ANNEX 1

KGN-SEC-18-2023

TECHNICAL SPECIFICATIONS FOR ISMS FOR WESTERN, KIPEVU AND UPPER TANA REGIONS

1. Introduction: General Description of the Project

The project entails upgrading Kengen's Western, Kipevu and Upper Tana regions security infrastructure through installation of an Integrated Security Management System (ISMS) in accordance with the technical specification provided in this document.

The ISMS subsystems to be installed are:

a) CCTV
b) Perimeter Intrusion Detection System
c) Access Control System with visitors' management system
d) Integration of fire Alarm system with Access control system
e) IP Public address system
f) Command and Control System/Security Management System

1.1 ISMS will be installed in the sites below:

a) Western region Power Stations (Sondu Power Station, Sangoro Power Station, Turkwel Power Station, Muhoroni Power Plant and Gogo Power Plant
b) Kipevu Region Power (Kipevu 1 & 3 Power Stations)
c) Upper Tana Region (Tana Power Station, Wanjii Power Station, sagana Power Station and Mesco Power Station)
d) Regional Command and Control Centers {RCCC}) located in Sondu regional Office Block, Tana regional office block and Kipevu regional office block.
e) Local Command and control Centres (LCCC) in respective stations and plants
f) Relay of ISMS from the respective RCCC (Sondu, Tana & Kipevu) to Stima Plaza MCCC
g) In the project's scope the regional command and control centers (RCCC) shall be in Sondu regional Office Block, Tana regional office block and Kipevu regional office block. RCCC allows oversight, supervision and control over the Integrated Security Systems installed in the respective Region's facilities.
h) The Main Command and Control Centre (MCCC) in Nairobi HQ is the highest level of control. It supervises security activities and controls critical emergency events that have a national impact.
i) The Main Command and Control Centre (MCCC) in Nairobi Stima Plaza shall have the option for receiving alarm signals, viewing the ISMS composite systems in real time through the security management system (SMS). The network link between respective region's RCCC and MCCC in Nairobi Stima Plaza HQ is responsibility of the Employer.

j) All electrical power supply required for the project components will be under the responsibility of the contractor. The contractor should coordinate with the Employer about details of the required power and the main connections' points. The electric cabling from

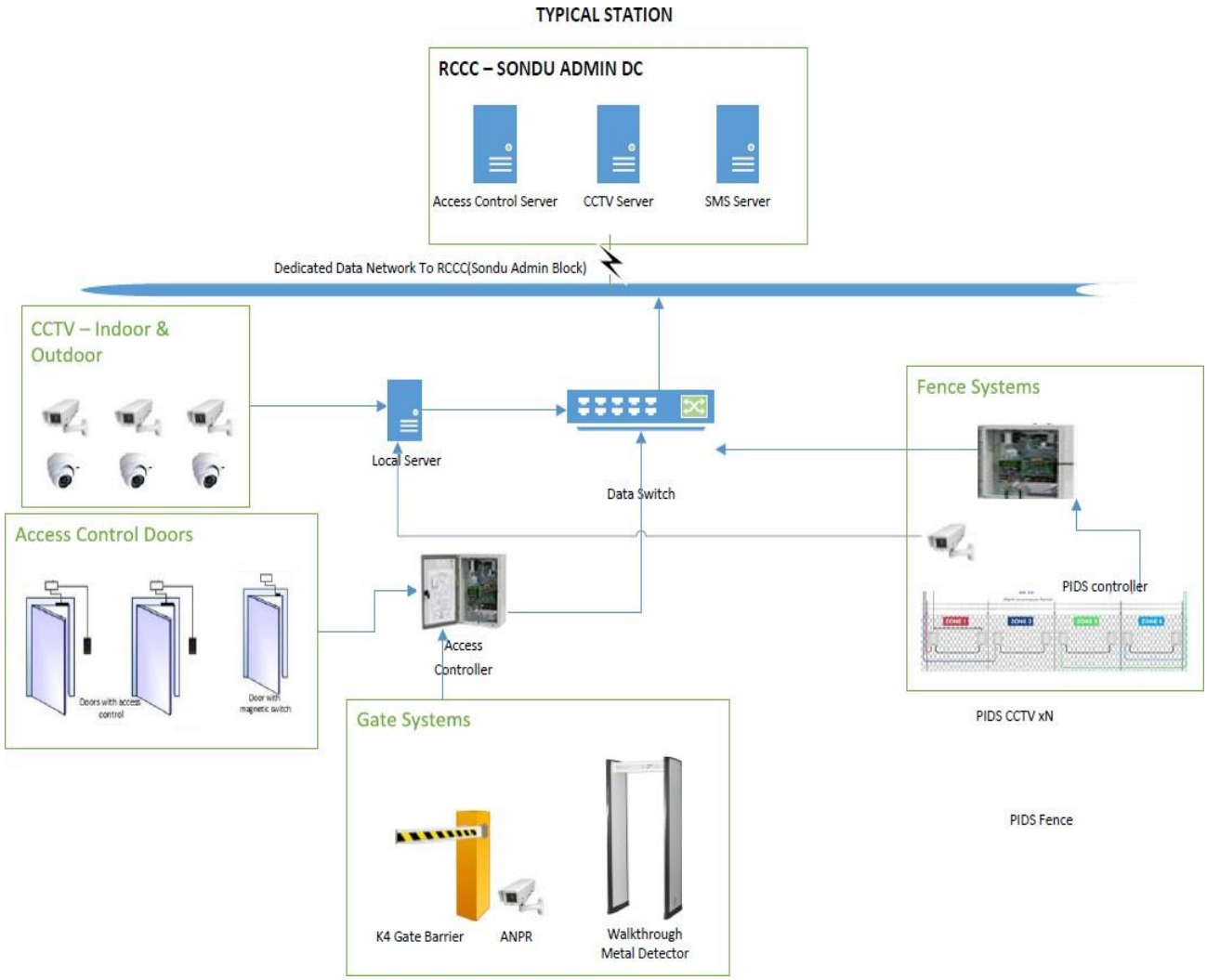
these main connections points to the various systems will be under the contractor's responsibility.

k) Illumination upgrading is required on some areas. It will be the contractor's responsibility to install lighting equipment as specified in this document.

The communication links between the power plant installation sites and the Hydro Plaza/RCCC compound will be under the responsibility of the Employer (based on the existing infrastructure and his data network).

Communication links within the sites, from the various components of the system to the closest connection point to the Employer's network, will be under the responsibility of the contractor and are part of this project.

The following image illustrates the configuration of the security systems in a typical single KenGen's single power station. The same shall apply for all power stations (***not all the power stations will be equipped with all the elements which are presented on the drawing***).


TYPICAL STATION
RCCC – SONDU ADMIN DC
Access Control Server
CCTV Server
SMS Server
Dedicated Data Network To RCCC(Sondu Admin Block)
CCTV – Indoor & Outdoor
Local Server
Data Switch
Fence Systems
PIDS controller
PIDS CCTV xN
Access Control Doors
Doors with access control
Door with magnetic switch
Access Controller
Gate Systems
K4 Gate Barrier
ANPR
Walkthrough Metal Detector
PIDS Fence

1.2 QUALITY OF MATERIALS TO BE SUPPLIED

All equipment and materials supplied as part of the contract works shall be new and of good commercial quality, shall be free from defects and imperfections and where indicated shall be of grades and classifications designated herein.

All products or materials not manufactured by the contractor shall be products from reputable manufacturers.

Materials and apparatus required for the complete installation as called for by the specification shall be supplied by the contractor unless mention is made otherwise.

Defective equipment, or that damaged during installation or tests shall be replaced as required to the approval of KenGen.

CABLES AND CONNNECTORS

- All the cabling shall be carried out in conduits or trunking.
- The positions for connectors and the equipment shall be directed and identified by KenGen on site.
- Bidders shall be required to visit the proposed site to ascertain cable routes and cable lengths before pricing the Bills of Quantities in this document.
- It shall be the responsibility of the contractor to provide wiring and connection diagrams for approval by KenGen.

UNINTERRUPTIBLE POWER SUPPLY (UPS)

- This shall be an on-line Un-interruptible power supply with output rating of 3KVA, 240V, 50HZ single-phase supply. It shall provide power to the security surveillance system in case of power failure and/or maintained power failure for a while.
- The positions for the UPS's shall be directed and identified by KenGen on site.

MOUNTING BRACKETS

- The Brackets shall be suitable for interior use, exterior use, wall, or ceiling mounting of a single camera depending on the actual mounting location of the camera.
- It shall be the responsibility of the contractor to provide the appropriate mounting bracket for each camera for approval by KenGen.

ELECTRICAL REQUIREMENTS

For any Electrical connection required, the contractor shall work with KenGen Engineer on site to ensure appropriate power supply is provided.

RECOMMENDED CABLING PRACTICES

The successful contractor shall be required to re-terminate and carry out proper cable management for ALL cables (electrical and network & existing and new) in the identified CCTV equipment cabinet.

Cabling shall be done to high standard with high quality cable management practices. Some of the Do's and Don'ts shall include but not limited to:

Do's

- Locate the main cross-connect near the center of the building to limit cable distances.
- Maintain the twist of horizontal and backbone cable pairs up to the point of termination.
- Tie and dress horizontal cables neatly and with a minimum bend radius of 4 times the cable diameter.
- Connecting hardware shall be installed to provide well-organized installation with cables.
- management and in accordance with manufacturer's guidelines (Patch cords must be factory terminated).
- Use patch cords for connectivity to and from the network switches through patch panels. The patch cords shall be 1M long (Fiber optic and UTP) unless otherwise needed. UTP patch cords will be RJ-45 male to RJ-45 male, while the Single Mode Fiber Optic patch cords shall be SC male to LC male.
- Strip back only as much jacket as is required to terminate individual UTP cable pairs.

Dont's:

- Do not use connecting hardware that is of a lower category than the cable being used.
- Do not create multiple appearances of the same cable at several distribution points (called bridged taps)
- Do not over-tighten cable ties, use staples, or make sharp bends with cables.
- Do not place cable near equipment that may generate high levels of electromagnetic interference. Cables of differing voltages shall be segregated.
- cable damaging any adjacent cables or imposing a different voltage upon them.
- It shall be the responsibility of the contractor to provide and install the appropriate cable management accessories after approval by KenGen.
- Cable routing shall be such that the maximum degree of protection against accidental damage is obtained by running cables along the inside of channels and beams, etc.
- Cables shall be laid in performed trenches or duct throughout all paved areas. Ducts shall be installed for underground cables before the paving is constructed.

- Cable ducts shall be sealed at both ends using materials which are resistant to any likely corrosive and insect attack in the area concerned.

- All cables shall be fitted with durable cable identification bands at each end, and at all changes of direction where they leave a group of cables. All cables cores connected to equipment having marked terminals shall be fitted with durable identification bands bearing markings corresponding to those of the terminals at both ends. The equipment shall be clearly labelled too. All labels must be approved by KenGen before installation.

TRUNKING AND CABLE ROUTING

Where there shall be no existing, clear, "smart-looking" route to a camera installation point or need for creation of a new route to the intended equipment destination, the following rules shall be adhered to with regards to the medium the cable will pass through:

CONDUIT RUNS, TRENCHING AND CONCEALMENT

- All conduits must be firmly and rigidly fixed to be entirely without whip or movement.
- The main material of conduits (Flexible or fixed) to be used shall be PVC for interior use and HPDE and/or Steel for exterior and dangerous areas use areas respectively.
- The routes of the conduit installation shall be agreed with the Engineer prior to commencing the installation. Conduits shall be installed at least 150 mm from, and preferably away from, any hot pipes and at least 50 mm from other surface pipes and cables. Conduits shall be bonded to other surfaces in accordance with the requirements of IEEE Regulations 413-2 and 547-4 to 547-7 inclusive.
- Each continuity test shall be applied to the system before conduit joining, plastering, screeding, or casting of concrete is commenced.
- Surface work will be allowed where certain prefabricated methods of construction preclude the concealment of the runs, and or fair-faced brickwork or block work or other un-plastered walls.
- For trenching works required, the trench shall be at least 3 ft deep at all sections with marking tape at the 2ft deep mark over the conduit path and once backfilling has been done, yellow cement markers indicating type of cable shall be placed at crossing junctions and at 10-20m on the surface unless agreed otherwise with KenGen.

CABLE TRUNKING-SHEET STEEL

- Trunking shall only be installed in situations which will remain readily accessible throughout the life of the buildings. No cable trunking shall be installed behind a plastered ceiling or in other inaccessible situations.
- All cable trunking shall comply with BS 4678, part 1 "Steel surface trunking" and part 2

for "Steel underfloor (duct) trunking".

- Sheet steel cable trunking may be used on installations employing steel conduits or where several conduits would otherwise have to run alongside each other. Proper allowance should be made for the derating of cables installed together in a container system.
- The trunking shall have an overlapping well-fitted lid securely fixed to the trunking by approved means that will avoid damage to the cables. Self-tapping screws shall not be used within the trunking.

NOTE

- All Tee pieces and bends shall be formed with similar means of connection and the inner radii area shall be such that cables will not be bent through a radius less than that prescribed in the IEE Regulations. Only bends and tees of approved pattern will be accepted.
- All necessary accessories including long sleeve couplings, end piece, bends, sets, tees, reducers, branches, fillets, pinracks, cable retainers etc., shall be purpose-made units rather than being fabricated on site. The trunking/conduit designs and any trunking/conduit accessory manufactured at site must be approved by KenGen before installation.
- All joints shall fit closely, and gaps will not be permitted. All burrs and sharp edges shall be removed, and no screw shall protrude into/from the trunking/conduit.

EARTHING AND LIGHTNING PROTECTION

All electrical connections must be properly earthed to ensure safety and durability of the system. For installations being done in areas where there is risk of lightning, the successful contractor shall ensure that these installations are protected appropriately.

SAFETY

KenGen Adheres to a strict safety culture and workers on site shall be required to follow all rules and regulations required before, during and after the contract this includes job safety licences, proper working attire, helmets, safety glasses, safety boots etc as advised by the KenGen safety officer.

INSPECTION AND TESTING

- This shall be done upon delivery of the equipment to KenGen and a continuous assessment on the quality components of the contract shall also be done throughout the period of the project.
- All designs must be approved by KenGen on site before and after installation.
- Where equipment requires factory inspection and testing, the contractor shall bid for

costs of the venue, inter-factory travel logistics and meals. KenGen shall bear cost on transport to venue and allowances.

- Upon completion of the works the whole installation shall be subjected to the tests detailed hereafter and every defect shall be noted, corrected, and brought to the notice of the Engineer.
- All tests shall be witnessed by the Engineers to their full satisfaction.

DISPOSAL OF OLD EQUIPMENT (Where applicable)

After successful commissioning of the CCTV upgrade at Tana power station, the successful bidder shall ensure that components from the old CCTV system are disposed as per NEMA regulations.

It shall be the responsibility of the contractor to ensure that the items from the old CCTV system are disposed of properly. KenGen shall confirm the process of disposal is as per regulation.

The area where the current equipment is must be prepared before mounting the new equipment. This shall entail but not limited to replacement of the raised floor tiles and structure under it.

AS BUILT DRAWINGS, AND DOCUMENTATION

Within one month of the date of completion the Contractor shall provide prints and soft copy of all network drawings, electrical drawings, CCTV positioning schematics, Inventory, configurations showing them "As built". In case the Contractor fails to provide "As Built" drawings as required, these will be prepared by others at the expense of the Contractor.

The contractor, together with KenGen, shall document an inventory of all active equipment, including but not limited to their location, serial numbers, I.P. addresses and any other information as directed by KenGen staff.

All equipment shall be labelled effectively for easy identification of equipment and cabling.

After commissioning, CCTV monitoring signs shall be placed at all strategic places to notify individuals that CCTV is in operation in the area.

2. EQUIPMENT TECHNICAL SPECIFICATIONS

2.1 CCTV

VMS SOFTWARE SPECIFICATIONS

General Requirements

- The specified product shall be an open, extensible video platform designed for use in any video application.
- The specified software shall include, free of charge, any API, or SDKs necessary to integrate 3rd party devices and systems.
- The specified Video Management solution's architecture shall include Desktop, Server, Mobile, and Cloud applications.

General Abbreviations, Acronyms, and Standards

1) ACC : Video Codec "Active Content Compression
2) ADDS: Active Directory Domain Services
3) AGC: Automatic gain control
4) API: Application Programming Interface
5) AVI: Audio Video Interleave
6) Bit Rate: The number of bits/time unit sent over a network
7) DHCP: Dynamic Host Configuration Protocol
8) FPS: Frames per Second
9) FTP: File Transfer Protocol
10) GbE: Gigabit Ethernet (1000Mbps)
11) H.264/5 (Video Compression Format)
12) HTTP: Hyper Text Transport Protocol
13) IEEE 802.1x: Authentication framework for network devices
14) IP: Internet Protocol
15) JPEG: Joint Photographic Experts Group (image format)
16) LAN: Local Area Network
17) MJPEG: Motion JPEG
18) MKV: Matroska video format
19) MP4: MPEG Layer-4 Audio
20) MPEG: Moving Picture Experts Group
21) NTP: Network Time Protocol
22) NTSC: National Television System Committee – a color encoding system based on 60Hz
23) ONVIF: Global standard for the interface of IP-based physical security products
24) PoE: Power over Ethernet (IEEE 802.3af/at) standard for providing power over network cable.
25) PTZ: Pan/Tilt/Zoom
26) SDK: Software Development Kit
27) RAID: Redundant Array of Independent Disks
28) RTSP: Real-Time Streaming Protocol
29) RADASS: Resolution and Algorithmic Data Adaptive Scaling System
30) SMTP: Simple Mail Transfer Protocol

31) SSL: Secure Sockets Layer
32) TCP: Transmission Control Protocol
33) TLS: Transport Layer Security
34) Unicast: Communication between a single sender and single receiver on a network
35) VMS: Video Management System

Ongoing Support & Warranty

Warranty

The VMS software and labor furnished including wiring, software, hardware and third party products shall be fully warranted for parts, materials and labor for a minimum of 3 year from date of the final acceptance of the Video Surveillance System.

Software Licensing & Warranty

1) Software licensing shall be on a per device basis (e.g. 1 x license for 1 IP Camera or I/O device) with no base license for additional features or capabilities and license shall be perpetual.
2) The VMS Software shall be completely free for live streaming or playback of offline media files (images, videos).
3) Lifetime software upgrades shall be provided by the Manufacturer without cost andwithout the need for an annual maintenance agreement.
4) VMS Software Components

1. The specified VMS System shall be comprised of four (4) applications which work together seamlessly.

a. Cloud
It shall be a cloud-based application layer that enables simple remote connectivity, viewing,and management of an unlimited number of connected Systems and Users.The Cloud application shall be an optional component that is free touse.

b. Server
It shall be a lightweight, cross-platform media server responsible for discovering compatible devices, enabling secure connections between clients and connected devices, system resources, and associated metadata.

i. The Server application shall be able to run on Windows, Ubuntu Linux, in most common Virtual Machines, and on select Debian operating systems for ARM embedded devices.

ii. The Server install package shall be <=200 MB in size and require no prerequisite software (e.g. MySQL, SQL, Visual Studio, .Net, etc) to install and use.

c. Desktop Client: Shall be a lightweight, Desktop application capable of acting as a stand-alone media player, a connected client used to actively configure, manage, and view devicesand related data, or a video wall / remote monitor.

i. The Desktop Client application shall be able to run on Windows, Mac, and

Ubuntu Linux devices.

ii. The Desktop Client application installation package shall not exceed150 MB in total size and require no prerequisite software to install anduse.

VMS Developer & Integration Tools

1. The VMS shall have built-in developer tools which are accessible from any System Server's Web Admin Interface (compatible with all major browsers) and shall include,at a minimum:

   a. A Generic Events Generator
   A tool which helps build HTTP Generic Event calls, a method of sending events from 3rd party systems to the VMS, which can be used to trigger system actions in the VMS.

   b. Server API
   An HTTP RESTful API that includes the following:

      i. System API
      ii. Server API
      iii. Video API
      iv. Audio API
      v. Proxy API
      vi. WebSocket API
      vii. Authentication & Encryption
      viii. Breaking Change Log

   c. Video Source Integration SDK
   VMS shall provide the ability to integrate virtually any live or recorded video source (IP Cameras, NVRs, DVRs, etc) into the VMS with methods for discovering, displaying, analyzing and recording video, as well as integrating device I/O ports and related motion detection information.

   d. Storage SDK
   Shall provide the ability to integrate any storage into System, allowing developers to read from or write to any storage location: local, remote, or evencloud-based storage locations.

   e. Metadata SDK
   An SDK designed for rapidly integrating object-driven video analytics from 3rd party software or hardware to pull in object coordinates and associated metadata, as well as generate events and context actions in Desktop client UI.

VMS Architecture

2. The VMS shall have a Server Hive Architecture wherein:

a. All servers in a system are equal and synchronize system databases (device configurations, system configuration, user rights) in real-time without the need for operator configuration or an additional administrative interface.
b. A user can connect to any system server to see and manage the entire system.

3. The VMS shall support one-click system wide updates.

    a. System Administrators shall be able to upgrade an entire system via a singlebutton in the Desktop Application.
    b. System Administrators shall be able to upgrade on demand to the latest releaseor specific builds with specific functionality or bug fixes.
    c. System Administrators shall be able to apply an OTA (over-the-air) update.
    d. System Administrators shall be able to generate a URL to download a portablesystem-specific update package in .zip file format which can be used to updateservers without an active Internet connection.

4. The VMS shall use secure technologies for inter-application communication and security.

    a. OpenSSL for network connections - deprecated and insecure protocols and useonly TLS v1+.
    b. Server to Client (Mobile, Desktop, Web) Communications – Option to force encryption between Client and Server for API data.
    c. Option to force HTTPS video traffic encryption between Client and Server.
    d. HTTPS Email notification - TLS / SSL - TLS is the default option for Email Server communications.
    e. Salted/Hashed Passwords - Local Credentials shall be protected using a saltedMD5 hash, Cloud Credentials shall use a complex multi-level hash

5. The VMS shall not require any licenses to increase the number of supported devices, users, or servers.

6. The system shall support scaling to support the maximum recommended system sizesshown below. The system shall support exceeding these recommended maximums by consulting with engineering support.

    a. The system shall support a maximum of 100 Servers in a system.
    b. The system shall support a maximum of 10,000 resources in a system.
    c. The system shall support a maximum of 1,000 concurrent users in a system.

VMS Server Application

A. Supported Operating Systems

1. The VMS Server application shall at least support the following operating systems.

    a. Microsoft Windows
        i. Windows 10 (Released: July 2015)

ii. Windows Server 2019 (Released: October 2018 | EoS: 01/2029)

b. Ubuntu Linux
   i. Ubuntu 18.04 LTS: "Bionic Beaver" (Released: April 2018 | EoS: 04/2028)
   ii. Ubuntu 20.04 LTS: "Focal Fossa" (Released: April 2020 | EoS: 04/2030)

c. ARM / Debian Developer Boards
   i. NVIDIA Jetson Devices
   ii. Raspberry Pi Devices

B. Minimum Hardware Requirements

1) The VMS Server application shall be capable of operating on any hardware able to run acompatible operating system.
2) The VMS Server shall be capable of recording 128 dual-streaming IP cameras (256streams) on a single core of an Intel Core i3 processor.

C. Features

1) The VMS Server Application shall automatically discover, stream, and record any ONVIF Profile S IP camera located on the same subnet as the server application.
2) The VMS Server Application shall manually discover, stream, and record RTSP, HTTP, or UDP (multicast, unicast) streams.
3) The VMS Server application shall support up to 1000 concurrent TCP connections.
4) The VMS Server application shall record and stream video of any resolution and framerate, limited only by hardware.
5) 6. The VMS Server application shall support an unlimited number of users and customuser roles
6) The VMS Server application shall support any type of storage medium - HDD's, SSD's, SDcards, DAS, NAS, or other network-attached storage devices or locations.
7) The VMS Server application shall support LDAP / Active Directory / Open LDAPintegration for user login credential management.
8) The VMS Server application shall record and stream H.264, H.265, and MJPEG streams.
9) The VMS Server application shall record and stream AAC, PCM (Mu-Law, A-law), g726, and MP3 audio.
10) The VMS Server application shall transcode streams on demand for delivery to 3rd partysystems or devices in H.265, H.264, MJPEG or WebM codecs.
11) The VMS Server application shall be able to provide pass-through high or low-res HLSstreams from connected devices.
12) The VMS Server application shall store archive indices in the same location as recordedvideo files.
13) The VMS Server application shall allow system administrators to recover archives fromany storage medium using a re-index archive feature.
14) The VMS Server application shall contain a boolean events engine allowing operators to program and trigger system actions based on system, connected device, or HTTP events sent from 3rd party system or device.
15) The VMS Server application shall be able to send HTTP PUT or GET requests to 3rd partysystems or devices.
16) The VMS Server application shall support IPv4 or IPv6 addressing.
17) The VMS Server application shall allow operators to set custom network routing configurations for system servers to optimize network routing and usage.

