

CONTRACT DATA

A contract between
SENTECH, Sender Technology Park, Radiokop, Octave Road, Honeydew,
and

APPOINTMENT OF A SERVICE PROVIDER to supply, deliver, and commission system upgrade using DVB SIS (Single Illumination System) on the SENTECH Digital Terrestrial Television (DTT) network with Multiple Operators and Regions and Direct-to-home (DTH) linking networks for a period of three (3) years.

Bid Number: SENT-026-2024-25

Contents

Part C1: Agreements and contract data

Form of Offer and Acceptance

Contract Data provided by the Sentech

Contract Data provided by the Supplier

Part C2: Pricing Data

Part C3: Scope of Work

Conditions of Contract (available separately)

PART C1: AGREEMENTS AND CONTRACT DATA –

Form of Offer and Acceptance Offer

Sentech, identified in the acceptance signature block, has solicited offers to enter into a contract for the appointment of a preferred OEM or a service provider on a Supply contract agreement to supply, deliver, and commission system upgrade using DVB SIS (Single Illumination System) on the SENTECH Digital Terrestrial Television (DTT) network with Multiple Operators and Regions and Direct-to-home (DTH) linking networks for a period of three (3) years.

The Bidder, identified in the offer signature block, has examined the documents listed in the Tender Data and addenda thereto as listed in the Bid schedules, and by submitting this offer has accepted the conditions of the Bid.

By the representative of the Bidder, deemed to be duly authorized, signing this part of this form of offer and acceptance, the Bidder offers to perform all of the obligations and liabilities of the Bidder under the Contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the Contract Data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF APPLICABLE TAXES; (in the Bids applicable currency).

_____ (amount in words);

_____ (amount in figures)

NB: The Prices quoted above is the total Bid offer inclusive of all applicable taxes for the Contract duration. The price must be carried over from the price breakdown / schedule of rates provided in the Bid document.

This offer may be accepted by Sentech by signing the acceptance part of this form of offer and acceptance and returning one copy of this document to the Bidder before the end of the period of validity stated in the Tender Data, whereupon the Bidder becomes the party named as the Bidder in the conditions of contract identified in the Contract Data.

Bidder's Signature(s) _____

Signed by the Bidder at _____ **on this the** _____ **day of** _____ **20** _____

Name(s) _____

Capacity _____

Address (*Domicillium*)

Acceptance

By signing this part of this form of offer and acceptance, Sentech accepts the Bidder's offer. In consideration thereof, Sentech shall pay the Bidder the amount due in accordance with the conditions of contract identified in the Contract Data. Acceptance of the Bidder's offer by the signature by Sentech shall form an agreement between Sentech and the Bidder upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1 Agreements and contract data, (which includes this agreement)

Part C2 Pricing data

Part C3 Scope of work.

and drawings and documents or parts thereof, which may be incorporated by reference into Parts C1 to C3 above.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto as listed in the Bid schedules as well as any changes to the terms of the offer agreed by the Bidder and the employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this agreement. No amendments to or deviations from the said documents are valid unless contained in this schedule of deviations.

Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Sentech's Signature(s) _____

Signed by Sentech at _____ **on this the** _____ **day of** _____ **20** _____

Name(s) _____

Designation _____

SENTECH SOC LIMITED,
Sender Technology Park
Octave Road, Radiokop
Honeydew
Johannesburg

Date _____

Upon acceptance by Sentech of the Bidder's offer, a contract will come into existence.

SCHEDULE OF DEVIATIONS

Notes:

- 1 The extent of deviations from the Bid documents issued by the Sentech before the Bid closing date is limited to those permitted in terms of the conditions of Bid.
- 2 A Bidder's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid, become the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
- 3 Any other matter arises from the process of offer and acceptance either as a confirmation, clarification or change to the Bid documents and which it is agreed by the Parties becomes an obligation of the contract shall also be recorded here.
- 4 Any change or addition to the Bid documents arising from the above agreements and recorded here shall also be incorporated into the Contract.

1. **Subject** _____

Details _____

2. **Subject** _____

Details _____

3. **Subject** _____

Details _____

4. **Subject** _____

Details _____

By the duly authorised representatives signing this schedule of deviations, Sentech and the Bidder agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the Tender Data and addenda thereto as listed in the Bid schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the Bidder and Sentech during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the Bid documents and the receipt by the Bidder of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

Contract Data

Part one - Data provided by Sentech given in all contracts

1. The *Purchaser* is

SENTECH SOC LIMITED,

Sender Technology Park

Octave Road

Radiokop

Honeydew

Johannesburg

2. General

The National Treasury General Conditions of Contract for goods and services (NT GCC, 2010) or General Conditions of Contract for Works (2015) as issued by National Treasury and the Construction Industry Development Board of the Republic of South Africa apply, respectively.

The goods are specified in the Scope of Work. The Special Conditions of Contract (SCC) are stipulated in the Tender Data.

3. Goods information:

The *Goods Information* is in the document called "Scope of Work" and in the documents and drawings referred to by it.

4. Terms of Delivery

The *Terms of Delivery* are contained in the General Conditions of Contract (GCC) and Special Conditions of Contract.

5. Language

The *language* of this contract is English.

6. Governing Laws and Jurisdiction

The Contract shall be governed by and interpreted according to the laws of the Republic of South Africa.

In the event of a conflict between or inconsistency in the laws applicable in the various provinces of the Republic of South Africa, the law as applied and interpreted in the Gauteng Province shall prevail.

The parties irrevocably submit to the exclusive jurisdiction of the South Gauteng High Court, Johannesburg in respect of any action or proceeding arising from this Bid.

This Bid and all contracts emanating there from will be subject to the General Conditions of Contract issued in accordance with Treasury Regulation 16A published in terms of the Public Finance Management Act, 1999 (Act 1 of 1999). The Special Conditions of Contract are supplementary to that of the General Conditions of Contract. Where, however, the SCC are in conflict with the GCC, the SCC shall prevail.

7. Sub-contracting post award

A Bidder awarded a Bid may only enter into a subcontracting arrangement with the approval of Sentech. The successful bidder may not subcontract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level of contributor than the Bidder concerned, unless the contract is subcontracted to an EME that has the capability and ability to execute the subcontract.

8. Transformation Plan

A transformation plan is a record of activities an entity intends to undertake to improve its BBBEE Level through Ownership, Management and Control; Skills Development; Enterprise and Supplier Development and Socio-Economic Development.

Sentech reserves the right to request a BBBEE transformation plan with clearly defined timelines and milestones if the recommended bidder does not meet Sentech's transformation goals. These milestones must be achieved over the term of the contract. This transformation plan shall be submitted within 10 working days from the written request, failing which Sentech reserves the right to withdraw its appointment of the preferred recommended Bidder.

9. Warranty

The warranty period is 12 months after Delivery.

10. Payment

The method and conditions of payment are contained in the Tender Data, GCC and SCC.

The interest on late payment is 0 % per complete week of delay.

11. Rate of Exchange, Currency Fluctuations and Currency

All bid prices quoted shall be in South African Rands (ZAR). If prices are in a foreign currency, the rate of exchange quoted shall remain fixed throughout the term of the agreement. Bidders will bear the risk of and all cost/s associated with currency fluctuations, therefore Bidders shall be required to manage such risk in their bid price.

12. General - Prices

All prices shall be quoted in ZAR.

Unless written approval has been obtained from Sentech, no adjustment in contract prices will be made. Applications for price adjustment must be accompanied by documentary evidence in support of any adjustment.

13. Price Negotiations

Sentech reserves the right to negotiate market related prices and discounts. If market-related prices are not agreed to, Sentech reserves the right to cancel the Bid.

14. Liabilities indemnities and insurance

Insurance is required from the Bidder in respect of delivery and transportation where applicable.

15. Disputes

Should any dispute, disagreement or claim arise between the parties ("the dispute") concerning this Agreement, the parties shall try to resolve the dispute by negotiation. This entails one party inviting the other party to meet and attempt to resolve the dispute within fourteen (14) days from the date of the written invitation.

If the dispute has not been resolved by such negotiation as referred to in this clause above, the Parties shall submit the dispute to the Arbitration Foundation of Southern Africa ("AFSA") for administered mediation, upon the terms set out by the AFSA secretariat.

Failing such resolution, the dispute shall be resolved by arbitration in accordance with the rules and procedures of AFSA by an arbitrator appointed by AFSA. Where the arbitration route is followed, the dispute must be adjudicated within Johannesburg in the English language and finally resolved in accordance with the rules of AFSA, by an arbitrator or arbitrators appointed by that Foundation.

The provisions of this clause shall not preclude any party from obtaining relief from a Court of competent jurisdiction. To this extent, the Parties hereby consent to the jurisdiction of the South Gauteng High Court, Johannesburg, South Africa. The provisions of this clause shall continue to be binding on the Parties, notwithstanding any termination or cancellation of this Agreement.

16. Termination

Sentech shall have the right, at its sole and exclusive discretion, upon written notice to the Bidder, to terminate this Agreement, in whole or in part should the Bidder fail to perform any of its obligations or deliver any deliverable timeously or should Sentech not be satisfied with the quality of any service/s in terms of this Agreement, to the satisfaction of Sentech.

Sentech shall furthermore have the right, as a result of such termination, to appoint a third party to perform the obligations of the Bidder in terms of the Agreement and the Bidder indemnifies Sentech against all costs incurred by Sentech in appointing such third party to fulfil the obligations of the Bidder.

Sentech shall have the right, at its sole and exclusive discretion, to terminate this Agreement, at any time, upon 30 (thirty) days' written notice to the Bidder.

17. Contract Term

This contract will run for a period of **36** months.

18. Supplier Due Diligence

Sentech reserves the right to conduct supplier due diligence at any time pre, during and post the contract period. This may include announced or unannounced site visits.

