current _____ kA
 - Control Power Supply _____ Vdc
- 5.4 Current transformers
 - Type/ Model _____
 - Manufacturer/ Country of Origin _____
 - Burden/ Accuracy Class _____
 - Number of Core _____

5.5	Voltage transformers		
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Burden	_____	
-	Number of Core	_____	
5.6	Indicating Instruments		
a)	Ammeter		
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Accuracy Class	_____	
b)	Voltmeters	_____	
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Accuracy Class	_____	
c)	Watt Hour Meter		
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Accuracy Class	_____	
d)	Selector Switch		
-	Type/ Model	_____	
-	Manufacturer	_____	
e)	Protective relays (27/ 59)		
-	Type/ Model	_____	
-	Manufacturer	_____	
f)	Protective relays (50/ 51)		
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Control Power Supply	_____	Vdc
g)	Auxiliary relays		
-	Type/ Model	_____	
-	Manufacturer	_____	
-	Control Power Supply	_____	Vdc
(6)	TRANSFORMER TERMINAL, GENERATOR TERMINAL CUBICLES and NEUTRAL CUBICLES		
6.1	MV Switchgear Cubicle for Generator Terminal and Transformer Terminal Cubicles		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated Capacity	_____	kV
-	Continuous Current	_____	A
-	Short Time Current	_____	kA
-	Protection Class	_____	
-	Control Power Supply	_____	Vdc
-	Type Test submitted (Yes/ No)	_____	
a)	MV Circuit Breaker		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated Capacity	_____	kV
-	Interrupting Medium	_____	
-	Continuous Current	_____	A
-	Short Time Current	_____	kA

	-	Type of operating mechanism	_____	
	-	Protection Class	_____	
	-	Control Power Supply	_____	Vdc
b)		MV Disconnecting Switch		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated Capacity	_____	kV
	-	Continuous Current	_____	A
	-	Control Power Supply	_____	Vdc
c)		MV Current Transformer		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated primary current	_____	A
	-	Rated secondary current	_____	A
	-	Rated CT ratio	_____	
	-	Accuracy classes (metering and protection)	_____	
	-	Continuous thermal current at ambient temp.	_____	A
d)		MV Voltage Transformer		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated primary Voltage	_____	V
	-	Rated secondary voltage	_____	V
e)		MV Lightning Arrester		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Residual voltage at 10 kA	_____	(kV)
	-	Residual voltage at 20 kA	_____	(kV)
	-	Manufacturer	_____	
6.2		Neutral Resistor Cubicles		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated Voltage	_____	V
	-	Resistance Value	_____	
	-	Disconnecting Switch Rating/ No. of Phase	_____	
(7) CONTROL, PROTECTION AND ALARM SYSTEM				
7.1		Unit Controller (PLC)		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated Power Supply	_____	Vdc
	-	Maximum processing time	_____	second
	-	Degree of protection of system board	_____	
	-	Type of CPU	_____	
	-	Type of memories and size	_____	Kbytes
	-	Interface to field devices	_____	(Yes/No)
	-	Communication port for network connection	_____	
	-	Max. number of I/O modules per CPU	_____	
	-	System Configuration submitted (Yes/ No)	_____	
7.2		Digital input/output module		
	-	Type/ Model	_____	
	-	Manufacturer/ Country of Origin	_____	
	-	Rated Power Supply	_____	Vdc
	-	Maximum processing time	_____	second

7.3	Analog input/output module			
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	- Rated Power Supply	_____	Vdc	
	- Number of input signal available per module	_____	second	
7.4	Communication module			
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	- Rated Power Supply	_____	Vdc	
	- Communication Type/ Port	_____		
	- Communication Protocol	_____		
7.5	Pulse Input Module			
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	- Rated Power Supply	_____	Vdc	
	- Maximum Input available per module	_____		
	- Input Frequency Range (MW, Mvar)	_____		
	- Input Frequency Range (rpm)	_____		
7.6	Operator Control Station			
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	- Rated Power Supply	_____	Vac	
	- Operating System Software	_____		
	- Power Supply Module	_____	Watt	
	- CPU Model/ Type	_____	MHz	
	- CPU microprocessor length	_____	bit	
	- HDD Capacity	_____	Gbyte	
	- RAM Capacity	_____	Gbyte	
	- VGA Card Capacity	_____	Gbyte	
	- LCD Monitor size	_____	inch	
7.7	PLC Liscensed Software (For Unit PLC)			
	- Name/ Descriptions	_____		
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
7.8	Protection Relay			
	a) Generator Multifunction Protection Relay			
	- Name/ Descriptions	_____		
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	b) Directional O/C and Ground Relay			
	- Name/ Descriptions	_____		
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	c) Directional O/C and Ground Relay			
	- Name/ Descriptions	_____		
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		
	d) Lock-Out Relay			
	- Name/ Descriptions	_____		
	- Type/ Model	_____		
	- Manufacturer/ Country of Origin	_____		

