

Republic of Yemen

Yemen Mobile Co.

Technical Committee



<b>Project Name:</b>	<b>MAHRAH and HADRMOUT LG BTS ReplacementProject</b>
<b>Tender No:</b>	<b>19/2013</b>
<b>For</b>	<b>The Supply , Installation and Commissioning of MAHRAH and HADRMOUT LG BTS Equipment'sReplacement</b>

## **Project Components & Technical Specifications**

# Chapter -1

## Introduction and General Requirement

## 1.1 Introduction

YEMEN MOBILE CO”, is a Yemeni Company for Mobile Telephony that started its commercial operations in September 22, 2004, and currently has over 3,000,000 subscribers (up to end of 2010). With over 600 BTS stations, YEMEN MOBILE provides full coverage of the Republic of Yemen.

YEMEN MOBILE already provides CDMA services to major corporations. Moreover new supplementary and value added intelligent network services are being offered to subscribers , educational institutions , government departments and banks. With the primary objective to carry Mobile traffic nationwide in order to create a competitive network compared to other local Mobile/Fixed operators, YEMEN MOBILE proposes to add BTS equipment for his network following :

## 1.2 Project Components.

All the following project components is mandatory, and it will introduce in the technical and financial proposal as the following:

### 1.2.1 Last LG BTS Replacement requirement BTS Type& 1X Capacity (Software and Hardware)

SN	Site Name	BTS 1X CONFIGURATION	No.1X TRX	1X BTS CE Software	BTS Type
1	Gaida1	S323	8	330	Outdoor Macro BTS
2	Gaida2	S333	9	375	Outdoor Macro BTS
3	Shehin	S311	5	210	Outdoor Macro BTS
4	Sayhoot city	S311	5	210	Outdoor Macro BTS
5	Raida	S112	4	165	Outdoor Macro BTS
6	Qusaier	S122	5	210	Outdoor Macro BTS
7	Aldees Mt.	S113	5	210	Outdoor Macro BTS
8	Al-olaib	S222	6	250	Outdoor Macro BTS
9	Alhami	S221	5	210	Outdoor Macro BTS
10	Nashtoon	S111	3	125	Outdoor Micro BTS
11	Sayhoot Mt.	S111	3	125	Outdoor Micro BTS
12	Maseela Mt.	S111	3	125	Outdoor Micro BTS
13	Qeshen	S111	3	125	Outdoor Micro BTS
14	Yaroob	S111	3	125	Outdoor Micro BTS
15	Hawf	S111	3	125	Outdoor Micro BTS
16	Hasyun	S111	3	125	Outdoor Micro BTS
17	Dhaboot	S111	3	125	Outdoor Micro BTS
18	Haat	S111	3	125	Outdoor Micro BTS
19	Etab	S111	3	125	Outdoor Micro BTS
20	Sagr	S111	3	125	Outdoor Micro BTS
21	Rabaah Mt.	S111	3	125	Outdoor Micro BTS

22	Ras Howaira	S121	4	165	Outdoor Micro BTS
23	Hision	S111	3	125	Outdoor Micro BTS
24	Hisay	S111	3	125	Outdoor Micro BTS
25	NEW1	S111	3	125	Outdoor Micro BTS
26	NEW2	S111	3	125	Outdoor Micro BTS
27	NEW3	S111	3	125	Outdoor Micro BTS
28	NEW4	S111	3	125	Outdoor Micro BTS

- 1- For the table above 9 BTS are multicarrier macro outdoor BTS Units.
- 2- for the table above 15 BTS are 3 sector multicarrier micro outdoor BTS Units
- 3- for the table above new additional 4 BTS are 3 sector micro outdoor BTS Units
- 4- for the table above total BTS CE 4585 (Software and Hardware) & will added as software license (either BTS or BSC level licenses control) in any current BSCs which determine by YEMEN MOBILE.
- 5- for the table above total 1X TRX 110 (Software and Hardware) & will added as software license (either BTS or BSC level licenses control) in any current BSCs which determine by YEMEN MOBILE.

### 1.2.2 DO Expansion (mandatory Software and Hardware)

SN	Site Name	BTS DO CONFIGURATION	No.DO TRX	DO BTS CE Software per 3Sect	DO BTS CE Hardware per 3Sect
1	Gaida1	S111	3	192	284
2	Gaida2	S111	3	192	284
3	Shehin	S111	3	192	284
4	Sayhoot city	S111	3	192	284
5	Raida	S111	3	192	284
6	Qusaier	S111	3	192	284
7	Aldees Mt.	S111	3	192	284
8	Al-olaib	S111	3	192	284
9	Alhami	S111	3	192	284

- 1- for the table above total DO BTS CE 1728 (Software and Hardware)& will added as software license (either BTS or BSC level licenses control) in any current BSCs which determine by YEMEN MOBILE.
- 2- for the table above total DO TRX 27 (Software and Hardware) & will added as software license (either BTS or BSC level licenses control) in any current BSCs which determine by YEMEN MOBILE.

### 1.2.3 Replacement BTS RF Parts Requirements for 1X & DO (mandatory Software and Hardware)

SN	Site Name	No.1X TRX	1X Nominal Power (W per TRX)	No.DO TRX	DO Nominal Power (W per TRX)	Allowed one TRX Power 1X&DO (W/TRX)	Total RFunit Power 1X&DO (W)	Antenna Type/Model	Feeder Length (per feeder )	E1 interface type
1	Gaida1	8	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V01	55	8E1 IP Mode
2	Gaida2	9	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V02	40	8E1 IP Mode
3	Shehin	5	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V03	60	8E1 IP Mode
4	Sayhoot city	5	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V04	80	8E1 IP Mode
5	Raida	4	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V05	70	8E1 IP Mode
6	Qusaier	5	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V06	80	8E1 IP Mode
7	Aldees Mt.	5	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V07	70	8E1 IP Mode
8	Al-olaib	6	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V08	70	8E1 IP Mode
9	Alhami	5	30	3	20	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V09	60	8E1 IP Mode
10	Nashtoon	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V10	50	8E1 IP Mode
11	Sayhoot Mt.	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V11	50	8E1 IP Mode
12	Maseela Mt.	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V12	60	8E1 IP Mode
13	Qeshen	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V13	70	8E1 IP Mode
14	Yaroob	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V14	70	8E1 IP Mode
15	Hawf	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V15	70	8E1 IP Mode
16	Hasyun	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V16	70	8E1 IP Mode
17	Dhaboot	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V17	70	8E1 IP Mode
18	Haat	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°-	80	8E1 IP

								10°T\ 80010300V18		Mode
19	Etab	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V19	65	8E1 IP Mode
20	Sagr	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V20	80	8E1 IP Mode
21	Rabaah Mt.	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V21	80	8E1 IP Mode
22	Ras Howaira	4	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V23	60	8E1 IP Mode
23	Hision	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V24	60	8E1 IP Mode
24	Hisay	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V25	65	8E1 IP Mode
21	NEW1	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V21	50	8E1 IP Mode
22	NEW2	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V23	50	8E1 IP Mode
23	NEW3	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V24	50	8E1 IP Mode
24	NEW4	3	30	0	0	100	100	XPol Panel 790-960 85° 16.5dBi 0°- 10°T\ 80010300V25	50	8E1 IP Mode

- 1- For the table above 1X Nominal Power per 1TRX mandatory 30 watt Hardware and Software.
- 2- For the table above DO Nominal Power per 1TRX mandatory 20 watt Hardware and Software.
- 3- For the table above allowed Power 1X&DO per 1TRX mandatory 100 watt Hardware and Software will added as software license (either BTS or BSC level licenses control) in any current BSCs
- 4- For the table above Total Power of one RF unit 1X&DO together mandatory at least 100 watt Hardware and Software will added as software license (either BTS or BSC level licenses control) in any current BSCs
- 5- For the table above The antenna total NO is 84 antenna and The antenna type\Model each BTS sector is XPol Panel 790-960 85° 16.5dBi 0°-10°T\ 80010300V24
- 6- For the table above feeder type is low lose foam 7\8" copper dielectric in average length 61m per one feeder in total length 61\*6\*28=10,300 m
- 7- For the table above the E1 interface type for all BTS is 8E1 IP over E1\T1 mode, with mandatory 1X& DO sharing in same interface.

