

CONTRACT DATA

A contract between

SENTECH, Sender Technology Park, Radiokop, Octave Road, Honeydew, and

Appointment of a Service Provider to supply, deliver, and commission a Service Information Generator System for Digital Terrestrial Television (DTT) with Multiple Operators and Regions and Direct-to-home (DTH) linking networks for a period of three (3) years.

Bid Number: SENT/046/2022-23

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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 a Service Information Generator System for Digital Terrestrial Television (DTT) with Multiple Operators and Regions and Direct-to-home (DTH) linking networks for a period of three 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 authorised, 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. Currency

South African registered businesses that purchase equipment overseas and quote in foreign currency will be required to provide Sentech a 6-month forward cover contract on appointment. The 6 months forward cover will be re-negotiated and renewed every 6 months should the contract term on this Tender be longer than 6 months.

12. General - Prices

Unless 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. 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 authorises 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

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, C, D and E**. Furthermore, a breakdown of this 'unit price' should be provided to assess the Cost of the available features required for the SI Generator System. Optional items will be quoted separately and not form part of the price adjudication. The Total Cost of ownership will be determined using SLA and Training costs.

The successful Bidder will be expected to provide the latest available model when the SI Generator System is required.

Bidders are requested to fill in the following tables, indicating the total price for each of the materials and quantities considering the Criterion stipulated per requirements in Sections 2.5, 2.6 and 2.7 of this document. Table3 in part C3 has the current system configurations for accurate license costing.

Schedule of Cost A: Main Production Platform (1+1)					
Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION	Unit Price	Quantities	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
SI Generator Hardware A	R	1	R		
SI Generator Hardware B	R	1	R		
SI Generator Licenses A	R	1	R		
SI Generator Licenses B	R	1	R		
Services (e.g. Delivery, Installation, Integration, commissioning, etc.):	R	1	R		
Total Cost					

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

Schedule of Cost B: Disaster Recovery Platform (Single Chain)					
Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION	Unit Price	Quantities	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
SI Generator Hardware A	R	1	R		
SI Generator Licenses A	R	1	R		
Services (e.g. Delivery, Installation, Integration, commissioning, etc.):	R	1	R		
Total Cost					

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

Schedule of Cost C: Head End Laboratory (Single Chain)

Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION	Unit Price	Quantities	Total Price	DELIVERY TIME ARO (Lead time)	DELIVERY RATE (Units / Month)
SI Generator Hardware A	R	1	R		
SI Generator Licenses A	R	1	R		
Services (e.g. Delivery, Installation, Integration, commissioning, etc.)	R	1	R		
Total Cost			R		

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

Schedule of Cost D: SI Generator SLA

Column A	Column B	Column C	Column D
DESCRIPTION	SLA Cost Year1	SLA Cost Year2	SLA Cost Year3
Main Production Platform	R	R	R
Disaster Recovery Platform	R	R	R
Head End Laboratory	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: SI Generator 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
Main Production Platform	R	R	R
Disaster Recovery Platform	R	R	R
Head End Laboratory	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).

Schedule of Cost F: SI Generator SaaS/Cloud Platform (Optional)					
Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION	SaaS Cost Year1	SaaS Cost Year2	SaaS Cost Year3	SaaS Cost Year4	SaaS Cost Year5
Main Production Platform	R	R	R	R	R
Disaster Recovery Platform	R	R	R	R	R
Services (e.g. Integration, commissioning, Support etc.)	R	R	R	R	R
Total Cost	R	R	R	R	R

In this scenario, the Tenderer hosts the Hardware, Software and licenses at a Datacentre of their choice within the boundaries of South Africa

Schedule of Cost G: SI Generator Hosted Cloud Platform (Optional)					
Column A	Column B	Column C	Column D	Column E	Column F
DESCRIPTION	Lease Cost Year1	Lease Cost Year2	Lease Cost Year3	Lease Cost Year4	Lease Cost Year5
Main Production Platform	R	R	R	R	R
Disaster Recovery Platform	R	R	R	R	R
Services (e.g. Integration, commissioning, Support etc.)	R	R	R	R	R
Total Cost	R	R	R	R	R