18) The VMS Server application shall allow operators to monitor the CPU, RAM, NIC, and HDD usage in real time.
19) The VMS Server application shall track all operator actions to allow audits.
20) The VMS Server application shall generate automatic crash files every time there is anunexpected crash of the Server application.
21) The VMS Server application shall allow operators to change the size of reserved diskspace for storage drives.
22) The VMS Server application shall automatically disable any system drive (drive containing the operating system) in computing hardware with more than one drive toensure the operating system drive does not become full.
23) The VMS Server application shall support configuration and events from binary I/Ocontacts on supported devices - including IP cameras and I/O devices.
24) The VMS Server application shall support sending email notifications via SMTP usingTLS, SSL or unsecured connections.
25) The VMS Server application shall support scheduled backup of recording archives tolocal, networked, or cloud storage locations.
26) The VMS Server application shall allow on-demand backup of recording archives to local,networked, or cloud storage locations.
27) The VMS Server application shall allow concurrent recording of all connected cameras /streams to two (2) servers in real-time.
28) The VMS Server application shall allow server-side, CPU-based motion analysis for allconnected IP cameras with no perceptible increase (<3%) in CPU usage.
29) The VMS Server application shall require no dedicated GPU to perform atmaximumcapacity.
30) The VMS Server application shall have a web administration interface that allows users toview live or recorded video from a single camera at a time in high or low resolutions.
31) The VMS Server application shall have a web administration interface that allows systemadministrators to view real-time server health monitoring statistics (CPU, NIC, and HDD usage).
32) The VMS Server application shall have a web administration interface that allows operators to cloud merge two systems together or disconnect the VMS Server from theVMS cloud application.
33) The VMS Server application shall have a web administration interface that allows users toview all available servers in the system.
34) The VMS Server application shall have a web administration interface that allowsoperators to switch between server interfaces.
35) The VMS Server application shall have a hidden advanced page that gives systemadministrators the ability to modify advanced system settings.
36) The VMS Server application shall support any RAID configuration of storage medium.

2.2 VMS Desktop Client Application

Supported Operating Systems

1. The VMS Desktop Client application shall support the following operating systems.
   a. Microsoft Windows
      i. Windows 10 (Released: July 2015)
      ii. Windows Server 2019 (Released: October 2018 | EoS: 01/20

   b. Ubuntu Linux
      i. Ubuntu 18.04 LTS: "Bionic Beaver" (Released: April 2018 | EoS: 04/2028)
      ii. Ubuntu 20.04 LTS: "Focal Fossa" (Released: April 2020 | EoS: 04/20

c. Apple MacOS
    i. macOS 11.0, 11.1, 11.2 "Big Sur" (November 2020)

A. Minimum Hardware Requirements

1. The VMS Desktop application shall be capable of operating on any hardware able to run acompatible operating system with a CPU that supports OpenGL 2.1 and Intel HD Graphics 3000 (or higher).

2. The VMS Desktop application shall not require any dedicated graphics drive to work atfull capacity (64 streams on a 64 bit OS) and shall use the CPU for all video decodingand rendering.

B. Installation & Configuration

1. The VMS Client application installer shall not exceed 150 MB (megabytes).

2. The VMS Client application shall be a publicly available, free download.

3. The VMS Client application shall require no prerequisite proprietary or 3rd party software and database technologies during installation.

4. The VMS Client installation process shall require no user input once initiated.

C. Features

1. The VMS Desktop application shall have the following basic structure:

    a. Navigation Panel - with a main menu button, an interactive cloud-login icon, tabbed layouts, minimize and maximize icons, a contextual help icon, and a close application icon.

    b. Resource Panel (Left) - contains all system resources (Servers, Devices, Users, Layouts, Offline files, etc.) with collapsible structure and a keyword search mechanism to allow operators to quickly search for a display live streams /cameras, offline video and image files, or any combination thereof.

    c. Notifications Panel (Right) - shows all system or rules-engine generated notifications which can be clicked on to display relevant resource in the ViewingGrid

    d. Timeline Panel (Bottom) - allows for navigation and search of recorded video files

    e. Viewing Grid (Main Viewing Area) - a flexible adaptive grid interface which allowsoperators to create and share customized layouts of system resources.

2. The VMS Desktop application shall allow operators to view and interact with thefollowing types of media:

    a. Live Streams: H.265, H.264, MJPEG

b. Offline Media: AVI MKV MP4 MOV TS M2TS MPEG MPG FLV WMV 3GP JPG PNGGIF BMP TIFF

c. I/O Devices: Status and Triggers

d. Servers: Real-Time Server Health Monitoring Status

3. The VMS Desktop application shall allow the operator to scroll to zoom in to any part ofthe Viewing Grid.

4. The VMS Desktop application shall allow the operator to drag & drop to reassigncameras from one server to another server.

5. The VMS Desktop application shall have a flexible timeline that allows operators to view the dates of any and all archived video in the System for a specific camera, or groups ofcameras.

6. The VMS Desktop application shall allow operators to manually create bookmarks - with a start time, end time, name, description, and tags - for later search. Automated Bookmarks shall also be able to be created using the Rules engine.

7. The VMS Desktop application shall allow operators to create automations using the Rules Engine with the following Events & Actions:

    a. Events
        i. User Defined Events

        User Defined Events are custom Events which must be programmed by auser before they can be utilized and include:

            1. Analytics Event
            2. HTTP Generic Event (covered in Advanced Training)
            3. Input Signal on Device
            4. Motion on Camera
            5. Plugin Event
            6. Soft Trigger

        ii. Default Events

        Default Events are configurable Events which are populated in the RulesEngine when a new VMS System is installed.

            1. Archive Backup Finished
            2. Device Disconnected
            3. Device IP Conflict
            4. License Issue
            5. Network Issue
            6. Server Conflict
            7. Server Failure
            8. Server Started
            9. Storage Issue

iii. System Generated Events

System Generated Events are built-in Events which the System shall generatea notification to operators and cannot be modified by System users.

1. Archive Integrity Check Failure
2. Email Address Not Set
3. Email Not Set for Users
4. Email Server Not Configured
5. Error while Sending Email
6. Licenses Not Configured
7. Reindexing Archive Canceled
8. Reindexing Archive Complete
9. Remote Archive Synchronization
10. Storage not Configured
11. System in Safe Mode

b. Actions

i. Bookmark
ii. Device Output
iii. Do Recording
iv. Do HTTP Request
v. Execute PTZ Preset
vi. Exit Fullscreen
vii. Open Layout
viii. Panic Recording
ix. Play Sound
x. Repeat Sound
xi. Send Email
xii. Set to Fullscreen
xiii. Send Mobile Notification
xiv. Send Desktop Notification
xv. Show on Alarm Layout
xvi. Show Text Overlay
xvii. Speak
xviii. Write to Log

8. The VMS Desktop application shall allow operators to create Soft Triggers - programmable, customizable buttons which sit on top of streams in the Viewing Grid - totrigger any available system action.

9. The VMS Desktop application shall have icons located on the top of live camera streamswhich allow operators to de-warp fisheye cameras, control PTZ cameras, apply client-side image enhancement, execute smart motion search, create zoom windows, rotate items to any orientation, and activate stream or file info.

10. The VMS Desktop application shall allow operators to create Zoom Windows (up to 63zoom windows on a single item in a 64 bit OS) - a magnified view of a part of a livestream, recorded videos, or static images.

11. The VMS Desktop application shall allow operators the ability to execute a Smart Motionsearch by selecting a subset of a live camera stream with results shown in red on theflexible timeline. Smart Motion search shall be able to search a year (12 months, 365 days) of archived video in less than one (1) second.

12. The VMS Desktop application shall allow users to search live cameras by name,manufacturer, IP address, MAC address, and status (e.g. live).

13. The VMS Desktop application shall allow operators to search video archives by date andtime with a responsive, adaptive timeline.

14. The VMS Desktop application shall allow operators to customize the background image ofthe application with supported image types.

15. The VMS Desktop application shall support digital mapping by allowing operators to addand customize background images - including opacity and number of grid points.

16. The VMS Desktop application shall utilize adaptive scaling technology to automaticallyswitch between high- and low-resolution streams during live and recording playback tooptimize CPU and network usage.

17. The VMS Desktop application shall allow operators to log in to the Cloud application inorder to quickly connect to any shared system.

18. The VMS Desktop application shall allow operators to quickly switch between previouslyconnected or cloud-accessible systems using searchable tiles that show system nameand status.

19. The VMS Desktop application shall have a Storage Analytics feature allowing operators toanalyze storage capacity of the system based on available drives and real-time and historical bandwidth analysis.

20. The VMS Desktop application shall allow management and configuration of all Systemdevices, users, and resources in a single unified interface.

21. The VMS Desktop application shall allow fast-forward and fast reverse of archived videoup to 16x normal speed.

22. The VMS Desktop application shall show operators which system server they areconnected to.

23. The VMS Desktop application shall allow operators to connect to previous versions byautomatically downloading and switching to compatible versions.

24. The VMS Desktop applications shall automatically discover available systems on thesame network as the computer running the Desktop application.

25. The VMS Desktop application shall automatically recover and reconnect to a system in theinstance the server the operator is connected to becomes inaccessible for any reason.

26. The VMS Desktop application shall allow operators to show or hide adaptive thumbnails inthe timeline

panel.

27. The VMS Desktop application shall allow operators to synchronize all items on a layout ordisable synchronization to view live and recorded video at the same time.

28. The VMS Desktop application shall have adaptive settings dialogs, allowing operators to switch dialog content while the dialog is open by clicking on a resource.

29. The VMS Desktop application shall allow batch configuration of camera recordingschedules, fps, and quality.

30. The VMS Desktop application shall allow operators to drag and drop multiple systemresources onto the Viewing Grid at the same time.

31. The VMS Desktop Application shall allow administrators to modify time synchronizationsettings for the system to utilize online resources (NTP servers) or to set a dedicatedlocal time server.

32. The VMS Desktop Application shall allow system administrators to view a full list ofsystem cameras and devices in a single dialog.

33. The VMS Desktop application shall allow operators to view, search and export all systemevents.

34. The VMS Desktop application shall allow operators to view, search and export all systembookmarks.

35. The VMS Desktop application shall allow operators to view, search, and export system logs.

36. The VMS Desktop application shall allow operators to view, search, and export an audit trail of all operator actions and replay related video.

37. The VMS Desktop application shall allow administrators to backup and restore the systemdatabase.

38. The VMS Desktop application shall allow administrators to create an unlimited number ofcustom user roles.

39. The VMS Desktop application shall allow administrators to create and share lockablelayouts.

40. The VMS Desktop application shall allow administrators to update layouts in real time.

41. The VMS Desktop application shall allow users to record their screen in full resolution andup to 30fps.

42. The VMS Desktop application shall allow users to add a local folder to add local files forsearch and playback.

43. The VMS Desktop application shall have a Video Wall mode which shall allow operators tocontrol the application remotely.

44. The VMS Desktop application shall have a Media Player mode which shall allow operatorsto use the application as a media player.

45. The VMS Desktop application shall remember past system connections and user credentials and shall allow operators to quickly search for and switch between systems.

46. The VMS Desktop application shall allow operators to adjust the aspect ratio and streaming quality (high resolution or low resolution) of items displayed on the viewinggrid.

47. The VMS Desktop application shall display I/O devices as an individual item on theviewing grid and allow operators to create custom names for inputs and output.

48. The VMS Desktop application shall allow users to customize the layout of I/O panels onthe item in the viewing grid including indicators for inputs and buttons for outputs.

49. The VMS Desktop application shall allow users to de-warp any fisheye lens using automatic calibration or manual calibration without the need for any third (3rd) partySDKs.

50. The VMS Desktop application shall allow users to create fully customizable viewing tours which include any combination of live video streams, offline videos, images, websites (or URLs), I/O devices, and Server health monitoring status.

51. The VMS Desktop application shall allow system administrators to modify and save a shared layout to affect an instantaneous change to that layout on the VMS Desktop application of any user connected to the system viewing that layout (when the system administrator saves the layout the layout shall update in real time for any user viewing that

    layout).

52. The VMS Desktop application shall support two-way audio between operators andsupported devices.

53. The VMS Desktop application shall support audio alerts as an action that can be playedon users' computers or connected system devices.

54. The VMS Desktop application shall support PTZ presets and tours.

55. The VMS Desktop application shall support PTZ presets and tours in fisheye camerasusing de-warp mode.

56. The VMS Desktop application shall allow operators to schedule recording for connectedcameras and devices with options to force minimum and maximum storage durations.

57. The VMS Desktop application shall allow operators to configure pre and post recording formotion events.

58. The VMS Desktop application shall allow operators to optimize camera streaming quality from connected devices automatically using low, medium, high, best quality selectors or manually in the camera.

59. The VMS Desktop application shall allow users to export video by selecting an area on thetimeline and right clicking to export.

60. The VMS Desktop application shall support single video export in .avi, .mp4, or .mkv formats and shall offer the option to transcode any client-side effects (image enhancement, de-warping, timestamps) as part of the exported video.

61. The VMS Desktop application shall support multi-video export in an executable format tocreate a fully portable version of the VMS Desktop application including all exportedvideo files.

62. The VMS Desktop application shall have a rapid review export feature which shall allowoperators to compress any length of video into a short video (e.g. export 8 hours of archives into a 30 second video clip).

63. The VMS Desktop application shall allow system administrators to activate or deactivatesystem licenses on Internet connected systems.

64. The VMS Desktop application shall allow users to force open an alarm layout triggeredby any system or 3rd party event with one or many associated cameras or resources.

65. The VMS Desktop application shall have a hidden configurable method of increasing the amount of items allowed on the viewing grid.

66. The VMS Desktop application shall allow users to adjust configuration of devices.

67. The VMS Desktop application shall support keyboard shortcuts to control various interface options including PTZ mode, Smart Search mode, & layout control.

68. VMS shall allow analytics from various vendors and other supported device with analytics (Axis, DW, Hikvision)

69. The VMS Desktop application shall force users to set an initial password for various camera vendor upon enrollment, for best cyber security practices.

70. The VMS Desktop application shall allow operators the ability to create and send custom Push Notifications to Mobile Application users.

71. The VMS Desktop application shall allow operators to access a camera web page as part of the Camera Settings dialog both locally and remotely (proxied via VMS) with a dedicated browser window embedded in the Camera Settings Dialog.

72. The VMS Desktop shall allow users to enable client-side Intel Quicksync decoding.

VMS Mobile Client Application

A. Supported Operating Systems

1. The VMS Mobile application shall support the following operating systems.
    a. Google Android (Latest version)

b. Apple iOS (Latest version)

B. Installation

1. The VMS Mobile application shall be available as a free download from Google Play orApple iTunes stores.

C. Features

1. The VMS Mobile application shall automatically discover available Systems on a localarea network (LAN).
2. The VMS Mobile application shall store past system connections and credentials and shallallow users to quickly search for and switch between systems.
3. The VMS Mobile application shall have adaptive streaming and automatically adjust thestream being displayed based on network speed.
4. The VMS Mobile application shall allow users to adjust streaming resolutions manually.
5. The VMS Mobile application shall allow users to search for cameras by name.
6. The VMS Mobile application shall allow fisheye de-warping of any fisheye lens without theneed for any 3rd party SDK.
7. The VMS Mobile application shall allow users to view live video from one system.
8. The VMS Mobile application shall allow users to log in to the VMS Cloud layer to view and access all systems shared with a user.
9. The VMS Mobile application shall utilize a custom media player to render and display livethumbnails and video.
10. The VMS Mobile application shall allow users to search video using a calendar.
11. The VMS Mobile application shall allow users to search video using a flex timeline.
12. The VMS Mobile application shall allow "Smart Motion Search" to search archived videoby selecting an entire video or specific area.
13. The VMS Mobile application shall support Push Notifications when connected to Cloud.
14. The VMS Mobile application shall allow users to control cameras using Soft Triggers.
15. The VMS Mobile application shall support two-way audio.
16. The VMS Mobile application shall allow operators to navigate using shared Layouts.

17. The VMS Mobile application shall have live thumbnails for connected cameras inmulti-camera view.

18. The VMS Mobile application shall allow users to control PTZ cameras with singletouch-to-move.

19. The VMS Mobile application shall auto-discover compatible Systems when on thesame LAN.

20. The VMS Mobile application shall support Push Notifications which can be separately configured for each System in a multi-System environment.

VMS Cloud Application

A. Supported Browsers

1. The VMS Cloud application shall allow users to log in from any modern web browser (Google, Chrome, Mozilla Firefox, Microsoft Edge, Opera, Brave, etc) on any device.

B. Features

1. The VMS Cloud application shall be an add-on to the VMS requiring no additionallicensing.

2. The VMS Cloud application shall allow users to connect an unlimited number of systemsto a single user account.

3. The VMS Cloud application shall allow system administrators to share access to a systemusing only an email address.

4. The VMS Cloud application shall allow system administrators to assign custom user roleswhen sharing system access.

5. The VMS Cloud application shall allow users to quickly search for and connect tocloud-connected systems by name.

6. The VMS Cloud application shall allow operators to view live or recorded video from onecamera at a time on any cloud-connected system.

7. The VMS Cloud application shall first attempt a direct connection to system servers using NAT Traversal technology and shall be able to proxy traffic to ensure access to a system inthe case of ISP or routing issues.

8. The VMS Cloud application shall allow an unlimited number of connected users andsystems with no additional licensing.

9. The VMS Cloud application shall utilize secure networking technologies (OpenSSL, HTTPS) and a complex Salted MD5 hash for any stored passwords.

10. The VMS Cloud application shall allow two systems to be merged to operate asone system without the need for port forwarding or local access.

11. The VMS Cloud application shall have a Health Monitoring Dashboard that shows all System devices, their status, and associated metrics with the ability to download a JSON log file containing all health information from the past 24 hours.

12. The VMS Cloud application shall allow operators to view and modify camera settingsincluding aspect ratio, rotation, audio, authentication, recording settings, quality of recording, and motion detection sensitivity.

13. The VMS Cloud application shall allow operators to view, restart, rename, or change communication port settings for all Servers in a System

2.2.1 CCTV & ARCHIVING SERVER

Item	KenGen Minimum requirement							Bidder Response
Form factor	2U rack							
Dimensions	Height: 86.5 mm (3.4 in). Width: 482 mm (19.0 in) with rack latches. Depth: 763.7 mm (30.1 in)							
Weight	Maximum configuration: 57.32 lb (26 kg)							
Processor	Two 125W Intel Xeon Scalable family processors, Gold. Up to 3.6GHz with 4 cores. Two processors are connected with two UPI (Ultra Path Interconnect) links up to 10.4GT/s							
Chipset	Intel C622 Platform Controller Hub							
Memory	Up to 12 DIMM sockets. Each processor supports up to 6 DIMM sockets with 6 channels. DDR4-2666.							
Memory capacity	With RDIMMs: Up to 384GB with 12 x 32 GB RDIMMs Include 128GB RAM							
Memory protection	ECC, memory mirroring, and memory sparing							
Storage controllers	Supports the following RAID/HBA adapters:							
		RAID	Interface	Drive type	RAID levels	JBOD	Cache	
		adapter						
	For SS bays	Onboard SATA	6Gb SATA	SATA	0/1/10/5	Yes	None	
	For HS bays	930-16i	12Gbs SAS	SATA/SAS	0/1/10/5/50/6/60	Yes	2GB	
Disk drive bays	12 front 3.5" SATA/SAS HS bays, Include 40TB HDDs							
	Two internal M.2 SSD for boot, dual M.2 SSD shall support mirroring. (Include 2 x 240GB SSD)							
Internal storage	For 3.5" SS bay			3.5" HDD, SATA6Gbs, 7.2K		1TB/2TB/4TB/6TB/8TB/10TB		

	For 2.5" bay	2.5" SSD, SAS12Gbs	400GB/800GB/3.84TB	
Item	**KenGen Minimum requirement**			**Bidder Response**
	Include storage 6TB			
Optical	No internal optical bay. Optional USB DVD±RW optical drive			
Network interfaces	Integrated one dedicated management port plus two GbE ports. One LOM slot for customized LOM with two RJ-45 or SFP+ ports, up to 10GbE. ML2 or PCIe adapters are supported. ML2 adapter requires riser card with ML2 slot.			
	Two ports support Wake-on-LAN and NC-SI			
Security features	Power-on and admin password. Trusted Platform Module, TCG 1.2 compliant, upgrade to 2.0 via UEFI setting.			
Operating systems supported	Include Microsoft Windows Server 2016/2019			
Systems management	XClarity Controller Standard, optional upgrades to Advanced or Enterprise are available. Energy Manager. XClarity Administrator. Capacity Planner. Provisioning Manager. Essentials. Light Path Diagnostics			
GPU support	None			
Warranty	3-year			
Power supply	Up to two redundant hot-swap 550W and 750W 80 PLUS Platinum qualified AC power supplies. Or up to two redundant hot-swap 750W Titanium qualified AC power supplies. 750W Titanium is 200V - 240V, others are 100V - 240V			
Video	Integrated Matrox G200 in XClarity Controller			
Cooling	Four fans (3+1) for dual processor model			
Front ports	One XClarity Controller USB, one USB 3.0, one optional VGA			
Rear ports	One VGA, two USB 3.0, two ethernet (RJ-45) one XClarity Controller connector.			
	Supports ASHRAE A4.			
Environmental specification	Temperature - operating	A3: 5°C to 40°C (41°F to 104°F)		
	Temperature - non operating (no package)	-10°C to 60°C (14°F to 140°F)		

	Temperature - non operating (with package)	-40°C to 70°C (-40°F to 158°F)	
	Altitude - operating	(Unpressurized): 0-10000ft (0-3048m)	
Item	**KenGen Minimum requirement**		**Bidder Response**
	Humidity - operating, non-condensing	A4: 8%~90%. A3:8%~85%. A2:20%~80%	
	Humidity - storage (with package), non-condensing	8%~90%	
Environmental certification	Energy Star Server 2.1 certified.		
External Slots	Slot 1-3 (riser card 1)	PCIe 3.0 x16/x8 (slot 1 and 3). Full height, half length	
	Slot 4 (onboard)	PCIe 3.0 x8, low profile	
	Slot 5 (riser card 2)	PCIe 3.0 x16, full height, half length, requires 2nd CPU	
	Slot 6 (riser card 2)	PCIe 3.0 x8, full height, half length	

2.2.2 BULLET CAMERA

Item	KenGen Minimum requirement		Bidder Response
Camera	Image Sensor		
		Color: 0.01Lux@F1.2 Color: 0.012Lux@F1.6	
	Min. Illumination	B/W: 0Lux with IR on	
	WDR	120dB Super WDR	
	Lens	2.8mm/4mm/6mm@F1.6	
	Mount	M12	
	Field of View	H110°/D126°/V60°(2.8mm) H91°/D106°/V50°(4mm) H55°/D63°/V32°(6mm)	
	Shutter Time	1/100000s~1s	
	IR Distance	Up to 30m	
	Day/Night Mode	Day/Night/Auto/Customize/Schedule	
	S/N	>55dB	
	Max.Image Resolution	3840x2160	
Video		20fps@(3840x2160, 3072x2048,	
		2592x1944, 2592x1520, 2048x1536,	
	Primary Stream	1920x1080, 1280x960, 1280x720,	
		704x576)	
	Secondary Stream	30fps(704x576, 640x480, 640x360, 352x288, 320x240, 320x192, 320x180)	
	Tertiary Stream	30fps@(1920x1080, 1280x720, 704x576, 640x480, 640x360, 320x240, 320x192, 320x180)	
	Video Compression	H.265+/H.265(HEVC)/H.264+/H.264/MJPEG	
	Video Bit Rate	16Kbps~16Mbps(CBR/VBR Adjustable)	
	Privacy Maskin g	Up to 8 areas	
	ROI	Up to 8 areas	
	Image Setting	Brightness/Contrast/Saturation/Sharpness	

Interface	Ethernet	1*RJ45 10M/100M Ethernet Port	
	Networ k Storage	NAS(Support NFS, SMB/CIFS), ANR	
Network		IPv4/IPv6, ARP, TCP, UDP, RTCP, RTP, RTSP, RTMP, HTTP, HTTPS, DNS, DDNS, DHCP, FTP, NTP, SMTP, SNMP, UPnP,	
	Protocol	Bonjour, SIP, PPPoE, VLAN, 802.1x, QoS, IGMP, ICMP, SSL	
Intelligent Analytics		Region Entrance, Region Exiting, Advanced Motion Detection, Tamper Detection,	
	Video Analysis	Line Crossing, Loitering, Object Left, Object Removed	
	Face Detection	Detect and capture faces, get real-time snapshots	
	People Counting&	Count the number of people entering or exiting,	
	Report	Up to 4 detection areas for regional people counting	
System	Storage	Support microSD/SDHC/SDXC Card Local Storage, up to 256G	
		BLC, HLC, 2D DNR, 3D DNR,	
	Advanced Function	Defog, AWB, EIS, IP Address Filtering, AGC, Anti-flicker, Corridor Mode, Deblur, Watermark, MultiCast, UniCast	
	SIP/VoIP Support	Yes, Voice & Video-over-IP	
	Event Trigger	Motion Detection, Network Disconnection, etc.	
	Event Action	FTP Upload, SMTP Upload, SD Card Record, SIP Phone, HTTP Notification, etc.	
	System Compatibility	ONVIF Profile G & Q & S & T, API	
General	Working Temperature	-40℃~60℃	
	Working Humidity	0~90%(non-condensing)	
	Power Supply	PoE (802.3af)	
		6W	
	Power Consumptio	8W MAX (With IR on)	

	n		
	Weather Proof	Up to IP67-rated for Weather-resistant Performance	
	Housing	Vandal-proof IK10-rated Metal Housing	
	Weight	610g (Junction Box Version) / 450g (Cable Out Version)	
	Dimensions	97mmX74mmX180mm (Junction Box Version) / Φ64mmX160mm (Cable Out Version)	
	Warranty	3/5 Years	