19. Cession

Sentech shall be entitled to cede, delegate, assign, charge, transfer or otherwise dispose of this Agreement or any rights or obligations therein in whole or in part, upon prior written notice to the Bidder.

20. Monitoring and Evaluation

The service delivery and performance of the Bidder will be monitored and evaluated by Sentech at all relevant times. In the event that the Bidder defaults in any manner or form, Sentech reserves the right to blacklist the Bidder on the National Treasury Database of Prohibited Suppliers and Tender Defaulters, and to take such further steps as may be warranted in the circumstances which steps shall be determined at Sentech's sole and exclusive discretion.

21. Protection of Personal Information Act No. 4 of 2013 ("POPI")

Sentech is POPI compliant and the Bidder will ensure that it conducts itself within the prescripts of the prescribed legislation.

Should Sentech need to collect Personal Information by law or in consideration of the Tender, and the Bidder fail to provide the Personal Information when requested, Sentech may refuse to accept the relevant services from the Bidder, and the Bidder will be notified in this event.

By agreeing to the terms of this Agreement, the Bidder voluntarily authorizes Sentech to process its' personal information (including its' name, credit card & banking details, physical address, telephone numbers, reference letters & any other information it has provided to Sentech) for purposes of Tendering and contracting.

The Bidder consents to the transfer of such personal information to third parties.

This consent is effective immediately and will endure until the relationship between the Bidder and Sentech has been terminated.

The Bidder indemnifies and holds Sentech harmless against any loss, whether direct or indirect, arising out of the failure to process any of its' personal data in accordance with applicable laws.

22. Delay damages

As stipulated in the Special Conditions of Contract.

Sentech's Representative is

Name: Mr. Zunaid Adams

Address: **SENTECH SOC LIMITED**

Sender Technology Park

Octave Road

Radiokop

Honeydew

2040

Johannesburg

Tel No. 0114714400

Sentech's Representative is the Executive: Legal and Regulatory.

Contract Data**Part two - Data provided by the Bidder****Statements given in all contracts****The Bidder is:**

Name _____ Address _____

a company / close corporation / partnership duly incorporated in accordance with the laws of the Republic of South Africa.

PART C2: PRICING DATA

Price List

Tenderers will provide a basic unit price for equipment compliant with **Section 19** of the Tender Data document. The **evaluation will be based on the total cost of Schedules A, B, D and E.** **Furthermore, a breakdown of this 'unit price' should be provided to assess the Cost of the available features and licenses required for the DVB-SIS System.** Optional items will be quoted separately and not form part of the price adjudication. The Total Cost of ownership will include SLA and Training costs.

The successful Bidder will be expected to provide the latest model when the DVB-SIS System is required.

Bidders are requested to fill in the tables below, indicating the total price for each of the materials and quantities considering the Criteria stipulated per requirements in Sections 2.4, 2.5, 3.1, and 3.2 of this document. Annexure B has a table to use for costing, indicating the no. of Head-End and Transmitter Sites and their redundant Satellite paths.

Equipment must be limited to CSGs and DSAs and any other DVB SIS equipment in the context of this tender. SENTECH provides encoders, MPEG Multiplexers, Scramblers, Satellite modulators, Satellite Receivers, Transmitters, Combiners, and antennas.

Schedule of Cost A: Phase 1 Operational MUX1

Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION <i>Equipment must be limited to CSG DSAs and any other DVB SIS equipment.</i>	Unit Price	Quantities See <i>Annexure B</i>	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
Head-End at Radiokop (Redundant)	R		R		
Head-End at Nasrec (Non-Redundant)	R		R		
Head-End at LAB (Redundant)	R		R		
C-Band: Transmitter Sites	R		R		
Ku-Band: Transmitter Sites	R		R		

Schedule of Cost A: Phase 1 Operational MUX1

Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION <i>Equipment must be limited to CSG DSAs and any other DVB SIS equipment.</i>	Unit Price	Quantities <i>See Annexure B</i>	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
Spares: Transmitter Sites	R		R		
C-Band: LAB Transmitter Site	R		R		
Ku-Band: LAB Transmitter Site	R		R		
C-Band: DTT LAB Transmitter Site	R		R		
Ku-Band: DTT LAB Transmitter Site	R		R		
C-Band: SFN Platform Transmitter Site	R		R		
Ku-Band: SFN Platform Transmitter Site	R		R		
Head End Services (e.g. Delivery, Installation, Integration, commissioning, etc.):	R		R		
Transmitter Site Service (e.g. Delivery, Installation, Integration, commissioning, etc.):					
*Costing for one Transmitter Site					
Total Cost					

Pricing Evaluation is based on the Total Cost of all Item prices (Column D).

Schedule of Cost B: Phase 2 Operational MUX2

Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION <i>Equipment must be limited to CSG DSAs and any other DVB SIS equipment.</i>	Unit Price	Quantities See Annexure B	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
Head-End at Radiokop (Redundant)	R		R		
Head-End at Nasrec (Non-Redundant)	R		R		
Head-End at LAB (Redundant)	R		R		
C-Band: Transmitter Sites	R		R		
Ku-Band: Transmitter Sites	R		R		
Spares: Transmitter Sites	R		R		
C-Band: LAB Transmitter Site	R		R		
Ku-Band: LAB Transmitter Site	R		R		
C-Band: DTT LAB Transmitter Site	R		R		
Ku-Band: DTT LAB Transmitter Site	R		R		
C-Band: SFN Platform Transmitter Site	R		R		
Ku-Band: SFN Platform Transmitter Site	R		R		
Head End Services (e.g. Delivery, Installation material, Integration, commissioning, etc.):	R		R		
Transmitter Site Service (e.g. Delivery, Installation material, Integration, commissioning, etc.):					
*Costing for one Transmitter Site					
Total Cost					

Pricing Evaluation is based on the Total Cost of all Item prices (Column D).

Schedule of Cost C: Phase 3 As and When required

Equipment Description	Unit Price	Quantity Discount 50+ units	Quantity Discount 100+ units	Delivery A.R.O.
Equipment at Head-end (Radiokop)	R			
Non-Redundant Test Head-end System (Nasrec)	R			
Non-Redundant Test Head-end System (Test Laboratory)	R			
Equipment at Transmitter Site:	R			
Services (e.g. Integration, commissioning, training, support etc):	R			

Schedule of Cost D: DVB-SIS System SLA (Phase 1 & Phase2)

Column A	Column B	Column C	Column D
DESCRIPTION	SLA Cost Year1	SLA Cost Year2	SLA Cost Year3
Head-End at Radiokop (Redundant)	R	R	R
Head-End at Nasrec (Non-Redundant)	R	R	R
Head-End at LAB (Redundant)	R	R	R
Transmitter Sites	R	R	R
Total Cost	R	R	R

Pricing Evaluation is based on the Total Cost for years 1, 2, and 3 (Columns B, C, D).

Schedule of Cost E: DVB-SIS System Training

Column A	Column B	Column C	Column D
DESCRIPTION	Training for a group of 5-10 heads per day	Training for a group of 10-20 heads per day	Training for a group of more than 20 heads per day
DVB SIS at Radiokop (Redundant)	R	R	R
DVB SIS at Nasrec (Non-Redundant)	R	R	R
DVB SIS at LAB (Redundant)	R	R	R
Total Cost	R	R	R

Pricing Evaluation is based on the Total Cost of Training for 20 or more heads (Column D).

Summary Pricing Evaluation:

Cost A: Total Cost: Schedule of Cost A R _____

Cost B: Total Cost: Schedule of Cost B R _____

Cost D: Total Cost Year 1-3 SLA Cost: Schedule of Cost D R _____

Cost E: Total Cost 20 Heads or more Training Schedule of Cost E R _____

Total Evaluation Pricing: Cost A + Cost B + Cost D + Cost E R _____

PART C3: SCOPE OF WORK

SENTECH'S GOODS INFORMATION

The goods and services are for the DVB SIS System's supply, delivery, upgrade and commission.

1. TECHNICAL REQUIREMENTS

1.1. Glossary of Terms

Abbreviations	Descriptions
AVC	Advanced Video Coding (MPEG 4, Part 10)
BB Frames	Baseband Frames
COFDM	Coded Orthogonal Frequency Division Modulation
DTH	Direct to Home Platform.
DTT	Digital Terrestrial Television, according to ETSI EN 302 755
DVB	Digital Video Broadcasting
DVB-S2	Satellite broadcasting according to ETSI EN 302 307
EPG	Electronic Programme Guide
FEC	Forward Error Correction
FEF	Future Extension frames
GbE	Gigabit Ethernet
MFN	Multi-Frequency Network
MISO	Multiple Input Single Output
MIP	Mega-frame Initialisation Packet
PLP	Physical Layer Pipe
PSI/SI	Programme Specific Information/Service Information
QAM	Quadrature Amplitude Modulation
SFN	Single Frequency Network
T2-MI	DVB-T2 Modulator Interface according to ETSI TS 102 773
TS	MPEG 2 Transport Stream
VSAT	Very Small Aperture Terminal (in satellite communications)
CSG	Control Stream Generator
DSA	Daughter Site Adapter

1.2. Preamble

SENTECH operates on several Intelsat Satellite IS-20 Transponder networks. Sentech has implemented digital Satellite television networks on the C-Band and Ku-Band Frequency spectrum using the Digital Video Broadcast – Satellite first-generation (DVB-S) and second-generation (DVB-S2) standards. SENTECH adopted the European Technical Standards Institute (ETSI) EN 300 421 and ETSI EN 302 307 Part-1. MPEG2 and MPEG4 video encoding, as well as MPEG1 Layer2 and AAC audio encoding, are used. SENTECH's current Satellite network parameter configurations are presented in Table 1 and **are not limited** to the following:

Transmission Parameter	Ku-Band		C-Band	
DVB Standard	DVB-S2	DVB-S2	DVB-S2	DVB-S2
Modulation Type	8-PSK	8PSK	8PSK	8PSK
FEC	5/6	5/6	3/4	5/6
Symbol Rate (MSys/s)	28.75	28.75	28.75	28.75
Roll-off	35%	25%	25%	25%
Pilots	Yes	Yes	Off	Off
Polarisation	Vertical	Vertical	RHCP	RHCP

Table 1: Sentech's current Satellite network parameter configuration

Sentech owns and operates several national terrestrial television and radio transmitter networks. Sentech has implemented digital terrestrial television (DTT) networks in the Ultra High Frequency (UHF) band using the Digital Video Broadcast – Terrestrial second-generation (DVB-T2) Modulator Interface (MI) Multiple Physical Layer Pipe (MPLP) technology. SENTECH adopted the European Technical Standards Institute (ETSI) EN 302755 v1.3.1 (2011-11. SENTECH uses MPEG4 video and AAC audio encoding standards. SENTECH's current DTT network parameter configuration and capacity allocation are presented in Table 2 and **are not limited** to the following:

Transmission Parameter	Mux 01		Mux 02	
Physical Layer Pipe	PLP 0	PLP 1	PLP 0	PLP 1
Transmission Mode (FFT)	32K Extended	32K Extended	32K Extended	32K Extended
Constellation	256 QAM rotated	256 QAM rotated	256 QAM rotated	256 QAM rotated
Guard Interval	1/16	1/16	1/16	1/16
Pilot Pattern	PP4	PP4	PP4	PP4
PAPR	None	None	None	None

Transmission Parameter	Mux 01		Mux 02	
Physical Layer Pipe	PLP 0	PLP 1	PLP 0	PLP 1
SISO/ MISO	SISO	SISO	SISO	SISO
FEC Frame length	64800	64800	64800	64800
Input Mode	Mode B (MPLP)	Mode B (MPLP)	Mode B (MPLP)	Mode B (MPLP)
PLP Type	Type 1	Type 1	Type 1	Type 1
Null Packet Deletion	Active	Active	Active	Active
In-Band Signalling Type A	On	On	On	On
Code Rate	3/5	3/5	3/5	3/4

Table 2: Sentech's current DTT network parameter configuration

The theoretical C/N value per type of channel, Multiplex & PLP is presented in Table 3 below:

Type Stationary Channel	Mux 01 - Theoretical C/N		Mux 02 - Theoretical C/N	
Physical Layer Pipe	PLP 0	PLP 1	PLP 0	PLP 1
Additional White Gaussian Noise (AWGN)	16.1 dB	16.1 dB	16.1 dB	20.0 dB
Fixed Reception (LOS) - Rice	16.3 dB	16.3 dB	16.3 dB	20.3 dB
Portable Reception (NLOS) - Rayleigh	18.3 dB	18.3 dB	18.3 dB	22.6 dB
0dB @ 90% of Guard Interval (SFN)	18.4 dB	18.4 dB	18.4 dB	22.7 dB

Table 3: Theoretical C/N per type of channel, Multiplex & PLP

Sentech intends to use the same satellite-based distribution system to link DTT (DVB-T2) television transmitter networks and direct-to-home (DTH) reception. SENTECH operates two DTT Multiplexes, MUX1 and MUX2, in 9 Provincial SFNs. Project timelines dictate that the system must be operational by the end of the 3rd calendar quarter of 2024. Due to the tight timelines, Sentech initially requires standard off-the-shelf field-proven equipment.

Sentech requires a standard, off-the-shelf, field-proven solution. However, the solution must be capable of upgrading the current DTH-compatible solution without replicating content.

Sentech, therefore, requires a three-phase approach:

- In the first phase of implementation, MUX1 Head End and Transmitter sites will be upgraded. The solution must maintain SFN synchronisation and allow SI cross-

referencing between Mux1 and MUX2, as well as C-Band and Ku-Band DSA equipment. Initially, 69 MUX1 Satellite receive sites will be targeted during this phase.

- The second phase would focus on MUX2 Head End and Transmitter sites. The solution must maintain SFN synchronisation and allow SI cross-referencing between Mux1 and MUX2, as well as C-Band and Ku-Band DSA equipment. Initially, 22 MUX2 Satellite receive sites will be targeted during this phase.
- The third phase will focus on further MUX1 and MUX2 transmitter sites, which will be upgraded depending on the Broadcasters' intention to expand the network or the possibility of introducing a third MUX.

Sentech's intention with this tender enquiry is to select a preferred supplier for a DVB-SIS and T2 MI-compatible, satellite-based linking system and establish a long-term supply relationship with the preferred supplier(s).

1.3. Content Distribution Philosophy

Currently, programme distribution to Analogue and DTT transmitter sites is via satellite. C-band satellite forms the primary feed with two carriers of 36MHz (C1 & C2), where C1 carries DTT Mux1 and DTT Regional T2-MIs and C2 carries DTT Mux2 and Analogue TV and radio services. The Ku-band satellite serves as a secondary feed with two carriers of 36MHz (Ku1 and Ku2), where Ku1 carries Mux1, DTT regional TV, business TV and Radio services, and analogue TV and radio services. Ku2 carries Mux2 and DTT Regional Services. The Ku-band satellite system also serves as a DTH platform for coverage for non-DTT areas.

All programme content for broadcasting on the digital networks, including regional content, is backhauled to Sentech's uplink facilities in Honeydew, Johannesburg. However, the system must also be capable of local programme injection at each transmitter site while maintaining synchronisation. In this scenario, local and national content will be synchronously combined at the transmitter sites.

All encoding and statistical multiplexing is done at the head-end (uplink site) and not at each transmitter site. It is also not intended to establish regional head-ends, but the ability to inject regional content at the transmitter sites is required. Advanced Video Coding (MPEG4, Part 10) are used at the head end. The output MPEG-2 Transport Streams is delivered from the multiplexers on IP; optionally, ASI is used in some cases. Services are scrambled to protect content on the satellite link only. Descrambling is performed at the transmitter site. Where DVB-T2 MI adaption is done, it should be determined by the need to maintain DTH

compatibility on the satellite streams. The input to this equipment should be ASI, but IP will be considered.

2. INTRODUCTION

2.1. Definitions

The following definitions are used in this document:

Head-end	refers to all equipment related to the satellite uplink.
Satellite Receive Sites	Refers to downlink sites that use Satellite Dishes to receive transport streams from the uplink Head End. These exclude Repeaters (i.e. Transposers and OFR Sites)
PIE Sites	Program Input Equipment built at transmitter sites to receive a DTH-compatible stream from satellite signals for generating, processing, and transmitting T2MI content.
National content	content, common to all SFNs in a multiplex and all regions.
Regional content	content, different in different provincial SFNs and transmitter sites. Initially, all regional content will be available at the head-end (uplink). There will be no initial regional input point.
A system	is an assembly or combination of interrelated elements or parts working toward a common objective.
Technical Specifications	are the specifications for a service's required technology configuration and technical characteristics, including requirements relating to minimum bandwidth and technical standards.
DVB SIS	Equipment In the context of this document, equipment must be limited to CSGs, DSAs, and any other DVB SIS equipment. SENTECH provides encoders, MPEG Multiplexers, Satellite modulators, Satellite Receivers, Scramblers, and Transmitters.

2.2. Detailed Technical Requirements

Sentech requires a DVB-T2 MI-compliant, satellite-based linking system.

In the preamble, Sentech described its strategy for distributing services to the transmitters in their SFNs. For clarity, Sentech feeds its DTT transmitter networks using a C-band satellite as the primary feed and a Ku-band satellite as a secondary feed to the same networks. The

same secondary satellite transport streams serve as the DTH platform to cover non-DTT areas. The satellite systems conform to DVB-S2 specifications ETSI EN 302 307 and ISO/IEC 13818-1.

The interface to the transmitter modulator (exciter) is ASI T2-MI. An IP interface option should be provided. Equipment must adhere to ETSI standards ETSI EN 302 755 and especially ETSI TS 102 773 for modulator input. Feeds may be preconfigured from the head-end regarding T2-MI Markers, DSACI, PSI/SI, Signalling, etc. Additionally, transmitters in an SFN may independently select primary or secondary feeds (C- or Ku-band). Synchronisation must still be maintained under such conditions.

Two multiplexes are deployed per region, which may consist of a mix of one or several SFNs and MFNs.

The same encoding and multiplexing equipment are used at the satellite head-end for the C-band and Ku-band systems. The outputs from the final multiplexer are split into the C and Ku-band Satellite modulators. Two carriers are used on each platform, and SENTECH intends to remove the DVB-S2 multi-stream feature on C-Band Mux1 modulators. As part of the upgrade, a single stream option shall be adopted for all Satellite modulators.

Whilst most transmitter sites are linked via satellite, some sites may be linked via a terrestrial IP network. At these sites, equipment must be capable of taking IP inputs. Tenderers shall specify the maximum jitter their equipment can tolerate and any other constraints the IP network should meet.

Diagrams in Appendix A1, A2, A3, and A4 illustrate the proposed logical layout of the Head-End and DTT Transmitter site. Tenderers must provide DVB-SIS signal generator equipment at the Head-End and signal adaptor equipment at transmitter sites. The diagrams are for illustration purposes only, and Tenderers may propose an alternative layout, thoroughly motivating the advantages.

The successful Tenderer will ensure compatibility with the rest of the head-end and transmitter site equipment; therefore, standards compliance is essential. Tenderers must indicate how their proposed equipment can be configured to provide redundancy.

The output at the head-end is secured using NagraVision conditional access. This is for content protection on the Satellite link only; descrambling is done at the transmitter site.