In this scenario, SENTECH provides the Hardware at their Datacentre. The Tenderer leases the software and licenses per annum to SENTECH

Summary Pricing Evaluation:

Cost A: Total Cost: Schedule of Cost A R_____

Cost B: Total Cost: Schedule of Cost B R_____

Cost C: Total Cost: Schedule of Cost C 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 C + Cost D + Cost E R_____

PART C3: SCOPE OF WORK

SENTECH'S GOODS INFORMATION

The goods are the supply, delivery and commission of DVB DVB SI Generator System

1. Preamble

Sentech is a state-owned company and is the largest broadcasting signal distributor in South Africa. Sentech is a licensed Electronic Communications Network Service provider. The enterprise currently operates many telecommunication networks for Satellite, Television, Radio, Internet, and more. Sentech is a global enabler of broadcasting and digital content delivery.

Sentech owns and operates much of analogue terrestrial television and FM Radio transmitters nationally. Sentech uses C-band and Ku-band satellite platforms to distribute signals to its terrestrial transmitters. Additionally, Sentech has rolled-out digital terrestrial television (DTT) networks using the DVB-T2 standard on two multiplexes. The country's coverage is achieved through Single Frequency Networks (SFN) and Multiple Frequency Networks (MFN).

Sentech operates several Satellites on Amos17 and IS-20 Transponder networks. Sentech has implemented digital Satellite television networks in the C-Band and Ku-Band Frequency spectrum using Digital Video Broadcast standards. SENTECH adopted the Satellite first-generation (DVB-S) and second-generation (DVB-S2) standards as contained in the European Technical Standards Institute (ETSI) EN 300 421 and ETSI EN 302 307 Part-1, respectively. The platform consists of MPEG2, MPEG4 AVC and HEVC video and MPEG1 Layer2, AAC and HE-AAC sound encoding systems. Sentech's current Satellite network parameter configuration and capacity allocation are tabled in Table 1 and **are not limited** to the following:

Transmission Parameter	TP 1	TP 2	TP 3	TP 4	TP 5	TP 6	TP 7
Bandwidth	36MHz	36MHz	36MHz	36MHz	36MHz	36MHz	36MHz
Orbital Position	IS 68.5° East	IS 68.5° East	Amos 17° East	68.5° East	68.5° East	68.5° East	68.5° East
DVB Standard	DVB-S2	DVB-S2	DVB-S2	DVB-S2	DVB-S	DVB-S	DVB-S
Modulation Type	8-PSK	8PSK	8PSK	8PSK	QPSK	QPSK	QPSK
FEC	5/6	5/6	3/4	2/3	3/4	2/3	1/2
Symbol Rate (MSys/s)	28.75	28.75	28.75	30.00	27.5	30.00	26.66
Roll-off	35%	25%	25%	20%			
Pilots	Yes	Yes	Yes	Yes	No	No	No
Polarisation	Vertical	Vertical	RHCP	Vertical	Vertical	Vertical	Vertical

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 Digital Video Broadcast standards. SENTECH adopted the Terrestrial second-generation (DVB-T2) Modulator Interface (MI) Multiple Physical Layer Pipe (MPLP) technology as contained in the European Technical Standards Institute (ETSI) EN 302755 v1.3.1 (2011-11) and TR 101290 v1.3.1 (2014-07). The platform consists of MPEG2, MPEG4 AVC and HEVC video and MPEG1 Layer2, AAC and HE-AAC sound encoding systems. Sentech's current DTT network parameter configuration and capacity allocation are tabled in Table 2 and **are not limited** to the following:

Transmission Parameter	Mux 01	Mux 02
Bandwidth	8MHz	8MHz
Carrier Frequency	Region Dependant (UHF Band)	Region Dependant (UHF Band)

Physical Layer Pipe	PLP 0	PLP 1	PLP 0	PLP 1
Transmission Mode (FFT)	32K Extended	32K Extended	32K Extended	32K Extended
Guard Interval	1/16	1/16	1/16	1/16
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)
Code Rate	3/5	3/5	3/5	3/4

Table 2: Sentech's current DTT network parameter configuration

The SENTECH DTT network comprises nine(9) regions, each with National Multiplex 01 and 02. Each region adapts to PLP substitution and SI Cross-Reference using a dedicated Regional PLP for content regionalisation on Mux01-PLP1. Where regional content does not exist, a common regional PLP is passed from the Head End on Mux01-PLP1. All national and regional services, including SI information, are generated and distributed or redistributed via Satellite links from the Head End.