2.2.3 PTZ CAMERA

Item	KenGen Minimum requirement		Bidder Response
Camera	Image Sensor	1/1.8″ Progressive Scan CMOS	
		Color: 0.006Lux@F1.2 Color: 0.009Lux@F1.55	
	Min. Illumination	B/W: 0Lux with IR on	
	WDR	120dB Super WDR	
	Shutter Time	1/100000s~1s	
	Digital Zoom	16X	
	Day/Night Mode	Day/Night/Auto/Customize/Schedule	
	S/N	>55dB	
		5.7~205.2mm,	
	Focal Length	**36X** Optical Zoom	
	Zoom Speed	Approx 7s (Wide-Tele)	
		H66°~H3°/D72°~D3°	
	Field of View	/V41°~V1°	
	Focus Control	Auto/Semi-Auto/Manual 1500/1500mm	
Lens	Minimum Working Distance	(Wide/Tele)	
	Aperture	F1.55~F4.8	
	Iris Control		
	Pan Range/Pan Speed	360°endless / Pan Manual Speed: 0.1°~400°/s, Pan Preset Speed: 400°/s	

	Tilt Range/Tilt Speed	-5°~90°(Auto Flip) / Tilt Manual Speed: 0.1°~320°/s, Tilt Preset Speed: 320°/s	
	Proportional Zoom	Support	
	Preset Quantity	255	
PTZ	Patrol	8 Patrols, up to 48 presets each patrol	
Item	**KenGen Minimum requirement**		**Bidder Response**
	Pattern	4 Patterns	
	Auto Tracking	Support	
	Power Off Memory	Support	
	Other Function	Auto Scan, Auto Home, Preset Freezing, 3D positioning, PTZ Limits, Initial Position	
IR	IR Distance	Up to 300m	
	IR Angle		
Video	Max. Image Resolution	3840x2160	
	Primary Stream	30fps@(3840x2160,	
		3072x2048, 2592x1944,	
		2592x1520, 2048x1536,	
		1920x1080, 1280x960,	
		1280x720, 704x576)	
	Secondary Stream	30fps@(704x576, 640x480,	
		640x360, 352x288, 320x240,	
		320x192, 320x180)	
	Tertiary Stream	30fps@(1920x1080, 1280x720, 704x576, 640x480, 640x360, 320x240, 320x192, 320x180)	
	Video Compression	H.265+/H.265(HEVC)/H.264+/ H.264/MJPEG	
	Video Bit Rate	16Kbps~16Mbps(CBR/VBR Adjustable)	
	Privacy Masking	Up to 8 areas	
	ROI	Up to 8 areas	
	Image Setting	Brightness/Contrast/Saturation/Sharpness	
	Ethernet	1*RJ45 10M/100M Ethernet Port	

Interface	Audio I/O	01-Jan	
	Alarm I/O	04-Feb	
	RS485	Support	
Network	Networ k Storage	NAS(Support NFS, SMB/CIFS), ANR	
		IPv4/IPv6, ARP, TCP, UDP, RTCP, RTP, RTSP, RTMP, HTTP, HTTPS, DNS, DDNS, DHCP, FTP, NTP, SMTP, SNMP, UPnP,	
Item	KenGen Minimum requirement		Bidder Response
	Protocol	Bonjour, SIP, PPPoE, VLAN, 802.1x, QoS, IGMP, ICMP, SSL	
Audio	Audio Compression	G.711/AAC/G.722/G.726	
	Audio Sampling Rate	8/16/32/44.1/48KHz	
	Audio Bit Rate	16~256kbps	
	Two-way Audio	Support	
Intelligent Analytics	Video Analysis	Region Entrance, Region Exiting, Advanced Motion Detection, Tamper Detection,	
		Line Crossing, Loitering, Object Left, Object Removed	
	Face detection	Detect and capture faces, get real-time snapshots	
		Count the number of people entering or exiting,	
	People Counting&Repo rt	Up to 4 detection areas for regional people counting	
	Storage	Support microSD/SDHC/SDXC Card Local Storage, up to 256G	
		BLC, HLC, 2D DNR, 3D DNR, Defog, AWB,	
	Advanced Function	EIS, IP Address Filtering, AGC, Anti-flicker, Corridor Mode, Deblur, Watermark, MultCast, UniCast	
	SIP/VoIP Support	Yes, Voice & Video-over-IP	
	Event Trigger	Motion Detection, Network Disconnection, External Input, Audio Alarm, etc.	

System	Event Action	FTP Upload, SMTP Upload, SD Card Record, External Output, SIP Phone, PTZ Motion, HTTP Notification, etc.	
	System Compatibility	ONVIF Profile G & Q & S & T, API	
	Working Conditio n	Temperature: -40℃~60℃ / Humidity: 0~90%(Non-condensing)	
	Power Supply	PoE (802.3at) / AC 24V/3A±10%	
Item	KenGen Minimum requirement		Bidder Response
General		13W MAX /25W MAX	
	Power Consumption	12W MAX / 25W MAX (With IR on)	
	Weather Proof/Housing	Up to IP66-rated for Weather-resistant Performance / Vandal-proof IK10-rated Metal Housing(Optional)	
	Heater	Support	
	Surge Protection	6KV	
	Dimensions/We ight	Φ205mmX308mm/4Kg	
	Warranty	2 Years / 3 Years (Optional)	
Certifications:	-	CE, FCC, LVD, ISO9001, ISO14001	
		EN55032:2015, EN55035:2017, EN61000-3- 2:2014, EN61000-3-3:2013, EN62368-1:2014+A11:2017	

2.2.4 DOME CAMERA

Item	KenGen Minimum requirement	Bidder Response
Camera		
Image Sensor	1/2.7" Progressive Scan CMOS	
Max. Resolution	2560 × 1920	
Min. Illumination	Color: 0.005 Lux @ (F1.6, AGC ON), B/W: 0 Lux with IR	
Shutter Speed	1/3 s to 1/100,000 s	

Day & Night	IR cut filter	
Angle Adjustment	Pan: 0° to 355°, tilt: 0° to 70°, rotation: 0° to 355°	
Lens		
Lens Type	Varifocal lens, motorized lens, 2.8 to 12 mm	
Focal Length & FOV	2.8 to 12 mm: horizontal FOV 96° to 29°, vertical FOV 69° to 22°, diagonal FOV 131° to	
	37°	
Lens Mount	Ø14	
Iris Type	Fixed	
Aperture	F1.6	
Item	**KenGen Minimum requirement**	**Bidder Response**
Illuminator		
Supplement Light Type	IR	
Supplement Light Range	Up to 30 m	
IR Wavelength	850 nm	
Video		
	50 Hz: 20 fps (2560 × 1920)	
	25 fps (2560 × 1440, 1920 × 1080, 1280 × 720)	
Main Stream	60 Hz: 20 fps (2560 × 1920)	
	30 fps (2560 × 1440, 1920 × 1080, 1280 × 720)	
Sub-Stream	50 Hz: 25 fps (1280 × 720, 640 × 480, 640 × 360)	
	60 Hz: 30 fps (1280 × 720, 640 × 480, 640 × 360)	
Video Compression	Main stream: H.265+/H.265/H.264+/H.264	
	Sub-stream: H.265/H.264/MJPEG	
Video Bit Rate	32 Kbps to 16 Mbps	
H.264 Type	Baseline Profile/Main Profile/High Profile	
H.265 Type	Main profile	
Region of Interest (ROI)	1 fixed region for main stream	
Audio		

Audio Compression	-S: G.711ulaw/G.711alaw/G.722.1/G.726/MP2L2/PCM/ AAC	
Audio Bit Rate	-S: 64 Kbps (G.711)/16 Kbps (G.722.1)/16 Kbps (G.726)/32 to 160 Kbps (MP2L2)/16 to	
	64 Kbps (AAC)	
Audio Sampling Rate	-S: 8 kHz/16 kHz	
Environment Noise Filtering	-S: Yes	
Network		
Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, NTP, UPnP™,	
	SMTP, IGMP, 802.1X, QoS, IPv6, Bonjour, IPv4, UDP, SSL/TLS	
Item	**KenGen Minimum requirement**	**Bidder Response**
Simultaneous Live View	Up to 6 channels	
API	Open Network Video Interface, ISAPI	
User/Host	Up to 32 users. 3 levels: administrator, operator and user	
	3 user levels: administrator, operator, and user	
Client	iVMS-4200, Hik-Connect	
	Plug-in required live view: IE 10+	
Web Browser	Plug-in free live view: Chrome 57.0+, Firefox 52.0+ Local service: Chrome 57.0+, Firefox 52.0+	
Image		
Image Settings	Saturation, brightness, contrast, sharpness, AGC, white balance adjustable by client	
	software or web browser	
Day/Night Switch	Auto, Schedule, Day, Night	
Wide Dynamic Range (WDR)	120 dB	
Image Enhancement	BLC, 3D DNR	
Interface		
Ethernet Interface	1 RJ45 10 M/100 M self-adaptive Ethernet port	
On-Board Storage	Built-in memory card slot, support microSD card, up to 256 GB	

	-S: 1 input (line in), two-core terminal block, max. input amplitude: 3.3 Vpp, input impedance: 4.7 KΩ, interface type: non-equilibrium	
	1 output (line out), two-core terminal block, max. output amplitude: 3.3 Vpp, output	
Audio	impedance: 100 Ω, interface type: non-equilibrium	
Alarm	-S: 1 input,1 output (max. 12 VDC, 30 mA)	
Reset Key	Yes	
Event		
Basic Event	Motion detection, video tampering, exception	
Item	**KenGen Minimum requirement**	**Bidder Response**
Linkage	Upload to FTP, notify surveillance center, send email, upload to memory card, trigger	
	recording, trigger capture	
General		
Power	12 VDC ± 25%, 0.8 A, max. 10 W, Ø5.5 mm coaxial power plug	
	PoE: 802.3af, Class 3, 36 V to 57 V, 0.32 A to 0.2 A, max. 11.5 W	
Dimension	Ø141 mm × 99.9 mm (Ø5.6" × 3.9")	
Package Dimension	140 mm × 140 mm × 154 mm (5.5" × 5.5" × 6.1")	
Weight	Approx. 825 g (1.8 lb.)	
With Package Weight	Approx. 1080 g (2.6 lb.)	
Storage Conditions	-30 °C to 60 °C (-22 °F to 140 °F). Humidity 95% or less (non-condensing)	
Startup and Operating	-30 °C to 60 °C (-22 °F to 140 °F). Humidity 95% or less (non-condensing)	
Conditions		
Language	English, Ukrainian	
General Function	Anti-flicker, heartbeat, mirror, password protection, privacy mask, watermark, IP address filter	

Approval		
	FCC SDoC: 47 CFR Part 15, Subpart B;	
	CE-EMC: EN 55032: 2015, EN 61000-3-2:2019, EN 61000-3-3:2013+A1:2019, EN	
	50130-4: 2011+A1: 2014;	
EMC	RCM: AS/NZS CISPR 32: 2015; IC VoC: ICES-003: Issue 7;	
	KC: KN 32: 2015, KN 35: 2015	
	UL: UL 62368-1;	
	CB: IEC 62368-1:2014+A11;	
Safety	CE-LVD: EN 62368-1:2014/A11:2017;	
	BIS: IS 13252(Part 1):2010/ IEC 60950-1: 2005	
	CE-RoHS: 2011/65/EU; WEEE: 2012/19/EU;	
Environment	Reach: Regulation (EC) No 1907/2006	
Protection	IP67: IEC 60529-2013, IK10: IEC 62262:2002	

2.2.5 THERMAL CAMERA

Long Range IR PTZ IP Thermal Camera

KenGen seeks to deploy a single Long Range IR PTZ IP Thermal Camera in Turkwel. Turkwel has very unique security and geographical characteristics that demand Long Range IR PTZ IP Thermal Camera system that has night vision. Turkwel area is volatile and potentially explosive security zone manned by an additional contingent of armed security. As such is the nature of armed combat, technology comes in handy to detect location of intrusion so that armed deployment can be dispatched to assess threat. The security team from the control house need visual kilometers into the Turkwel bush at night and be able to coordinate with the armed security.

Long-Range IR PTZ System can see things that are miles away. The thermal imaging cameras use special sensors and lenses to view objects in total darkness. These cameras include special lenses that allow infra-red light to reach the sensor. The long-range IP camera systems provide night-vision using either a long-range laser illuminator or an additional thermal camera and a very long-distance lens and special pan-tilt mechanisms that allow you to see details that are over 4 miles away. This camera shall attach to the network and can be integrated into a complete security system.

In Turkwel, the threat lurks in the dark 5km radius. The threat is armed and dangerous. The security team needs to detect and see the threat 24x7x365 from the vantage point of the control house.

	KENGEN MINIMUM SPECIFICATIONS	BIDDERS RESPONSE
1.	Model	
2.	Country of origin	
3.	Year of manufacture	
4.	Ultra long-range military grade EO/IR PTZ surveillance	
5.	Sensor Type : Uncooled Vox Thermal 5th generation UFPA sensor	
6.	Sensor Format : 400x300 or 640x512	
7.	Spectral Band : 7.5 ~ 13.5µm	
8.	Thermal Lens Night Vision Motion image stabilization IP Camera Motion Stabilization.	
9.	Detection : About 5000m day, 1000m night Recognition : About 2000m day, 500 night	
10.	Laser Illumination : About 2000 m	
11.	Frame : 50Hz (PAL)	

12.	Connectors : 2 RJ45/BNC Connectors, One for thermal image output, another for visible camera output.	
13.	Optical zoom : over 60X Digital Zoom : 2X / 4X Focus Adjustable	
14.	Pan range : 360° Pan speed : 0~60°/s Pan preset speed : 80°/s Auto pan speed : 0.5~30°/s Endless 360° rotation	
15.	Tilt Speed : 0~40°/s Tilt preset speed : 60°/s	
16.	Installation Wall Mount or Vehicle Mount	
17.	Outdoor Work temperature : -40°C~+60°C Waterproof: IP66 Water-proof IP67 sealed with anti-corrosion finish NEMA IP66	
18.	Data Storage Options: NVR Video Compression Format: H.265 Image processing : DDE	
19.	Certificate: ISO FCC CE RoHS	
20.	Warranty	
21.	Connected to the ISMS and NVR system GPS Enabled Video Analytics Wireless Secured Communication Enterprise Video Management Threat Detection Technologies Radar, Microwave and Electromagnetic	

2.2.6 LPR CAMERA

Item	KenGen Minimum requirement	Bidder Response
Camera		
Image Sensor	1/1.8" Progressive Scan CMOS	
Max. Resolution	1920 × 1080	
	Color: 0.0005 Lux @ (F1.2, AGC ON);	
Min. Illumination	B/W: 0.0001 Lux @ (F1.2, AGC ON), 0 Lux with IR	
Shutter Time	1 s to 1/100,000 s	
Day & Night	IR cut filter	
	Blue glass module to reduce ghost phenomenon	
Lens		

	2.8 to 12 mm, horizontal FOV: 114.5° to 41.8°, vertical FOV: 59.3° to 23.6°, diagonal FOV: 141.1° to 48°	
Item	**KenGen Minimum requirement**	**Bidder Response**
	8 to 32 mm, horizontal FOV: 42.5° to 15.1°, vertical FOV: 23.3° to 8.64°, diagonal FOV:	
Focal Length & FOV	49.6° to 17.3°	
Focus	Auto, semi-auto, manual	
Iris Type	P-iris	
Aperture	2.8 to 12 mm: F1.2 to F2.5	
	8 to 32 mm: F1.7 to F1.73	
DORI		
	Wide:	
	2.8 to 12 mm: D: 45 m, O: 17.9 m, R: 9 m, I: 4.5 m	
	8 to 32 mm: D: 112.7 m, O: 44.8 m, R: 22.6 m, I: 11.3 m	
DORI	Tele:	
	2.8 to 12 mm: D: 111.8 m, O: 44.3 m, R: 22.4 m, I: 11.2 m	
	8 to 32 mm: D: 300 m, O: 119.0 m, R: 60 m, I: 30 m	
Illuminator		
Supplement Light Type	IR	
Supplement Light Range	2.8 to 12 mm: 50 m	
	8 to 32 mm: 100 m	
Smart Supplement Light	Yes	
IR Wavelength	850 nm	
Video		
Main Stream	50 Hz: 25 fps (1920 × 1080, 1280 × 720)	
	60 Hz: 30 fps (1920 × 1080, 1280 × 720)	
Sub-Stream	50 Hz: 25 fps (704 × 576, 640 × 480)	
	60 Hz: 30 fps (704 × 480, 640 × 480)	
Third Stream	50 Hz: 25 fps (1920 × 1080, 1280 × 720, 704 × 576, 640 × 480)	
	60 Hz: 30 fps (1920 × 1080, 1280 × 720, 704	

	× 480, 640 × 480)	
Fourth Stream	50 Hz: 25 fps (1920 × 1080, 1280 × 720, 704 × 576, 640 × 480)	
	60 Hz: 30 fps (1920 × 1080, 1280 × 720, 704 × 480, 640 × 480)	
Fifth Stream	50 Hz: 25 fps (704 × 576, 640 × 480)	
Item	**KenGen Minimum requirement**	**Bidder Response**
	60 Hz: 30 fps (704 × 480, 640 × 480)	
Video Compression	Main stream: H.265+/H.265/H.264+/H.264	
	Sub-stream/Third stream/Fourth stream/Fifth stream: H.265/H.264/MJPEG	
Video Bit Rate	32 Kbps to 8 Mbps	
H.264 Type	Baseline Profile/Main Profile/High Profile	
H.265 Type	Main Profile	
Bit Rate Control	CBR/VBR	
Scalable Video Coding (SVC)	H.265 and H.264 encoding	
Region of Interest (ROI)	4 fixed regions for each stream	
Target Cropping	Yes	
Audio		
Audio Type	Mono sound	
Audio Compression	G.711/G.722.1/G.726/MP2L2/PCM/AAC/MP3	
Audio Bit Rate	64 Kbps (G.711)/16 Kbps (G.722.1)/16 Kbps (G.726)/32 to 192 Kbps (MP2L2)/16 to 64	
	Kbps (AAC)/8 to 320 Kbps (MP3)	
Audio Sampling Rate	8 kHz/16 kHz/32 kHz/44.1 kHZ/48 kHz	
Environment Noise Filtering	Yes	
Network		
Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, SFTP, SRTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP,	
	PPPoE, NTP,UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6, UDP, Bonjour, SSL/TLS	

Simultaneous Live View	Up to 20 channels	
API	Open Network Video Interface (PROFILE S, PROFILE G, PROFILE T), ISAPI, SDK, ISUP	
User/Host	Up to 32 users. 3 user levels: administrator, operator and user	
Item	**KenGen Minimum requirement**	**Bidder Response**
	Password protection, complicated password, HTTPS encryption, 802.1X authentication (EAP-TLS, EAP-LEAP, EAP-MD5), watermark, IP address filter, basic and digest authentication for HTTP/HTTPS, WSSE and digest authentication for Open Network Video Interface, RTP/RTSP OVER HTTPS, Control Timeout Settings, Security Audit Log,	
	TLS 1.2	
Security		
	NAS (NFS, SMB/CIFS), auto network replenishment (ANR)	
Network Storage	Together with high-end Hikvision memory card, memory card encryption and health detection are supported	
Client	iVMS-4200, Hik-Connect, Hik-Central	
	Plug-in required live view: IE8+	
Web Browser	Plug-in free live view: Chrome 57.0+, Firefox 52.0+, Safari 11+ Local service: Chrome 41.0+, Firefox 30.0+	
Image		
Image Parameters Switch	Yes	
Image Settings	Saturation, brightness, contrast, sharpness, gain, white balance adjustable by client	
	software or web browser	
Day/Night Switch	Day, Night, Auto, Schedule, Alarm Trigger, Video Trigger	
Wide Dynamic Range (WDR)	140 dB	
SNR	≥ 52 dB	

Image Enhancement	BLC, HLC, Defog, 3D DNR	
Picture Overlay	LOGO picture can be overlaid on video with 128 × 128 24bit bmp format	
Image Stabilization	EIS	
Interface		
Video Output	1 Vp-p Composite Output (75 Ω/CVBS) (Only for debugging)	
Ethernet Interface	1 RJ45 10 M/100 M/1000 M self-adaptive Ethernet port	
Item	**KenGen Minimum requirement**	**Bidder Response**
On-Board Storage	Built-in memory card slot, support microSD/microSDHC/microSDXC card, up to 256 GB	
Audio	With -Y: 1 input (line in), 1 output (line out), 3.5 mm connector	
Alarm	2 input, 2 outputs (max. 24 VDC, 1 A)	
RS-485	With -Y: 1 RS-485 (half duplex, HIKVISION, Pelco-P, Pelco-D, self-adaptive)	
Reset Key	Yes	
Power Output	With -Y: 12 VDC, max. 100 mA	
Wiegand	/P-Y: 1 Wiegand (CardID 26bit, SHA-1 26bit, Hik 34bit, NEWG 72bit)	
Event		
	Motion detection, video tampering alarm, exception (network disconnected, IP address conflict, illegal login, abnormal reboot, HDD full, HDD error), video quality	
Basic Event	diagnosis, vibration detection	
	Intrusion detection, scene change detection, audio exception detection, defocus detection	
	Line crossing detection, up to 4 lines configurable Intrusion detection, up to 4 regions configurable	
	Region entrance detection, up to 4 regions configurable	
Smart Event	Region exiting detection, up to 4 regions configurable	
Linkage	Upload to FTP/NAS/memory card, notify surveillance center, send email, trigger alarm	

	output, trigger recording, trigger capture	
Deep Learning Function		
Perimeter Protection	Line crossing, intrusion, region entrance, region exiting	
	Support alarm triggering by specified target types	
	Blocklist and allowlist: up to 10,000 records Captures vehicle that has no license plate	
Item	**KenGen Minimum requirement**	**Bidder Response**
	Support license plate recognition of motorcycles (only in checkpoint scenario) Support vehicle attribute detection, including vehicle type, color, brand, etc. (City	
Road Traffic and Vehicle Detection	Street mode is recommended.)	
Metadata	Metadata of road traffic is supported.	
General		
Power	12 VDC ± 20%, 1.19 A, max. 14.28 W, three- core terminal block	
	PoE: 802.3at, Type 2, Class 4, 42.5 V to 57 V), 0.396 A to 0. 295 A, max. 16.8 W	
Material	Aluminum alloy body	
Dimension	Without -Y: Ø144 × 347 mm (Ø5.7" × 13.7")	
	With -Y: Ø140 × 351 mm (Ø5.5" × 13.8")	
Package Dimension	405 × 190 × 180 mm (15.9" × 7.5" × 7.1")	
Weight	Approx. 1950 g (4.2 lb.)	
With Package Weight	Approx. 3070 g (6.7 lb.)	
Storage Conditions	-30 °C to 60 °C (-22 °F to 140 °F). Humidity 95% or less (non-condensing)	
Startup and Operating	-40 °C to 60 °C (-40 °F to 140 °F). Humidity 95% or less (non-condensing)	
Conditions		

	33 languages: English, Russian, Estonian, Bulgarian, Hungarian, Greek, German, Italian, Czech, Slovak, French, Polish, Dutch, Portuguese, Spanish, Romanian, Danish, Swedish, Norwegian, Finnish, Croatian, Slovenian, Serbian, Turkish, Korean, Traditional Chinese,	
	Thai, Vietnamese, Japanese, Latvian, Lithuanian, Portuguese (Brazil),Ukrainian	
Language		
General Function	Anti-flicker, 5 streams, EPTZ, heartbeat, mirror, privacy mask, flash log, password reset	
	via email, pixel counter	
Heater	Yes	
Item	**KenGen Minimum requirement**	**Bidder Response**
Approval		
	FCC (47 CFR Part 15, Subpart B);	
	CE-EMC (EN 55032: 2015, EN 61000-3-2:2019, EEN 61000-3-3:2013+A1:2019, EN	
	50130-4: 2011 +A1: 2014);	
EMC	RCM (AS/NZS CISPR 32: 2015); IC (ICES-003: Issue 7);	
	KC (KN 32: 2015, KN 35: 2015)	
	UL (UL 62368-1);	
	CB (IEC 62368-1:2014+A11);	
Safety	CE-LVD (EN 62368-1:2014/A11:2017);	
	BIS (IS 13252(Part 1):2010/ IEC 60950-1 : 2005); LOA (IEC/EN 60950-1)	
	CE-RoHS (2011/65/EU); WEEE (2012/19/EU);	
Environment	Reach (Regulation (EC) No 1907/2006)	
Protection	IK10 (IEC 62262:2002), IP67 (IEC 60529-2013)	
Anti-Corrosion Protection	With -Y: NEMA 4X(NEMA 250-2018)	
Automotive and Railway	EN50121-4	
Other	PVC FREE	

2.2.7 PERIMETER CAMERA/LONG RANGE IR

Item	KenGen Minimum requirement		Bidder Response
Camera	Image Sensor	Color: 0.001Lux@F1.2 Color: 0.012Lux@F1.6	
	Min. Illumination	Color: 0.001Lux@F1.2 B/W: 0Lux with IR on	
	WDR	120dB Super WDR	
	Lens	Motorized: 8~32mm\ 5.3~64mm	
	Mount	M12	
	Field of View	H110°/D126°/V60°(2.8mm) H91°/D106°/V50°(4mm) H55°/D63°/V32°(6mm)	
	Shutter Time	1/100000s~1s	
	IR Distance	Up to 180m	
	Day/Night Mode	Day/Night/Auto/Customize/Schedule	
	S/N	>55dB	
	Max.Image Resolution	3840x2160	
Video			
	Primary Stream	30fps@(3840x2160, 3072x2048, 2592x1944, 2592x1520, 2048x1536, 1920x1080, 1280x960, 1280x720, 704x576)	
	Secondary Stream	30fps(704x576, 640x480, 640x360, 352x288, 320x240, 320x192, 320x180)	
	Tertiary Stream	30fps@(1920x1080, 1280x720, 704x576, 640x480, 640x360, 320x240, 320x192, 320x180)	
	Video Compression	H.265+/H.265(HEVC)/H.264+/H.264/MJPEG	
	Video Bit Rate	16Kbps~16Mbps(CBR/VBR Adjustable)	
	Privacy Masking	Up to 8 areas	
	ROI	Up to 8 areas	
	Image Setting	Brightness/Contrast/Saturation/Sharpness	
Interface	Ethernet	1*RJ45 10M/100M Ethernet Port	

	Networ k Storage	NAS(Support NFS, SMB/CIFS), ANR	
Item	**KenGen Minimum requirement**		**Bidder Response**
Network		IPv4/IPv6, ARP, TCP, UDP, RTCP, RTP, RTSP, RTMP, HTTP, HTTPS, DNS, DDNS, DHCP, FTP, NTP, SMTP, SNMP, UPnP,	
	Protocol	Bonjour, SIP, PPPoE, VLAN, 802.1x, QoS, IGMP, ICMP, SSL	
Intelligent Analytics		Region Entrance, Region Exiting, Advanced Motion Detection, Tamper Detection,	
	Video Analysis	Line Crossing, Loitering, Object Left, Object Removed	
	Face Detection	Detect and capture faces, get real-time snapshots	
	People Counting&	Count the number of people entering or exiting,	
	Report	Up to 4 detection areas for regional people counting	
System	Storage	Support microSD/SDHC/SDXC Card Local Storage, up to 256G	
		BLC, HLC, 2D DNR, 3D DNR,	
	Advanced Function	Defog, AWB, EIS, IP Address Filtering, AGC, Anti-flicker, Corridor Mode, Deblur, Watermark, MultiCast, UniCast	
	SIP/VoIP Support	Yes, Voice & Video-over-IP	
	Event Trigger	Motion Detection, Network Disconnection, etc.	
	Event Action	FTP Upload, SMTP Upload, SD Card Record, SIP Phone, HTTP Notification, etc.	
	System Compatibility	ONVIF Profile G & Q & S & T, API	
General	Working Temperature	-40℃~60℃	
	Working Humidity	0~90%(non-condensing)	
	Power Supply	PoE (802.3af)	
		6W	
	Power Consumption	8W MAX (With IR on)	

	Weather Proof	Up to IP67-rated for Weather-resistant Performance	
	Housing	Vandal-proof IK10-rated Metal Housing	
Item	**KenGen Minimum requirement**		**Bidder Response**
	Weight	610g (Junction Box Version) / 450g (Cable Out Version)	
	Dimensions	97mmX74mmX180mm (Junction Box Version) / Φ64mmX160mm (Cable Out Version)	
	Warranty	3/5 Years	

2.3 Access Control System with visitors' management system

The access control equipment in this tender shall include the supply, installation, and commissioning of the following components.

l) Access Credentials (Badges)
m) Access Controllers
n) Badge Readers (proximity)
o) Access Control Server Software and Database
p) The Access control Server and back-up systems
q) Workstations to operate the system.
r) Networking Equipment required to connect controllers, the server, and its users.
s) Electric and electromagnetic locks and entrance monitoring equipment (contacts)
t) Turnstiles (detailed separately)
u) Cabling from badge reader to controller
v) Cabling from controller to entrance monitoring equipment and lock
w) Interfaces to existing security systems & Safety systems (Fire Alarm Systems).