## 1.2.4 Replacement BTS Power Systems Requirments.

SN	Site Name	BTS Type	Power System	Battery Capacity (Ah)	Solar minimum capacity (watt per System)
1	Gaida1	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
2	Gaida2	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
3	Shehin	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
4	Sayhoot city	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
5	Raida	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
6	Qusaier	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
7	Aldees Mt.	Outdoor Macro BTS	Solar+ Battery's	800	3800
8	Al-olaib	Outdoor Macro BTS	Solar+ Battery's	800	3800
9	Alhami	Outdoor Macro BTS	Built-in REC+ Battery's	480	NO
10	Nashtoon	Outdoor Micro BTS	Solar+ Battery's	480	NO
11	Sayhoot Mt.	Outdoor Micro BTS	Solar+ Battery's	650	3040
12	Maseela Mt.	Outdoor Micro BTS	Solar+ Battery's	650	3040
13	Qeshen	Outdoor Micro BTS	Built-in REC+ Battery's	480	NO
14	Yaroob	Outdoor Micro BTS	Solar+ Battery's	650	3040
15	Hawf	Outdoor Micro BTS	Built-in REC+ Battery's	480	No
16	Hasyun	Outdoor Micro BTS	Solar+ Battery's	650	3040
17	Dhaboot	Outdoor Micro BTS	Solar+ Battery's	650	3040
18	Haat	Outdoor Micro BTS	Built-in REC+ Battery's	480	No
19	Etab	Outdoor Micro BTS	Solar+ Battery's	650	3040
20	Sagr	Outdoor Micro BTS	Solar+ Battery's	650	3040
21	Rabaah Mt.	Outdoor Micro BTS	Solar+ Battery's	650	3040
22	RasHowaira	Outdoor Micro BTS	Solar+ Battery's	650	3040
23	Hision	Outdoor Micro BTS	Solar+ Battery's	650	3040
24	Hisay	Outdoor Micro BTS	Solar+ Battery's	650	3040
25	NEW1	Outdoor Micro BTS	Solar+ Battery's	650	3040
26	NEW2	Outdoor Micro BTS	Solar+ Battery's	650	3040
27	NEW3	Outdoor Micro BTS	Solar+ Battery's	650	3040
28	NEW4	Outdoor Micro BTS	Solar+ Battery's	650	3040

**1- For the table above belong to non-Solar Macro BTS the DC power supply is BTS cabinet Built-in rectifier and the Capacity of DC Power batteryis 480-500 Ahr with outdoor battery Container**

- 2- **For the table above for non-Solar Micro BTS DC power supply is BTS cabinet Built-in rectifier and the Capacity of DC Power battery per is 480-500 Ahr with outdoor battery Container**
- 3- **For the table above belong to Solar System BTS the DC Solar Power System designed and compatible with same required BTS with capacity depend on the maximum power consumptions, not less than the value in above table and the Capacity of DC Power battery per solar micro outdoor BTS is 600- 690 Ahr and the Capacity of DC Power battery per solar macro outdoor BTS is 800-850 Ahr and both type with outdoor battery Container**

### 1.2.5 Replacement BTS-BSC Software Requirements.

- 1- **The BTS Software compatible with current BSCs software and all BTS resources will joined to the current BSC without any additional cost, which mean the resources license in BSC side will be increased equivalent to required BTS resources licenses TRX and CE (if the vendor have some financial condition should clarify and added in financial offer).**
- 2- **1X 307Kbps function is mandatory enabled for all replacement BTS (if vendor have some financial condition added in financial offer)**

### 1.2.6 Training.

See detail in training chapter.

## 1.3 General Requirements

1.3.1 The vendor must identify and describe every equipment proposed, including hardware, software, installation materials, peripherals, installation services, configuration and tests, applications, integration with management systems, report customization, software licenses etc.

1.3.2 The vendor must also describe the resources for Operation, Maintenance, Supervision, Support and Technical Assistance, as well as for Charging, Invoicing and Training. Support should be provided during the BSS installation. Such support must include the transfer of knowledge to technicians and engineers .

1.3.3 The vendor must be responsible for the interconnection and integration issues.

1.3.4 The vendor shall attach user certificates (or site references) of at least 10 commercial BSS networks with a total capacity of 35 million subscribers or more, who are currently using those proposed equipment's, system and software. Details must include Operator (or service provider) name, country, date of installation, model of equipment, and type of service

1.3.5 The vendor will determine the software version of each BTS type where all BTS software mandatory compatible with current BSCs version for all vendors, which currently work in YEMEN MOBILE.



### 1.3.6 BUILDING:

1.3.6.1 It should be possible to install any equipment on any floor/place. Floor lay out for equipment's (at actual site) and dimensioning of equipment shall be done by bidder in consultation with YEMEN MOBILE.

1.3.6.2 The Air Conditioning plant, standby Engine alternator, A.C. Power supply, and lights will be provided by YEMEN MOBILE.

1.3.6.3 The smoke detection/Fire alarm will be provided by bidder.

1.3.6.4 The vendor shall inspect the site in advance, give layout plans and also indicate requirements regarding Civil/Electrical works, well in advance, so that the user could provide these.

### 1.3.7 ENVIRONMENTAL CONDITIONS

1.3.7.1 The vendor shall indicate the heat dissipation of the equipment for initial and ultimate equipped capacity of the and BTS. The Vendor shall clearly indicate any special environmental requirement, if any.

1.3.7.2 vendor should be supply out of range environmental alarm sensor and extend it to control room.

### 1.3.8 DDF/FDF

For the equivalent quantity of offered E-1, the DDF equipment (Slim Rack Type) and associated items shall be provided. DDF equipment for both "TDM" side, and "network" side should be supplied for at least 1.5 times the initial capacity.

YEMEN MOBILE will arrange to terminate all trunks and junctions on the "TDM side". The Vendor shall provide all cabling from the BTS to the DDF. The Vendor shall supply the cabling required for jumpering E1's on the DDF.

### 1.3.9 DC power

The D.C power supply shall be included in the offer with a capacity not less than 1.5 times of the consumption for BTS equipment.

Rectifiers are required for Out Door BTS & must put the Rectifiers in the same cabinet with BTS (Built in Rectifier) . i.e. 10 Rectifiers .

The Capacity of DC Power battery per non-Solar BTS is 480-500 Ahr with outdoor battery Container, the DC Solar Power System designed with same required BTS with capacity depend on the maximum power consumptions, the Capacity of DC Power battery per solar micro outdoor BTS is 600- 690 Ahr and the Capacity of DC Power battery per solar macro outdoor BTS is 800-850 Ahr and both type with outdoor battery Container The duty cycles of batteries at least 1700 Cycles at 50% DOD.