Each region is configured with its unique Network Information Table containing carrier frequencies and regional services. However, they maintain a common Network Name, Network ID, Original Network ID and Private Data Specifier. The table below represents the number of **Networks, Transport Streams and Services** configured on the SENTECH SI Generator System:

	Network Type	
	Satellite	DTT
Network Groups	10	15
Regions	SA; SSA; CA; UAE	SA; 9
Transport Streams	75	75
TV and Radio Services	100	100
MPEG-TS EIT Aggregators	10	10

Table 3: Current System Configuration

The primary requirement is the supply, delivery, and commission of a Service Information Generator System for Digital Terrestrial Television (DTT) with Multiple Operators and Regions and Direct-to-home (DTH) linking networks, and it is this Tender's primary focal point. The system is required to meet the functionalities of the SENTECH field DTT and DTH Set Top Boxes, Professional Integrated Satellite Receivers. There are functionalities the Receiver units are required to perform:

- Satellite Signal Reception, decodability, display of readable event information and interactive services on SENTECH's Satellite Network
- Terrestrial Signal Reception, decodability, display readable event information and interactivities services on SENTECH's DTT Network
- Operate with Free-To-Air, Free-To-View, and Pay TV services on the DTH network.
- Operate with Free-To-Air, Free-To-View, and Pay TV services on the DTT network.
- Operate with Free-To-Air, Free-To-View and premium services on DTT and DTH networks.
- **In future**, operate with Free-To-Air, Free-To-View, and Steaming networks such as IPTV and OTT.

Sentech intends to use the same satellite-based distribution system for linking DTT (DVB-T2) television transmitter networks and for Direct To Home (DTH) reception. Project timelines dictate that the system must be operational by the end of the first quarter of 2023. Due to the tight timelines, Sentech initially requires standard off-the-shelf field-proven equipment.

Sentech, therefore, requires a three-phase approach:

- Sentech requires a standard off-the-shelf field-proven solution in the first implementation phase. However, the solution must be capable of replacing the current SI Generator system without the need to replicate content on the distribution link.
- The second phase would entail a proof of concept in which a solution is established to demonstrate the concept and overall system stability in our Head-End laboratory.
- The third phase would entail implementing the system in phase two to our production (live) platforms in our Head End production and Disaster Recovery site.

2. DETAILED TECHNICAL REQUIREMENTS

2.1 Definitions and Abbreviations

Definitions

The following definitions are used in this document:

head-end	refers to all equipment related to the satellite uplink;
national content	content common to all SFNs in a multiplex;
regional content	content which will be different on different SFNs. Initially, all regional content will be available at the head-end (uplink). There will be no initial regional input point.
System	is an assembly or combination of interrelated elements or parts working together toward a common objective.
Technical Specifications	means the specifications for the required technology configuration and technical characteristics of a service, including requirements relating to minimum bandwidth and technical standards;

Abbreviations

	Description
AVC	Advanced Video Coding (MPEG 4, Part 10)
HEVC	High-Efficiency Video Coding
AAC	Advanced Audio Coding
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
GbE	Gigabit Ethernet
MFN	Multi-Frequency Network
DVB-T2 PLP	DVB-T2 Physical Layer Pipe
PSI/SI	Programme Specific Information/Service Information
PSK	Phase Shift Keying Modulation
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
STB	Set-to-box Decoder (CPE) for home installation
ETSI	European Telecommunications Standards Institute
IEC/ISO	International Electrotechnical Commission/International Organisation for Standardisation
PSU	Power Supply Unit

2.2 Introduction

Sentech requires DVB Service Information Generator System.