2.3.1 Management System Requirements

a) The system must be easily manageable from various locations through a network PC workstation or wireless TCP/IP enabled devices in the future.
b) There is no additional client software required to manage the system from these workstations or wireless IP devices.
c) In the Access Control management system, it should be possible to grant user-definable and user-specific permissions. In other words, for each user it should be possible to select which actions (system functions and settings, personnel data, authorization of badges, and so forth) are allowed and to which users, user groups, entrances, or entrance groups these permissions apply.
d) In addition, it should be possible to determine for each user which messages are to be shown on his or her screen. These fully user-based functions can only be changed by the nominated security system manager and are protected with passwords and log-on names.
e) In addition, the system allows for user verification upon login to the system by means of badge (PC-security) or biometric device (e.g., fingerprint).
f) Based on the log-on name and credentials the application starts automatically in English.
g) The system must be laid out for multi-tenant use, where each user that logs in, starts the application automatically and gets access only to those areas of his or

her authority.

h) All activities of the various users and managers are logged, and time stamped into a central database for tracking and troubleshooting purposes.

i) Badges, Areas, Tenants and Visitor Groups can be grouped with pre-defined rights, time zones and functionality. Various user templates are pre-defined: such as security personnel, reception desk personnel, system management daily use (to pre-register visitors), to keep the use of the system for each user group simple and straightforward.

j) The central management software must be platform independent and be able to run on any modern Server operating system, such as Windows 2003 Server or Linux.

k) User workstations shall carry no application specific user software, but just a standard Internet browser. User interfaces into the system must be configurable by the user. For instance, when employees pre-register their visitors over a secure intranet connection, they log into an intranet site, with the proper layout and logos to guide them through the pre- announcement.

l) The software must cater for invisible badges (for personnel that will not be traced) or special badges (badges that are continuously traced) to optimize fraud-finding capabilities for the Employer.

2.3.2 The following specifications are required:

- ★ The number of users allowed to manage / log in should be virtually unlimited (>1,000).
- ★ For each user it should be possible to select specific functions and system operations:
- ★ Creation and activation of templates for users, identifiers, areas, and date/time zones
- ★ Authorization of employees, temporary employees, tenderers, or visitors
- ★ Assignment of entrance groups for which authorization can be given by the user
- ★ Events and alarms (depending on the assigned areas)
- ★ Windows dialogue functions such as delete, edit, copy
- ★ System functions such as looking into historical files, controller settings and reports.

2.3.3 Based on this requirement, it should be possible to configure specifically the permissions of a user for the management of the system or part of the system.

2.3.4 The functions (permissions) should be username or password protected. The management of these passwords and permissions should only be accessible by an authorized system administrator.

2.3.5 The application of access control should be structured according to what is known as an objective/action dialogue. This means that important and specific functions and their actions and menus can be selected directly on the screen.

2.3.6 Data of regular staff and visitors should be entered and processed separately.

2.3.7 It should be possible to run other applications on the same workstation where the access control is installed. (Windows multitasking).

2.3.8 The system software should contain special jobs to be executed automatically such as automatic de-authorizing of badges after a specific period or automatic full or incremental back up.

2.3.9 Data Processing

The Access Control Software runs as application over a TCP/IP network. Daily management, monitoring and user processing (e.g. pre-registering of visitors) should be done over a secure TCP/IP connection from any device with a web browser (thin client).

It should be possible to record all messages, such as alarms, movements with name indication, initials, badge number, time, date and the reason for access denial in a historic file. In addition, the system should activate the CCTV upon attainment of a threshold number of failed access attempts, and record in the system clips of cases of unauthorized access, tailgate or piggybacking.

All system actions executed by the user as well as a description and the log-on data of the relevant user should be recorded in a logbook. The system should give a warning message in case of data overflow on the central disk.

2.3.10 Managing Access Control Users and Identifiers

The following data should be recorded and processed for each employee:

- ★ Name
- ★ Initials
- ★ Employee number
- ★ Department
- ★ Telephone number
- ★ Start of employment date (dd/mm/yyyy)
- ★ End of employment date (dd/mm/yyyy)
- ★ User-definable fields (at least seven)
- ★ Fingerprint template
- ★ Type of identifier (minimum one) with badge number
- ★ Status per identifier (issued, free, withdrawn, defective, lost or blocked)
- ★ Validity date per identifier (dd/mm/yyyy)
- ★ Expiration date per identifier (dd/mm/yyyy)
- ★ Authorization date per identifier (access profile)

The following data should be recorded and processed for each visitor.

- ★ Name
- ★ Initials
- ★ Name of company
- ★ The visiting department
- ★ Remarks field
- ★ Type of identifier (minimum one) with badge number
- ★ Fingerprint template
- ★ Issue date (dd/mm/yyyy)
- ★ Expire date (dd/mm/yyyy)
- ★ Authorization data (access profile)

By default, issued visitor badges should be valid for only a day and be automatically blocked the next day.

As soon as the validity of the badge expires, the visitor badges and employee badges should be automatically blocked by the system.

With the aim of simplifying the badge issue procedure, it should be possible to determine default authorization profiles based on generic templates for employee and visitor. Each template specifies access areas and day/time zones.

2.3.11 Alarm Handling

a) The user should be able to decide which message is to be considered either as alarm or event.
b) The system should contain a user interface for processing and displaying alarms and events in such a way that the alarms (priority label) can be always identified and shown by the user, even if programs other than the access management program are active (word-processor for example).
c) Messages concerning access control should include date, time, badge number, name, and the direction of movement (In/Out) as well as the entrance location (entrance description).
d) If messages appear concerning the identification of a rejected badge, this message should state the reason for denying access: denial based on Anti-Pass-Back (also referred to as APB, the badge has already been granted access at this entrance, it avoids users handing their badge backwards to other users), not allowed by schedule, badge blocked, and so forth.
e) It should be possible to add certain user-definable sounds or presentation colors to the events and alarms.

2.3.12 Reporting

a) The user should be able to decide which printing location he or she wants to use.
b) The system should be able to control more than one printer to be used at different locations.
c) The system should have both default and user-definable reporting facilities. Within this context, it is necessary that freely optional search criteria are used. In other words, it must also be possible to select and search on the user defined fields.

2.3.13 Specific Access Management Requirements

The system should possess the following specific access control functionality:

a) Control over all authorized badges within the context of the criteria time, date, entrance,

and facility.

b) Easy operation via the user-definable authorization profiles (date, time, and entrance combinations).

c) The number of user-definable authorization profiles is virtually unlimited (> 1,000).

d) The number of user defined schedules is virtually unlimited.
e) It is possible to assign various schedules per badge.
f) IN and OUT registration for each entrance
g) Anti-Pass-Back (APB) for at least 15 different security levels.
h) User-definable blocking time during which badges cannot be re-identified.
i) User-definable collective and personal holidays (for each badge holder)
j) It should be possible to use the system to monitor special individuals, which means that alarm messages will be generated even in the case of authorized badge movements.
k) It should be possible to use the system to have certain badges move invisibly through the facility. The events should, however, be recorded in a log file.
l) The software should have a facility to import and / or export data from / to external databases and / or applications using ODBC drivers.
m) The software has a clear log function and alarm handler, where alarms can be prioritized, routed, and verified and handled by the designated security officer.
n) The access control software can be connected to a Security Management Architecture (SMA) as single graphical source for alarms and alarm handling procedures for Access Control and various other Security Systems, such as Fire Alarm, Burglar Alarm and / or CCTV.
o) The system should generate alarms or events in case of tamper with any of the connected contacts or a loss of communication with the controllers and / or readers.
p) The software can be configured as guarded tour, generating an alarm when a certain badge is not presented within a certain timeframe to a specific reader.
q) The software can be configured to cater for high security rules, such as four eyes principle (only a certain combination of identifiers and / or other credential can unlock an entrance.)

2.3.14 Interfacing and Connecting

a) The system must be based on an open standard using TCP/IP, Java and Jini. This guarantees a future compatibility with standardized intelligent networked devices such as smartphones, Tablets, and smartphones. In specific critical monitoring devices, such as burglar detectors, IP enabled CCTV cameras and fire detectors can be connected and share their intelligence at the local level, to guarantee maximum

stability and uptime, even in the event of a power and or network failure.

b) The central database with badges must potentially interconnect to various other applications or databases using open standards as ODBC to facilitate visitor and employee movement management. A live connection to the building management system must thus be catered for. In addition, the database must back up automatically or function in a (stand-by) rollover scenario in case of a calamity. The central management system must be accessible remotely after strong authentication and encryption by system managers.

c) A separate alarm management system must be connectable as a single graphical and visual monitoring system for all alarm related content. The system must be catered for in a redundant way and hierarchical, so that alarms can be grouped into various management and security levels and alarms not responded to in time are re-routed to a pool of security officers. User definable instructions must be attached to alarms, and alarm handling is logged per user or security guard.

All downstream connections at a local level to analogue or digital inputs, open collector outputs or relays must be monitored. Thus, in the event of sabotage or malfunctioning, the system will automatically detect and report the event as an alarm, so that the proper action can be taken.

2.3.15 Visitors Management System

The required visitors' management system shall be installed as a component of the access control system. The required system computerizes and streamlines all the visitation process.

Authorization to enter to internal areas may be defined according to the location of the inviter, or his authorization level. Another alternative to give these authorizations shall be at the visitors' counter after checking the purpose of the visit.

The system shall be capable of providing reports at any moment on how many visitors are in the facility.

The visitors' allowed visit time shall be defined, and visitors' management workstation receives notifications if visitors passed their visitation/meeting time.

System shall also support blacklists and blocked visitors.

2.3.16 Intrusion Alarm System

The intrusion alarm system shall be installed as part of the Access Control System, sharing the same controllers, the same servers and same managing software.

The intrusion alarms system shall consist of:

- ★ Intrusion detectors – installed in the protected area.
- ★ Alarm activated elements – installed in control posts and around the building (sirens, strobes etc)
- ★ Intrusion I/O controllers – distributed in the building, according to the architecture of the system.
- ★ Regional control server with managing intrusion alarm software inbuilt into the access control system.

The local controllers shall be connected by the TCP/IP data network of the Procuring Entity to the intrusion alarm central control server at the Head Office building.

Local alarm monitoring at the sites shall be executed by local workstations and relay the alarm to the Head Office control room.

2.4 Card Production

The Tenderer shall supply, install, and commission a card production station at the regional command and control centers in Sondu, Tana and Kipevu.

The card production station will be based on the following components:

a) Capture equipment - digital camera with all its accessories including studio lighting enhancements for good quality photo capture.
b) Fingerprint capture unit
c) Dedicated software
d) Card printer

2.4.1 Capture equipment.

The capture equipment should have at least the following features:

e) Auto capture: Operator clicks once in the image field and photo is immediately captured.
f) Manual capture/live video: Provides live video for the operator to confirm positioning and facial expression.
g) Auto crop: Image is automatically cropped to pre-defined ratio without operator intervention.
h) Manual crop: The captured image can be resized by the operator by moving and sizing the boundaries of the cropping frame.
i) White balance: Settings can be selected to capture the most realistic colors for the lighting environment.
j) Red-eye reduction: When selected, the camera triggers a red-eye reduction lamp to eliminate the possibility of red-eye.
k) The fingerprint capturing unit will be based on a dedicated fingerprint reader and a controller which produce the biometric template to be used in the access control process.

The required camera should have at least the following technical specifications:

l) 12.1 Megapixels digital camera
m) Operating environment

n) Humidity: 10% ~ 90%

o) Temperature: 0^{o} ~ 40^{o} C

p) Flash range: Subject should be 0.6 to 1.8 meters from camera

q) Memory: 32 MB memory card

The camera will be supplied with Tripod, backdrop, stand and frame

2.4.2 Dedicated card production software

The required software should have the following features:

- Flexible card, report, and production form design
- User-defined card size
- Auto-create production form
- Shape drawing support
- Font sizing and colors
- Multiple field selection, alignment, and formatting
- Copy card and report designs between projects
- Field types
- Variable text (with masking)
- Static text (with word wrap option)
- Photo (with border, ghost, or transparent background option)
- Date
- Bar code (22 types, including PDF417 binary support)
- Magnetic stripe
- Static and variable graphic (with ghost and transparent color options)
- Nonprintable area
- List
- Composite
- Print count
- Auto sequence
- Signature
- Smart card
- Binary field
- Event button
- PDF417 binary bar code support

Image management

- In-production image import and export (.BMP, .EPS, .JPG, .PCT, .PCX,PNG,PSD, .TGA, .TIF, .WMF)
- Image and signature storage as BLOBs or files

- Multiple images per record
- Crop and adjust existing photo

- Batch import/export photos and images from production
- Production and data management
- Data-driven production
- Supports multiple-table databases
- Supports Software Developer's Kit
- Proximity card plug-in
- SASI and Lifetouch plug-ins
- Auto-create Microsoft® Access 2000 database

Database management

- Quick, advanced, and stored searches
- Retrieve records from "today"
- Retrieve records from "this week"
- Database support
- Oracle® Oracle8i, Oracle9i and Oracle10g®
- LDAP-compliant directory services (such as Microsoft® Active Directory®)
- Microsoft Access 2000 and later
- Microsoft® SQL Server™ 2000 and 2005
- IBM® DB2® Universal Server 7.1 and 8.1

Help features

- Online user's guide
- Online help
- Help desk support

Security features

- Wizard for managing user account privileges
- USB hardware security key
- Application- or activity-level user security (per computer or system-wide)
- Login timeout feature
- Restrict project access by user
- Secure user audit trail
- Enhanced user password security
- Expiration of password after user defined number of days
- Compatible with the card printers

Image capture options

- File input

- The digital camera
- TWAIN capture devices
- Video for Windows capture devices
- Signature solutions
- Visitor Manager solution

System Requirements

- Operating system
- Microsoft® Windows® 2000, XP or Windows Vista
- Web browser
- Internet Explorer v6.0 or later

Memory

- 512 MB RAM
- 100 MB hard disk space for application (not including database)
- Color
- 16-bit color (65,536 colors) (Cameras may require higher color)

Resolution

- 800 x 600 screen resolution (1024 x 768 recommended)
- Peripherals
- CD ROM drive
- Available USB port

2.4.3 Card Printer

The required card printer should have the following features:

- ★ Print capabilities
- ★ One- or two-sided edge-to-edge printing
- ★ Full-color or monochrome
- ★ Ultraviolet fluorescent printing
- ★ Continuous-tone, full-color, black-and-white photos
- ★ Alphanumeric text, logos and digitized signatures
- ★ Variety of bar codes
- ★ Background patterns

- ★ Full-color print speed capabilities
- ★ Up to 175 cards per hour (one-sided print and laminate)
- ★ Up to 165 cards per hour (two-sided print and laminate)
- ★ Up to 105 card per hour (two-sided print and two-sided laminate)
- ★ Lamination and topcoat capabilities
- ★ Topcoat or patch lamination
- ★ Superior laminate patch coverage
- ★ Laminate without printing

Connectivity

- ★ Direct connect 10/100 Base-T
- ★ Ethernet
- ★ Bi-directional USB
- ★ Capacity
- ★ Operating system support
- ★ Bi-directional USB supported on Microsoft® Windows® 2000, XP and Windows
- ★ Vista® operating systems
- ★ Printer driver pooling supported on Microsoft operating systems
- ★ Printer driver
- ★ User-adjustable image and color controls
- ★ Stand-alone driver diagnostics
- ★ Color image and test card preview
- ★ Online user help
- ★ Add text, pattern or image to topcoat

User-friendly operation

- ★ Backlit LCD panel
- ★ Audible and visual message prompts
- ★ Automatic card feed
- ★ Quick-change ribbon and laminate cartridges

- ★ Automatic identification and validation for ribbons, laminates and topcoats
- ★ Automatic printer settings and offsets
- ★ Ribbon low warning
- ★ Ribbon saver

The printer will be able to accept the following options:

r) Second laminator
s) Magnetic stripe encoding
t) ISO: IAT or NTT
u) Dual high and low coercivity
v) Tracks 1, 2 and 3 (1 track for

NTT) Other features

- ★ Smart card personalization
- ★ Contact/contactless all-in-one reader
- ★ Contact station
- ★ Prox by HID
- ★ iClass® by HID
- ★ Magnetic stripe and smart card field upgradeability
- ★ Input hopper empty alert
- ★ Printer-PC security software
- ★ Hardware lock suite
- ★ 100-card input hopper
- ★ 100-card output hopper

The required technical specifications will be as following:

- ★ Print resolution: 300 dots per inch, 256 shades
- ★ Electrical requirements
  - Dual voltage autosensing
  - 100/120V, 50/60 Hz
  - 220/240V, 50/60 Hz

★ Plastic cards accepted

- ISO ID-1/CR-80 size cards
- 3.370 in. x 2.125 in.
- (85.6mm x 53.98mm)
- PVC with glossy laminate surface
- Other core materials with PVC over-laminates are optional
- Card thickness accepted (±10%)
- Print only: 0.02 to 0.05 in. (0.51mm to 1.27mm)
- Print and laminate: 0.03 to 0.05 in (0.76mm to 1.27mm)

★ Operating environment

- 60°F to 95°F (15°C to 35°C)
- 20% to 80% non-condensing humidity

★ Storage conditions

- 5°F to 140°F (-15°C to 60°C)
- 10% to 90% humidity

2.4.4 SMART READER

Item	KenGen Minimum requirement	Bidder Response
Operating Voltage Range	8 – 16 VDC	
Current at 12 VDC	Maximum: 300 mA @ 12 VDC	
BLE Read Range*	12 m (39.3 ft) (line of sight)	
RFID and NFC Read Range**	Contactless: 13.56 MHz: 5 cm (1.97 in.), 125 kHz: 8 cm (20.32 in.)	
LED/Buzzer Controls	Dry Contact, N.O.	
Tamper / Touch Button Output	Optical tamper, open collector, active low, max. sink current 20 mA @12 VDC, 10 mA@5 VDC. Current limit: 500 Ω series resistance	
	125kHz ASK	
	125kHz FSK - supports Wiegand 26, 32, 34, 35, 37, 40, 48 bit	

RFID	13.56MHz: ISO14443A (UID): MIFARE® Classic® EV1: Sector Read, MIFARE® Ultralight® Nano /Ultralight EV1/ Ultralight C, MIFARE Classic® / Classic EV1,	
	MIFARE Plus® S / SE / X / EV1, MIFARE DESFire® EV1, LEGIC ISO14443B (UID), ISO15693 HID®, iClass®, PicoPass, iCode, LEGIC ISO18092 (UID): SONY® FeliCa®	
Communication and Controller Connection	Wiegand 26-64 bit***, Clock & Data, and OSDP Secure Channel V2 via 11-wire Pigtail (58 cm / 22.8 in.)	
ENVIRONMENTAL SPECIFICATIONS		
Operating Environment	IP68, UV-resistant, epoxy-potted, suitable for indoor and outdoor use	
Vandal Resistance	IK09	
Operating Temperature Range	-35°C to 66°C (-31°F to 150°F)	
Operating Humidity Range	0% to 95% (non-condensing)	
Antimicrobial efficacy	Inhibits bacteria proliferation by up to 99.8%	
MECHANICAL SPECIFICATIONS		
Material Type	Tough polycarbonate plastic	
Enclosure Dimensions (H x W x D)	88 × 48 × 24 mm (3.46 x 1.89 x 0.94 in.)	
Weight	121 g (4.27 oz)	
System Components:	Multi-Smart™ Readers are compatible with a variety of Rosslare controllers, as well as with many third-party access control systems supporting Wiegand or OSDP interfaces.	
Product Warranty:	5-year limited product warranty	

2.4.5 SMART READER S/W

Item	KenGen Minimum requirement	Bidder Response
Operating system	Windows 7, Windows 8, Windows 10, Windows Server 2012, Windows Server 2016,	
	Windows Server 2019	

Minimum PC requirements	Intel i5 2.4GHz or higher, 4 GB RAM, 500 GB HDD, LAN port for TCP/IP	
Data Base Features (DB)		
DB version	Microsoft SQL Server 2012 Express, password protected. Supports up to Microsoft SQL Server 2017.	
DB Backup	Backup now option or clear all now option	
	Complete DB export configuration or by event (selectable backup and restore) Auto file naming for backups	
	Automatic backups	
User capacity	AC-215: 5,000	
	AC-215B/IPB, AC-225B/IPB, AC-425B/IPB: 30,000 AC-825IP: 100,000	
	Up to 16 credentials per user and user credential double authentication by reader and	
	time zone	
Event capacity	AC-215: 5,000	
	AC-215B/IPB, AC-225B/IPB, AC-425B/IPB: 20,000 AC-825IP: 500, 000	
Networks	1024 controllers: up to 10,000 readers	
Supported Access Control Panel Models	AC-215/215IP, AC-215-B /215IP-B, AC- 215-DIN, AC-225/225IP, AC-225-B / 225IP-B, AC- 225-DIN, AC-425/425IP, AC-425-B / 425IP-B, AC-425-DIN, AC- 825IP, AC-825IP with R/S/D/P-805	
Panel Networks Communication Interface	Serial (RS-232/485), TCP-IP	
Communication Speed	9600, 19200, 57600 and 115200 bps	
Time zones	Up to 256 time zones that can be assigned to Access/Reports/Update	

Holidays	Up to 64 holiday dates, synchronizes with MS Outlook	
Supports multiple reader modes	PIN only, PIN and card, PIN or card, card only, Desktop	
Alarm handler	Advanced event color coding of Tamper/Forced/Antipassback/Input Alarm events with confirmation status/ email notifications	
User dual authentication	The reader grants access only for two credentials per user per access	

2.4.6 Access Control Accessories

For completing the access control system the following accessories shall be installed on the controlled doors:

2.4.7 Electric lock

The required electric lock should be a Surface Door Lock Release with the following specifications:

w) 12v AC Surface Lock Release for door entry systems
x) Fail Secure remains locked in the event of a power failure but can still be opened in the normal
y) Coil Current: ~ 750 mA
z) Coil Voltage ~ 12v AC
aa) Coil Impedance ~ 9 Ohms

2.4.8 Electro-magnetic lock

The required surface mounted electromagnetic lock for Interior doors and general traffic control applications.