## Chapter -2

# Technical Specification of ProjectComponents

## 2. BTS Technical Requirements

### 2.1 General

- a. Frequency band (800 MHz) 824 – 849 MHz paired with 869 – 894 MHz,
- b. Channel centre frequencies As per TIA/EIA/IS-2000
- c. Channel Spacing 1.25 MHz
- d. TX-RX separation 10/45 MHz
- f. Air Interface TIA/EIA IS-2000
- g. Frame Structure As per TIA/EIA/IS-2000
- h. Duplexing method Frequency Division Duplexing (FDD)
- i. Voice Coding 8Kbps Enhanced variable rate vocoder (EVRC) , 8K QCELP & 13K QCELP
- j. Transmission bit rate As per TIA/EIA/IS - 2000
- k. Modulation scheme As per TIA/EIA/IS - 2000
- l. Demodulation scheme As per TIA/EIA/IS - 2000 m Forward compatibility 1x EVDO, (EVDO rA , rB)
- n. Local Oscillators Synthesized, frequency shall be settable in steps to achieve desired frequency.
- o. The proposed BTS system should offer a Power efficiency with not less than 33%
- p. The proposed BTS should support remote login from one BTS to another BTS or BSC
- q. The proposed BSS shall support inverse spectrum scanning which can quickly check the interference condition in the network.
- r. The Abis interface of the proposed BTS must support the function of sharing transmission for 1X services traffic and EVDO services traffic. in E1's/FE interface in same resource . in the same time the QoS must be supported to assure the quality of 1X voice service.
- s. E1 Performance and E1 BER bit error rate and other performance of all BTS must be collected and reported automatically similar to BSC statistics hourly or daily as basic requirement without any additional license , fee or conditions .
- t. Performance of call fail reasons (in TXT or CSV log files format ) of all BTS must be collected and reported automatically similar to BSC statistics daily or hourly as basic requirement without any additional license , fee or conditions.
- u. The vendor shall provide single RAN: unified BTS supporting different modes,like CDMA1X/EVDO/LTE (For every mode point vendor must mention what to change in hardware board and which board need software upgrade); unified BSC ,OMC and site solution, to reduce the operator cost and ensure investment protection for future.
- v. For indoor coverage, vendor must provide effective solution to solve pilot pollution and absorb indoor traffic.

### 2.2 BTS

#### 2.2.1 Basic Function

1. MACRO OUTDOOR BTS upto 24TRX - one cabinet
3. The outdoor MACRO BTS should be all-in-one design with built-in battery, aircondition or heat exchanger. Please provide the photos of your MACRO OUTDOOR BTS.
4. MICRO OUTDOOR BTS– All-in-one design, needs to support 3Sector, up to (12) TRX in onecabinet
5. Optical RF unit, Minimum cascading distance shall be 70 km, this function important when need to connect RF unit from other RF unit and the distance between them 70 km or more.
6. The BTS's output power per sector at antenna port must be more than 60W or above
7. The nominal transmit power MICRO OUTDOOR BTS must be at least 20W~80W (per

carrier) and The nominal transmit power of MACRO OUTDOOR BTS must be at least 20W~100W (per carrier) without any additional license ,fee or conditions.

8. The vendor should provide detailed description of the series BTS products, including the specification (TRX, Erl per sector/carrier, etc.) and expansion capability.
9. Multiple Frequency Bands (such as 1900MHz/800MHz, 450MHz/800MHz) must be supported in one RF Module. describe their implementation.
10. The number of E1 ports at Abis interface with load sharing function should no less than 8 E1s (per board)
11. The remote switch off,RF cards temperature control, VSWR alarms, and RSSI measurements, and diversity signal alarm must be supported
12. The MACRO OUTDOOR BTS & MICRO OUTDOOR BTS can be switch on easily (by battery ) with out AC power input.
13. The proposed BTS should support multi-carrier & multi-mode and capable of serving CDMA & LTE or GSM in single cabinet .
14. For the IP BSS evolution ability consideration ,the vendor should support IP Clock solution to reduce GPS number and provide clock resource for failure of GPS
15. The vendor should support MICRO OUTDOOR BTS which can support 1X and DO at the same time in one cabinet. & provide the necessary documents.
16. For the IP BSS evolution ability consideration , the proposed BTS shall support E1 and FE transmission at same time and the FE interface should be ready now.

## 2.2.2 Specifications of Transmitter and Receiver

### I. Basic Requirements:

The output power at the top of the cabinet for each carrier (and in multi-carrier case too) must be changeable range according to Yemenmobile configuration demands in range of 1 W ~ 100W.

The output power from the port of power amplifier for each carrier also for each carrier must be changeable range according to Yemenmobile configuration demands in range of 1 W ~ 100W.

Expansion through adding extra carriers on the existing multi-carrier module and using the existing Power Amplifier must not cause power output decreasing for the existing carriers, and the coverage must not decrease.

The RF Module must be has two RF sample port, one port for transmitter measurement & one port for receiver measurement.

For MACRO OUTDOOR BTS one RF Module must be support 100W output at least

For MICRO OUTDOOR BTS one RRU Module must be support 80W output at least.

MACRO OUTDOOR BTS & MICRO OUTDOOR BTS must be support the total output power measurement for RFU Module by using PC measure and power meter measure for single or multi carrier .

MACRO OUTDOOR BTS & MICRO OUTDOOR BTS must be support 1X RTT also Multi-Frequency Bands must be supported in one BTS.

Please describe their implementation.

### II. Transmitter:

a. Nominal Transmit Power per sector per carrier As per TIA/EIA/IS – 2000

b. Tx Power Limits As per TIA/EIA/IS – 2000

c. Transmitter Frequency Accuracy As per TIA/EIA/IS – 2000

d. Channel Allocation in full band of operation. As per TIA/EIA/IS – 2000

e. Spurious emission at Antenna port As per TIA/EIA/IS – 2000

f. Protection Transmitter shall be protected against infinite VSWR. III. Receiver:

a. Receiver sensitivity (at 1% FER) better than –126dBm

- b. Channel de-sensitization or Single As per TIA/EIA/IS – 2000, tone desensitization
- c. Inter modulation spurious response As per TIA/EIA/IS – 2000
- d. Conducted Spurious Emission As per TIA/EIA/IS – 2000
- e. Receiver Interference performance As per TIA/EIA/IS – 2000 and IS97D

### 2.2.3 Evolution Capability

- The proposed BTS must be able to operate within ONE-SINGLE cabinet in the following modes:

- CDMA2000 1X mode
- CDMA2000 DOrA /DOrB mode
- CDMA2000 1X/DOrA/DOrB hybrid mode
- CDMA / GSM
- CDMA /LTE GSM
- LTE

LTE (For every mode point vendor must mention what to change in hardware board and which board need software upgrade)

- The base stations proposed should adopt broadband platform and digital transceiver technology to provide better performance and smooth evolution to 1xEV-DO RevA/1x EV-DO RevB , GSM , LTE

(For every mode point vendor must mention what to change in hardware board and which board need software upgrade). And also for (CDMA & LTE or GSM) during launch two deferent system network in the same time (The vendor must provide detailed description For every mode point vendor must mention what to change in hardware board and which board need software upgrade.

- BTS transceiver should satisfy the requirements of “C0032 Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Network” to guarantee the smooth evolution to 1xEV-DO RevA/ 1xEV-DO RevB and also for (LTE, GSM) (The vendor must provide detailed description For every mode point vendor must mention what to change in hardware board and which board need software upgrade.

### 2.2.4 Interfaces

- BTS must be connected to BSC through E1/T1/FE interface at the Abis reference point.
- IMA (Inverse Multiplex ATM) shall be supported to guaranty Abis transmission in using multiple E1s when part of E1 is broken.
- MLPPP( Multi-link point to point protocol )shall be supported to guaranty Abis transmission in using multiple E1s when part of E1 is broken
- The proposed BTS system must be capable to support satellite transmission mode. The satellite transmission mode should supports the voice, data, fax, DO services and the performance that the delay of two hops should less than 700ms. In addition, vendors should provide at least six user reports.
  - BTS 1x and EVDO service mut be share the same transmission E1 to connect BTS- BSC through E1/T1/FE interface .

### 2.2.5 Performance

Performance and call fail reasons and hardware log files (in TXT or CSV log files format ) of all BTS must be collected and reported automatically similar to BSC statistics.

Performance of E1 BER and other performance of all BTS must be collected and reported automatically similar to BSC statistics hourly or daily.

## Chapter -3 Important Requirements

### 3.1 Global Evolution Platform

The Network shall be on a global platform that supports evolution through all defined phases of CDMA2000 (1X, 1xEV-DO<sub>r</sub>A, 1xEV-DO<sub>r</sub>B , GSM , LTE ). Also, the Radio Access Network must offer highly scalable, high-capacity product design that supports highspeed 3G data and increased voice capacity.