In the preamble, Sentech has described its strategy for distributing services to the transmitters in the SFN networks. For clarity, Sentech intends to feed its DTT transmitter networks using 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 will be used to serve as the DTH platform. The satellite systems conform to DVB-S2 specifications ETSI EN 302 307 and ISO/IEC 13818-1 standard.

Tenderers shall specify the maximum jitter their equipment can tolerate and any other constraints the IP network should meet. Diagram in *Annexure 1* illustrates the proposed logical layout of the head-end. Tenderers are required to provide the equipment required at the head end. The diagram is for illustrative 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 equipment; therefore, standards compliance is essential. Tenderers must indicate how their proposed equipment can be configured to provide redundancy.

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

- Centralised DTT distribution with regional programme information; some PSI/SI will not be locally generated but come from customers.
- Multiple multiplexes allow PSI/SI cross-carriage for other DTT multiplexes.
- Delivery to the DTH platform.

It should be assumed that 100M/1000M IP switches will be available at the Head End.

The MPEG-TS Multiplexer will switch between primary and secondary feeds at the Head End. The SI equipment should be able to detect missing DVB table sections in the incoming streams from the broadcasters (schedule providers) and mute its output to allow redundancy switching by the MPEG-TS Multiplexers.

Suppose a Tenderer cannot supply equipment that can fully meet Sentech's proposed requirement. In that case, they may propose an alternative solution with a detailed explanation as to what extent Sentech's requirements can be met and its implications.

Tenderers must also give details of their practical experience deploying the DVB-SI equipment in a Multi environment for DTT, DTH and IP networks (IPTV and OTT).

A complete solution is required, which must include all DVB-SI equipment.

2.3 Response Details and Requirements

The Proposer shall provide the following information,

- A firm and fixed quotation with full technical specifications indicating any 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 and software offered must be provided. 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 must also be indicated if this is field upgradeable. Specifications must include maximum data rates supported by each type of equipment and the number of transport 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 in *Annexure 1*. 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.
- The Tenderer, should his Bid be successful, will ensure that the equipment supplied is integrated into the head-end as appropriate.
- The head-end equipment consists of Harmonic ProStream 9000 and XG2 and XG3 multiplexer systems. These are, managed explicitly through Harmonic NMx. Tenderers must supply a common platform for the management of the equipment provided. Tenderers must also indicate which network management systems they have integrated or would recommend. Currently, Sentech uses the ANT NMS and Skyline Determiner System.
- The current Head End Multiplexers are Harmonic ProStream Series. Multiplexer equipment from alternative suppliers may be used in future. The Tenderer must indicate known compatibility or incompatibility with various MPEG-TS Multiplexer manufacturers' equipment.
- Sentech must meet critical timelines for this project to be successful. Tenderers must be able to deliver and commission the system offered by not later than 30 June 2023 to Sentech sites, should their Bid be successful.
- Tenderers may be requested to demonstrate the successful operation of their equipment to Sentech staff at the Tenderers' premises. Tenderers may alternatively offer, at their own expense, to demonstrate a working system at Sentech's premises.

2.5 General Technical Requirements

2.5.1 Environmental (Score 6)

- **Environment**

The equipment must operate at any altitude up to 2 800 metres above mean sea level, ambient 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 supplied must be adequately protected against lightning-induced transients, survive, and recover to a normal operational state after a prolonged power dip or "brownout".

- **Safety**

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

- **Fire**

All materials used in the construction of the equipment should be flame retardant. The design of heat dissipation of PCB-mounted devices must be such that no danger of component desoldering occurs should the ambient room temperature rise above 45°C.

- **EMC**

The Tenderer shall provide a complete list of specifications complied with. Equipment shall meet at least EN 55022 and EN 55024.

- **Equipment Layout**

All physical connections shall be made to the rear of the equipment, and the user interface shall be from the front of the equipment. Common Interface access may be from the front of the equipment, and all equipment shall be rack mountable in a standard 19-inch rack (IEC60297). All equipment dimensions must be specified.

2.5.2 Operation Manual (Score 4)

Each piece of equipment must be supplied with at least one Operations manual written in English, describing installation, operations and fault finding with a complete list and meaning of all error messages. The manual must also describe, at least to block diagram level, the operation of the equipment offered.