Its modular design should employ a standardized circuit board with easy to install connectors, adjustable mounting brackets, integrated mounting screws, and slide-in architectural finish plates.

The armature housing should hold the armature in place, eliminating the noise and sagging known with armatures and increasing the overall reliability of the product.

The armature housing should also provide an aesthetically pleasing look over traditional armature mountings, blending into the surrounding environment more easily.

The required electro-magnetic lock should be available for single, in-swinging or out- swinging, hollow metal, aluminum, and wood doors and frames and glass doors.

The required electric lock should be a Surface Door Lock Release with the following specifications:

bb) Holding force: 700 lbs. per door leaf
cc) Input Voltage: 12/24 VDC
dd) Current Draw: .75A@12VDC .38A@24VDC Height: 21/8"
ee) Length: 89/16" Width: 111/16" Weight: 5.60 lbs

2.4.9 Door closer

Features

ff) Tri-Pack Installation — Closer packed with brackets for regular arm, top jamb or parallel arm installation.
gg) Non-Handed—Installs on doors of either hand or swing.
hh) Aluminum Alloy Shell—Light-weight, with proven durability.
ii) Adjustable Closing/Sweep Speed—Independent regulating valve; hex-key operated.
jj) Adjustable Latch Speed—Independent regulating valve; hex-key operated.
kk) Adjustable Back-check Cushioning — Independent regulating valve; hex-key operated.
ll) Non-Critical Valves — All control valves are non-critical; 1/8" hex-key operated.
mm) Non-Hold-Open Arm

2.4.10 Magnetic Contact

This sensor shall be essentially a reed switch, encased in an ABS plastic shell. Normally the reed is 'open' (no connection between the two wires). The other half is a magnet. When the magnet is less than 13mm (0.5") away, the reed switch closes. They're often used to detect when a door or drawer is open, which is why they have mounting tabs and screws. You can also pick up some double-sided foam tape from a hardware store to mount these, that works well without needing screws.

· Technical Details

- Normally open reed switch
- ABS enclosure o Rated current: 100 mA max
- Rated voltage: 200 VDC max
- Distance: 15mm max

Dimensions:

- Box size (each side): 29mm x 14mm x 9mm / 1.1" x 0.6" x 0.4"
- Cable Length: 305mm ± 12mm / 12" ± 0.5"

Weight (per side): 5.4g

2.4.11 WALK THROUGH METAL DETECTOR

Item	KenGen Minimum requirement	Bidder Response
Standard Programs	Over 20 application programs included	
Sensitivity	Up to 200 distinct sensitivity levels	

Zone Indications	33 independent zones	
Overhead Control Unit	All electronics—LCD, alarm light, LED bar graph, control touch pads— integrated to eliminate wire exposure.	
Tamper-Proof Settings	Three access levels of security clearance	
Self Diagnostic Program	Complete and automatic	
Zone Sensitivity Boost	Adjustable in six areas	
Battery Pack (optional)	10-hour or 30-hour backup available	
Warranty	24 months, Limited Parts/Labor	
Passageway Interior Size	Width 30" (0.76 m)	
	Height 80" (2.03 m)	
	Depth 23" (0.58 m)	
Overall Exterior Size	Width 35" (0.90 m)	
	Height 87" (2.21 m)	
	Depth 23" (0.58 m)	
Shipping Size	Width 35.5" (0.90 m)	
	Height 91.5" (2.32 m)	
	Depth 6.25" (.16 m)	
Shipping Weight	165 lbs. (74 kg)	
Temperatures	Operating: -4° F (-20° C) to +149° F (65° C) Humidity to 95% non-condensing Storage: -40° F (-40° C) to 158° F (70° C)	
Power	Fully automatic 100 to 240 VAC, 50 or 60 Hertz, 45 watts; no rewiring, switching or adjustments needed.	
Regulatory Information	Meets international airport standards such as TSA, ECAC,	
	STAC, AENA, CJIAC, DFT. Meets additional standards and requirements such as USMS, NIJ-0601.02, NILECJ. Meets Electrical Safety and Compatibility Requirements for CE, FCC, CSA, IEC, ICNIRP, IEEE.	
Weatherproofing	Meets IP 55, IP 65, IEC 529 Standard for moisture, foreign matter protection	
Construction	Attractive scratch and mar-resistant laminate. Detection Heads and Support: heavy duty aluminum.	
Control Outputs	Solid state switches (low voltage AC or	

	DC) for operating	
	external alarms and control devices.	
Remote Control *(optional)*	Desktop Remote Control with Zone Indication and/or via	
	network with CMA Interface Module.	
Networking *(optional)*	Manage individual or groups of walkthroughs and	
	perform statistical analysis of throughput.	
Alarm Indicators/Random Alarm Feature	33 zones, volume-adjustable audible tone, bright LED visual and remote alarms. Random alarm feature; adjustable from 0 to 50 percent.	

2.4.12 HANDHELD METAL DETECTOR

Item	KenGen Minimum requirement	Bidder Response
Three-color LED indication	Green LED = ON	
	Amber LED = LOW BATTERY	
	Red LED = ALARM	
Operating Temperatures	minus 35° F (-37° C) to 158° F (70° C) Humidity To 95% noncondensing	
Audio Frequency	2 kHz Warble	
Tuning	Automatic	
Width	3.25" (8.3 cm)	
Thickness	1.625" (4.1 cm)	
Length	16.5" (42 cm)	
Total Weight	17.6 oz (500 g)	
U.S. Trademarks	1,754,933 and 3,236,345	
Battery Requirements	one 9V (included)	
Warranty	2 Year, Limited Parts/Labor	
	• Meets international security standards	
	for airports *(including ECAC and STAC)* and prisons NIJ-0601.02.	

Regulatory Information	• Meets Health Canada RPB-SC-18 health standards, electrical safety and	
	compatibility requirements, and exceeds MIL-STD-810G *(drop test)* Method 516.6, Procedure II.	
	• Exceeds MTBF in excess of 100,000 hours	

2.4.13 FULL HEIGHT SPEED GATES

This shall be installed at the Tana Archive and R&D building for entry and exit. The exit turnstile shall be of PWD specification meaning it can accommodate wheelchair access.

Item	KenGen Minimum requirement	Bidder Response
Operation	Controlled or control-free entrance/exit in both directions.	
Chassis	AISI 304 quality stainless steel. Optional: Black stainless steel.	
Wing	Angular winged, 10 mm tempered glass. Optional: Smoke colored glass.	
Upper Table	10 mm black tempered glass. Optional: Wood.	
Functions	Works bidirectionally and allows the passage of a single person only with its microprocessor control. Electronic passage memory feature saves in memory card swipes that occur before a passage is completed and allows them to pass without closing the wings. Optional: 2 x RS232 and 1 x RS485 communication ports.	
Mechanism	With its adjustable mechanical torque control, the unit does not cause injury in the event of any jamming.	
Sensors	6 reciprocal sensors in every corridor.	
Emergency Mode	Turnstile switches to emergency mode upon the receipt of a signal from fire detection system and wings open. Optional: In case of power shortage, wings automatically switch to open position with the power supplied from the accumulator (Fail Safe).	
Safety Level Setting	There are 2 security level adjustments that the customer can adjust. Runaway and reverse transitions are detected, and voice / confidential notification is made.	
Indicator	Led lighting around the top plate and transition leds. Led lighting on wings.	
Operating Voltage	100-230 VAC. 47-60 Hz	
Power Consumption	58W during passage, 9W during standby (For two wings).	
Operating Temperature	0° / +70°	

Passage Speed	~40 persons / minute.	
Passage Width	50 cm	
Weight	~79 kg (Single wing)	
Security Level	Deterrent.	
Areas of Use	Suitable for indoor use.	
Accessories	Logo engraving. Sticker. Remote control unit. Stainless steel reader apparatus. Meter. Button control unit. Stainless steel reader leg. Stainless steel bottom plate.	

2.5 Perimeter Intrusion Detection System (Sondu & Sang'oro)

The perimeter intrusion detection system shall be installed along the anti-climb/cut fence in Sondu power station and Sang'oro power station.

The required perimeter fence intrusion detection system will have the following core features:

a) Locating resolution of 2 to 3 m (6.5-10 ft.)
b) Detection and location of simultaneous multiple intrusions
c) Software-based zoning
d) Sensitivity adjustable per sensor or zone
e) Adaptable to most types of fences
f) Relay inputs available at any location
g) Environmentally resistant
h) Very low False Alarm Rate (FAR)
i) Pinpoint troubleshooting
j) Easy to install and integrate.
k) Robust and reliable

Technical Specifications

l) VIBRATION SENSOR -MEMS accelerometer, Operating temperature: -40°C to 70°C (-40°F to 158°F), Completely weatherproof IP 67 Size: 95 x 35 x 29 mm (3.7 x 1.4 x 0.8 in.),
Weight: 125 g (4.4 oz)
m) SENSORS LINE - sensors every 2, 2.5 or 3 m (+10%),
n) RELAY INPUTS - Input Units are mounted on the sensors line, One relay inputs

per Input Unit Supervised by End-of-Line resistor

o) INDOOR/OUTDOOR PROCESSOR - Supply voltage: 18 - 36 VDC
p) Power consumption: 8 W for 2 km single pass ,16 W for 2 km double pass configuration
q) Transient suppression: All I/O's are lightning protected
r) Temperature range: -40°C to 70°C (-40°F to 158°F)
s) Humidity: No restriction (when in outdoor enclosure)
t) Outdoor Enclosure: Weatherproof NEMA 12 / 13, IP66
u) Unit size: 240 x 180 x 100 mm (9.4 x 7.1 x 3.9 in.)
v) Inputs: 4 sensor line cables (2 inputs and 2 outputs), 1 tamper cover switch, 5 auxiliary inputs (supervised by End-of-Line resistor)
w) Outputs: 1 Normally Open (NO) line 1 alarm relay, 1 Normally Open (NO) line 2 alarm relay , 1 Normally Closed (NC) fail relay , All relay contacts are 500 mA 50 VDC , Can be extended to 96 relays
x) Enclosure: Outdoor (IP66) or indoor enclosure
y) Data communication: 10/100BASE-TX Ethernet or RS-485
z) Regulatory compliance: CE (including RoHS 2), FCC

2.6 Security Management System (SMS)

2.6.1 Following are the general system specifications for the required SMS.

aa) The Command-and-Control solution for an integrated Command, Control, Communications, Computers & Intelligence (C4I) integrated Security Management System (herein referred to as SMS) shall be designed for the monitoring, control, and management of all the security systems and personnel assets involved in the security, safety protection and related activities of a site or area.
bb) The SMS shall be designed to manage daily routines and activities as well as crisis situations.
cc) The SMS shall have modular, hierarchical architecture that is able to integrate, at the physical level, with both new and legacy (previously installed) security systems and sensors, through a configuration and logic level and up to the situational awareness and management levels.
dd) The SMS shall offer an integrated, user-friendly graphic interface for both operators and managers that shall enable the security organization to reduce its reaction time, improve its efficiency and safeguard its personnel and property.
ee) The SMS shall be developed in an advanced development environment and shall combine a wide range of technologies and interfaces.
ff) The SMS shall have a "built in" 3D (three dimensions) engine to enabling 3D

display, to be used whenever required.

gg) The SMS shall have an open, modular, hierarchical architecture and shall use software and hardware technologies that enable rapid integration of new sensors, as well as existing sensors that are already installed at the site.

hh) The SMS shall work according to a Client-Server configuration, enabling installation of an unlimited number of network stations as may be required to distribute the processing load handling between different operators during security events.

ii) The SMS shall use a backup server that can also function as a primary server to achieve maximum system redundancy and survivability.

jj) The SMS shall work under the Windows operating system, using one of the standard Microsoft databases e.g., Microsoft SQL, Access SQL

kk) The SMS shall incorporate an advanced user permissions system that allows adjusting the permissions based on the different roles of personnel and officials

2.6.2 The system shall be based on advanced modules which support the dissemination of information via wired or wireless communications to any or all the following:

ll) Remote management workstations

mm) Site business network (e.g., to report arrival /departure of staff)

nn) Patrol vehicles equipped with mobile computers

oo) Smart phones, and other mobile devices, as text messages, digital maps, video, lists of procedures etc.

2.6.3 SMS general capabilities

pp) Manage – to provide a single system for daily operations, incident, and crisis management.

qq) Identify – to quickly pinpoint threats, aggregate alarms and locate problems providing full situational awareness.

rr) Respond – to provide staff with optimized procedures and real-time directives for different types of situations, enabling a synchronized view and response.

ss) Communicate – to provide a single port with multiple views that can be seen from multiple locations. To send messages, reports, and directives in real-time, to all entities across an organization, enabling them to respond promptly and correctly.

2.6.4 SMS interaction with systems

The following table gives examples of how the SMS shall interact with the systems shown in the diagram. The system shall be programmable to suit displays and functions to Employer requirements.

System	Display on SMS	Automatic/Operator Response
Gate security	Gate state (open/closed) on map gate forced > displayed on map as alarm	Open gate to authorized vehicle/ person (Electronic badge) Close all gates during security event
Access Control System (ACS)	Door forced or left open > displayed on building plan as alarm	Camera view of alarm door displayed Open door to authorized person Report arrival of staff member to Site Business Network for salary etc.
Surveillance Cameras (CCTV)	Routine – automatic tour of cameras or manual selection Security event – view of alarm door or fence section	Operator monitors view of alarm door
Video Motion Detection (VMD)	View from cam detecting suspicious movement	Automatic/operator alert of Patrol Vehicle via wireless com
Network Video Recording (NVR)	Replay of recorded event, viewed from camera selected off map	Operator/manager investigates recorded events systematically
Perimeter Intruder Detection System (PIDS fence)	Intrusion detected – view of alarm fence section from nearest camera, displayed on map as alarm	Operator monitors view of alarm fence section Automatic/operator alert of Patrol Vehicle via wireless com

System	Display on SMS	Automatic/Operator Response
Alarm System	Fire alarm / Panic-button alarm Alarm area displayed on map Alarm area view from nearest cam Routine – automatic tour of cameras or manual selection GPS locations of patrol vehicles on map Work timetable for security staff	Pre-recorded alarm warning broadcast on PA system Fire escape doors opened by ACS Text message to mobile phones of site managers
Routine Site		Manager: investigation of past video
Activities		recorded and system events Operator: system and sensor status checks
Security Event Activities	Alarm area view from nearest cam Map shows alarm points, vehicles locations List of emergency procedures	Lock security doors / gates Alarm announcements / sounds on PA system Auto calls to local police/ emergency forces

2.6.5 Configurable GUI

The SMS shall feature a modular, highly configurable GUI as the main component of the control and command interface. The GUI shall include the following display elements:

a) GIS interactive map of site
b) Video (live or recorded) from site CCTV cameras
c) System and sensor status and alarm reports
d) Security management instructions and protocols
e) GUI Display Screens - The SMS shall support the display of GUI elements on various screens, according to changing operational requirements:
f) Operator workstation screens
g) Large wall screens, mainly for site map and videos
h) Video walls, made up of arrays of large screens to create wall-sized viewing areas
i) Manager screens, mainly for security management elements

2.6.6 Integrated management of the SMS components

j) Interface with security systems
k) Interface with wired/wireless communications systems
l) Displays of security system outputs (video images, alarms etc.)
m) Graphic User Interface (GUI) with GIS map of site area
n) Operator & management interface levels

2.6.7 GIS Interactive Map

The interactive site map shall be based on GIS and ESRI map engines that are independent of specific companies. The system shall allow quick and free movement and zoom in/out of the map imagery and shall include the following features

2.6.8 Map creation and format

a) Enable use of drawn maps, aerial photographs, vector map and additional maps of various scale (1:50,000, 1:100,000 , 1:250,000 , 1:400,000 or designated scale of the site).
b) Enable display of building plans, showing access doors, escape routes etc.
c) Enable the main system map to be divided into four different simultaneous maps, either:

Independent, allowing free movement of any map separately and simultaneous management of four different sites (or areas of one site) with different scales, from one screen.

Synchronized, allowing synchronization of the maps to a location selected by the controller.

Enable creation and placing of markings or icons on map, including: marking of areas (Firing range, hostile areas, etc.), marking routes (Patrol vehicle route, foot patrol, unpaved roads, etc.), marking landmarks (antenna, gate, etc.).

The SMS shall display of all system alerts, immediately and in real time, with UTM

coordinates and the appropriate marking/icon

The SMS shall enable multiple map layers to be displayed separately as required to keep map clear and uncluttered without losing essential details, for example:

a) Emergency escape routes layer, appears only during fire alarm
b) System layers, showing electric cables routes, sensor positions, patrol vehicle locations etc.
c) Map – PIDS fence integration
d) Map – CCTV

integration The SMS shall be

able to:

a) Display location, orientation, and field of view of any fixed or PTZ camera

b) Select any camera directly from map to view its video stream (on another screen or superimposed on map)
c) Select, orientate, point, and zoom in/out any PTZ camera directly from map.
d) Select any point or object on map to display video of that point on the site from nearest camera.
e) Analyze the line of sight of any viewing means (e.g., a camera or radar) between two points on the map.
f) Simulate the possibility of changing the height of camera installation and display the effect of proposed change on the lines of sight.

The SMS shall be able to monitor the patrol vehicles in the site area (if patrol vehicles are equipped with GPS mobile computers) as follows:

a) Receive and display the location of each vehicle in real time to an accuracy of 5 meters.
b) Selection of vehicle location update rate (every number of seconds, minutes).
c) Restrict the vehicle patrol area by marking the desired patrol area on map. If the vehicle leaves the marked area, the system shall alert the operator or security manager.
d) Monitor and debrief the progress of patrol vehicle along patrol route and display entire route over time.
e) Transmit site alarms to patrol vehicles, either to the patrol vehicle closest to the event or to all vehicles. Video and event location can be relayed to mobile computers screen.

In addition to the video control capabilities the SMS shall

a) Enable easy access to the recorded archives of the Network Video Recording (NVR) system and search video recordings according to specific cameras, locations, dates, times, sensors, or events, selected from system lists or from interactive map.
b) The SMS shall be able to interface with camera systems from leading manufacturers:
c) The SMS shall be able to interface with any type of camera when a suitable protocol is provided.

The SMS shall provide specific user authorizations to managers to enable the following.

Screen display of protocols and procedures for dealing with routine tasks or alarm events, to prompt operators to execute tasks in correct order.

d) Generate system reports according to event type, time, location etc.

e) Generate reports to monitor the response times of security staff and operators.

f) Monitor periodic system maintenance checks and tests.

g) System experience and development

The proposed SMS solution shall be capable of data recovery and restoration in the event of system failure (hardware or software) or data loss. The required backup/ recovery period is at least 60 days

2.6.9 Access Control / SMS Server Hardware Specifications

Item	KenGen Minimum requirement	Bidder Response
Attribute	Specification	
Form factor	1U rackmount	
Processor	2 two 2nd Gen Intel Xeon Gold processors: 3.8 GHz core speeds (4 cores). UPI links up to 10.4 GT/s (2 UPI links used). Up to 38.5 MB cache. Up to 2933 MHz memory speed. 1st Gen Intel Xeon processors are also supported.	
Chipset	Intel C624	
Memory	Up to 24 DIMM sockets (12 DIMMs per processor; six memory channels per processor with two DIMMs per channel). Support for RDIMMs, LRDIMMs (1st Gen processors only), or 3DS RDIMMs. Memory speed up to 2933 MHz depending on the processor selected. Memory types cannot be intermixed.	
Persistent memory	Up to 12x TruDDR4 2666 MHz DCPMMs in the DIMM slots. Not supported with 1st Gen Intel Xeon SP processors.	
Memory capacity	Memory DIMMs only: Up to 3 TB with up to 24x 128 GB 3DS RDIMMs (Up to 1.5 TB per processor). (Include 128GB)	
Memory protection	Processor's integrated memory controllers: Error correction code (ECC), SDDC (for x4~ based memory DIMMs), ADDDC (for x4~ based memory DIMMs, requires Intel Xeon Gold or Platinum processors), memory mirroring, memory rank sparing, patrol scrubbing, and demand scrubbing. DCPMM's onboard memory controllers: ECC, SDDC, DDDC, patrol scrubbing, and demand scrubbing.	
Drive bays	10 SFF SAS/SATA hot-swap drive bays: 8x 2.5" (front) + 2x 2.5" (rear) Up to 12 SFF hot-swap drive bays:	
Internal storage capacity	3.5-inch drives: Up to 80TB using 4x 20TB 3.5-inch HDDs (Include 1TB HDD) Up to 61.44TB using 4x 15.36TB 3.5-inch SAS/SATA SSDs (Include 500GB HDD)	
Storage controller	12 Gb SAS/SATA RAID adapters with up to 8GB flash~ backed cache 12 Gb SAS/SATA HBA (non~ RAID) Onboard PCIe NVMe (with Intel VROC NVMe RAID support for Intel SSDs and optionally non~Intel SSDs) NVMe Switch Adapters (with Intel VROC NVMe RAID support for Intel SSDs and optionally non~Intel SSDs)	

Network interfaces	Onboard LOM slot for up to 4x 1/10 Gb Ethernet ports: 2x or 4x 1 GbE RJ-45 ports (no 10/100 Mb support) 2x or 4x 10 GbE RJ-45 ports (no 10/100 Mb support) 2x or 4x 10 GbE SFP+ ports (no 10/100 Mb support) Optional Mezzanine LOM (ML2) slot for dual-port 10 GbE cards with SFP+ or RJ-45 connectors or single- or dual-port 25 GbE cards with SFP28 connectors. 1x RJ-45 10/100/1000 Mb Ethernet systems management port.	
I/O expansion slots	Up to four slots. Slot 4 is the fixed slot on the system planar, and the remaining slots depend on the riser cards installed. The slots are as follows: Slot 1: PCIe 3.0 x8, ML2 x8, or ML2 x16; low profile Slot 2: PCIe 3.0 x16 or x8; low profile or full-height, half-length Slot 3: PCIe 3.0 x16; low profile Slot 4: PCIe 3.0 x8 (dedicated to an internal storage controller) Slot 3 requires the second processor to be installed.	
Ports	Front: 1x USB 2.0 port with XClarity Controller access and 1x USB 3.0 port; optional 1x VGA port. Rear: 2x USB 3.0 ports and 1x VGA port. Optional 1x DB-9 serial port.	
Cooling	Seven (two processors) hot-swap dual-rotor system fans with N+1 redundancy.	
Power supply	Up to two redundant hot-swap 750 W(100 - 240 V) High Efficiency Platinum, AC power supplies. HVDC support.	
Video	Matrox G200e with 16 MB memory integrated into the XClarity Controller. Maximum resolution is 1920x1200 at 60 Hz with 32 bits per pixel.	
Hot-swap parts	Drives, power supplies, and fans.	
Systems management	XClarity Controller (XCC) Standard, Advanced, or Enterprise (Pilot 4 chip), proactive platform alerts, light path diagnostics, XClarity Provisioning Manager, XClarity Essentials, XClarity Administrator, XClarity Integrators for VMware vCenter and Microsoft System Center, XClarity Energy Manager, Capacity Planner.	
Security features	Power-on password, administrator's password, secure firmware updates, Trusted Platform Module (TPM) 1.2 or 2.0 (configurable UEFI setting). Optional lockable front bezel. Optional Trusted Cryptographic Module (TCM) or Nationz TPM (available only in PRC). Optional Lenovo Business Vantage security software (available only in PRC).	
Operating systems	Include Microsoft Windows Server 2016/2019	
Warranty	Three-year customer-replaceable unit (CRU) and onsite limited warranty with 9x5 Next Business Day Parts Delivered.	
Dimensions	Width: 435 mm (17.1 in.), height: 43 mm (1.7 in.), depth: 750 mm (29.5 in.). SeePhysical specifications for details.	
Weight	Minimum configuration: 11.9 kg (26.2 lb), maximum: 18.8 kg (41.4 lb)	

2.7 Public Address System (P.A.S)

A public address system will be installed in Sondu Offices, Sondu Power Station, Sang'oro Power station and Turkwel Control Building and Base Camp.
Indoor & outdoor loudspeakers will be distributed at the various offices and corridors of the buildings as well as outside. The local microphones and addressing panels will be located at the regional security centre (Sondu RCCC and Turkwel LCCC) and at the gatehouses.
The required system should be a high-end Public Address and Voice Alarm System (PA/VA), specially designed for distributed installations and allowing the transmission audio and control data over IP networks in real time.
The PA system should work in already existing IP networks, sharing it with other existing systems and therefore saving costs on the IP network infrastructure.

The PA system should be designed to fit Procuring Entity's buildings. The system should have all the parameters and functionalities of surveillance and control and should be continuously checked and tested for integrity and any defaults promptly reported.
The PA system should be designed under the philosophy of the "no single point of failure" for a total reliability, making it suitable for those installations that require the highest reliability and dependability.
The PA system has to be interfaced with other security systems, such as fire alarm, CCTV, intrusion detection and, in general, with the ISMS by means of different integration software, to cover the most difficult and stringent integration philosophies and situations oriented to the life-saving priorities in case of hazards and emergency situations.
The required main features of the security and safety public address system are as follows:

a) Digital audio (UDP/IP Multicast) Dedicated Ethernet: Real time
b) Shared Ethernet through VPN: Real time. TCP/IP Control
c) Amplifier parameters general control Heartbeat signals.
d) Two Ethernet connections for security installations Automatic switch
e) Permanent supervision of secondary net.
f) Server free system, with only maintenance PC if required.