The Vendor is required to propose shared platforms across CDMA2000 nodes for switching, radio access, IP services and applications results in reduced operations and maintenance expenses due to fewer spares.

### 3.2 Multi-vendor Support

Standard compliant & Multi-vendor Support: System shall be based on CDMA 2000 1x Standard and other standards mentioned in Standards Requirements. IOT test report with current vendor NSS system (Vendor ATCA C9) on A interfaces (A1/A2, A3/A7,A10/A11,A12,A13,A16,A1p/A2p,A5), C/D interfaces shall be provided.

### 3.3 General Function Requirements

#### 3.3.1 Mobility functions.

It must be possible to restrict the services of the subscriber within the sector, within the BTS, within a Group of BTSs, within BSC area and within a group of BSCs/MSCs in a area.

#### 3.3.2 Handoff functions

The action of switching a call in progress i.e. hand-off from one sector to another sector of same or adjacent BTS of same or different BSCs shall be automatic and smooth without the user noticing it. Continuous control of call quality shall be maintained automatically to get the optimum transmission quality. System shall support hard handoff, soft handoff, softer handoff and inter-BSC handoff with Inter-MS-C handoff in future The system support Access Handoff, which can improve the performance of CDMA system and increase connection success ratio

#### 3.3.3 Quick Paging Channel

The system shall support Quick Paging Channel as defined by IS –2000 standards to reduce “Wake –up” time required by mobile/FWT terminals.

#### 3.3.4 Power Control

The system shall support power control between Mobile/FWT Terminal and BTS automatically to get the optimum transmission quality. It shall support the following power control capabilities specified in IS-2000

- Enhanced Reverse Link Open Loop Power Control
- Reverse Link Closed Loop Power Control, Inner Loop and Outer Loop
- Forward Link Open Loop Power Control
- Forward Link Closed Loop Power Control

All modes of forward Power Control as defined in the standards shall be supported.

Reverse Link Power Control step size shall be configurable by the base station and the Precise shall be 0.25dB. Fast access solution should be provided with detailed description.

#### 3.3.5 Radio Resource Management

The system must support the following:

1. Call admission control algorithm that would permit dynamic allocation of system resources between voice and data users. It shall also be possible to pre-set desired thresholds for resource-allocation in terms of resources to be used by voice and data applications.

2. Radio Congestion control algorithm that would monitor the availability of resources and take corrective action when a transition from the normal state to the congested state is detected, to avoid drifting into the overload state.
3. Support anti-interference technologies that assumed to improve the voice quality and increase the system capacity and decrease the power consumption of terminal. Please provide description
- 4- The system(hardware or software) must support applying the maximal power implementation of radio equipment RRU with existing carrier license (even one carrier per RRU unit) without any additional license or conditions.
- 5- the load balance between carriers in the same sector must be controlled by power or by number of subscribers.

### 3.3.6 Deployment Flexibility

Deployment flexibility of Radio Base Stations is an essential factor and should be easily mountable in different environments, including poles, outdoors and indoors.

### 3.3.7 Call Release

Either Party release must be acceptable.

## 3.4 Security

The system shall provide confidentiality, subscriber authentication features and high security. Latest digital encryption technologies to support secure communications for message and voice privacy shall be provided.

## 3.5 Wireless Public Phone

The system shall support Wireless Public Phone.

- Vendor shall provide details about all supported mechanism for complete Wireless Public Phone solution on prepaid basis.
- The system should be capable of displaying real time metering to the subscriber. • Bidder shall propose the type of customer premises equipment required for this purpose.
- Vendor shall describe how an ordinary FWT could be used for Wireless Public Phone purposes.
- Vendor shall describe how real time metering shall be performed for wireless Public Phone service in multi-vendor environment.

## 3.6 Diagnostic/Testing

The equipment shall support diagnostic capabilities (which will run as background tasks) to verify the equipment's proper operation within the network and self-adaptive network parameter adjustment according to the system's running status. Built -in test capabilities shall be provided which will run at specific events or on demand. Health monitoring signals shall be continuously passed between the various modules to ensure the detection of any failure in a module. Individual channel element functionality shall be also be monitored to prevent call blocking due to a lack of channel element resources. Markov call testing shall be supported to verify local coverage and channel element Frame Error Rates (FER)

## 3.7 Quality of Service

The quality of service shall conform to the following quality standards:

- a. Speech Quality - As per 3GPP2 standard C. S0012-0 (TIA/EIA/IS 125 A)  
(Recommended Minimum Performance Standard for Digital Cellular Wideband Spectrum Speech Service Option 1)
- b. Speech Delay - As per ITU-T Rec G.173.
- c. Free from Echo - As per ITU-T G.165.
- d. Voice Band Data Requirements • DTMF Signaling as per  
ITU-T Rec. G.174
- Data as per TIA/EIA/IS-707-A(Data Service Options for Spread Spectrum System)



- Connection Performance as per ITU-T Res. E.770
- Reliability Performance as per ITU-T Rec. E.800

### 3.8 Expansion

Expansion techniques of the system shall be easy, economical and must not interrupt a working system. Expansion shall be required when the number of subscribers (capacity) in the area is increased, the GOS deteriorates or when the geographical coverage is increased.

The equipment shall be modular in construction permitting expansion, without any major hardware changes by simply adding shelves and modules.

### 3.9 Evolution

The 1XEV-DO shall be smoothly upgraded from existing CDMA 2000 1x platforms with the minimum investment possible at all components of the system. Also specify what would be require when upgrading to 1XEV-DO<sub>r</sub>B.

### 3.10 Reliability Requirements

#### 3.10.1 Redundancy

The power supply of main equipments as well as the control equipments shall be provided 1 + 1 hot standby/ N + 1 mode redundancy, in case of all equipment such as BTS, BSC and MSC based Core Network. The equipment Vendor shall indicate any other redundancy provided.

#### 3.10.2 MTBF

VENDOR shall provide the description of Mean Time between Failure (MTBF) analysis report for BTS. The MTBF and MTTR (predicted and observed values) figures shall be at least as the following figures.

- Base Transceiver Station:

MTBF (hours) 100,000

### 3.11 Markings

- The plug-in units -whose removal or insertion (while the equipment is in operation) might endanger the reliability or performance of the equipment -shall have suitable protection and caution marking.
- Each sub-assembly shall be clearly marked to show its functions and circuit reference so that its complete description can be located in the handbook.
- The components shall be marked with their schematic references so that they are identifiable from the component layout diagram in the handbook.
- All controls, switches, indicators etc. shall be clearly marked to show their circuit designations and functions.
- Each terminal block and terminal shall be marked with an identifying code.

### 3.12 Software

- The vendor should have attained CMM /CMMI(Capability Maturity Model) certificate at least the CMM Level-4. (The CMM is a model that evaluates the process maturity of software development. It is an assessment method that was developed by the Software Engineering Institute of Carnegie-Mellon University in 1991 as requested by the U.S. government. The CMM certificate is the world's most recognized standard certificate.)
- Software commands shall be user friendly menu- driven. The software shall be modular in architecture. Complete software for the system operation and maintenance including Operation & Maintenance Centre (OMC) shall be provided. The architecture of the software shall be open so that the growth can be handled in practice without any need of redesign of the software. The software supporting documentation shall be in English.
- The equipment Vendor shall undertake to supply on continuing basis all software updates. These updates shall include new features and services and other maintenance updates. The software up -

gradation shall be possible with minimum interruption to the service. iv. The system hardware/software shall not pose any problem due to changes in date and time caused by events such as changeover of millennium/ century, leap year etc, in the normal functioning of the system. v- In case of BSC mode license or module mode license the system(hardware or software) must use essentially the maximal resource pool for hardware resource capacity of Channel element Boards with any BTS carrier configuration (with any carrier number in the base station) without any restriction or any additional license,fee or conditions.