C and Ku-band transport streams are received and descrambled at the transmitter site using a transport stream descrambler. The clear transport streams will be passed to the ASI inputs of T2-MI adaptors or Daughter Site Adaptors. This equipment is expected to synchronously constitute the DTT multiplex to pass to the transmitter exciter on the T2-MI standard. Additional content may also be required using PLPs locally. This should be possible by utilising MPEG-2 transport streams and generic stream formats. In all cases, PLP pre-configuration is performed at the head-end, and a mechanism for local injection should be available at the site, e.g. PLP substitution and PSI/SI cross-carriage. Tenderers shall specify how many PLPs the system can handle.

Tenderers must provide for flexible management of PSI/SI, mainly keeping in mind the following:

- Centralised distribution with regional programme insertion; some PSI/SI is not locally generated but comes from customers (i.e. broadcasters).
- Multiple multiplexes and PSI/SI cross-carriage for other multiplexes.
- Delivery to the DTH platform.

SENTECH provides a management system to perform overall system configuration management and monitoring capability. The proposed system shall provide the necessary northbound interfaces, protocols, and applications to collect such information.

It should be assumed that GPS-derived 1PPS and 10MHz reference signals will be available at the transmitter sites.

The exciters switch between primary and secondary feeds at the site. The site equipment should be able to detect missing frequency reference signals or missing timing information in the satellite stream and mute its output to allow redundancy switching by the transmitter. In the case of MFN installations with no redundancy, however, it must be possible to override this feature.

Suppose a Tenderer cannot supply equipment that meets Sentech's proposed requirement. In that case, they may propose an alternative solution with a detailed explanation of the extent to which Sentech's requirements can be met and their implications.

Tenderers must also describe their practical experience deploying the DVB-T2 equipment in an M-PLP, SFN environment.

A complete solution is required, which must include all T2-MI adaption equipment.

2.3. Response Details and Requirements

The Proposer shall provide the following information:

A firm, fixed quotation with full technical specifications which indicates deviations from the Request for Quotation.

All development, integration, and certification costs are to be included in the proposal.

Unit pricing for each piece of equipment must be provided, and integration and commissioning costs must be shown separately.

Complete technical specifications for each type of equipment offered shall be provided. This must specify all power consumption, equipment interfaces, interface protocols, connector types and impedances where applicable. Specifications shall include the maximum number of input and output interfaces supported as standard and the maximum to which equipment can be configured. It is recommended that the equipment be field upgradeable. Specifications must include maximum data rates supported by each type of equipment and the number of elementary streams handled.

2.4. Information to Tenderers

- Sentech is seeking the best practical and cost-effective solution to meet its overall needs and has therefore attempted to assist Tenderers by defining a conceptual solution. Should Tenderers feel they have alternative and better (e.g. standards-based) solutions, they are invited to offer such solutions. Differences and advantages must be indicated.
- Should this bid be successful, the Tenderer will ensure that the supplied equipment is integrated into the head-end, uplink system, and transmitters as appropriate.
- The SENTECH head-end equipment consists of a Harmonic encoding and multiplexing system. Electra 8110 MPEG-4 encoders and ProstreamX multiplexers are managed through Harmonic NMX. Newtec M6100 equipment is used for satellite modulation. Tenderers must ensure the system is integrated as a common platform for managing the equipment provided. Tenderers must also indicate which network management systems they have integrated or which network management systems they would recommend.

- The current DTT transmitters used on the DTT network come from various manufacturers,
 - Electrosys Exciter MEX II-T26F1 - Manufacturer Enensys, PN 5453600102
 - Itelco MEX II Multimode UHF Exciter, Manufacturer PTV, PN 545050011
 - R&S Combo, TSE800, PN 2108.5005.02 and SX800 Exciter, PN 2095.1502.71
 - R&S Combo, TSE800, PN 2108.5005.02 and SLX8000 Exciter, PN 2100.1000.30

Transmitter equipment from alternative suppliers may be used in future. The tenderer must indicate compatibility or incompatibility with various transmitter manufacturers' equipment.

- SENTECH uses Harmonic PVR 7100s as transport stream descramblers in each satellite receiving site. This equipment provides an unscrambled MPEG-2 TS ASI output to the T2-MI adaption equipment. Again, it is emphasised that NagraVision scrambling is used only on satellite or IP links where applicable. Scrambling is performed at the head-end on a service level and removed before the adapters at the site. Tenderers must ensure this will not affect the operation of their proposed systems.

See Annexure E of the Contract Data for a list of vendors and equipment models operated by SENTECH.

- Sentech must meet critical timelines for this project to be successful. Tenderers must be able to deliver all equipment offered 4-8 weeks after receiving a purchase order to Sentech stores in Honeydew, South Africa, should their bid be successful.
- Tenderers will be requested to demonstrate the successful operation of their equipment to Sentech staff at their premises. Tenderers may offer to present a working system at Sentech's premises at their own expense.
- The deliverables of Project Phase 1 and 2 are listed in Table 4 below and are not limited to the following,

Project Phase 1	
Activity	Project Deliverables
A	Replace proprietary Mux1 T2 DTH Gateways and Mux1 T2 MI Generators at the parent site (i.e. Uplink or Head End) with redundant CSG generators.

B	Replacement of Proprietary Mux1 T2MI Generators and Mux 1 ENENSYS T2Edge NH4 at the daughter sites with DSA adaptors.
C	The DSA output stream from the Mux1 C-Band and Ku-Band paths must feed the secondary inputs of the Mux2 C-Band and Ku-Band ENENSYS T2Edge NH4 for Cross-Carriage and SI Updates on Mux2.
Project Phase 2	
Activity	Project Deliverables
A	Replace proprietary Mux2 T2 DTH Gateways and Mux2 T2 MI Generators at the parent site (i.e. Uplink or Head End) with redundant CSG generators.
B	Replace Proprietary Mux2 T2MI Generators and Mux2 ENENSYS T2Edge NH4 at the daughter sites with DSA adaptors.
C	The DSA output stream from Mux1 C-Band and Ku-Band paths must feed the secondary inputs of the Mux2 C-Band and Ku-Band DSA equipment for Cross-Carriage and SI Updates on Mux2.

-

2.5. Preparatory work for each project phase

The following cases will impact delivery timelines, and Tenderers must consider them.

The current DTH compatibility architecture is implemented such that,

Case 1: The T2-MI streams are generated at the Head-End for C-Band distribution using the DTH-compatible stream from the output of the T2 DTH Gateways.

Expected Outcome: SENTECH has made it mandatory, as part of this project, to generate a T2-MI stream at the transmitter sites for the C-Band chain.

Rationale: To make the C-Band chain less complex, improve the integrity of the T2MI packets and reduce overheads on the Satellite stream by making DTT services usable for the analogue network.

Case 2: For the network to conform to DVB SIS's technical requirements, C-Band and Ku-Band must have identical services.

Expected Outcome: Re-align the services in C-Band and Ku-Band so that they are identical regarding the number of services, bitrates, and transport stream size.

Rationale: To enable SFN operations across all regions, the network must conform to DVB SIS's technical requirements, mainly when redundant paths are considered for distribution.

Project Phase 1 Dependencies:

Phase 1 will focus on upgrading Mux1 Head Ends and its transmitter sites. As such, TV and Radio analogue services must be duplicated across the C-Band carrier C2 to C1 during the implementation to form part of the DTH-compatible stream but should not form part of the T2MI streams at the DTT sites. This duplication will allow the migration of Analogue decoders to point to C-Band C1. Similarly, non-DTT business services will be migrated from carrier K-Band Carriers Ku1 to Ku2. The above steps will satisfy the outcomes of Case 2 above. *For more context, see par—1 of Section 1.3.*

Project Phase 2 Dependencies:

Phase 2 will focus on upgrading Mux2 Head Ends and its transmitter sites. As such, TV and Radio analogue services must be removed from the C-Band carrier C2 during the implementation. The project will factor in timelines for SENTTECH Operational sites to migrate all the Analogue TV and Radio Satellite receivers/decoders to C-Band C1. The above steps will satisfy the outcomes of Cases 1 and 2 above. *For more context, see par—1 of Section 1.3.*

3. SCOPE OF WORK

3.1 General Technical Requirements

3.1.1 Environmental (Score 6)

- **Environment**

The equipment operates at any altitude up to 1,800 metres above mean sea level, with room temperature from 0°C to +45°C and relative humidity from 5% to 90% non-condensing.

- **Power**

230V A.C.± 15%, single phase 50Hz. The equipment protected against lightning-induced transients survives and recovers to a normal operational state after a prolonged power dip or "brownout".

- **Safety**

Equipment Plug Power Cord must conform to SANS IEC C13 Socket to BS 446 or Straight IEC C13 Socket to Straight IEC C14, at least 2m.

- **Fire**

The equipment's materials should be flame-retardant. The heat dissipation of PCB-mounted devices must be such that no component desoldering occurs should the room temperature rise above 45°C.

- **EMC**

Provide a complete list of specifications complied with. Equipment shall meet at least EN 55022 and EN 55024 or their latest amendments.

- **Equipment Layout**

Physical connections shall be on the rear of the equipment. The user interface and Common Interface are on the front of the equipment. The equipment is rack mountable in a standard 19-inch rack (IEC60297). All equipment dimensions must be specified.

3.1.2 Operation Manual (Score 4)

Equipment must be supplied with at least one Operations manual (or manual set) written in English, describing installation, operations and fault finding with a complete list and meaning of all error messages. The manual must also explain, at least at the block diagram level, the operation of the equipment offered.

The system documentation must include full technical details when modules, such as interface adaptors, sourced from third-party suppliers are included in the Tenderer's equipment.