Where modules included in the Tenderer's equipment are sourced from third party suppliers, e.g. Interface Adaptors, full technical details of such modules must be included with the system documentation. Tenderers must include an Operations Manual as part of the tender response.

2.5.3 Support (Score 8)

Suppliers must guarantee adequate product support, including software upgrades and adequate spare keeping for ten(10) years after the warranty expiry of the last delivery of the equipment supplied.

The Tenderer shall specify the maximum turnaround time for equipment repair. Turnaround time shall not exceed ten(10) working days after receipt of faulty equipment.

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

Tenderers shall 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 a replacement of the Hardware within three(3) years or more if the servers/hardware reach their end-of-life and end-of-support. (Qualifying)

2.5.4 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 specified within 12 months of the date of delivery, the Contractor shall replace or repair the defective item at his 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.

The Tenderer can provide an option to offer SENTECH an extended warranty of at least three (3) years.

2.5.5 Delivery (Score 8)

Prices must be as specified in Part C2. Guaranteed delivery time after receipt of an order must be indicated in the table in Part C2. Delivery may not exceed eight(8) weeks from receipt of the order.

2.5.6 Quantity (Score 2)

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

Tenderers must also propose a non-redundant test (laboratory) system as well as for the disaster recovery site.

However, the intention is to enter into a long-term supply agreement to meet the requirements.

2.5.7 Training (Score 4)

Tenderers must offer full Training to Sentech technical staff to enable them to operate and maintain all equipment offered. Training is to be provided at Sentech's offices in Johannesburg, South Africa. Training must allow for at least three days, covering the theory of system operation, operation and maintenance of SI Generator site equipment. Provision should be made for at least 20 trainees.

2.5.8 Installation and Commissioning (Score 8)

Tenderers must offer installation and commissioning of their equipment at the Johannesburg and Nasrec head ends. Sentech will provide rack space. Final acceptance will only occur after demonstrating full technical and operational compliance (i.e. fully debugged).

2.5.9 System Integration (Qualifying)

The Tenderer, should his Bid be successful, will ensure that the equipment supplied is integrated into the head-end as appropriate.

2.5.10 System Configuration (Score 8)

Sentech requires elegant (not overly complicated) solutions. Preference will be given to systems which require lower equipment counts at the head end.

2.5.11 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.

2.6 Special Technical Requirements**2.6.1 Ability to Meet Project Objectives (Qualifying)**

Sentech requires a three-phase approach to implementation:

- In the first phase of implementation, Sentech requires an off-the-shelf field-proven solution. Tenderers must specify where their proposed solution is operationally deployed and when the equipment was put into operation. However, the solution must be capable of replacing the current SI Generator system without the need to replicate content on the distribution link.
- The second phase would entail a proof of concept in which a solution is established to demonstrate the concept and overall system stability in our Head-End laboratory.

- The third phase would entail implementing the system in phase two to our production (live) platforms in our Head End production and Disaster Recovery site.

2.6.2 Compliance With DVB Specifications (Qualifying)

Equipment offered must comply and generate MPEG/DVB-compliant PSI/SI tables following DVB Standards,

- DVB SI – ETSI EN 300 468 V1.16.1 (2019-05) - Specification for Service Information (SI) in DVB systems
- DVB SI – ETSI TS 101 211 V1.12.1 (2013-12) - Guidelines on implementation and usage of Service Information (SI)
- DVB PI - EN 50083 - Interfaces for CATV/SMATV Headends and similar Professional Equipment
- DVB M - ETSI TR 101 290 - Measurement guidelines for DVB systems
- DVB DATA - ETSI EN 301 192 V1.7.1 (2021/08) - Specification for data broadcasting
- DVB SI – ETSI TS 101 162 V1.9.1. (2020/07) - Allocation of Service Information (SI) codes for DVB systems
- DVB MPEG – ETSI TR 101 154 V1.4.1 (2000/07) Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in Satellite, cable and terrestrial broadcasting applications
- ITU-T Recommendation H.222.0, ISO/IEC 13818
- DVB ETSI TS 102 034 V2.1.1, Transport of MPEG-2 Based Services over IP-Based Networks.