### 3.13 Documentation

#### 3.13.1 General Requirements

This describes the general requirements to be met by documentation to be provided by the equipment Vendor. Hard & Soft copy of all documents shall be provided in English. The documents shall comprise of: i System description documents ii System operating documents including system repair document.

#### 3.13.2 System Description Documents

The following system description documents shall be supplied along with the system:

- Overall system specification and description of hardware and software.
- Installation manuals, testing procedures and commissioning forms with specified levels. Installation manuals to be provided that contain step-by-step process of installation of system. • Equipment layout drawings
- Schematic drawings of all circuits in the system with timing and level diagrams wherever necessary.
- Spare parts catalog including information on individual component values, tolerances etc. Enabling procurement from alternate sources.
- Detailed description of software describing the principles, functions, interactions with hardware, structure of the program and data.

#### 3.13.3 System Operation Documents

The equipment Vendor shall provide the following system operational documents: - • Operating manual of the system

- Maintenance manual.
- Man-machine language manual.
- Faulty location and trouble shooting instructions including fault dictionary.
- Test procedures with auxiliary test equipments.
- Emergency action procedures and online alarm dictionary.

### 3.14 Quality Standards

The equipment shall be manufactured in accordance with the International Quality Standard ISO-9002 for which the manufacturer shall be duly accredited. Alternatively the product design/manufacture shall conform to the international/national quality standards. A quality manual describing the quality of the system to be followed during bulk manufacturing of the product would be required to be submitted by the manufacturer. The quality plan describing the quality assurance system followed by the manufacturer shall be submitted

## Chapter -4 Operational Requirements

## 4.1 Supervision

Supervision of complete network, including BSC, BTS, MSC and HLR shall be both automatic and YEMEN MOBILE controlled and centralized at OMC/NMC, which supports remote operation. All entire man/machine operation terminals should support MML&GUI interface for YEMEN MOBILE operators.

The hosting of commands must not be less than two months.

## 4.2 Alarm Indications

In case of all major alarms both audio and visual alarm indications shall be provided .In case of minor alarms, visual indications shall be provided and provision of audio alarms is desirable. It shall be possible to define the major and minor alarm conditions and set the threshold by faulty operations to either a pager, a short message service system, an electronic mail or additional alarm windows in the OMC interface. It shall also be possible to extend the alarms at the BTS as well as external alarms to the BSC. Centralized alarm terminal for alarm management should be provided. Both visual and audible alarms to be extendible to external lights (visual) and speakers (audible). In case of alarms, there should be facility to switch of BTS remotely from BSC.

All BTS cards alarms must be transfer in real-time to BSC OMC side all kinds of cards even channel cards Power Solar System alarms mandatory transfer and be shown in OMC system. .

## 4.3 Synchronization

At certain locations, it may be necessary to co-locate a number of BTSs. In such cases, the BTSs shall be synchronized so that all the traffic channels are accessible by all the subscribers served by these BTSs. The CDMA 1X2000 would be synchronized with YEMEN MOBILE network ..

BTS should support GPS/GLONASS dual-satellite system synchronization mode, providing two synchronization solutions (GPS or GPS/GLONASS) as required by the operator. In GPS/GLONASS dual-satellite synchronization, the whole network can operate normally without any adverse effect when GPS or GLONASS system is not available.

BTS should provide other system external synchronization interface, when GPS/GLONASS is not available, it makes the system clock synchronized with external clock.

Vendor should provide detailed description of the system radio synchronization solutions, including all external synchronization interfaces which the system can support. Redundancy of links between BTS-BSC and GPS receiver (along with other fixtures) if required, shall be indicated by the vendor at the time of tendering.

The system should support the man-machine command to check the locked-satellite status for convenience of trouble shooting. The check functionality should include the following:

- 1) Whether the clock signals of a base station are correct.
- 2) Whether the clock module and GPS or GLONASS antenna are well connected.
- 3) Whether the captured GPS or GLONASS satellites are more than 4.

- Internal Clock
- Recovered Clock from any incoming 2048 Kbps signal.

In case of failure of recovered clock, the equipment shall support "Hold Over Mode ", the stability of which shall be equal to or better than  $1 \times 10^{-8}$  for at least 24 hours.

## 4.4 Maintenance Aspects

1. In case of testing traffic load, BTS channel load simulation function must be supported.
2. Maintenance philosophy is to replace faulty units after quick analysis of monitoring and alarm indications. Actual repair will be undertaken at a repair centre.

3. Procedure for repair of equipment giving full details of testing instruments must be provided by the equipment Vendor. Test jigs, fixtures required for maintenance/repair shall also be provided. The Vendor shall ensure the repair of faulty equipment during and after warranty period.
4. The equipment must have easy access for servicing and maintenance.
5. All important switches/controls on front panel shall be provided with suitable safeguards such as interlock system to avoid accidental operation by the maintenance personnel.
6. Extensive facilities for testing, supervision and monitoring functions must be provided for quick isolation and rectification of faults. These functions must be performed by Operations and Maintenance Centre (OMC). Any additional instruments required shall be provided by the equipment Vendor with details. The capabilities such as alarm reporting, automatic operation test and on-hook test of subscriber line is desirable. The number of subscribers which can be tested simultaneously may be indicated.
7. There must be facility in the BTS for send the alarm to BSC in case of high VSWR.

#### 4.5 Dimensions

Macro outdoor Maximum height of BTS rack shall be restricted to 1800-2000mm. range of dimension Dimensions/Weight – Actual Dimension and weight of each of the equipment shall be Indicated by the equipment Vendor.

Micro outdoor Maximum height of BTS rack shall be restricted to 600-700mm. range of dimension Dimensions/Weight – Actual Dimension and weight of each of the equipment shall be Indicated by the equipment Vendor.

#### 4.6 Power Supply

The power supply unit shall form an integral part of the equipment and must have protection against output over voltage, short circuit, input reverse polarity protection & must have visual indication for output under voltage.

Outdoor BTS Input supply (110V and 220V) +/- 20%; Nominal 240 V AC 50/60 Hz And support working in DC voltage only.

#### 4.7 Power Consumption

The equipment shall have low power consumption. Equipment Vendor shall specify the power requirement of the BTS for various configurations e.g. 1 Cell 3 Sector (1C 3S), 2C 3S, 3C 3S, 4C 3S, in order to engineer suitable and optimum power infra- structure. The power system.

#### 4.8 Cooling Arrangement

The equipment must have necessary self-cooling arrangement with or without in -built fan. The equipment Vendor shall specify the recommended life of the fan when used.

#### 4.9 Antenna Type/Model

Model XPol Panel 790–960 85' 16.5dBi 0–10T\ 80010300V02

#### 4.10 Feeder Cable

Type of feeder cable will be is low lose foam 7/8" copper dielectric 800 MHZ and the length of the cable which determine by the Yemen Mobile . Detailed specifications (technical as well as mechanical) shall be furnished by equipment Vendor.

A 7/8" Feeder cable is used for base station, which includes wireless mobile communication, cellular, microwave and broadcast applications.

The Vendor should introduce ISO 9001 & ISO 14001 Quality Certifications from manufacturer of feeders.

#### 4.10 Outdoor Equipment

All outdoor equipment must be housed in robust, compact lightweight weatherproof cabinets suitable for mounting on telephone pole/tower/wall. Suitable lightning protection must be provided at the antenna ports. The cabinets shall have a locking facility with a single master key for opening it.

#### 4.11 Lightning Protection

The equipment including Antenna & feeder shall have adequate protection against lightning & power surges. All equipment except for Handheld subscriber terminal shall have provision for grounding.