7.9	e)	Auto Sync. Relay			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	f)	Auto Sync. Relay			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	g)	Protection Relay Cubicle			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	-	Degree Of Protection			
	-	Power Supply for relay		Vdc	
	-	Power Supply for transducer, conditioner, aux. relay		Vdc	
Metering and Alarm System					
	a)	Digital Multimeter			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	b)	Energy Meter for selling electricity			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	c)	Frequency Meter			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	d)	Voltmeter			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
		Scale Range		V	
	f)	Ammeter			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	-	Scale Range		A	
	g)	Power Factor Meter			
	-	Name/ Descriptions			
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
(8) MAIN TRANSFORMERS					
	-	Type/ Model			
	-	Manufacturer/ Country of Origin			
	-	Rated Capacity		kVA	
	-	Impedance at rated voltage		%	
	-	Vector Group			
	-	Material of Winding			
	-	Temperature Rise Avarage		Celsius	
	-	Temperature at Hottest Spot		Celsius	

-	Insulation Class	_____	
-	No load losses at 75°C	_____	Watt
-	Load losses at 75°C	_____	Watt
-	Sound Level	_____	dBA
-	Amount of oil required per transformer	_____	Liter
-	Weight of Transformer with oil	_____	kg

(9) LINE PROTECTION AND SWITCHYARD EQUIPMENT

a)	22kV Gas Circuit Breaker		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated Capacity	_____	kV
-	Interrupting Medium	_____	
-	Continuous Current	_____	A
-	Short Time Current	_____	kA
-	Control Power Supply	_____	Vdc
b)	22kV Disconnecting Switch		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated Capacity	_____	kV
-	Continuous Current	_____	A
-	Short Time Current	_____	kA
-	Control Power Supply	_____	Vdc
c)	22kV Current Transformer		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated primary current	_____	A
-	Rated secondary current	_____	A
-	Rated CT ratio	_____	
-	Accuracy class for metering	_____	
-	Accuracy class for relaying	_____	
-	Continuous thermal current at ambient temp.	_____	A
-	Rated thermal burden	_____	VA
d)	22V Voltage Transformer		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated primary Voltage	_____	V
-	Rated secondary Voltage	_____	V
-	Rated VT ratio	_____	
-	Rated thermal burden	_____	VA
e)	22kV Lightning Arrester		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Residual voltage at 10 kA	_____	(kV)
-	Residual voltage at 20 kA	_____	(kV)
-	Manufacturer	_____	
f)	22kV Protection Relay Cubicle		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Power Supply for relay	_____	Vdc
-	Power Supply for transducer, conditioner, aux. relay	_____	Vdc

(10) DC STATION SERVICE

a)	Battery Cells		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Battery Cell type	_____	
-	Number of Cells	_____	
-	Rated capacity at 10 hr rate	_____	Ah
-	Battery Sizing Calculation submitted	_____	(Yes/ No)
-	Battery Sizing Calculation Standard	_____	
b)	Battery Charger		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Power Supply	_____	Vac
-	Enclosure Type	_____	
-	Protection Class	_____	
-	Nominal Output of Charger	_____	Vdc
-	Output Range of Charger	_____	Vdc
c)	DC Distribution Panel		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	

(11) ELECTRICAL AUXILIARIES

a)	Motor Control Center		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Rated Capacity	_____	V
-	Rated Continuous Current	_____	A
-	Short Time Current	_____	kA
-	Protection Class	_____	
-	Control Power Supply	_____	Vdc
-	Type Test submitted (Yes/ No)	_____	
b)	Forebay Water Level Transmitter		
-	Type/ Model	_____	
-	Manufacturer/ Country of Origin	_____	
-	Sensing Method	_____	
-	Control Power Supply	_____	Vac (or) Vdc