Interface to Head End Multiplexers must be DVB-MPEG-TS over IP with Multicast (UDP or RTP options) of 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.

2.6.3 Equipment Interface (Qualifying and Score)

- TS inputs on the SI Generator equipment shall be provisioned on GbE ports for redundancy configuration and incoming broadcaster streams. (Qualifying)
- TS outputs on the SI Generator equipment shall be provisioned on GbE ports for redundancy configuration and outgoing streams. (Qualifying)
- TS inputs on the SI Generator equipment with ASI support are required **as an** option for incoming broadcaster feeds, SDT and EIT Extraction and redundancy configuration and outgoing streams. (Score 4)
- ASI inputs and outputs must work in conjunction with IP inputs and outputs. (Point = 4)
- The command and control or management interface shall be RJ45 on at least 100bT Ethernet ports. (Qualifying)

NB: It is recommended and advantageous to supply a server with PCI or PCIe slots where connection interfaces are field upgradable.

2.6.4 System Capacity (Score 8)

The Tenderer must specify the maximum data rates supported by each type of equipment. The minimum data rate must exceed the maximum supported by TS streams, Services and EIT Aggregators specified in Table 3 of Part C3 of this document.

The Tenderer shall specify the maximum number of streams their equipment can support. The minimum number of transport streams supported must exceed 150 per type of equipment.

2.6.5 Monitoring and Supervisory (Score 32)

The SI Generator equipment should preferably be able to analyse inputs and convey the information to the network management platform (NMS).

The equipment should monitor all incoming schedules.

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.

It would be advantageous for the platform to compose a transport stream of services selected from services in different input streams and generate some or all of the PSI/SI tables for the output, provided that it can cope with channel line-up changes.

The equipment should monitor all playout schedules at each transport stream per service.

It should be possible to save the configuration and recover from the last active configuration in case of system failure.

Upon any channel line-up change, i.e. adding, deleting or changing a service name or descriptor values, there should be a means to reconfigure the system which is not cumbersome and error-prone and does not require more than a few minutes to complete. Cold standby redundancy, with manual Primary and Secondary Hardware synchronisation

The equipment should operate at High Performance and Responsiveness with sufficient memory allocation. The equipment should be compatible with at least SNMP version 2. The equipment should log and store application, event and operational error messages

The supplier shall make the SNMP MIB (Management Information Base) files available to enable Sentech to determine which parameters can be monitored and controlled. The equipment shall be able to send traps to a higher-level operations management platform (i.e. NMS).

Equipment shall, in addition, support web browser-based remote control and monitoring. This shall allow complete equipment configuration, control and monitoring. Equipment must also be equipped with an open contact relay summary alarm.

SNMP is preferred for the configuration of equipment. If any proprietary protocol is used standalone or in conjunction with SNMP, it should be indicated, and all protocol details will be made known to Sentech.

2.6.6 Redundancy (Qualifying)

Fully redundant equipment for the SI Generator must be proposed. Redundancy between the primary and secondary GbE I/O ports from the Primary and Secondary Chassis will be provided. The MPEG-TS Multiplexers will perform redundancy switching of the SI Generator streams.

Head-end redundancy switching must be automatic and seamless with no manual intervention. The process must be specified if a separate management system is required to perform this function.

Prepare the system for redundancy configurations and have a watchdog application to ensure high availability and allow the automated restart of processes and services.

Ensure Regular serialised file backup in a *one-on-one* redundant architecture with SENTECH TS Multiplexers, affording a fail-safe configuration upgrade procedure. (If preferred)

Ensure Regular serialised file backup in a *Cross-Connect* redundant architecture with SENTECH TS Multiplexers, affording a fail-safe configuration upgrade procedure. As per Diagram in *Annexure 1*

2.6.7 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 as a whole. Tenderers must indicate if these are calculated or historical values. Tenderers shall calculate the effect on MTBF for equipment redundancy where proposed.

2.6.8 OTT EPG Integration (Score 4)

Provision stream ingests and playout for extended EPG and metadata targeting OTT platforms (e.g. Web, Mobile application, etc.) using API, XML, JSON, etc.