#### 4.12 Environmental Specifications

(a) Base Transceiver Station: 1. Outdoor macro

Cell Temperature:

-40°C ~ 55°C

Relative humidity

5% ~ 100%

2. Micro Cell (indoor/outdoor): Temperature:

-40°C ~ 55°C

Relative humidity

5% ~ 100%

#### 4.13 Interference to Existing Wireless Networks

The system must not cause any interference to the existing wireless networks (GSM, CDMA or any other wireless system)

**CHAPTER-5**  
**INSPECTION, TEST, INSTALLATION**  
**&**  
**COMMISSIONING**

## 5.1. TESTS AND MEASUREMENTS

### 5.1.1 TEST CATEGORIES

i) The following tests shall be conducted for acceptance of the equipment and the system before final acceptance of the system. The test procedure must be discussed between the vendor and YEMENMOBILE during installation and testing. A1 ,A2 , A3 , A4 & A5

Pre-Factory Acceptance Testing  
Factory Acceptance Testing (FAT)

Pre-commissioning test (after installation) for total integrated system. Site Acceptance Testing (SAT) Trial Run

ii) These tests shall be carried out on all equipment supplied by Vendor including those supplied by sub-vendors, if any.

iii) Vendor shall arrange all necessary test instruments, manpower, test-gear, accessories etc.

iv) All technical personnel assigned by Vendor shall be fully conversant with the system specifications and requirements. They shall have the specific capability to make the system operative quickly and efficiently and shall not interfere or be interfered by other concurrent testing, construction and commissioning activities in progress. They shall also have the capability to incorporate any different from the specifications or reasonable minor modifications/suggestions put forward by Purchaser/Engineer.

v) The Vendor shall arrange Necessary temporary commissioning facility including communication system required for installation/testing/commissioning of the telecommunication equipment.

vi) Test Plan: The Vendor shall discuss with Yemenmobile 'Test Plans' well in advance of commencement of actual testing in each of the above mentioned test categories. The plans shall include:

0) **System/Equipment functional and performance description (in short) and Tests to be conducted and purpose of test.**

1) **Test procedures (including time schedule for the tests) and identification of test inputs details and desired test results**

2) **Test Report:**

The observations and test results obtained during various tests conducted shall be compiled and documented to produce Test Reports by Vendor. The Test Reports must be given for each

i) Test results

ii) Comparison of test results and anticipated (as per specifications) test result as given in test plans and reasons for deviations, if any.

iii) The data furnished shall prove convincingly that a. The system meets the Guaranteed Performance objectives  
Mechanical and Electrical limits were not exceeded.



Failure profile of the equipment during the tests are well within the specified limits

v) The observations and test results obtained during various tests conducted

shall be compiled and documented to produce Test Reports by Vendor. The Test Reports must be given for each equipment/item and system as a whole. The report shall contain the following information to a minimum:

vi) Failure of Components:

Till the system is accepted by the Purchaser, a log of each and every failure of components shall be maintained. It shall give the date and time of failure, description of failed component, circuit, module, component designation, effect of failure of component on the system/equipment, cause of failure, date and time of repair, mean time to repair etc. Repair/modification done at any point of time at one site, shall be carried out by Vendor at all the

sites. Detailed documentation for the same shall be submitted to Purchaser for future reference.

If the malfunction and/or failures of a unit/module/sub-system/equipment repeat during the test, the test shall be terminated and Vendor shall replace the necessary component or module to correct the deficiency. Thereafter, the tests shall commence all over again from the start.

If after the replacement the equipment still fails to meet the specification, Vendor shall replace the equipment with a new one and tests shall begin all over again. If a unit/ subsystem/module has failed during the test, the test shall be suspended and restarted all over again only after the Vendor has placed the Equipment back into acceptable operation. Purchaser's approval shall be obtained for any allowable logical time required to replace the failed component/unit/module/sub-system.

vii) Readjustments

No adjustments shall be made to any equipment during the acceptance tests. If satisfactory test results cannot be obtained unless readjustments are made, Vendor shall carry out only those readjustment needed to ready the equipment/system for continuance of tests. A log of all such adjustments shall be kept giving date and time, equipment, module, circuit, adjustments, reasons, test result before and after adjustment etc. Fresh acceptance tests shall be conducted after the readjustments have been completed.

### **3 Pre Factory Acceptance Testing**

The Vendor on his own exactly in line with FAT shall conduct prefactory acceptance testing and test reports for the same shall be forwarded to Purchaser/Engineer before start of FAT.

### **4 Factory Acceptance Testing (FAT)**

Factory acceptance tests shall be carried out after review and approval of FAT procedure/documents as per bid requirements and review of Pre- Factory acceptance results & shall be conducted at the manufacturing facilities from where the respective equipment/subsystems are offered. The factory acceptance testing shall be conducted in the presence of the Purchaser/Engineer. The tests shall be carried out on all equipment/items including those supplied by Sub-vendoRS and factory acceptance certificates shall be issued. The factory tests shall include but not be limited to:

**A) Equipment Testing :**

- i) Mechanical checks to the equipment for dimensions, inner and outer supports, finishing, welds, hinges, terminal boards, connectors, cables, painting etc.
- ii) Electrical checks including internal wiring, external connections to other equipment etc.
- iii) Check for assuring compliance with standards mentioned in the specifications.
- vii) Individual check on each/module/sub-assembly in accordance with the modes and diagnostics programs of the Vendor.
- viii) Checks on power consumption and heat dissipation characteristics of various equipment
- vi) Environment testing and other laid down tests in Type Tests plan of the specification of the equipment.

Functional testing.

Any other test not included in FAT document but relevant to the project as desired by the Purchaser/Engineer at the time of factory acceptance testing.

**B) System Integration Testing**

Functional and performance test should be conducted for the complete system concerning and connecting the NLD equipment and all major equipment constituting the system (including the equipment supplied by sub-VENDORS, as applicable) simulating the complete network.

The system shall include the total Network Management System. All the functions of NMS shall be demonstrated in totality (as per requirements/specifications of this document).

All equipment shall be connected using the same cables (interfaces/components) as will be used during final installation so that the system can be tested in its final configuration. This testing shall be conducted at the manufacturing facility of the BSS OEM.

**5 Installation**

After successful completion of factory acceptance testing, equipment shall be sent to site for installation. Equipment without factory acceptance certificates shall not be acceptable at site.

Prior to installation, all equipment shall be checked for completeness as per the specifications of equipment required for a particular station. Installation shall be carried out in accordance with the installation manuals and approved installation drawings in the best workmanship. Vendor shall bring all installation tools, accessories, special tools, test gears, spares parts etc. at his own cost as required for the successful completion of the job. If during installation and commissioning any repairs are undertaken, the maintenance spares supplied with equipment shall not be used for the repair. Vendor shall arrange his own spare parts for such activities till such time the system has been finally accepted by the Purchaser. A detailed report & log of all such repairs shall be made available by the Vendor to Purchaser/Engineer and shall include cause of faults and repair details, within 2 weeks of fault occurrence. A detailed time schedule for these activities shall be submitted by Vendor to

Purchaser/Engineer to enable their representatives to be associated with the job.

Vendor shall supply all installation materials required for proper installation of the equipment. These shall include but not be limited to, all connectors, interbay and inter equipment cables, power supply cables and connectors, power distribution boxes, anchoring bolts, nuts, screws, washers, audio distribution frames, voice frequency cables, junction boxes etc. The installation of equipment shall be done as to present neat and clean appearance in accordance with approved installation document drawings. All inter bay, power supply and other cables shall be routed through wall mounted cable trays. No cable shall be visible. All through wall openings, trenches etc. shall be properly sealed to prevent the entry of rodents, insects and foreign materials.

**6 Pre-Commissioning & Network Integration**

On completion of installation of equipment, the correctness and completeness of the installation as per Manufacturer’s manual and approved installation documents shall be checked by the Vendor on his own.

A list of Pre-Commissioning tests (same as approved by the Purchaser/Engineer for site acceptance testing) and activities shall be prepared by Vendor and the test shall be carried out by the Vendor on his own. After the tests have been conducted to the Vendor’s own satisfaction, the Vendor shall provide the test results for review by Purchaser/Engineer and then offer the system for Site Acceptance Testing.

During pre-commissioning , if any fault occurs to any equipment or system, Vendor shall identify the same and provide report/history of all faults to the Purchaser.