3.1.3 Support (Score & Qualifying)

The tenderer must guarantee adequate product support, software upgrades, and spare keeping for ten (10) years after the warranty expires on the last delivery of the equipment supplied.

Specify the maximum turnaround time for equipment repair. The turnaround time shall be at most ten (10) working days after receipt of the faulty equipment. The bidder must provide an advanced replacement option should they anticipate exceeding the turnaround time.

End of Sale and Support announcements shall be made six months before such event.

Offer an annual maintenance and support programme for equipment offered.

The Tenderer must commit to an SLA contract term of at least three (3) years after the warranty and guarantee software upgrades and hardware replacement. (Qualifying)

3.1.4 Warranty (Score 8)

If there are defects arising from the failure of goods to meet the specifications within the period specified in the Contract, or if no period is determined within 12 months of the date of delivery, the Contractor shall replace or repair the defective item at his/her expense or shall refund Sentech such costs as Sentech may incur in replacing such defective item. The Contractor shall also bear the cost of transporting replaced/repaired items to the place of destination.

Provide an option to offer SENTECH an extended warranty of at least three (3) years.

3.1.5 Delivery (Score 8)

Prices must be as specified in Part C2 of the Contract Agreement. The tables in Part C2 must indicate a guaranteed delivery time after receipt of an order, which may be eight (8) weeks.

3.1.6 Quantity (Score 2)

Annexure B indicates the number of Phases 1 & 2 Head Ends and Satellite-Receive transmitter sites for MUX1 and MUX2 with C-Band or Ku-Band.

Tenderers must quote both a unit price as well as for a quantity as indicated in Part C2 of the Contract Agreement.

The initial order is expected to consist of Phase 1 equipment for head-end uplink sites and several transmitter sites. Propose a non-redundant Head-End test (laboratory) system and Head End Disaster Recovery site.

However, the intention is to enter into a long-term supply agreement to meet the complete requirements of all 3 Project Phases.

3.1.7 Training (Score 4)

Sentech technical staff will receive full training to operate and maintain all equipment. Training will be provided at Sentech's offices in Johannesburg, South Africa. At least three days will be required to cover the DVB SIS equipment's system operation and maintenance theory. Make provision for at least 20 trainees.

3.1.8 Installation and Commissioning (Score 8)

Offer installation and commissioning of the equipment at the Johannesburg and Nasrec Head Ends and one receive (transmitter) site. Sentech will provide rack space. Final acceptance will only occur after demonstrating full technical and operational compliance (i.e. fully debugged).

3.1.9 System Integration (Qualifying)

The Tenderer will ensure that the supplied equipment is integrated into the head-end, uplink system and transmitters as appropriate.

3.1.10 System Configuration (Score 8)

Sentech requires elegant (not overly complicated) solutions. Sentech will prefer systems that require lower equipment counts at the head end.

3.1.11 General (Info – Not scored)

The specifications provided are minimum specifications. The supplier's standard hardware products that meet or exceed the specifications are sought. Deviations from the required specifications must be indicated.

3.2 Special Technical Requirements

3.2.1 Ability to Meet Project Objectives (Qualifying)

- Supply an off-the-shelf field-proven solution.
- Specify where the proposed solution is operationally deployed and when the equipment was put into operation.
- Capable of replacing the current DTH-compatible system without replicating content on the distribution links.
- Demonstrate the Proof of concept and overall system stability.

- Implement the system in the production live platforms in the head-end production, Disaster Recovery, and transmitter sites.

3.2.2 Compliance With DVB Specifications (Qualifying)

- Equipment offered must comply with all applicable DVB specifications, mainly ETSI TS 102 773, EN 302 775 and ISO/IEC 13818-1. Interface to DTT exciters must be DVB-T2 MI over ASI with the option of (GbE) IP. ASI input is 188 or 204-byte packets.
- A complete list of standards and specifications to which the equipment conforms must be provided for each type of equipment offered. Specifically, the following must be supported:
 - Validation of T2 parameters
 - Full in-band control of T2 modulators (L1 signalling)
 - Full support of BB frame modes
 - Static and dynamic PLP handling
 - Compatible with FEF
 - Null Packet Deletion
 - In-band signalling (ISSY signalling)
- The interface to Head-End Multiplexers and Satellite Modulators must be DVB-MPEG-TS over IP with Multicast (UDP or RTP options) of 188 or 204-byte packets.

The definition of these standards required by Sentech, at a minimum, can be found in Annexure C.

3.2.3 Conformance to ETSI TR 101 290 (Qualifying)

All transport streams the DVB-SIS equipment generates must conform to ETSI TR 101 290 ver. 1.3.1, including T2MI validation, at minimum.

3.2.4 Equipment Interface (Qualifying and Score)

TS inputs and outputs on the Head End's CSG equipment shall be provisioned on GbE ports for redundancy configuration and redundant SIS or content streams. ASI ports must be provided as an option.

TS inputs and outputs on the transmitter site's DSA equipment shall be provisioned on ASI ports for easy integration at transmitter equipment.

TS inputs and outputs for transmitter site equipment shall be ASI. Additional GbE may be indicated as an option.

The command, control, or management interface shall be RJ45 on at least 100bT Ethernet ports.

NB: It is recommended and advantageous to supply an HDc (High-Density Chassis) with PCI or PCIe slots where connection interfaces are field upgradable.

3.2.5 Deterministic Transport Streams (Qualifying)

The system must produce deterministic TS or T2-MI streams to operate over Single Frequency Networks (SFNs) and Multi Frequency Networks (MFNs).

3.2.6 PLP Service Selection (Qualifying)

The system should select services from the DTH streams, allocate them to different PLPs and perform, update and process PSI/SI for the services.

3.2.7 DVB-SIS compliant system (Qualifying)

The tenderer must supply a DTH-compatible system that is compliant with DVB-SIS standards and interoperable with other vendors. For a list of vendors and equipment models, see Annexure E of the Contract Data.

3.2.8 Standardised DTT Multiplex System (Qualifying)

The vendor-supplied system shall rebuild the DTT Multiplex based on standardised DSACI and Framing & Timing packet.

3.2.9 System Functional Support (Qualifying)

The system must support:

- Provision of in-band control and signalling
- Provisioning and generation of DTT configuration and SFN timestamp information.
- Provisioning in-band service description to assign to the resulting DTT Multiplexes and related SI for update at transmission sites.
- Simulcast DTH and Terrestrial DTT services.
- Production of DTT multiplexes from DTH Services where the DVB-SIS metadata and information are transparent to DTH receivers.
- Setup the system for DTT regional service broadcasting
- DTT Synchronised SFN cells between C-Band and Ku-Band with no timing drifts.
- Integration to the existing head-end equipment

3.2.10 Regionalised Content (Qualifying)

- Provide a detailed description of how content per PLP will be defined, including management of regionalised content.
- it must be possible to substitute regional content and SI updates at a transmitter site.
- The same regional content must be substituted synchronously at each transmitter site within a particular SFN.
- Assigning the regional content to a separate PLP must be possible.

3.2.11 System Capacity (Score 8)

Specify the maximum data rates supported by each type of equipment. The minimum data rate supported shall equal the maximum supported by DVB-T2 per multiplex.

Specify the maximum number of streams the equipment can support. The minimum number of elementary streams supported must exceed 300 per Multiplex.

3.2.12 Support for MPLP (Qualifying and Score)

The number of PLPs supported must be specified, and whether the restriction is a hardware or software limitation.

The system must be capable of supporting at least 8 PLPs per multiplex.

Preference will be given to systems supporting 16 or more PLPs per multiplex.

3.2.13 Network Management System (Score 18)

It is not a requirement for the Tenderer to supply a Network Management System, but it is required for the DVB SIS System to:

- Analyse inputs and convey the information to the management platform.
- Convey PLP configuration, e.g., regional, or otherwise differentiated service groups.
- Control the handling of PSI/SI for each transport stream/PLP reaching the end-user devices. The system should be able to pass locally (Sentech head-end) or externally generated PSI/SI.
- Compose a transport stream consisting of services selected from different input streams and be able to generate some or all the PSI/SI tables for the output. The system must cope with channel line-up changes.
- Ensure that the correct selection of PLPs is emitted into each transmitter.
- Save the configurations and recover from the last active configuration in case of system failure.
- Reconfigure the system so that it is not cumbersome and error-prone and does not require more than a few minutes to complete. This considers any change in the channel line-up, e.g., adding a new service, deleting a service, or changing service names or components.
- Perform cold standby redundancy with manual Primary and Secondary synchronisation.
- SNMP is preferred for equipment configuration. If any proprietary protocol is used as a standalone or in conjunction with SNMP, it should be indicated, and all protocol details will be made known to Sentech.

3.2.14 Monitoring and Supervisory (Score 14)

- **Equipment must be compatible with at least SNMP version 2. The tenderer must clearly state the SNMP version supported in their reference material.**
- **The equipment should operate at High Performance and Responsiveness with sufficient memory allocation.**
- The equipment should log and store application, event, and operational error messages.

- The supplier shall make the SNMP MIB (Management Information Base) files available so that Sentech can determine which parameters can be monitored and controlled.
- The equipment shall be able to send traps to a higher-level operations management platform (e.g., NMS systems operated by SENTECH). See Annexure E of the Contract Data for a list of vendors and equipment models.
- Equipment shall also support web browser-based remote control and monitoring or standalone applications. This shall allow complete equipment configuration, control, and monitoring. Tenders must ensure the application is fully supported on the latest web browser application versions and Windows operating systems. If applets such as Java and HTML5 are used, the tenderer must ensure the application continues to operate normally.
- Equipment must also be equipped with an open contact relay summary alarm.