2.7 System Technical Requirements (Qualifying)

- Supply an integrated editor, generator, scheduler and spooler for DVB SI (Service Information) and MPEG PSI (Program Specific Information) tables
- Must support Logical Channel Numbering (LCN) and service ID mapping, not limited referencing in the Network Information Tables. Descriptor Tag x83 is to be used at a minimum.
- Enable operators to schedule PSI/SI information, dependently or independently from each other, via a clear and organised GUI.
- The ability to copy, paste and edit a DVB SI Table with appropriate descriptors in the first loop and secondary loops is required at a minimum.
- Enable operators to schedule DVB EIT descriptors at the event and sub-event level and allow altering the content of the EIT Present/following during the event's lifespan.
- Allow defining specific descriptors at a higher level; for example, the Network Name_descriptor occurring in the NIT does not have to be defined for each network group. Instead, it is possible to define a default version at the network level so that each Network group subsequently inherits this descriptor version.

2.7.1 EPG Schedule - DVB file import

Support the automatic import of third-party scheduled files—fully automated generation and multiplexing of EIT tables containing descriptors to various network groups, transport streams/PLP and services.

- Allow third-party providers to upload the EPG Schedule information using DVB files (any compatible file format is acceptable)
- Any supported file transfer protocol is acceptable (e.g. FTP, SFTP, etc.)
- Every imported schedule file must be associated with an import service to be processed by the EPG-DVB Aggregator
- Compose a response log file for successful or non-successful imports
- Exchange the schedule response log files with third-party providers
- Archive all successfully imported files for tracking which schedule files have been delivered

2.7.2 EPG Schedule – MPEG-TS EIT Aggregation

Support the unattended, automatic import of third-party schedule information—fully automated generation and multiplexing of EIT tables containing descriptors to various network groups, transport streams/PLP and services.

- Extract schedule information and descriptors conveyed in the EIT tables (both present/following) from an **IP-Multicast Transport Stream feed**
- Extract SDT information and descriptors, and the running status is extracted from the received SDT Table(s) depending on the configuration settings from an **IP-Multicast Transport Stream feed**

2.7.3 Table Generator

Generate the MPEG PSI tables PAT, PMT, CAT and DVB SI tables NIT, BAT, SDT, EIT (present/following and schedule) and TDT/TOT. Both actual and other tables can be generated with control over the occurrence of descriptors. For example, this allows operators to save bandwidth on the EIT other tables by having fewer descriptors than the actual version.

The system must exclude or include SI Other tables from other Network Groups and Transports in the current/actual Transport Stream (e.g. exclude SDT other or EIT Other from actual TS).

Allow PID value Offset in Decimal or HEX from the defined DVB SI Table PIDs.

2.7.4 BAT – Service Mapping

Allow the creation of multiple BAT Tables. Allow mapping and grouping of Networks, Transport Streams and multiple services to separate BAT Tables.

2.7.5 Table Cycler

Allow creation of table cycler components. Allow manually controllable cycle rates. Allow mapping and grouping of Networks and Transport Streams to separate table cyclers.

2.7.6 IO Board Ingest and Payout

The IP input/output sockets must be **jitter tolerant** and allow input or payout of **MPEG TS streams at variable and constant bitrates**.

Support IP multicast payout through GbE ports. All TS Payout shall be IP Multicast, compliant with DVB ETSI TS 102 034 V2.1.1, Transport of MPEG-2 Based Services over IP-Based Networks.

2.8 Optional Items

2.8.1 Future Development

Flexible add-in architecture for additional descriptors and DVB Standardised tables: through this architecture, one can easily extend the natively supported set of descriptors (e.g. generate DVB-INT, DVB-NIP and DVB-I tables with their descriptors)

2.8.2 IO Board and Payout

Support a Network Adaptor for TCP/IP Output for delivery of Streams (SI Tables) using unicast session protocols

2.8.3 External trigger

Supports external triggering of events as opposed to schedule-based triggering

1. ANNEXURE: Head End Cross-Connect Configuration