During installation and pre-commissioning of the telecom system, Vendor shall have enough number of commissioning spares so that the installation is not held up because of non-availability of commissioning spares. Vendor shall ensure that the spares meant for operation and maintenance are not used during installation , commissioning and Network integration.

**7 Site Acceptance Testing (SAT) (Provisional Acceptance Test)**

Site acceptance test items and procedure must be decided between vendor and Yemen mobile engineers before the BTS going to incommmercial, through the following items:-

**BSC Radio Resource Management Function**

Test Category	Test Item	Test Sub-item
Operations	1 Local Terminal System	1 Local User Login
		2 Domain User Login
		3 Site Management
	2 System Management	1 Command Group Management
		2 User Management
		3 Workstation Management

		4 Command Log Management
		5 Scheduled Task Management
		6 Database Management
3 Alarm Management		1 Alarm Query
4 Performance Management		1 Traffic Measurement Through OMC Management system
5 Dynamic Configuration		1 Dynamic Modification of SID and NID
		2 Dynamic Sector Addition/DeletionObjective Verify that the cBSC66 product supports dynamically adding or deleting a sector.
		3 Dynamic Board Addition/Deletion
		4 BTS Configuration
6 BTS Networking		1 Information Management for a BTS
7 BTS Configuration Management		1 BTS Software Loading
		2 BTS Parameter Configuration
8 BTS Maintenance and Management		1 Equipment Management
		2 Test Management
		3 BTS Tracing
7 Link Troubleshooting		1 BSC-BTS Link Troubleshooting
8 System Test Function		1 Subscriber Interface Tracing Test
		2 System Status Monitoring
Configuration of IP Transmission	1 Configuration of IP-Based Abis Interface	1 Configuration of IP-Based Abis Interface Links in the E1-PPP Mode
		3 Configuration of IP-Based Abis Interface Links in the E1-MLPPP Mode
SomeCDMA Key	FPC_MODE	FPC_MODE

Algorithm	Proportional Allocation Between Voice and Data Services	Proportional Allocation Between Voice and Data Services Based on Walsh Codes
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### Services Functions and Radio System Evolution (Radio Work) Items :-

#### RNP&OATP Items

This list defines RNP&OATP items suggestions for 1x & EVDO.

The procedures of test we will provide later.

The criteria depend on agreement between the YM and vendors

#### 1X ATP items

##### Coverage KPI DT Acceptance Test (Network\Cluster Level)

- Voice quality / FER in case of voice calls (FER) and Call Drop Rate Test
- Pilot Scan Test Voice Coverage Testing
- Pilot Pollution Rate Acceptance Test
- Origination Failure Rate Test
- Termination Failure Rate Test
- Pilot Scan Test Voice Coverage Testing
- Cells Coverage Area rang Test

#### 1X DATA DT KPI

- EC/IO max for supplemental channel
- Average user throughput
- Convergence of FCH and SCH FERs

#### Functionality 1X DT Testing (Cell Level)

- Mobile Originated Call Setup (MS in Idle State)
- Mobile Terminated Call Setup (MS in Idle State)
- Handoffs During a Voice Call
- Voice Call in FCH Softer Handoff
- Voice Call in FCH Soft Handoff (Intra-BSC / Inter-BSC)

- Voice Call in FCH Hard Handoff (intra BSC, inter BSC\Intra MSC\inter MSC)
- Single Cell Coverage rang Test
- Test Voice Originations in a Data Loaded Cell
- Data Coverage Testing
- Data Call in FCH Softer Handoff
- Data Call in FCH Soft Handoff (Intra-BSC / Inter-BSC)
- Data Call in FCH Hard Handoff

#### EVDO ATP items

##### Connection Setup

- PPP Session Setup Time
- Mobile IP Registration
- AT Initiated Connection Setup Time Handoffs
- DRC Re-pointing, Softer Handoff DRC re-pointing, Soft-Handoff (Default FTCMAC)
- DSC Switch / DRC Re-pointing, Soft Handoff (Enhanced FTCMAC)
- 1xEV-DO Revision A to Release 0 Personality Switch
- EVDO Rel 0 to Revision A personality switch

##### Radio Access Network

- Single User Packets
- Multi-User Packets
- Multi-User Packet NAKs
- Null-rate DRC mapping to DRC=1
- RAN Latency Test Release 0 (Physical Layer Subtype 0)

##### Reverse Link Test

- Steps to fix the reverse link packet size transmitted by the AT
- Reverse Link Packet Error Rate
- Reverse link data performance in softer handoff with full buffer traffic
- Reverse link data performance in soft handoff with full buffer traffic

Release 0 and Revision A Mixed AT's

- 1xEV-DO AN Initiated Connection Setup..
- Voice Call Origination and Termination in Idle State
- Voice Call Origination and Termination in Dormant State
- Voice Call Origination and Termination in Connected State

System Coverage Tests

- SINR Distribution Test
- Receive and Transmit Power Distribution Test
- DRC Distribution Test
- Packet Error Rate Distribution Test
- Active Set Size Distribution Test
- AT Initiated Connection Setup Success Rate Test
- Connection Drop Distribution Test
- Packet Error Rate (Reverse Link)
- Imbalance Scenarios

Hybrid Mode – 1xEV-DO and 1x/IS-95

- Voice Call Origination and Termination in Idle State
- Voice Call Origination and Termination in Dormant State
- Voice Call Origination and Termination in Active Data Session
- SMS Origination and Termination in Idle State
- SMS Origination and Termination in Dormant State
- SMS Origination and Termination in Active Data Session
- cdma2000 to HRPD Dormant Data Session Handoff - Existing HRPD Session
- cdma2000 to HRPD Dormant Data Session Handoff - New HRPD Session
- HRPD to cdma2000 Dormant Packet Data Session Handoff
- Access Network support for Hybrid Mode Terminals

Network Management Systems

- Connection failures reporting/management
- Probe number reporting/management
- Configuration Management
- Performance Management
- Fault Management
- Overload Detection & Control
- Stability in Overload
- Session Keep Alive

#### **Radio Equipment Test(BTS & Radio Test )**

All minimum standard values depend on 3GPP standard)

Note: Please see 3GPP2 C.S0010-C v2.0 ( Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations)

Test Items

1. FREQUENCY COVERAGE
- 2 . FREQUENCY TOLERANCE
- 3 . PILOT TIME TOLERANCE
- 4 . PILOT CHANNEL TO CODE CHANNEL TIME TOLERANCE
5. PILOT CHANNEL TO CODE CHANNEL PHASE TOLERANCE
6. WAVEFORM QUALIT
7. TOTAL POWER
8. PILOT POWER
9. CODE DOMAIN POWER
10. CONDUCTED SPURIOUS EMISSIONS
11. OCCUPIED BANDWIDTH
12. RX GAIN BUDGET ( receiver sensitivity test for many values )
13. TX GAIN BUDGET (Transmitter Gain test for many values )



## 8 OPTIMIZATION

The vendor will participate with YEMEN MOBILE engineer for all the following optimization works:

### 8.1 Network Benchmarking

Conduct tests timely after the project implementation is complete.

Compare and analyze the test results.

### 8.2 System Parameter Audit

Audit and check all system parameters, including cell parameters and network

### 8.3 Network Drive Test, Analysis, and Tuning

Test services and performance the network, tune the RF parameters of sites according to the test result, to get the network reach the launch requirement.

### 8.4 Optimization of Traffic Statistics KPI

Monitor and analyze the traffic statistics data to find TOPN problems in the network. Analyze and solve the TOPN problems. Check the network quality is promoted.

### 8.5 Coverage Performance Optimization

Conduct drive tests to test the coverage and services, and make relevant adjustment to have the coverage and services reach targets.

### 8.6 Care for VIP and Hotspot Areas

Monitor the network quality at VIP areas by taking the following actions: analyzing the RF complaints from VIP customers, monitoring the network quality of CBD areas by means of drive tests, dialing tests.