3.2.15 Redundancy (Qualifying)

- Fully redundant equipment for the SIS system must be proposed to avoid TV blackouts.
- Redundancy between the C-band primary and Ku-band secondary must be provided at the transmitter sites. The transmitter exciter must perform redundancy switching for two multiplexes.
- Redundancy must be provided between the primary and secondary GbE I/O ports from the Primary and Secondary Chassis. The Head-End MPEG-TS Multiplexers perform redundancy switching of the Broadcaster's streams.
- Head-end redundancy switching must be automatic and seamless with no manual intervention. A process must be specified if a separate management system is required to perform this function.

3.2.16 DVB PSI/SI Table Cycler Editor (Qualifying)

Supply or embed an integrated editor, scheduler, and table cycle spooler for DVB SI (Service Information) and MPEG PSI (Program Specific Information) tables in the system code.

Note: The PSI/SI table cycles are determined by the agreed DTT SLA between SENTECH and the broadcasters. See *Annexure D*

3.2.17 Service ID mapping and PID Filtering (Qualifying)

As part of the DTH-DTT conversion/adaptation, the system must support:

- Service IDs or program numbers mapping, including assignment and referencing in the PSI tables PAT and PMT.
- DVB CAS, ECM PID filtering, and options for the EMM PID pass-through mechanism, with the ability to remove or maintain the descriptor references in the CAT and PMT tables.

Note: The PSI tables, PAT, PMT and CAT are common to DTH and DTT. The DTT and DTH DVB SI tables will be distributed in parallel over Satellite. DTT SI tables must be transparent to the DTH viewers.

3.2.18 External Clock Reference (Score 4)

It should be assumed that 1PPS and 10MHz GPS feeds will be available at the head-end *and* transmission sites. Equipment capable of synchronising with external 1PPS and 10MHz GPS references will be preferred. As an option, bidders can indicate if their equipment has internal GPS receivers.

3.2.19 System Availability (Score 2)

The MTBF (mean time between failures) for each proposed equipment type must be provided. MTBF must also be specified for the system. Indicate if these are calculated or historical values. Calculate the effect on MTBF for equipment redundancy where proposed.

3.2.20 OTT Data Integration (Score 4)

The system must be capable of allocating encapsulated data PIDs with necessary PSI/SI information into any DTT Multiplex PLP. The PID and PSI/SI must be transparent to the DTH and STB viewers.

3.2.21 Table Generator (Qualifying)

Generate and limit the MPEG PSI tables PAT, PMT, and CAT to the services allocated to each PLP TS accordingly.

Each PLP must select the correct and appropriate SI tables NIT, BAT where applicable, SDT (actual and other), EIT (present/following and schedule actual and other) and TDT/TOT along with their descriptors from the TS ID embedded in the Head-End MPEG streams.

Note: SENTECH defines actual and other SI tables for the national and regional groups for the DTT network.

Note: If needed, the tenderer can submit an alternative solution with a detailed explanation of the extent to which Sentech's requirements can be met and their implications.

3.2.22 NIT updates for content regionalisation (Qualifying)

At the transmitter site and as part of content regionalisation and SI updates, the system must update NIT tables per transport stream (i.e. PLP) in each region or transmission site to limit the scanned transport streams and related information to that region. The system must use head-end generated NIT tables to perform such updates.

Note: Each region's NIT is generated at the Head End. These tables are distributed over Satellite and are transparent to DTH viewers.

3.2.23 NIT-Frequency Updates for Regionalisation

At the transmitter site and as part of content regionalisation and SI updates, the system must have a configurable feature to allow frequency changes/assignment per transport stream (i.e. PLP) in each region or transmission site to limit the scanned frequency signals (i.e. centre frequency in T2-Delivery Descriptor) and related information to that region.

3.2.24 SI Cross-Carriage for Regionalisation (Qualifying)

SENTECH operates two DTT Multiplexes with two PLPs per Multiplex. 3 National and one Regional PLP.

SENTECH defines actual and other SI tables for the regional groups in the DTT network. The system must update the relevant SI actual and other tables for each PLP by the TSs defined for the region or Transmitter site and as described in The TS loop in each NIT per clause **3.2.22**.

The system must include SI Other tables from other Transport streams into the current/actual national or regional Transport Stream on any given PLP (e.g. include SDT other or EIT Other from actual TS in other PLPs).

3.2.25 DTH viewer transparency (Qualifying)

The DTT SI Tables on the DTH Compatible stream must be transparent to the DTH viewers; hence, SENTECH recommends using PID value Offset in Decimal or HEX from the defined/standardised DVB SI Table PID numbers.

Note: If needed, the tenderer can submit an alternative solution with a detailed explanation of the extent to which Sentech's requirements can be met and their implications.

3.2.26 IO Board Ingest and Playout (Qualifying)

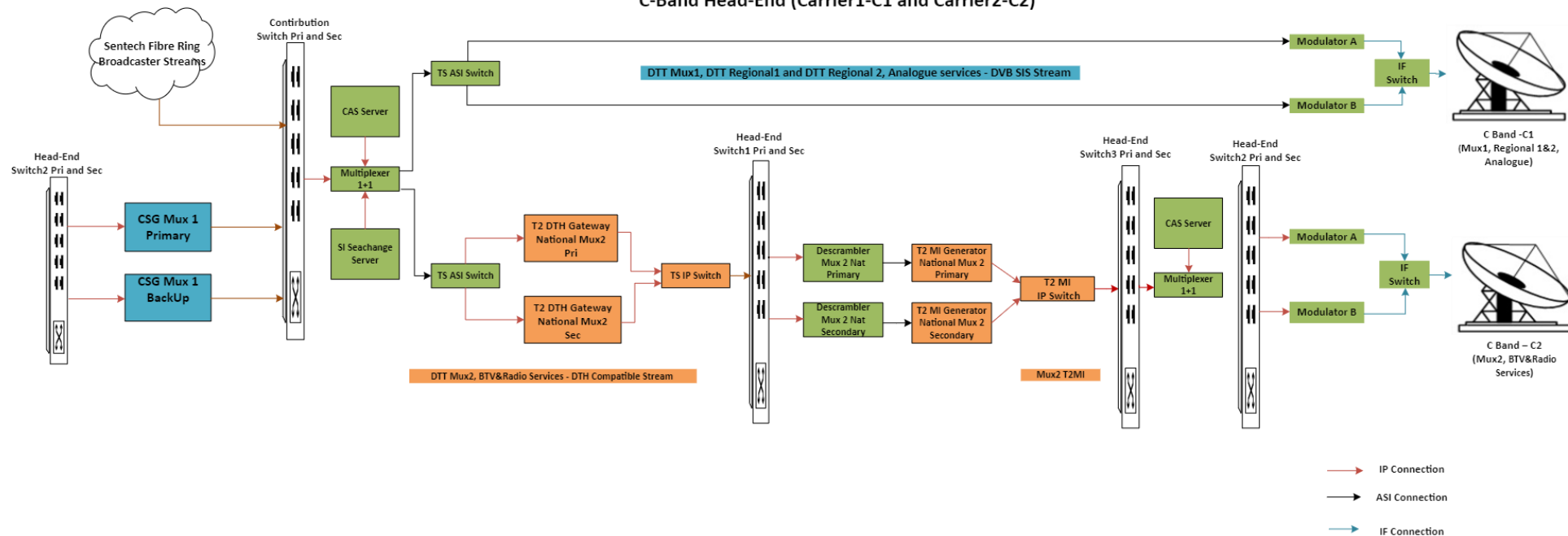
- The IP input/output sockets must be **jitter tolerant** and allow input or playout of **MPEG TS streams at variable and constant bitrates**.
- Support IP multicast playout through GbE ports.
- All TS Playout shall be IP Multicast, compliant with DVB ETSI TS 102 034 V2.1.1, Transport of MPEG-2 Based Services over IP-Based Networks.

Annexure A1: Phase 1: MUX 1 Upgrade – Head End

Phase 1: Mux1 Upgrade

DVB-SIS - Proposed Redundant Layout

C-Band Head-End (Carrier1-C1 and Carrier2-C2)