IP Address by dipswitch makes easier the equipment replacement for the maintenance staff.
Digitalized audio at microphone level international standards certified.
Pre-recorded messages at power unit level (pre-evacuation and evacuation).
Configurable output/input contacts in each power unit. Loudspeaker's supervision and emergency signal critical path. RS485 connection for peripherals control: noise sensors, etc. Analog inputs for:
Program Priority
Emergency (hardwired maximum priority

The Power Amplifier features and technical specifications:
The networked power amplifier is part of a public address system. The networked power amplifier is one integrated component consisting of a networked controller part built together with a power amplifier stage.
The networked power unit works as an interfacing unit that can receive digital audio messages either via streaming or as compressed files.
The decoded digital audio must be transmitted as an analogue audio signal on loudspeaker lines. It must be possible to connect local paging desks.
The networked amplifier should have facilities that make it a component in a certifiable Voice Alarm system e.g., being able to deliver an emergency message less than 10 sec after power on and with all required internal surveillance functions.
It must be possible to apply automatic signal level control with the purpose to counter ambient noise in the listening area.
The output amplifier stage must be able to deliver sufficient power.
The amplifier should have the following functions:
Protection against short-circuit/ overloading in the loudspeakers line. Thermal protections:
Notification of alarm with threshold configurable by the user Automatic turn off (hardware fix temperature). Fans control with thresholds configurable by the user. Loudspeakers lines surveillance
Digital audio through Ethernet connection Digital audio in compressed files Real-time audio via streaming
DSP functions for the ETHERNET channels: Volume, bass and treble. Additional input channels: Emergency, Priority and Program.
Double Ethernet connection, AUDIO+ CONTROL DATA They occupy two units height in the 19" Rack cabinets. Equipped with Safe Fail Relay for the amplifier activity surveillance Pre-recorded messages stored in the amplifier flash memory.
Emergency input continuous surveillance (critical signal path).

Input/output contacts configurable for auxiliary functions (emergency messages activation, zones sub-division) RS485 connection for control of peripheral devices (noise sensors,) Automatic level control functions.
Heart beats to central equipment via Ethernet for Supervision of the equipment
operation Keyboard locking option, to avoid its unintentional manipulation.
Loudspeakers lines output in low impedance (4-8-16 Ohms) and high impedance (50-70-100 V).

Security paging auxiliary relay Battery power supply input (24VDC).
IP address configuration by dipswitch, which facilitates the equipment replacement in any installation, or via software.

Loudspeakers

The required speakers should be wall-mount 5" (12cm) cone-type speakers with a compact and unobtrusive enclosure of ABS resin.
Installation should be quick and easy, and the speakers will be hook- mounted or mounted directly onto a wall. A push-type input terminal should allow easy cable connections and bridge wiring.
Input impedance will be easily adjusted by changing the tap position of the transformer.
The speaker should come with a built-in attenuator and may be connected to 2-wire and 3-wire systems. The required technical specifications should be as following:

- Rated Input: 6W (100V line), 3W (70V line)
- Rated Impedance: 1OOV line: 1.7k0 (6W), 3.3k0 (3W), 10k0(1W) 70V line: 1.7k0 (3W), 3.3k0 (1.5W), 10k0 (0.5W)
- Sensitivity (1W, 1m): 91dB
- Frequency Response: 120 - 15,000Hz (-20dB) Speaker Component: 5" (12cm) cone-type Applicable Cable: 600V vinyl-insulated cable (IV wire or HIV wire)
- Solid copper wire: 00.8 - 01.6mm (equivalent t (AWG 20 - 14)
- 7-core twisted copper wire: 0.75 - 1.25mm2 (equivalent to AWG 18 - 16)
- Connection: Push-in connector (bridging terminal) Operating Temperature: -10°C to 50°C (14°F to 122°F)
- Finish: Case: ABS resin, off-white Rear board: Hard board
- Dimensions: 173 (W)' 195 (H)' 101 (D) mm (6.81'"
- 7.68", 3.98")
- Wall Mounting Case front mount: 184mm (7.24") Dimensions: Fixing hole mount: 120mm (4.72")

CEILING SPEAKER

Item	KenGen Minimum requirement	Bidder Response
Load Rating	15W	
Transformer tappings at 100v	15-7.5W	
Frequency range	100-15KHz	
SPL(@1W/m)	93dB	
Speaker and impedance	8" / 8 ohms	
Dimension , install depth	226 (79)mm	
Material/Color	ABS white	

PAGING CONTROLLER WITH SPEAKER SELECTOR

Item	KenGen Minimum requirement	Bidder Response
	Standard cabinet design (2U).	

Features	* Built-in 10 zone selector and paging selector, which can be expanded to 300 zones.Each zone power capacity is 500W, and the total ten zones capacity is 5000W.	
Item	KenGen Minimum requirement	Bidder Response
	* With memory function when power off, it can realize the restoration after electricity is turn on.	
	* Two-color zones status indicators accurately indicate music, paging or alarm status.	
	*Music zone play control function to realize music playback in any zone.	
	*Local and ultra remote (1km) zone paging function	
	* 3 levels of input priority from high to low: EMC input, Mic1, remote paging console (equivalent priority with built-in chime).	
Power Supply	~220V 50Hz	
Power Supply	35W	
Communication Protocol	RS-422	
Communication Interface	RJ45	
Communication Rate	4800bps	
Dimensions	484×303×88mm	
Weight	5.04Kg	

MICROPHONE CONTROLLER

Item	KenGen Minimum requirement	Bidder Response
	• Standard rack mounted design (l U), SMT design With MP 3/TUNER /Bluetooth module, Digital screen displaying the current music from USB.	
	• With mp3/TUNER /Bluetooth remote control function.	
	• I EMC input, 2 AUX input, 4 MIC input.	

Features	* Channel priority: EMC > MIC I > MIC 2, MIC3, AUX I , AUX 2.	
	• Each channel hos volume control function, master volume control and bass/treble tone control.	
	• With level indicator, overload and protection indicator.	
	• With high temp, overload & short-circuit protection.	
	• 2 output modes: I 00V, 70V (non-Bridged mode).	
Item	**KenGen Minimum requirement**	**Bidder Response**
	• High energy and energy saving design of power suppl y and efficient power amplifier.	
	• Wide voltage power suppl y: 180V - 240V can work normally.	
	• 0(24V con be a vail able.	
Model	T-60TBV	
Output Terminal	70V, l00V	
Output Power	60W	
The Input Sensitivity And Impedance	MIC l, 2, 3, 4in put:5mV/600 0 Unbalanced 6.3 con nectar	
	AUX 1 , 2 input:350mV/ l0 KO Unbalanced RCA connector EMC in put:775mV/ 1 0KO Unbalanced 6.3 connector	
The Output Sensitivity &	MIX OUT: l 000mV /4700 Unbalanced RCA connector	
Source Impedance		
Tone	Bass : ±l 0dB at l 00Hz	
	Treble: ± l 0dB at lOKHz	
Frequency Response	50Hz-l6KHz(+ 1 d8 ,-3d8)	
SNR	MIC l , 2, 3:66d8; AUX 1 , 2:B0d B	
THD	Less than 0.5%(at l KH z, 1 /3 rated power)	
Mute Control	EMC has highest priority	
	MIC l priority over MIC 2-4, AUXl-2 audio in put,	
Channel Crosstalk Attenuation	50dB	
Heat Dissipation	Flank in and rear panel out to force fan coo ling , fan starts	
	when amplifier turned on, infinitely variable speeds	
Protection	Overheat, overload, short circuit, etc.	

Power Supply	~220~240V /50Hz OR ~ 1 10~1 20V / 60Hz	
Power Consumption	100W	
Dimension	484 X 260 X 44mm	
Weight	1.1 Kg	

PAGING MICROPHONE

Item	KenGen Minimum requirement	Bidder Response
Features	*Desktop design, black aluminum oxide drawing panel, exquisite and beautiful, exquisite technology, full of modern feeling.	
Item	KenGen Minimum requirement	Bidder Response
	*LCD and zone indicator light display the working status of each zone, 16 number keys and function keys, easy to operate.	
	*With bell and volume adjustment.	
	* It can page 30 zones and connect 10 zone pagers to 300 zones.	
	*1 mic and independent volume adjustment; one auxiliary line input; one audio auxiliary output, external expansion of active speaker.	
	* It can be expanded to 16 remote call microphones t~218 (a) for paging broadcast, with a max connection distance of 1km.	
Model	T~218(A)	
Power Supply	DC 24V	
Power Supply	10W	
Communication Protocol	RS~422	
Communication Interface	RJ45	
Communication Rate	4800bps	
Dimensions	220×143×52mm	
Weight	2.04Kg	

DIGITAL MESSAGE RECORDER

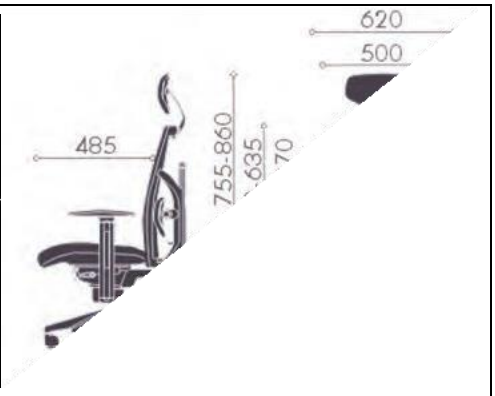
Item	KenGen Minimum requirement	Bidder Response

Feature	- 8 digital message recorder / player (wav, mp3).	
	- USB port for copying files, internal storage 256MB flash.	
	- Combo XLR/PL input jack for recording by Microphone or Line input, (1~4 messages).	
	- Operates from front switches / dry contacts.	
	- Balanced +4dB (Terminal Block) / unbalanced 0dB (RCA) output, with Volume adjust.	
	- Microphone VOX and Phantom power (24V).	
	- Priority A>B>C>D>1>2>3>4 playback.	
	- 1~4 automatic playback by front switch / dry contact.	
Item	**KenGen Minimum requirement**	**Bidder Response**
	- 24V DC input by Terminal Block / DC Jack.	
	- Play one time / Repeat option.	
	- 19~inch Rack Mount 1U.	

2.8 Regional Command and Control Center

2.8.1 CONTROL ROOM CONSOLE AND CHAIRS

ITEM	DESCRIPTION	IMAGE
Executive Control Room Desk	**Specifications** • Size; (180.5 x 76.5 cm). • Top Material; Wood. • Finish Type; MDF /Wooden High Pressure Laminate. • Shape; slightly curved. • With Control Room Console features. • With back cabinet and integrated cable management channels.	
Executive Office filing cabinet	**Office file cabinet** **Specifications** • High level cabinet with glass and full doors at the bottom which are lockable made of melamine faced boards. • The cabinet to match the desk. Size 800x400x1905mm. The cabinet to have 4 compartments. • The shelves are adjustable. The doors have 180° degree hinges which enable soft closing of the doors. • The Cabinet has height adjustable tabs at the bottom for stability and easy alignment.	

Executive Office Chair	**specifications** • High Back Ergonomic Chair to be used at Control Rooms (Use 24 hours daily) with the following features: • Adjustable lumbar support • Three way adjustable armrests(Height, depth and swivel angle) • Synchronized mechanism with tilt tension control, multi position tilt lock and pneumatic seat height adjustment • 5 star chrome Base in die-cast aluminum with sliver epoxy coating • Pure leather and black in colour • Seat slider • 4D adjustable arm	 

2.8.2 VIDEO WALL

The surveillance Regional Command and Control Centers (RCCC) shall have a security video wall. The commercial grade video wall shall be mounted appropriately with style and standards.

Key features

37) Support a variety of signal ports
38) Built-in splicing module, Support splice function
39) Support Creating one window PIP across the screen, roaming service, scaling, PIP
40) Support matrix joint control
41) Unique DNX motion supplement image processing technology
42) Dynamic image without motion trail

43) Splicing image processing RS-232 RJ45 loop-circuit input/output
44) Input by remote control with wire, mobile receiver head

Tenderers must ensure that the video wall is of state-of-the-art specifications and design. It must enable the security team with a comprehensive coverage view.

	MINIMUM REQUIREMENTS	QTY	TENDERERS RESPONSE
1.	Video wall display Branded	3x3 55” (Specify)	
	Panel Size:55inch Resolution:1920x1080 Bezel Width:<3.5mm Viewing Angle: at least 178x178 Brightness:>500nits Backlight: LED Working Time Capacity:7x24hours High Light: HD video wall, narrow bezel video wall FHD video wall unit, high brightness, high contrast, high gamut. Flexible structure design, easy installation, extensible, arbitrary combination. Stable performance, suitable working for a long time.		
2.	Video wall control board and system	Specify	
3.	Installation grid	Floor standing	

Due to the hot nature of Kengen sites, the installation method must consider the cooling of the monitor and video wall. The desired installation is the floor standing 3x3 video wall grid as shown below. This will aide cooling and if necessary, placement of fans to help dissipate heat.

There will be high-definition video streams screens enabled at the control rooms, head of security office, transport office and the security operations room with competent video management software (VMS).
These screens are for the monitoring purposes of live ongoing activities.

User shall be enables using screen mirroring technology to enable viewing of live footage by different users simultaneously. All the control rooms, head of security shall be enabled with high-definition video streams with competent video management software from the centralized and/or distributed SSM servers.

2.8.3 SECURITY CONTROL ROOM WORKSTATION

Item	KenGen Minimum requirement	Bidder Response
PERFORMANCE		
Processor	12th Gen Intel® Core™ i9-12900K (16 cores, 5.2GHz)	
Chipset	Intel W680 Operating System Windows 11 Pro	
Graphics	Up to NVIDIA RTX™ A5000 24GB VRAM	
Total Memory	Up to 128GB DDR5, 4000MHz	
	3 UDIMM Slots	
Memory DIMM Capacity	16GB / 32GB ECC	
	8GB / 16GB / 32GB non-ECC	
Storage Type Capacity	M.2 PCIe Gen4 NVMe SSD up to 2TB, 4TB3	
	3.5" SATA 7200rpm up to 6TB	
	2.5" SATA HDD up to 1TB	
CONNECTIVITY		
Front Ports	(4) USB 3.2 Gen 2 Type-A**	
	(1) USB 3.2 Gen 2 Type-C**	
	(1) Audio Jack	
	(1) Microphone Jack	
Rear Ports	(4) USB 3.2 Gen 1 Type-A**	
	(1) Audio (Line Out)	
	(2) DisplayPort™	
	(1) Flexible IO Port (DisplayPort/HDMI/ Type-C)7	
	(1) HDMI	
	(1) RJ-45 Gigabit Ethernet	
	(1) Serial Port7	
	(1) Thunderbolt™ 45	
	(2) PS/27	
	(1) Parallel Port7	
	(1) VGA7	
	(1) Single Type-C Ports USB 3.2 Gen 2x2 Adapter7	
	(1) Dual Type-A Ports USB 3.0 Adapter7	
WLAN	Intel AX211 AC WiFi 6e + Bluetooth™ 5.2 Intel AX201 AC WiFi 6 + Bluetooth 5.0 Intel Wi-Fi w/ Bluetooth™ External Antenna Kit7	
DESIGN		
Dimensions (WxDxH)	(mm): 170 x 315.4 x 376	

SOFTWARE		
Windows Preload	Include Windows 11 Pro	
SUSTAINABILITY		
Green Certifications	ENERGY STAR® 8.0	
	EPEAT® Gold8 RoHS Compliant	
	80 PLUS Platinum (500W, 750W) TCO 9.0	
	VOC	
Removable Storage	(1) 3-in-1 Media Card Reader	
	(1) Slim ODD	
	(1) Front Accessible Drive Bay	
Total Storage	Max 3.5" = 2 (12TB)	
RAID	SATA = 0/1/5/10	
Power Supply	500W (92% efficient)	
Expansion Slots	(1) PCIe 4.0 x16	
	(1) PCIe 4.0 x4	
	(2) PCIe 4.0 x1	
Expansion Options	Serial/DP/HDMI/Type C-DP/VGA Thunderbolt 4	
Input	Keyboard and Mouse	

CONTROL ROOM 27" MONITOR

Monitor		
Item	KenGen Minimum Requirement	Bidder's Offer
Make		
Model		
General		
Diagonal Viewing Size	686.00 mm (27 inches)	
Active Display Area Width Height	597.89 mm (23.54 inches) 336.31 mm (13.24 inches)	
Maximum Preset Resolution	1920 x 1080 at 60 Hz	
Aspect Ratio	16:9	
Pixel Pitch	0.3114 mm x 0.3114 mm	
Pixel Per Inch (PPI)	82	
Brightness	300 cd/m² (typical)	
Color Support	Color gamut: sRGB 99% (typical) Color depth: 16.7 million colors	
Contrast Ratio	1000:1 (typical)	
Viewing Angle	178°/178°	
Response Time	5 ms typical (Fast) (gray to gray) 8 ms (Normal mode) (gray to gray)	

Panel Type	In-Plane Switching Technology	
Display Screen Coating	Anti-Glare	
Backlight Technology	White LED edgelight system	
ComfortView Plus with Flicker-free screen	Yes	
Dell Display Manager Compatibility	Yes	
Remote Asset Management	Yes, via Dell Command I Monitor	
GSA/TAA	Yes	
Optional Soundbar	SB521A	
Connectivity		
Connectors	1 x HDMI 1.4 (HDCP 1.4) 1 x DisplayPort 1.2 (HDCP 1.4) 1 x VGA 1 x SuperSpeed USB 5Gbps (USB3.2 Gen1) upstream 4 x SuperSpeed USB 5Gbps (USB3.2 Gen1)	
HDCP Support	HDMI HDCP 1.4 DP HDCP 1.4	
Design Features		
Adjustability	Height adjustable stand (150 mm), Tilt (-5° to 21°), Swivel (-45° to 45°), Pivot (-90° to 90°)	
Security	Security lock slot (cable lock sold separately)	
Flat Panel Mount Interface	VESA (100 mm x 100 mm)	
Power		
AC input voltage/frequency/current	100 VAC to 240 VAC / 50 Hz or 60 Hz ± 3 Hz / 1.5 A (typical)	
Power Consumption (Operational)	0.2 W (Off mode)[6] 0.2 W (Standby Mode)[6] 15 W (On Mode)[6] 55 W (Max.)[7]	
Power Consumption Stand by / Sleep	Less than 0.3W	
Dimensions (with stand)		
Height	534.15 mm (21.03 inches)	
Width	609.90 mm (24.01 inches)	
Depth	190.10 mm (7.48 inches)	
Weight		
Weight (panel only - for VESA mount/ no cables)	4.38 kg (9.66 lb)	
Standard Service Plan	Premium Panel Exchange, 3 Years Advanced Exchange Service[2] & Limited Hardware Warranty[5]	

Environmental Compliance	ENERGY STAR® certified monitor, EPEAT® Gold registered where applicable[8], RoHS- compliant, TCO Edge Certified Displays, BFR/PVC free monitor (excluding external cables), Meets NFPA 99 leakage current requirements, Arsenic-free glass and Mercury-free for the panel only.	
Warranty	At least 1 year warranty	

2.8.4 REMOTE WORKSTATION

Item	KenGen Minimum requirement	Bidder Response
Operating System[1]	Windows 11 Professional	
Processor[2]	Intel® Evo™ platform powered by 12th Generation Intel® Core™ i7-1250U(2b) • 10-Core	
Chipset	Intel® SOC Chipset	
Integrated Graphics	Intel® Iris® Xe Graphics(14)	
Display	HP Sure View Integrated Privacy Screen 13.3" diagonal FHD IPS micro-edge WLED-backlit touch screen with Corning® Gorilla® Glass NBT™ (1920 x 1080), 72% Color Gamut 13.3" diagonal FHD IPS micro-edge WLED-backlit touch screen with Corning® Gorilla® Glass NBT™ (1920 x 1080), 72% Color Gamut 13.3" diagonal 4K IPS micro-edge WLED-backlit touch screen with Corning® Gorilla® Glass NBT™ (3840 x 2160), 72% Color Gamut	
Standard Memory	Dual channel memory support- Non-User accessible/upgradable. 16 GB DDR4-2400 SDRAM	
Storage	128 GB M.2 SSD 1 TB PCIe® NVMe™ M.2 SSD	
Networking/Wireless	• Wi-Fi 6E (2x2) (19c) and Bluetooth® combo (26) (Supporting Gigabit data rate) (7e) • MU-MIMO supported	
I/O ports	• 2 Thunderbolt™ 4 with USB4™ Type-C® 40Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4, HP Sleep and Charge) (42)(50)(51)(59)(64) • 1 SuperSpeed USB Type-A 10Gbps signaling rate (HP Sleep and Charge)(64) • 1 SuperSpeed USB Type-A 10Gbps signaling rate • 1 Headphone/microphone combo	
Media Card Reader	1 microSD media card reader	
Webcam/MIC	Wide Vision HD IR Camera	
Integrated Microphone	Dual array digital microphone	
Audio	Bang & Olufsen Quad speakers Audio Boost 2.0 (discrete smart amp solution)	
Keyboard/Touchpad	Full-size island-style backlit keyboard Image pad with multi-touch gesture support	
Power/Battery[5]	45W/65W AC power adapter 4-cell, 53.2Wh Li-ion polymer Support battery fast charge - Approximately 50% in 45 minutes[8]	

Dimensions (mm)/Weight (kg)	306.7 x 214.6 x 14.9 mm / From 1.27 kg	
Screen to body ratio	86.5%(40)	
Warranty and support	• 1-year limited hardware warranty. • 1-year limited technical support for software and initial setup	

2.9 SMART DISPLAY TERMINAL

Smart Screen Display Minimum Specifications (for 43 inch and 65 inch)

- Product Type: UHD TV
- CPU: 64-bit A73*4 @1.6GHz max
- GPU: G52(2EE) MP2, 550Mhz
- OS : Android
- RAM: DDR4-2666: 3G Bytes
- Storage: eMMC5.0 32G Bytes
- Launcher Homepages Show: Google Play, You-tube, Featured Apps, Source, etc.
- OSD Language: English
- TV System: ATV: PAL/NTSC/SECAM-DK/BG/I/M; DTV: DVB-T/T2
- AV System: PAL, NTSC
- HDMI & HDCP Version: HDMI1.4 & HDMI2.1, HDCP1.4 & HDCP2.2
- HDR: HDR10 Decoding, Dolby Vision IQ
- Power Supply: AC 100V-240V 50/60Hz
- Certification: CB, HDMI, Dolby Audio, Dolby Vision, DTS-HD; CTS (Google Official Certification)
- Internet Link: 2.4GHz/5GHz dual-band Wi-Fi 802.11 b/g/n 2T2R; Ethernet Network (RJ45, 10/100M)
- Bluetooth: Bluetooth 5.0
- Antiglare for bright viewing rooms
- Must have casting/mirroring feature from Android and iOS devices

CEILING MOUNT BRACKET

- Vesa mount cantilever ceiling mount
- Can hold up to 15kgs of mounted display screen weight
- Can accommodate display screen sizes of 43" to 65"
- Retractable/Telescopic capability

WALL MOUNT BRACKET

- Adjustable Strong 14-55 Inch TV Wall Mount Bracket

2.10 Integration of fire Alarm system with Access control system

The access-controlled system will be integrated with the existing fire alarm system in all areas where a fire alarm system is installed. Furthermore, the contractor will work with Kengen's fire alarm system contractor to ensure full integration functionality. The aim of the access control system integration with the fire alarm system is to ensure that doors are unlocked in the event of a fire alarm going off.