### 8.7 Radio Network KPI Monitoring

Monitor and analyze the network at the implementing and ending stages of the RNO to guarantee the required KPI of the network.

### 8.8 RF Trouble Shooting

Analyze and solve the RF problems that are detected in network monitoring process to improve the network performance and promote satisfaction of end users.

### 8.9 Benchmark Drive Test

Conduct benchmark drive tests on the coverage performance.

## 9 SPARES

### 9.1 MANDATORY SPARES

20 % mandatory spares (for operation and maintenance) must be provided for all electronic Boards , sub-system, equipment, etc.

Spares must be provided from the same manufacturing facilities/location from where the respective equipment, subsystems are offered. Unit rates for each spares required for operation and maintenance shall be provided.

Vendor must provide the address, contact person, fax, telephone no. of the manufacturer of the spare parts. The Vendor must warrant that spare part for the system would be available for minimum of 10 years after system commissioning (taking over). After this period if the Vendor discontinues the production of the spare parts, then he must give at least 6 months notice prior to such discontinuation so that Purchaser may order the requirements of spares in one lot.

The list of the required spares being supplied with unit cost and total cost should be attached along with the bid.

### 9.2 Commissioning spares

The commissioning spare must be decided between the Vendor to bring the requirement during installation, commissioning, site acceptance testing, trial run and warrantee period. These spares shall be readily available with the Vendor. These commissioning spares are different from mandatory spares and Vendor must not use mandatory spares as commissioning spares.

**CHAPTER-6**  
**TRAINING AND DESIGN GUIDELINES**

## **1. TRAINING**

Vendor must train 13 Engineers Trainees of engineer in all aspects of Telecommunication system.

There must be at least three training course;

- 1- The first course must be conducted for BSS system, This course for 5 BSS engineers.
- 2- The second course must be conducted for YEMEN MOBILE Network Engineering, This course for 5 RF engineers.
- 3- The third course must be conducted for YEMEN MOBILE POWER System This course for 3 Power engineers.

Vendor's offer excludes costs of transportation, lodging and boarding of the trainees which shall be arranged by the Purchaser. Vendors offer is on man-week basis.

Vendor shall specify in his offer the types of courses he intends to impart, including but not limited to, the ones aforementioned.

Vendor shall provide comprehensive documentation, course material, manuals, literature etc. as required for proper training of personnel at his own cost. Consolidated and comprehensive documentation shall be available to each participant. After the completion of course, all such materials shall become the property of the PURCHASER. Vendor shall update the course material of manuals in case there are any changes owing to revision/modifications in equipment/system specifications.

**CHAPTER-7**  
**MISCELLANEOUS ITEMS**

### **7.1 ACCESSORIES/ OTHER ASSOCIATED ITEMS**

The Vendor shall be responsible for

1. Procurement, supply and installation of equipment racks, all patch cords, DDF and all other items not indicated here but required for completion of the system.
2. Supply and installation of necessary equipment, cables and accessories to meet the system requirements .
3. Carrying out factory acceptance tests of the BTS equipment as per the approved specifications and procedures at the respective manufacturers works in the presence of Purchaser/Engineer's representatives.
4. Training of Purchaser/Engineer's personnel at manufacturer's works for each individual system and at site.
5. Provide suitable power distribution box and complete wiring from the distribution box to the respective telecom equipment at each telecom station as per specifications.

## Annex 1

### The Key Items for Evaluation of MACRO OUTDOOR BTS&MICRO OUTDOOR BTS

S	Item	Compliance	Remarks
1	BTS		
1.1	All Project Components and items in tables (1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.2.6) (should be approved in the tender quotation)		
1.2	The capacity of MACRO OUTDOOR BTS is at least 24 TRX in One Single Cabinet & The capacity of MICRO OUTDOOR BTS is at least 12 TRX in one single cabinet. Multi carrier added by s/w commands and assigned any amount of power by commands per carrier.		
1.3	The proposed BTS system should offer a Power efficiency with not less than 40%		
1.4	The proposed BTS must support remote login from one BTS to another BTS or from BSC and OMC terminal		
1.5	The proposed BTS must basically monitor inverse spectrum scanning which can quickly check the interference condition in the network		
1.6	The Abis interface of the proposed BTS must essentially implement the function of transmission sharing of 1X carrier traffic and EVDO carriers traffic together in the same E1's/FE (1 E1 or more E1's) interface in unified unit. QoS must be supported to assure the quality of 1X voice service.		
1.7	The Abis interface of the proposed BTS must have the function of automatic adapting Bandwidth management, fault detection and recovery		
1.8	Performance and call fail reasons according IMSI and ESN and .... (in TXT or CSV log files format) of all BTS must be collected and reported automatically similar to BSC statistics daily or hourly.		
1.9	The proposed BTS must be able to operate within ONE SINGLE cabinet in the following modes: CDMA2000 1X mode CDMA2000 DOrA /DOrB mode CDMA2000 1X/DOrA/DOrB hybrid mode CDMA / GSM CDMA /LTE GSM LTE For each point what to change in hardware board and which board need software upgrade		
1.10	VSWR alarms, RSSI measurements, transmitting power must be Supported local & remote.		
1.11	The proposed outdoor BTS power supply could be 48VDC/110VAC/220VAC/ solar system.		

1.12	In case of BTS mode license or BSC module mode license:- the system(hardware and software) must essentially use the maximal hardware resource capacity of CE Boards. All BTS CE boards work as unique resource pool (from one channel board and adding more cards to the pool only after resource congestion not for necessity of adding new carrier configuration at all) with any BTS carrier configuration (with any carrier number in the base station for ex. S999) without any restriction or any additional license,fee or conditions.		
1.13	The system(hardware or software) must essentially applying the maximal power implementation of radio equipment RF with existing carrier license (even one carrier per RF unit for ex. 100W/one sector/carrier) without any additional license , fee or conditions		
1.14	E1 Performance daily and hourly and E1 BER bit error rate and other performance of all BTS must be collected and reported automatically similar to BSC statistics hourly or daily.		
1.15	BTS 1x and EVDO services must be essentially share the same transmission E1 to connect BTS- BSC through E1/T1/FE interface .		
1.15	All BTS Boards essentially must transfer in real time the alarm when any RF cards (for ex. High power amplifier cards) or CSM chip or Channel element damaged or their temperature becomes more than set threshold in OMC side or their performance have decreased than normal state to OMC client without any restriction or any additional license,fee or conditions.		
1.16	Antenna model XPol Panel 790-960 85° 16.5dBi 0° -10° T\ 80010300V02 Type of feeder cable will be is low lose foam 7/8" copper dielectric 800 MHZ and the length of the cable which determine by the Yemen Mobile . The Vendor should introduce ISO 9001 & ISO 14001 Quality Certifications from manufacturer of feeders.		
1.17	RF cards temperature control Available		
1.18	Expansion through adding extra carriers on the existing multi-carrier module and using the existing Power Amplifier must not cause power output decreasing for the existing carriers, and the coverage shall not decrease. The RF Module must be has two RF sample port, one port for transmitter measurement & one port for receiver measurement. For MACRO OUTDOOR BTS one RF Module must be support 100W output at least For MICRO OUTDOOR BTS one RF Module must be support 80W output at least. MACRO OUTDOOR BTS & MICRO OUTDOOR BTS must be support the total output power test.		
	power measurement for RF Module by using PC measure and power meter measure for single or multi carrier . MACRO OUTDOOR BTS & MICRO OUTDOOR BTS must be support 1XRTT. If Multiple Frequency Bands must be supported in one BTS.		
1.19	the load balance between carriers in the same sector must be controlled by power or by number of subscribers.		
1.20	The proposed outdoor MACRO BTS & MICRO OUTDOOR BTS When the temperature reach to the threshold, there is a temperature alarm and (RF unit ) stop work automatically. The proposed MACRO OUTDOOR BTS & MICRO OUTDOOR BTS must be ) supports (ATM over E1/T1) and supports (IP over E1/T1) and (FE) for Abis interface.		