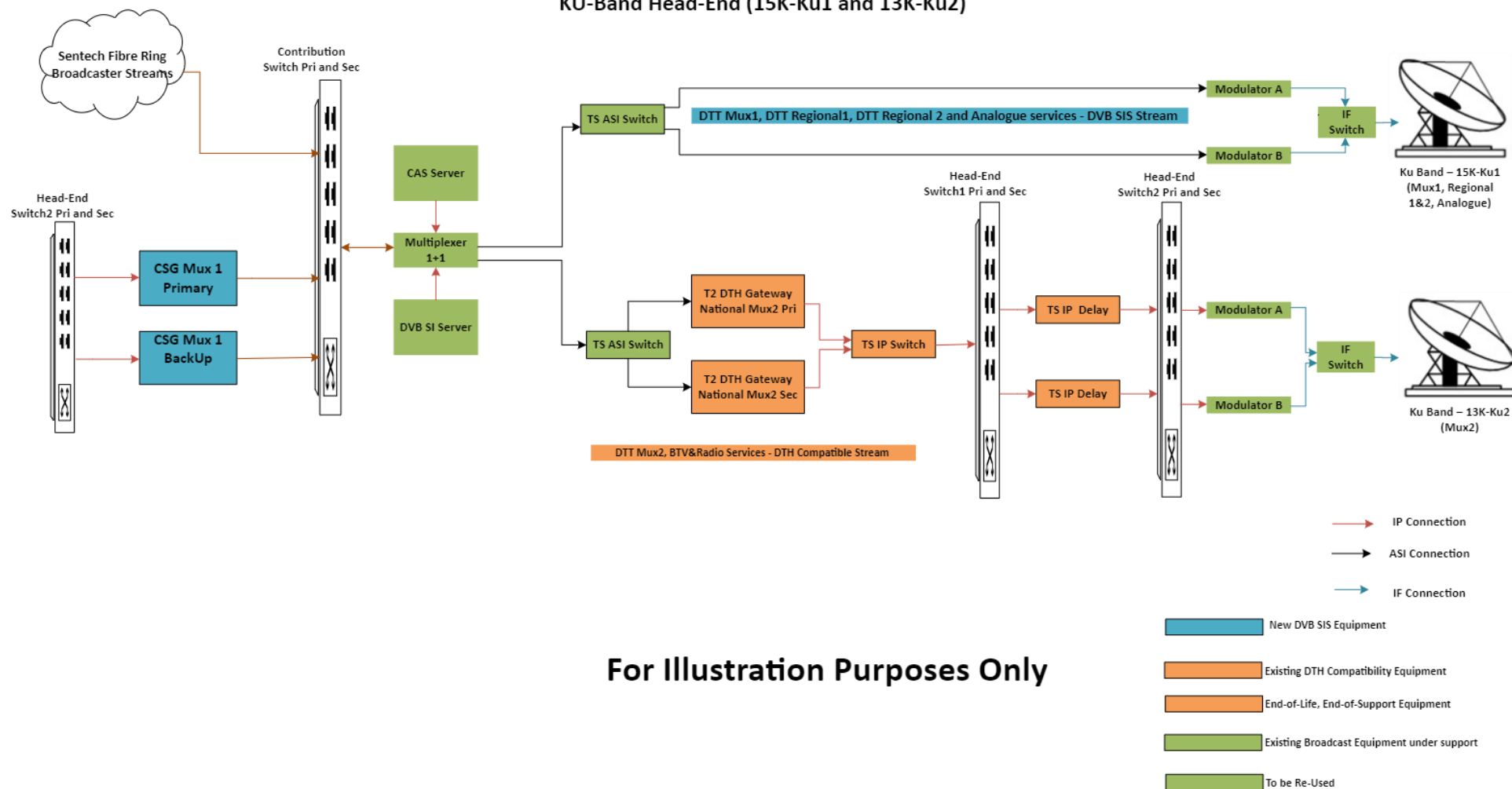


For Illustration Purposes Only

Phase 1: Mux1 Upgrade

DVB-SIS - Proposed Redundant Layout

KU-Band Head-End (15K-Ku1 and 13K-Ku2)

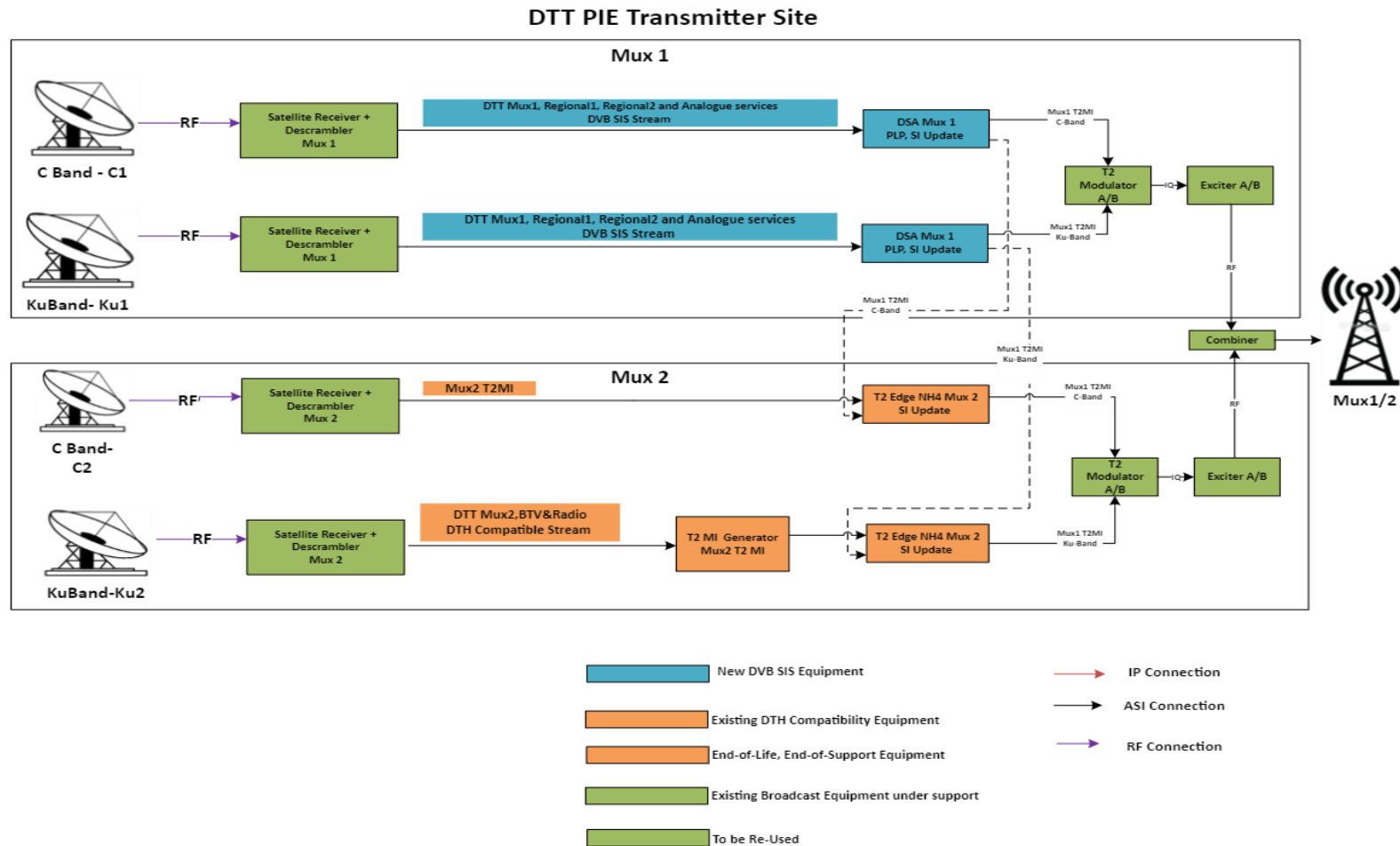


For Illustration Purposes Only

Annexure A2: Phase 1: MUX 1 Upgrade – DTT Site

Phase 1: Mux1 Upgrade

DVB-SIS - Proposed Redundant Layout

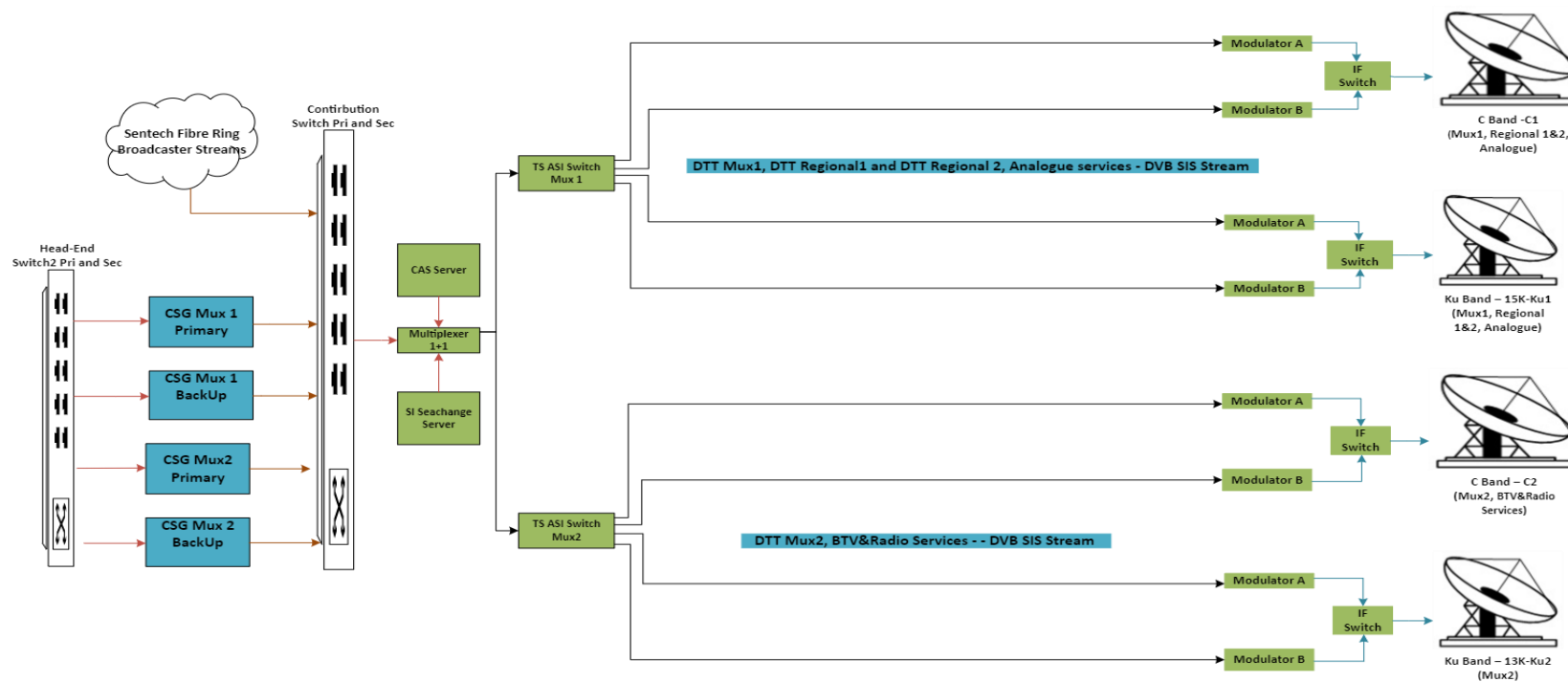


Annexure A3: Phase 2: MUX 2 Upgrade – Head End

Phase 2: Mux2 Upgrade

DVB-SIS - Proposed Redundant Layout

C-Band&KuBand Head-End (Carrier1-C1 and Carrier2-C2, 15K-Ku1 and 13K-Ku2)