2.11 Network Components

24 PORT SWITCH (include SFPs)

Item	KenGen Minimum requirement	Bidder Response
Product Description	24 GE SFP Ports, modular uplink Switch	
Total 10/100/1000 or Multigigabit copper ports	24x 1G SFP	
Uplink Configuration	Modular Uplinks	
Default AC power supply	715W AC	
Available PoE power	N/A	
Dimensions (H x W x D)	1.73 x 17.5 x 17.7 Inches	
StackWise-480	Yes	
StackPower	Yes	
Default power supply	PWR-C1-715WAC-P	
Switching capacity	208 Gbps	
Stacking bandwidth	688 Gbps	
Forwarding rate	154.76 Mpps	
Total number of MAC addresses	32,000	
Total number of IPv4 routes (ARP plus learned routes)	32,000 (24,000 direct routes and 8000 indirect routes)	
IPv4 routing entries	32,000	
IPv6 routing entries	16,000	
Multicast routing scale	8000	
QoS scale entries	5120	
ACL scale entries	5120	
Packet buffer per SKU	16 MB buffer for 24- or 48-port Gigabit Ethernet models 32 MB buffer for 24 and 48-port Multigigabit	
FNF entries	64,000 flows on 24- and 48-port Gigabit Ethernet models 128,000 flows on 24-port Multigigabit	
DRAM	8 GB	
Flash	16 GB	
VLAN IDs	4094	
Total Switched Virtual Interfaces (SVIs)	1000	
Jumbo frames	9198 bytes	
Total routed ports Catalyst per 9300 Series stack	448	
Wireless bandwidth per switch	Up to 96 Gbps on 48-port Gigabit Ethernet model	
Mean time between failures – MTBF(hours)	284,130	
Safety certifications	• UL 60950-1,• CAN/CSA-C222.2 No. 60950-1 • EN 60950-1, IEC 60950-1, • AS/NZS 60950.1 • IEEE 802.3,	

Electromagnetic emissions certifications	• 47 CFR Part 15,• CISPR22 Class A,• EN 300 386 V1.6.1,• EN 55022 Class A, EN 55032 Class A • CISPR 32 Class A,• EN61000-3-2, N61000-3-3 • ICES-003 Class A,• TCVN 7189 Class A, • V-3 Class A,• CISPR24, EN 300 386,• EN55024, TCVN 7317 • V-2/2015.04, • V-3/2015.04, CNS13438 • KN32, • KN35, • IEC 61000-6-1, • EN 61000-6-1	
Environmental	Reduction of Hazardous Substances (ROHS) 5	
Warranty	3 year smartnet warranty	

8 PORT INDUSTRIAL SWITCH

Item	KenGen Minimum requirement	Bidder Response
Performance		
Switch Technology	Store and Forward Technology with 20 Gbps Switch Fabric	
System Throughput	29.7Mega packet per second	
CPU performance	MIPS-4KEc CPU running at 500 MHz	
System Memory	32M Bytes flash ROM, 256M Bytes DDR3 SDRAM	
Transfer packet size	64 bytes to 10K bytes Jumbo Frame	
MAC Address	8K MAC address table	
Packet Buffer	4.1Mbit SRAM packet memory	
Forwarding performance	14,880 pps for Ethernet and 148,800 pps for Fast Ethernet, 1488,100 pps for Gigabit Ethernet	
Interface		
Enclosure Port	• 10/100/1000 Mbps Ethernet port: 8 x RJ-45 • Gigabit Ethernet port : 2 x RJ-45 with auto MDI/MDI-X function • 100Mbps / 1000Mbps Fiber port : 2 x SFP Socket for SFP fiber transceiver with Hot- swappable and D.D.M. functions • RS-232 Console port : 1 x RJ-45 for system configuration • Digital Input / Relay Output port: 4-Pin removable terminal block connector • Power input port: 4-Pin removable terminal block connector	
Ethernet Cable	100 Base-TX: 2-pair UTP/STP Cat.5e/Cat.6 cable, EIA/TIA-568B 100-ohm (100m) 1000 Base-T: 4-pair UTP/STP Cat.5e/Cat.6 cable, EIA/TIA-568B 100-ohm (100m)	
Digital Input	Digital Input (Hi): DC 11V~30V Digital Input (Low): DC 0V~10V Supports sink type signal input with photo-coupler isolation	
Relay Output	Dry Relay output: 1A / DC 24V Supports Multiple Events Binding trigger function.	
Diagnostic Indicators	• 1000Mbps RJ-45 port: Link /Activity (Green on, Green Blinking),1000Mbps (Yellow) • SFP port: Link/Activity (Green on, Green Blinking) • Power: System Power ready (Green on) • Sys: System Ready (Green on), System Updating (Green Blinking) • DO (Alarm): Alarm Relay Active (Red On) • R.S.: Green on (Ring normal)/Blinking (wrong ring	

	port connective), Amber on (Ring abnormal) / Blinking (device's ring port failed) • PoE: Green On (PD Detect/On), Off (None- Detect/Off)	
Power over Ethernet		
Standard	IEEE 802.3af, IEEE 802.3at, IEEE 802.3bt	
PoE operating mode	Auto Mode: IEEE 802.3af/at/bt Forced Mode: User configured Power consumption budget control with IEEE 802.3 PoE /PD detection, or forced without PD detection	
PoE forwarding conductor	IEEE 802.3 af/at: RJ-45: V+(3,6), V- (1,2) IEEE 802.3 bt: RJ-45: V+(3,4,5,6), V- (1,2,7,8)	
Power forwarding capability	8 Port PoE (#1-8) 15W/IEEE802.3af, 30W/IEEE 802.3at, 60W-90W/IEEE 802.3bt*Note	
PoE System Power Budget	Port-based system power budget control with first plug-in high priority mechanism PoE System Power Budget: 480Watts.*Note	
Management		
Telnet & Local Console	Supports command line interface with Cisco-like commands and maximum 4 sessions; the telnet interface also supports SSH	
SNMP	Support IPv4/IPv6, v1, v2c, v3 with SNMP trap function, trap station up to 4 and can be manually configured the trap server IP address.	
SNMP MIB	MIBII, Bridge MIB, Ethernet-like MIB, VLAN MIB, IGMP MIB	
Network Time Protocol	Supports NTP protocol with daylight saving function and localized time sync function.	
Management IP Security	IP address security to prevent unauthorized access	
E-mail Warning	4 receipt E-mail accounts with mail server authentication	
System Log	Supports both Local or remote Server with authentication	
IEEE 802.1x	Port based network access control, RADIUS, MAB, TACACS+	
Network Redundancy		

Multiple Super Ring (MSR™)	New generation Ring Redundancy Technology, Includes Rapid Super Ring, Rapid Dual Homing, TrunkRing™, MultiRing™, SuperChain™ and backward compatible with legacy Super Ring™.	
Rapid Dual Homing (RDH™)	Multiple uplink paths to one or multiple upper switch	
TrunkRing™	Integrates port aggregation function in ring path to get higher throughput ring architecture	
MultiRing™	Couple or multiple rings; Up to 5 Gigabit rings in single switch	
SuperChain™	It is new ring technology with flexible and scalability, compatibility, and easy configurable. The ring includes 2 types of node Switch – Border Switch and Member Switch	
ITU-T G.8032 ERPS	Support ITU-T G.8032 ERPS V1 single ring topology, and ERPS V2 multiple rings with ladder topology	
Rapid Spanning Tree	IEEE802.1D-2004 Rapid Spanning Tree Protocol. Compatible with Legacy Spanning Tree and IEEE 802.1w multiple spanning tree	
Loop Protection	The Loop Protection prevents any network looping caused by RSTP and MSR ring topology change	
Network Performance		
Port Configuration	Port link Speed, Link mode, current status and enable/disable	
Port Trunk	IEEE 802.3ad port aggregation and static port trunk; trunk member up to 8 ports and maximum 5 trunk groups	
VLAN	IEEE 802.1Q Tag VLAN with 256 VLAN Entries and provides 2K GVRP entries 3 VLAN link modes- Trunk, Hybrid and Link access	
Private VLAN	Direct client ports in isolated/community VLAN to promiscuous port in primary VLAN	
IEEE802.1 QinQ	Supports Double VLAN Tag function for implementing Metro Network topologies	
Class of Service	IEEE 802.1p class of service; per port 4 priority queues.	
Traffic Prioritize	Supports 4 physical queues, weighted fair queuing (W.R.R.) and Strict Priority scheme, which follows 802.1p CoS tag and IPv4 ToS/ DiffServ information to prioritize the traffic of your industrial network	
IGMP Snooping	IGMP Snooping v1/v2c /v3 for multicast filtering and IGMP Query mode; also support unknown multicasting process forwarding policies- drop, flooding and	

	forward to router port	
Rate Control	Ingress/Egress filtering for Broadcast, Multicast, Unknown DA or All packets	
Port Mirroring	Online traffic monitoring on multiple selected ports	
Port Security	Port security to assign authorized MAC to specific port	
DHCP	DHCP Client, DHCP Server with IP & MAC Address binding, DHCP relay and port based DHCP server	
Mechanical		
Installation	DIN-Rail mounting	
Case	Steel metal with Aluminum heat-dissipate panel housing	
Ingress Protection	IP31	
Dimension (mm)	74 (W) x 132(D) x 135 (H) – w/o DIN Rail Clip	
Weight	1.2Kg	
Power Requirement		
System power	2x DC power input with polarity reverse protection	
Input Range	DC 48V & 50V (48-57V)	
PoE Power Budget	PoE 240W@48V; 480W@50V *Note	
Power Consumption	10W@50VDC without PoE	
Environmental		
Operating Temperature	-40 ~75°C	
Operating Humidity	0% ~ 95%, non-condensing	
Storage Temperature	-40 ~ 85°C, 0% ~90% Humidity	
Hi-Pot	AC 1.5KV for Ethernet port and power	
Regulatory Approvals		
EMC	IEC/EN61000-6-2, IEC/EN61000-6-4 Heavy Industrial EMC EMI: FCC Class A, CE/ Class A EMS:IEC/EN61000-4-2, IEC/EN61000-4-3, IEC/EN61000-4-4, IEC/EN61000-4-5, IEC/EN61000-4- 6, IEC/EN61000-4-8	
Railway Application	EN50121-4	
Shock	Compliance with IEC 60068-2-27	
Vibration	Compliance with IEC 60068-2-6	
Free Fall	Compliance with IEC 60068-2-32	
MTBF	551,403 hrs	
Warranty	5 years	

24 CORE SM FIBER OPTIC

Item	KenGen Minimum requirement	Bidder Response
Outer Jacket Material	HDPE	
General Construction	This All Dielectric Self-Supporting (ADSS) cable contains 24 SM G652D color-coded optical fibers. The cable contains 2 loose tubes filled with thixotropic gel, each tube containing 12 fibers. The loose tubes and 3 fillers are stranded around a dielectric central strength member. The cable core is reinforced and protected by strength yarns and an outer jacket with a black, UV-resistant HDPE compound. The cable is designed to comply with following standards: IEC 60793-1, IEC 60793-2, IEC 60794-3-10, EIA/TIA 598	
Design & Materials		
Buffer Material:	PBT	
Tube Diameter:	2.1 mm nom.	
Color Code:	Per TIA/EIA 598-D	
Central Strength Member:	FRP	
Cabling:	SZ	
Strength Elements:	Aramid Yarns	
Fiber Containing Tubes:	2	
Item	KenGen Minimum requirement	Bidder Response
Total Number of Elements:	5	
Number of fibers:	24	
Rip-Cord:	Yes	
Standards		
Applicable Standards:	IEC 60794, IEC 60794-1-21/22, EIA/TIA-455	
Performance		
Max. Span:	80 m	
Sag:	1.00%	

Max. Installation Tension:	622 N	
Loading Tension:	858 N	
Max. Wind Velocity:	60 km/hr	
Max. Fiber Strain at Installation:	0.05%	
Max. Fiber Strain at Operation:	0.20%	
MRCL:	3757 N	
Impact Resistance:	10 N*m	
Impact Resistance:	3 cycles	
Max. Crush Resistance:	400 N/cm	
Min. Bend Radius for Installation:	20xD mm	
Min. Bend Radius for Operation:	10xD mm	
Max. Operating Temperature:	+65 °C	
Min. Operating Temperature:	–40 °C	
Max. Installation Temperature:	+35 °C	
Min. Installation Temperature:	– 5 °C	
Max. Storage Temperature:	+65 °C	
Min. Storage Temperature:	–40 °C	
UV Resistance:	Yes	

CAT 6 A UTP CABLE

Item	KenGen Minimum Requirement	Bidder's Offer
Make		
Model		
Electrical Performance	Certified performance in a 4-connector configuration up to 100 meters	
Conductor/Insulator	23 AWG solid copper insulated with HPDE	
Operating Temperature	-20°C / +75°C	
Compliance	ANSI/TIA-568-C.2, ISO 11801, IEC 60603-7	
RoHS Compliance	Compliant	
Bulk Cable Weight	50 Kg/km	
Max. Pull Tension	100N	
Min. Bend Radius (installation)	8x OD.	
Min. Bend Radius (installed)	4x OD.	
Characteristic Impedance	(1-100MHz) (100-250MHz)	
DC Resistance	Ω/100m	
Resistance Unbalance	%	
Capacitance Unbalance to Earth	Pf/km	
Delay Skew	ns/100m	
Nominal Velocity of Propagation	%	
Propagation Delay (Nominal)	ns/100m	
Test Voltage (d.c. for 1 minute) Conductor /Conductor	VDC	
Insulation Resistance (500V d.c)	MΩ	

OUTDOOR UPS

Item	KenGen Minimum requirement		Bidder Response
DC INPUT / DC BUS	DC VOLTAGE (Typ.)	24 ~ 29V	

	RATED CURRENT	40A	
BATTERY	PARAMETERS	Two 12V ~20A batteries included with the UPS	
BATTERY INPUT / OUTPUT	VOLTAGE RANGE (Typ.)	21 ~ 29V	
	CURRENT RANGE	0 ~ 40A	
	CHARGE CURRENT (Typ.)	2A	
	EXTERNAL BATTERY (Typ.)	4 / 7 / 12AH / 24V	
FUNCTION	RELAY CONTACT RATING (max.)	30VDC, 1A	
	DC BUS OK	Relay contact : Short when DC voltage between 21~29V(3%), relay contacts	
		LED(Green) : DC BUS OK : light ; DC BUS fail : dark	
	BATTERY FAIL Note.2	Short when battery voltage falls below 21.9V(3%) or battery failure is observed through the battery test function, relay contacts	
		LED(Red) : Battery over-discharge warning or battery broken : light ; Battery OK : dark	
	BATTERY DISCHARGE	Relay contact : Short when battery in discharge condition, relay contacts	
		LED(Yellow) : Battery discharging : light ; Battery is not discharging or discharging current<2.0A : dark	
ENVIRONMENT	WORKING TEMP.	-20 ~ +70J	
	WORKING HUMIDITY	20 ~ 90% RH	
	STORAGE TEMP., HUMIDITY	-20 ~ +85J, 10 ~ 95% RH	
	VIBRATION	Component : 10 ~ 500Hz, 2G 10min./1cycle, 60min. each X, Y, Z axes ; Mounting : Compliance to IEC600068-2-6	
SAFETY & EMC (Note 3)	WITHSTAND VOLTAGE	Terminal-Chassis :0.5KVAC, Relay Contacts-Terminal :0.5KVAC	
	ISOLATION RESISTANCE	Terminal-Chassis :>100M Ohms / 500VDC / 25/ 70% RH	
	EMC EMISSION	Compliance to EN55022 (CISPR22) Class B, EN61000-	

		3~2,~3	
	EMC IMMUNITY	Compliance to EN61000~4~ 2,3,4,5,6,8,11, heavy industry level, criteria A	
OTHERS	**MTBF**	161.9Khrs min.	
	DIMENSION	55.5*125.2*100mm (W*H*D)	

1kVA UPS

Item	KenGen Minimum requirement		Bidder Response
Input	Nominal Input Voltage	220-240Vac	
	Input Connection	IEC C14	
	Input Frequency	50 Hz / 60 Hz	
	Input Voltage Range (V)	110 Vac – 285 Vac @ 50% Load	
	Power Factor	≥ 0.95	
	Topology	Online	
Output	Output Power Capacity (Watts)		
		800 W	
	Output Power Capacity (VA)		
		1000 VA	
	Nominal Output Voltage	220/230/240VAC	
	Frequency Range (Sync.mode)	50/60Hz +/- 3 Hz	
	AC Voltage Regulation	□ 1%	
	Frequency Range (Batt. Mode)	50 Hz ± 0.5 Hz or 60Hz ± 0.5 Hz	
	Transfer Time (AC to DC)	Zero	
	Waveform Type	Pure Sinewave	
	Total Output Connections	IEC 3*C13	
	Efficiency (AC Mode)	88%	
	Current Crest Ratio	03:01	
Battery	Battery Type	Maintenance-free sealed Lead-Acid battery	
	Typical Recharge Time	4 hours recover to 90% capacity	
Physical	Dimension, D X W X H (mm)	312x438x86 (2U)	
	Weight (kgs)	11	
	LED	ü	
	LCD	Load level, Battery level, AC mode, Battery mode, Bypass mode, and Fault indicators	
	EPO	X	

	USB communication port	ü	
Features	DB-9 RS-232	Supports Windows 2000/2003/XP/Vista/2008/7/8/10	
	Input Breaker	ü	
	Battery user disconnector	ü	
Protection	Surge Energy Rating (Joules)	600 J	
ENVIRONMENT	Humidity	0 to 95% relative humidity, noncondensing	
	Temperature	0° to 40°C at rated load	
	Noise Level	Less than 50dBA	
Conformance	Regulatory Approvals	CE	

INVERTER FOR OUTDOOR SWITCH

Item	KenGen Minimum requirement		Bidder Response
OUTPUT	DC VOLTAGE	48V	
	RATED CURRENT	4.2A	
	CURRENT RANGE	0 ~ 4.2A	
	RATED POWER	201.6W	
	RIPPLE & NOISE (max.)	200mVp-p	
	VOLTAGE ADJ. RANGE	43 ~ 53VDC	
	VOLTAGE TOLERANCE	±1.0%	
	LINE REGULATION	±0.5%	
	LOAD REGULATION	±1.0%	
	SETUP, RISE TIME	300ms, 50ms at full load	
INPUT	VOLTAGE RANGE	B:19 ~ 36VDC C:36 ~ 72VDC D:72 ~144VDC	
	EFFICIENCY (Typ.)	86%	
	DC CURRENT (Typ.)	10.4A/24V	
	INRUSH CURRENT (Typ.)	C:45A/48VDC D:45A/96VDC	
PROTECTION	OVERLOAD	105 ~ 135% rated output power	
		Protection type : Shut down o/p voltage, re- power on to recover	
	OVER VOLTAGE	53 ~ 65V	
		Protection type : Shut down o/p voltage, re-power on to recover	

	OVER TEMPERATURE	Shut down o/p voltage, recovers automatically after temperature goes down	
ENVIRONMENT	WORKING TEMP.	-20 ~ +60℃ (Refer to "Derating Curve")	
	WORKING HUMIDITY	20 ~ 90% RH non-condensing	
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH	
Item	KenGen Minimum requirement		Bidder Response
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)	
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes	
SAFETY & EMC	SAFETY STANDARDS	UL62368-1approved (for SD-200C-5/12/24 type only), EAC TP TC 004 approved, design refer to AS/NZS 62368.1	
	WITHSTAND VOLTAGE	I/P-O/P:1.5KVAC I/P-FG:2KVAC O/P - FG:0.5KVAC	
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25℃/ 70% RH	
	EMC EMISSION	Compliance to BS EN/EN55032 (CISPR32) Class B, EAC TP TC 020	
	EMC IMMUNITY	Compliance to BS EN/EN61000-4- 2,3,4,6,8, BS EN/EN55035, light industry level, EAC TP TC 020	

OTHERS	MTBF	1919.7K hrs min. Telcordia SR-332 (Bellcore) ; 280.6K hrs min. MIL-HDBK-217F (25°C)	
	DIMENSION	215*115*50mm (L*W*H)	

3kVA UPS

Item	KenGen Minimum requirement		Bidder Response
Input	Nominal Input Voltage	220-240Vac	
	Input Connection	IEC C20	
	Input Frequency	50 Hz / 60 Hz	
	Input Voltage Range (V)	110 Vac – 285 Vac @ 50% Load	
	Power Factor	≥ 0.95	
	Topology	Online	
	Output Power Capacity (Watts)	2400 W	
Item	**KenGen Minimum requirement**		**Bidder Response**
	Output Power Capacity (VA)	3000 VA	
	Nominal Output Voltage	220/230/240VAC	
	Frequency Range (Sync.mode)	50/60Hz +/- 3 Hz	
	AC Voltage Regulation	□ 1%	
	Frequency Range (Batt. Mode)	50 Hz ± 0.5 Hz or 60Hz ± 0.5 Hz	
Output	Transfer Time (AC to DC)	Zero	
	Waveform Type	Pure Sinewave	
	Total Output Connections	IEC 6*C13+1*C19	
	Efficiency (AC Mode)	88%	
	Current Crest Ratio	03:01	
Battery	Battery Type	Maintenance-free sealed Lead-Acid battery	

	Typical Recharge Time	4 hours recover to 90% capacity	
Physical	Dimension, D X W X H (mm)	632x438x86 (2U)	
	Weight (kgs)	27.6	
Features	LED	ü	
	LCD	Load level, Battery level, AC mode, Battery mode, Bypass mode, and Fault indicators	
	EPO	X	
	USB communication port	ü	
	DB-9 RS-232	Supports Windows 2000/2003/XP/Vista/2008/7/8/1 0	
Protection	Input Breaker	ü	
	Battery user disconnector	ü	
	Surge Energy Rating (Joules)	600 J	
ENVIRONMENT	Humidity	0 to 95% relative humidity, noncondensing	
Item	**KenGen Minimum requirement**		**Bidder Response**
	Temperature	0° to 40°C at rated load	
	Noise Level	Less than 50dBA	
Conformance	Regulatory Approvals	CE	

2.11.1 OUTDOOR CABINET

Item	**KenGen Minimum Requirement**	**Bidder's Offer**
Make		
Model		
Feature	The cabinet shall have a central Swing handle for profile half cylinder	
	Dimensions at least	
	The cabinet shall be made of hot molded, fiber glass reinforced polyester, dyed in mass. The enclosure is furnished with four threaded studs and bolts for mounting plate or mounting frame installation.	

	The enclosure must provide total insulation and a protection degree of IP66 following IEC 60E29 and EN 60E29.	
	Protection degree IK10 against external mechanical impact according to EN 62262 and IEC 62262 (IK07 for cabinets with glazed door).	
	The protection covers the total volume of the enclosure according to EN 62208 and IEC 62208.	
	Resists temperatures up to 70°C in continuous use (peak temperature up to 100°C).	
	Self-extinguishing and halogen-free.	
	Cabinets are maintenance free and corrosion resistant.	
	Rated insulation voltage Ui = 10007.	
	Monobloc type of cabinet	
	In and outdoor use	
	1, 2 or 3 point locking mechanism Glass fibre reinforced polyester	
	Protection degree IP66-IK10 (plain door) Fitted for mounting plate and modular mounting frame	
	Wall mounting or pole fixing options	
	Dimensions:	
	Shall be equivalent to 9U	
	Execution on base (metal or concrete) Approval: UL/CSA/AS	
	Self-adhesive rainhood	

2.11.2 42U CABINET

Item	KenGen Minimum Specs	Bidders Response
42 U Cabinet	Unit height - 42U	
	Dimensions - height/width/depth), 2055x800x1000 mm	
	Front door - Rounded Mesh front door	
	Back door - Solid Steel	
	Sideway covers - Steel, detachable with lock	
	Standard - Comply with ANSI/EIA, RS-310-D, IEC297-2, DIN41491	
	Application Floor-stand network cabinet/Server rack	
	Color - Black	
	Stress weight 800 kg	
	plinth to meet under base wiring, ventilation and rat-proof	
	Vented front door and rear door enable ventilation and reliable operation	

2.11.3 15U CABINET

Item	KenGen Minimum Specs	Bidders Response
15U Outdoor Cabinet	Net width (mm) 600,00 Net height (mm) 770,00 Net to depth (mm) 595,00	
	Min. ambient temperature (°C) 0	
	Max. ambient temperature (°C) 40	
	Enclosures Wallmounting Monobloc with removeable sidepanels	
	IP20 Protection	
	Roof fan unit	
	Welded, powder-coated sheet steel chassis	
	Color:Lightgrey	
	Degree of protection: IP20	
	Front-full-glasdoor made from safety glass 5mm including lock and 2 keys.	
	Door hinged right, easy and quick chance to left hinging possible	
	Door opening: ca. 180°	
	Fullmetall- and perforated doors available as an option	
	Removable sidepanels with lock and keys.	
	19"-rails 2 pairs in front and behind, galvanized, continuously depth-adjustable. Numbering of Height-Units (U) by laser for easy readability	
	Roof and floor with 3 openings each for optional fan DLT12121. Covered with „break-out-style" blanking covers, which can be easily broken out by use of a simple tool like a screwdriver	

	Cable-entry-openings in roof (1x), floor (1x) and rearpanel (2x). Covered with „break-out-style“ blanking covers, which can be easily broken out by use of a simple tool like a screwdriver.	
	Cable-entry-panel with brush included (1x).	
	Cooling:Passive cooling by ventilation slots and by sharing heat with environment via chassis. Active cooling by fans installed in roof and floor	
	Earthing:M8- Earthing point in the rear of the cabinet.FastOn-Earthing-connections to all dismountable parts pre-installed.Earthing-connections to all dismountable parts pre-installed	
	Enclosure to be delivered fully-assembled.	