For Illustration Purposes Only

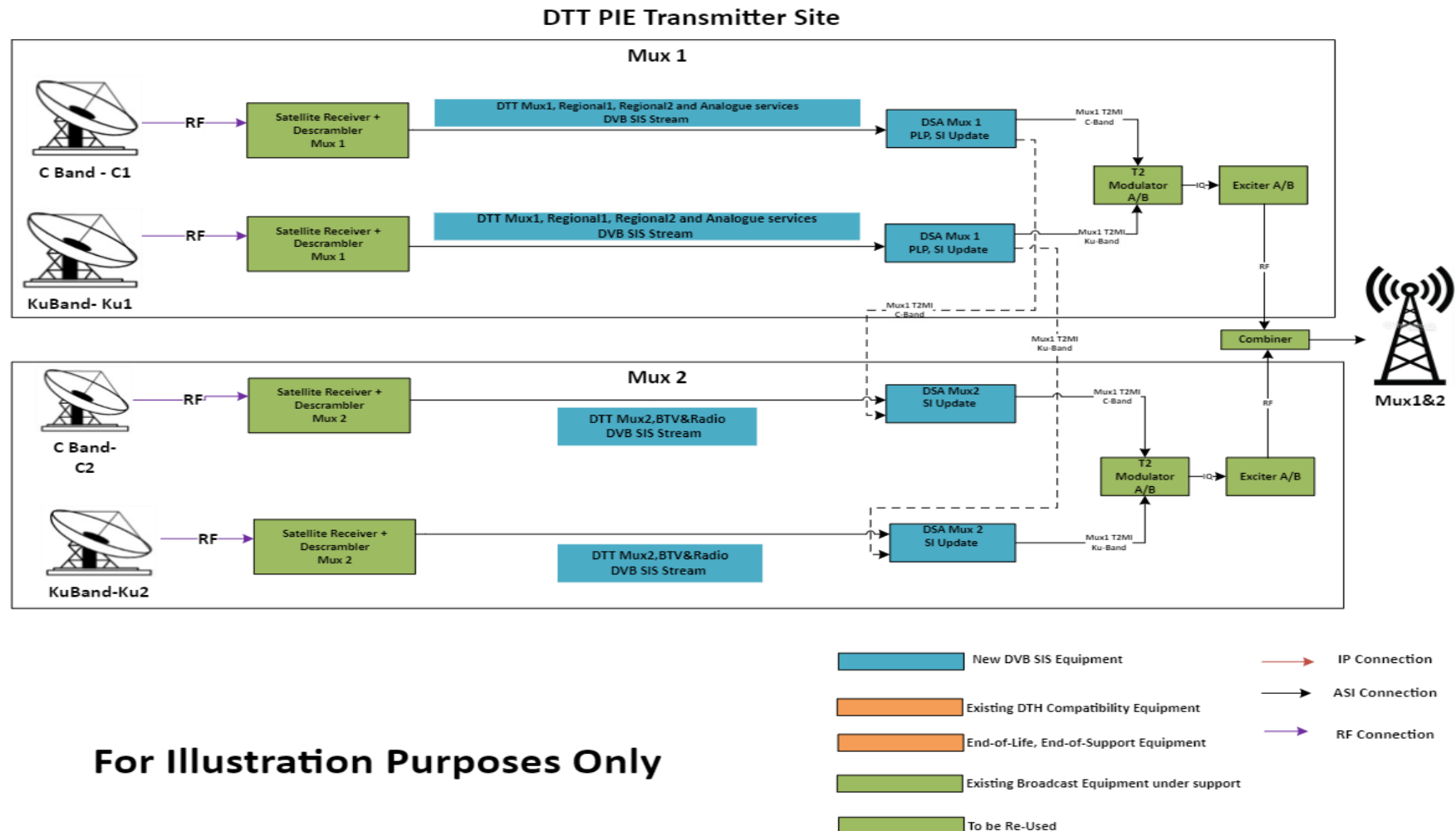
→ IP Connection
 → ASI Connection
 → IF Connection

■ New DVB SIS Equipment
 ■ Existing DTH Compatibility Equipment
 ■ End-of-Life, End-of-Support Equipment
 ■ Existing Broadcast Equipment under support
 ■ To be Re-Used

Annexure A4: Phase 2: MUX 2 Upgrade – DTT Site

Phase 2: Mux2 Upgrade

DVB-SIS - Proposed Redundant Layout



Annexure B

Summary of quantities for Radiokop, Nasrec DTT Head End sites and DTT Regional Transmitter Sites

The list is separated according to Project Phases.

Phase 1 - Operational Mux 1		
	No. of paths	Redundancy
Head End		
Radiokop Production	1	Yes
Nasrec	1	No
Radiokop LAB	1	Yes
Satellite Sites		
Total no. of Transmitter Satellite Sites	69	
C-Band Transmitter Sites	68	
Ku-Band Transmitter Sites	68	
Spares: Transmitter Sites	16	
C-Band LAB Transmitter Site	1	
Ku-Band LAB Transmitter Site	1	
C-Band DTT LAB Transmitter Site	1	
Ku-Band DTT LAB Transmitter Site	1	
C-Band SFN Platform Transmitter Site	1	
Ku-Band SFN Platform Transmitter Site	1	

Phase 2 - Operational Mux 2		
	No. of paths	Redundancy
Head End		
Radiokop Production	1	Yes
Nasrec	1	No
Radiokop LAB	1	Yes
Satellite Sites		
Total no. of Transmitter Satellite Sites	22	
C-Band Transmitter Sites	22	
Ku-Band Transmitter Sites	22	
Spares: Transmitter Sites	10	
C-Band LAB Transmitter Site	1	
Ku-Band LAB Transmitter Site	1	
C-Band DTT LAB Transmitter Site	1	
Ku-Band DTT LAB Transmitter Site	1	
C-Band SFN Platform Transmitter Site	1	
Ku-Band SFN Platform Transmitter Site	1	

Annexure C

Equipment offered must comply with and generate MPEG/DVB-compliant MPEG-TS and PSI/SI tables using but not limited to the DVB Standards below to address consumer receivers or other transmission equipment. The latest versions of these standards can be adopted where applicable.

Standard	Definition
ETSI TR 101 290 V1.3.1	DVB Measurement guidelines for DVB systems
ETSI TS 103 615	DVB Metadata generation and deterministic DVB-T-mega-frame/DVB-T2-MI stream generation from MPEG-2 Transport Stream(s) for a DVB Single Illumination System (DVB-SIS)
DVB-S (ETSI EN 300 421)	DVB Framing structure, channel coding and modulation for 11/12 GHz satellite services
DVB-S2 (ETSI EN 302 307-1)	DVB Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications
DVB-S2X signals (ETSI EN 302 307-2)	DVB Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 2: DVB-S2 Extensions (DVB-S2X)
MPEG-2 TS format (ISO/IEC 13818-1)	Information technology — Generic coding of moving pictures and associated audio information
DVB-T2-MI, TS 102 773	DVB Modulator Interface (T2-MI) for a second-generation digital terrestrial television broadcasting system (DVB-T2)
DVB-T2, ETSI EN 302 755	DVB Frame structure channel coding and modulation for a second-generation digital terrestrial television broadcasting system (DVB-T2)
DVB-T, ETSI EN 300 744	DVB Framing structure, channel coding and modulation for digital terrestrial television
DVB SI – ETSI EN 300 468	DVB Specification for Service Information (SI) in DVB systems
DVB SI – ETSI TS 101 211	DVB Guidelines on implementation and usage of Service Information (SI)
DVB PI - EN 50083	Interfaces for CATV/SMATV Head-Ends and similar Professional Equipment

DVB SI – ETSI TS 101 162	DVB Allocation of Service Information (SI) codes for DVB systems
DVB MPEG – ETSI TR 101 154	DVB Specification for the use of Video and Audio Coding in Broadcast and Broadband Applications
DVB ETSI TS 102 034	DVB Transport of MPEG-2 Based Services over IP-Based Networks.

Annexure D

PSI/SI playout cycle according to the agreed SLA between SENTECH and the Broadcasters.

PSI SI Tables	Recommended table playout rate cycle time in seconds
PAT	0,2
PMTs	0,2
CAT	0,2
NIT a	2
SDT a	2
SDTo	5
BAT	2
EIT a p/f	5
EIT o p/f	10
EIT a sch	40
EIT o sch	40
TDT	10

Annexure E

Vendor	Equipment	Model, Version
Harmonic	MPEG4 Encoder	Electra 8110
	Multiplexer	Prostream X, 3.7.1.0.28
	Multiplexer Management System	NMX, 9.5.0.0.030.000
	Satellite Receiver, Descrambler	PVR 7100, from 3.4.0.0.045
Newtec	Satellite Modulator	M6100, 2.1.60.79350
Rhode & Schwarz	Transmitter Modulator	TSE800, PN 2108.5005.02
	Transmitter Exciter	SX800, PN 2095.1502.71
		SLX8000, PN 2100.1000.30
Itelco	MEX II Multimode UHF Exciter	PTV, PN 545050011
Electrosys	Exciter MEX II- T26F1	Enensys, PN 5453600102
Enensys	T2 Edge	NH4, 2.5.0
NagraVision	One CAS Protect on top of Guard	1CASHE_20.35SEN1.3
	One CAS Nagra GUARD	1CASHE_20.35SEN1.0
ANT Group	NetPOD Evo	Client release: 17.4.1.0 Server release: 17.4.0.0
SkyLine Communications	Dataminer	10.3.0.0-13537-CU9