2.11.4 PATCH CORDS (UTP and FO)

Patch cords shall be factory terminated of the same specification as the UTP and Fiber optic cables in this tender.
The patch cords shall be compatible with all equipment delivered in the scope of the tender ie ODF's, Switches, Routers, etc

2.11.5 8 PORT ODF (COMPLETE WITH SC SM COMPATIBLE PIGTAILS AND SC ADAPTERS (with slanted tip))

KenGen Minimum Requirement		Bidder's Offer
Make		
Model		
Fiber optic patch panel(ODF) is also called fiber distribution panel. Its main function is to terminate the fiber optic cable and provide connection access to the cable's individual fibers. Fiber patch panels are termination units, which are designed to provide a secure, organized chamber for housing connectors and splice units.		
1	The Fiber Optic Distribution Frame shall have aluminum sliding fittings with self-locking functions that prevent drawers from falling when moved;	
2	It shall be wall/din rail mounted to a standard 19 inch rack.	
3	The drawer shall be the holding board for splicing trays, easy to withdraw the fibers when testing and distributing.	
4	Shall have at least 8 ports or similar arrangement	
5	It shall have a modular design with splicing and distribution function	

KenGen Minimum Requirement		Bidder's Offer
6	The splice tray inside shall be changeable for maintenance or other purposes	
7	Standard size, can be used in an outdoor cabinet distribution frame	
8	Shall utilize SC adapters	
9	The front shall have provision to mark on the plate for easy identification and operation	
10	Shall have a front door and rear door for front and rear access	
11	Shall be supplied with factory terminated 1M Single Mode OS2 pigtails on all ports	
12	All Unused ports must be blanked by appropriate blanking tool	

2.11.6 24 PORT ODF (COMPLETE WITH SC SM COMPATIBLE PIGTAILS AND SC ADAPTERS (with slanted tip))

KenGen Minimum Requirement		Bidder's Offer
Make		
Model		
Fiber optic patch panel(ODF) is also called fiber distribution panel. Its main function is to terminate the fiber optic cable and provide connection access to the cable's individual fibers. Fiber patch panels are termination units, which are designed to provide a secure, organized chamber for housing connectors and splice units.		
1	The Fiber Optic Distribution Frame shall have aluminum sliding fittings with self-locking functions that prevent drawers from falling when moved;	
2	It shall be rack mounted to a standard 19 inch rack.	
3	The drawer shall be the holding board for splicing trays, easy to withdraw the fibers when testing and distributing.	
4	Shall have at least 3pcs splice tray. Each tray shall have 8 ports or similar arrangement	
5	It shall have a modular design with splicing and distribution function	
6	The splice tray inside shall be changeable for maintenance or other purposes	
7	Standard size, can be used in 19", 23" standard distribution frame	
8	Shall utilize SC adapters	
9	The front shall have provision to mark on the plate for easy identification and operation	
10	Shall have a front door and rear door for front and rear access	

KenGen Minimum Requirement		Bidder's Offer
11	Shall be supplied with factory terminated 1M Single Mode OS2 pigtails on all ports	
12	All Unused ports must be blanked by appropriate blanking tool	

2.11.7 24 PORT PATCH PANEL RJ45/RJ45

KenGen Minimum Requirement		Bidder's Offer
Make		
Model		
1	Shall be designed for use with CAT6 cables	
2	Shall have a minimum of 24 CAT6 Ports	
3	Meets or Exceeds TIA/EIA 568-A and 568-B Standard	
4	RJ-45 female input to RJ-45 female output	
5	Shall be rack mounted	

2.11.8 COMMUNICATION RADIOS

Description	KenGen Minimum Requirements	Bidder's Response
OUTDOOR UNIT (ODU)		
Architecture	ODU: Outdoor Unit with Integrated Antenna, Embedded Antenna or Connectorized Unit for External Antenna IDU: Indoor Unit PoE Device	
IDU to ODU Connection	Outdoor CAT-6e cable. Maximum cable length: 100m	
ODU Power Feeding	Via Indoor Unit PoE	
IDU Power Feeding	48Vdc	
RADIO		
Data Rate	≥750 Mbps full-duplex net throughputs	
Frequency Band	Sub-6 GHz (5.145-6.090 GHz)	
Duplex Technique	TDD	
Asymmetric TDD	Configurable	
Dynamic Channel BW Selection	20/40/80MHZ	

TDD Synchronization	Intra-Site and Inter-site using GPS	
Description	**KenGen Minimum Requirements**	**Bidder's Response**
DFS/ACS	Supported	
Adaptive Modulation & Coding	10 levels: BPSK to 256QAM	
Diversity	Polarization and Spatial diversity supported	
Spectrum view	Built in spectrum Analyzer	
Maximum information Rate	Supported	
Radio Access Scheme	MIMO 2x2 - OFDM	
Tx Power	≥25 dBm, Configurable: 25 dBm @ 3.3-3.8 GHz, 4.9-6.4 GHz, 26 dBm @ 2.3-2.5 GHz	
QoS	4 levels supported, Strict Priority, TTL	
Maximum Frame Size	2048 bytes	
Latency	< 3 msec	
Encryption	AES 128	
Range	Up to 40 km	
Radio Regulations		
FCC, ETSI	47CFR Part15 Sub part C & E, 47CFR Part90 Sub part Y, , 47CFR Part90 Sub part Z UCBP, EN300 328, EN301 893; EN 302 502, EN 302 326-2	
SAFETY		
FCC	UL 60950-1, UL 60950-22	
ETSI	EN/IEC 60950-1, EN/IEC 60950-22	
EMC		
FCC	47CFR Part15 Sub part B, Class B	
ETSI	EN301 489-1, EN301 489-4	
MANAGEMENT		
Link Management Application	Application Manager	
Protocol	SNMPv1, SNMPv3, Telnet and HTTP	
Web based management/Client Application	Web access via browser/Client App	

ENVIRONMENTAL		
Description	**KenGen Minimum Requirements**	**Bidder's Response**
Operating Temperature	Up to 60°C	
Humidity	100% condensing	
Protection	IP67	
ANTENNA		
Polarization	Dual	
Antenna Type	Indicate	
Gain	As per link budget	
INDOOR UNIT (IDU)		
IDU Ethernet Ports	2 X 10/100/1000BaseT ports 1 X SFP Gbe ports Interface with Auto-negotiation (IEEE 802.3u)	
Framing/Coding	IEEE 802.3/U	
Bridging	Up to 2047 MAC addresses Self-learning	
Traffic Handling	MAC layer bridging, self- learning	
VLAN Support	Support	
Connector	RJ-45	
POWER AND MOUNTING		
Power Feeding	48Vdc	
Mounting	Telecommunication Masts	
GENERAL		
Diagnostics	Local and remote loopbacks	

Description	KenGen Minimum Requirements	Bidder's Response
Grounding and Lightning Protection	Individual grounding for each IDU/ODU Internal arrestors for lightning protection (includes Lightning protection kit)	
Approval	Type approved by Communications Authority of Kenya (CA).	
Country/Region of Origin	(Provide documentary evidence)	
	USA, European Union, Canada, Japan, or Israel	
Warranty	2 Years	

2.11.9 MANAGEMENT TOOLS

Item	KenGen Minimum requirement	Bidder Response
The tools provided shall be made of mild steel and branded from reputable manufacturer. The tool kit shall be supplied as one and no loose items will be accepted.		
1	Network cable tester (patch cord not included)	
2	Side cutter 125mm (4.92")	
3	Long nose plier 138mm (5.43")	
4	RJ-45 die set	
5	RJ-11 die set	
6	RG-58, RG-59/62, BNC/TNC die set	
7	RJ-22 die set	
8	RG-58, RG-59/62 AU BNC/TNC die set	
9	Super crimp tool frame	
10	Desoldering pump	
11	Quick heat ceramic soldering iron 110V 6"	
12	Curved forceps	
13	Multi-network cable tester	
14	Round cable cutter	
15	Rotary coaxial stripper	
16	Desoldering braid	
17	Precision wire stripper	
18	Punch down tool with 110/66 blades	
19	Mini flashlight 7 pcs folding type hex key set (inch)	
20	Blowing brush Extension blade 7" (175mm)	
21	Nut blade: 1/4", 3/8", 3/16", 7/16", 11/32" ,5/16"	
22	Super torque ratchet handle 8 pcs screwdriver blades: #0, #1, #2 3, 5, 6mm T10, T15	
23	Driver blade T6	
24	Driver blade T7	
25	Driver blade T8	
26	Driver blade T9	
27	Wrist strap 10FT	
28	Inspection mirror 3- 3/4 auto range digital multimeter 2pcs pallets	
29	ABS tool carrying case w/1 pallet	
	• Case size: 435x310x145mm (17.1"x12.2"x5.7")	
	• Individual packing: Color box	

2.11.10 Visual Fault Locator

Specifications

KenGen Minimum Requirements	
Wavelength	650nm
Output power	<1.3mW
Dynamic Distance	3km MMF, 4km SMF
Laser Safety Rating	Class II
Connector	1.25mm & 2.5mm Universal Connectors
Operation Mode	Pulsed (2~3Hz) and CW

3. Physical Security Specifications/ Civil Works

3.1 CCTV CAMERA POLES

The CCTV anchorage poles shall be made of galvanised iron, 75mm dia, anchored on plate as described in the drawings. The height of the poles shall be 6 meters above ground in consideration to areas of installation and prevailing site conditions.

For proper grounding of the poles copper lightning arrestors shall be at least 5-8inches high or as necessary. Ground rods must be made of copper-clad steel with a nominal thickness of at least 42mm .

Ground rod sections must be a minimum of eight feet in length and manufactured for the sole purpose of providing electrical grounding.

3.2 CONCRETE POLE / KENYA POWER POLES

The concrete pole shall be prestressed reinforced concrete poles. The finished pole shall have a smooth external surface that is free from honeycombing. The poles shall be in accordance to DKS 1933.

The minimum length of the poles shall be 10m long, taper shall be 13mm/m for each concrete pole.

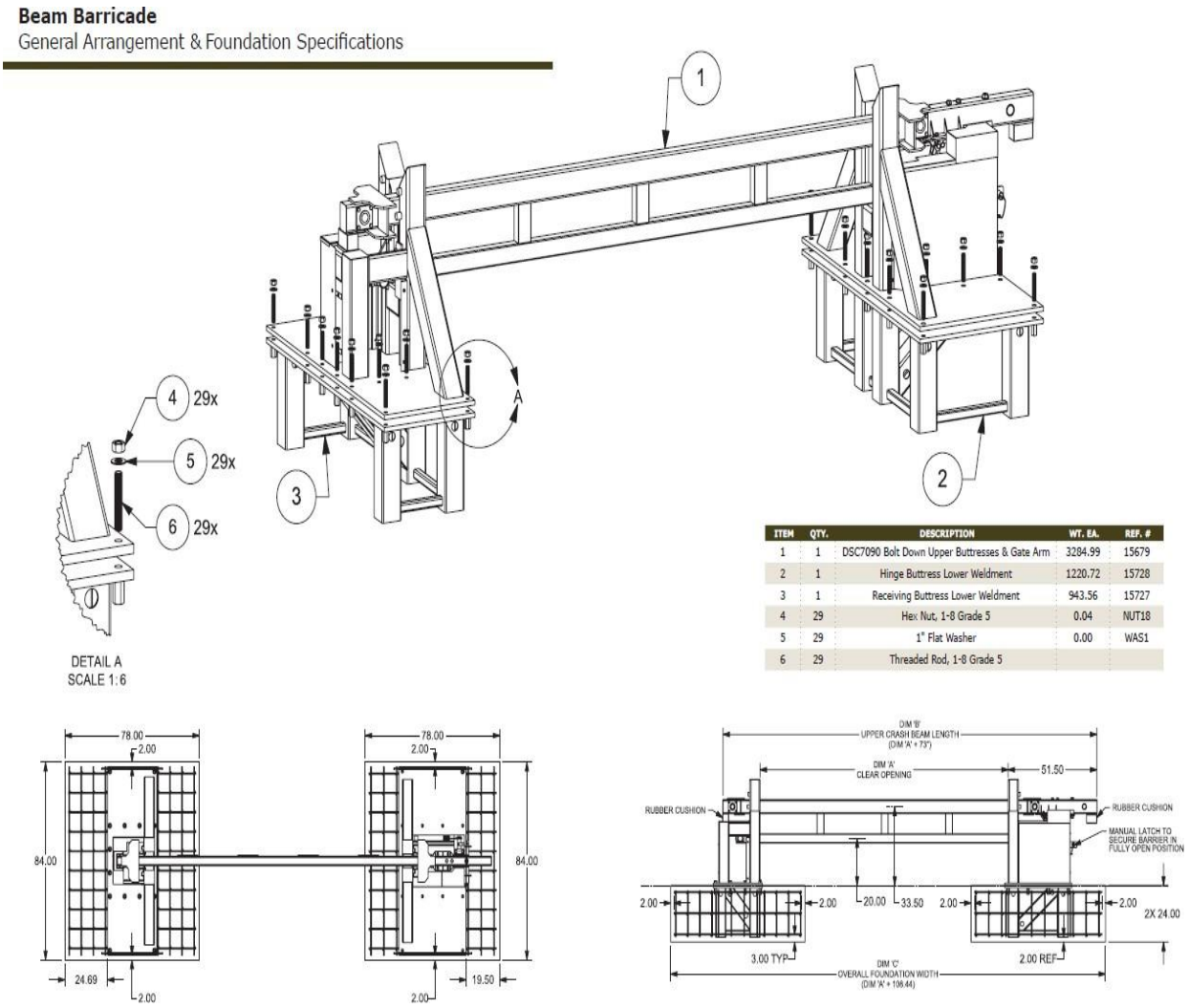
The poles shall be supplied with cabinets. The cabinets shall house solar batteries, controllers and a switch. All the cabinets to be supplied and fixed with din rails of width 35mm, base 27mm and depth 18mm. 6m high above the ground.

More details on Appendix – 2 Kenya Power Poles

3.3 WOODEN POLES

Appendix 1 – Specification for treated wooden poles.

3.4 K4 RATED BEAM BARRICADE



General Description

Fast cycle rate: The barrier should open and close in under 8 seconds to handle the medium traffic of the power stations.

Power options: Remote electro-hydraulic power unit (HPU)

Arm locking (optional)

Electro Magnetic 500kg force lock (optional) to secure the barrier in the down position for maximum security in an emergency event.

Operation: Barrier should be operated locally through manual operation in the guardhouse and integrated to Security management system for remote operation

Traffic Control Operation System

- Electromagnetic system, Industrial gear HD
- 3 phase engine/mortar
- 230- 240V power supply
- Wheel drive ¾ "impact resistance 2900kg
- Industrial controller

- Frequency converter
- 4-6 sec operational speed each direction (adjustable)
- Adjustable speed control element/each direction/reversible.
- Adjustable speed, end of motion (raise or lower)

Safety

Safety infra-red sensors both sides to prevent from being accidentally closed over authorized vehicles or pedestrians. An option for extra safety loop detector to allow for automatic closing of the barrier.

- Operation Method
- Any selected method available.
- Synchronized interlock.
- Safety feature elimination in an emergency event.
- A manual handle in case of power supply failure.

Notes

- It shall be the responsibility of the contractor to determine proper selection, placement, and design of the barrier installation to ensure the safety of the vehicles, pedestrians, and guards.
- Barrier arm lengths (to protect 9-meter-wide road) and counterweights shall be ascertained during the site visit.
- In some areas e.g., Tana, the barricade should be supported by Jersey barriers on the side of the road to prevent vehicle entry.

4. Electrical Items

4.1 SURGE PROTECTOR

KenGen Minimum Specs		Bidders Response
Nominal Voltage	230V	
Watts	7200	
Frequency	50/60 Hz	
Load Current (Amps)	30	
Inrush Current (20ms)	110 Amps	
Max consumption (milli Amps)	<100mA	
Wait Time	10s ~10m plus manual	
Over-Voltage Disconnect	230V-300V plus off	
Over-Voltage Reconnect	2V below HVD setting	
Under-Voltage Disconnect	150 ~ 230V	
Under-Voltage Reconnect	5V above LVD setting	
Max supply	320V	
Spike / surge protection Joules Amps Response	 160 6500A (8/20us) 10 nanosecs	
Response time (over voltage)	<20 millisec	
Response time (under voltage)	adjustable 05 ~ 10 secs	
Brown-out response time	20 millisec	
Approx packed weight	600 g	
Dimensions packed (mm)	H 230 x W 135 x D 55	
Socket type screw terminal	direct via brass	

4.2 SOLAR ANCHORAGE

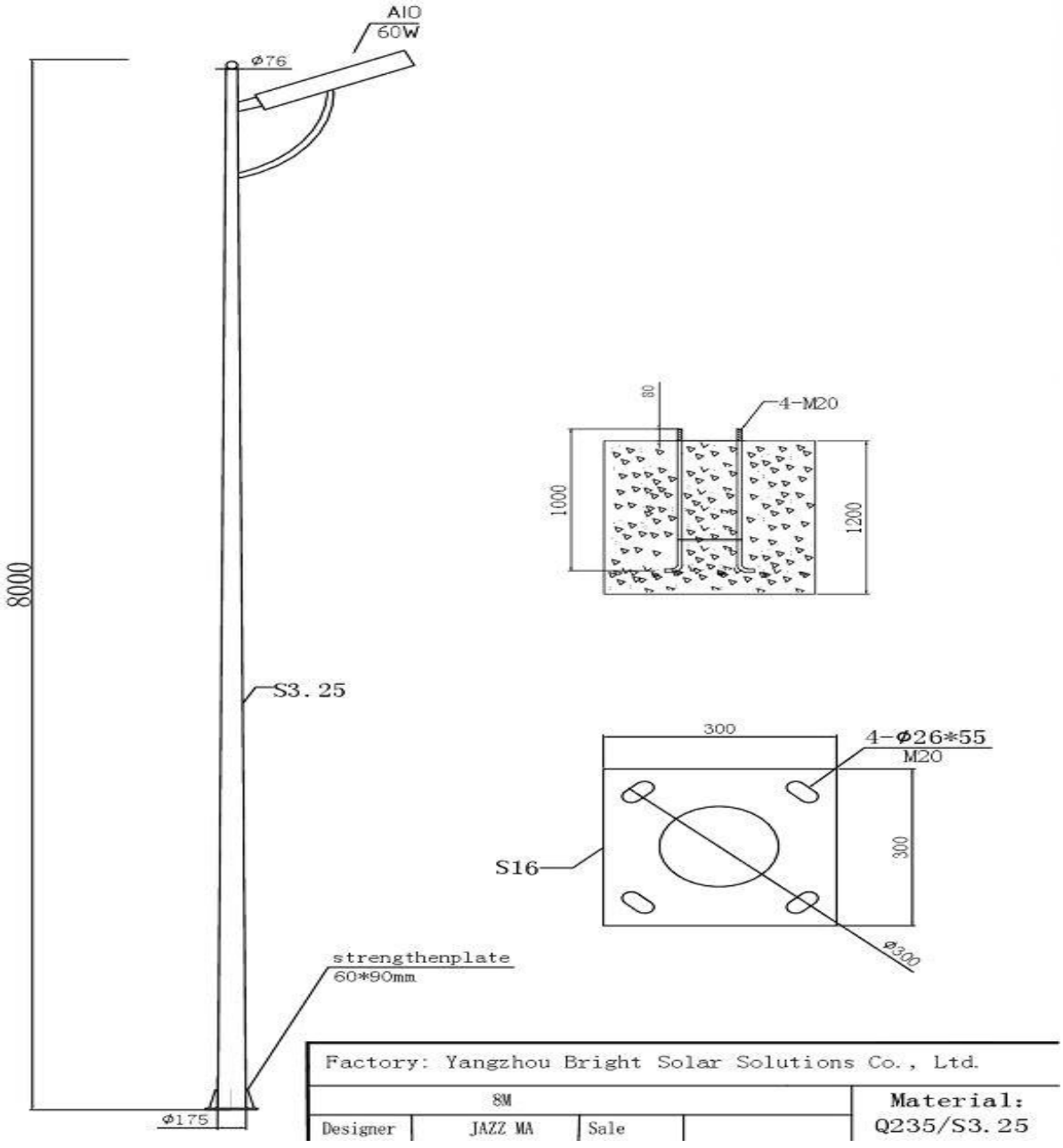
KenGen Minimum requirement	Bidder Response
1. Length(m): 1m	
2. Shape: Round	
3. Diameter(mm): 35-40mm	
4. Wall thickness class: Class "B" as per BS 1387:1985	
5. Wind resistance (kph): 140kph	
6. Base clamp plate size (mm): GI steel, round. Dimensions (to fit a concrete pole at the top of the pole)	

7. Anchor bolts: 4 pieces for each pole, each made from GI steel, washers	
8. Paint: Aluminum paint for all metallic Support structure including GI pipes	
NB. The anchor should be inclined 30 decrees away from the pole and the top part to accommodate the panel.	

4.3 SOLAR PANELS

Item	KenGen Minimum requirement		Bidder Response
	Max Power	18V80W (High Efficiency Mono crystalline Silicon)	
Solar Panel	Life Time	25 Years	
	Type	12.0V/200Ah Lithium	
Battery Battery	Life Time	5~10 Years	
	Max Power	12V 60W	
	LED Chip Brand	USA Cree Chips with High Brightness	
LED Lamp (With sensor)	Lumen (LM)	8500~8800LM	
	Life Time	50000 Hours	
	Viewing Angle	70*140°	
Charge Time	by Sun	6~7 Hours (with Enough Strong Shine)	
	Full Power	More 15 Hours	
Discharge Time	Saving Mode	More 34 Hours	
working Temperature	Range(℃)	Reach up to +70℃	
Color Temperature	Range(K)	5000~6500K	
Mounting Height	Range (M)	7~9M	
Space Between Light	Range (M)	20~25M	
Main Material of Lamp	Aluminum Alloy		
Certificate	*CE / ROHS / IP65 /IES*		
Warranty Period	3 Years		
	Product Size	1200*455*45mm	
	N. W/G. W.	19kg/21kg	
Packing & Weight	Carton Size	1345*510*185mm	

	Q'ty/CTN	1 Set/CTN	
	20' GP		
Packs Containers	40' GP	100 Sets	
Before installation Base Foundation Bolts-Assemble			



4.4 SOLAR LED AUTO FLOOD LIGHT

KenGen Minimum requirement	Bidder Response
1.Type: High efficiency Solar LED light fitting	
Modular construction	
2. Solar panel type: High efficiency monocrystalline silicon	
3. Solar panel life: 20 years	
4. Battery: Built-in LiFePO4 Battery protection that includes Over charging & over discharging protection	
Ø Waterproof, damp proof, explosion proof Charge controller	
5. Battery life: ≥ 5years	
6. Charging time (by sun): 6-10 hours	
7. LED maximum power (not solar panel power): 100 Watts	
8. Lumen: >8500lm	
9. Color temperature: 4000-7000k	
10. Minimum working time (full bright) :13 hours	
11. LED lifetime: ≥ 50000 hours	
12. Beam angle: 1200	
13. Control mode: Time control and dimming control, motion sensor.	
14. Lamp material of main: Aluminum. The panel shall also be mounted on a aluminum frame.	
15. Mounting: Non-corrosive Metallic mounting brackets, pipes, bolts, nuts &washers and other accessories, all from the solar fitting manufacture.	
16. Ingress Protection: IP65	
17. Warranty period: 3 years.	
18. Net weight for whole fitting: < 30kg	
19. Working temperature: -20 to +600C	

4MM 3 CORE ARMOURED CABLE

Kengen Minimum Specification	Bidder's Response
• Three core cable, voltage rating of400/600v, copper stranded conductor with a double steel tape armored PVC sheathed electric cable, core identification (red & black insulated) current rating 42a .	

4MM 1 CORE EARTHING CABLE

Kengen Minimum Specification	Bidder's Response
• 4mm² single core cable. • Voltage rating of400/600v, copper stranded conductor with a PVC sheath, current rating 42a. • Color yellow/green for earthing.	

2.5MM TWIN AND EARTH CABLE

3 Core 2.5mm2 PVC Insulated Copper Wire Cable 3X2.5mm

Item	Kengen Minimum Specification	Bidder's Offer
Application:	Construction, Underground Installation, Industrial, Power Station.	
Voltage:	Low and Medium Voltage Cable.	
Current:	A.C Cable.	
Insulation Material:	PVC.	
Sheath Material:	PVC.	
Material Shape:	Round Wire.	

32 A TRIPPLE POLE MCB

Kengen Minimum Specification	Bidder's Response
• Rated current 32a • Rated voltage 230/400ac 50 Hz • Number of pole 3 poles • 6KA Short circuit breaking capacity. • Compliance with IEC standards • C Curve trip characteristics • Breakers mounting on standard 35mm Din rail. • Designed for use with medium magnetic	

start up currents.	
• Breaker use is for A.C only.	

10 A 2 POLE MCB

Kengen Minimum Specification	Bidder's Response
• Rated current 10a • Rated voltage 230/240ac 50 Hz • Number of pole 2 poles • 6 KA Short circuit breaking capacity. • Compliance with IEC standards • C Curve trip characteristics • Breakers mounting on standard 35mm Din rail. • Designed for use with medium magnetic start up currents. • Breaker use is for A.C only	

DIN RAILS

Kengen Minimum Specification	Bidder's Response
• 35mm width standard dimensions • 7.5 And 15mm deep. • Material steel • Rust proof	

5. Wiring, Installations, Signposting, and Signpost Markings

1) Every installation will require preliminary planning and the client's approval.
2) All of the cables installed outside the buildings will be XLPE-insulated, with a double protection cover and a standard mark. They shall be installed by means of UV resistant designated clasps or PVC-coated copper wires. When embedded in asphalt or the ground, the cable will be passed through a PVC pipe conduit with an appropriate diameter. When installed on fences, the cable will be passed through the PVC conduit, installed at horizontal or vertical direct lines, with clasp reinforcements every 60 cm. Angle bending will be done by means of PVC angles with the proper diameter. A transmission box will be installed at maximum intervals of 15 meters. Connection items will not be priced separately: they will constitute part of the overall length.
3) All electrical work will be done according to the Electricity Law valid in Kenya.
4) The contractor will be responsible for any damage to a facility or building or a part which belongs to the site, caused by the contractor or his employees, including his sub- contractors.
5) Work will be performed by means of tools suitable for their designation and according to the acceptable and legal standards of installation in Kenya.
6) Immediately upon the completion of work, any waste or leftover materials, devices, and cables will be removed from the facility or the area where the installation has been completed.
7) Thickness of the wires for the system will be adapted to the required distances and currents. The installation cables will be a different color for each and every wire, enabling their easy and convenient identification.
8) All connections will be done with professional and marked connection clips.
9) All joints will be of the highest quality and suitable for use in a security system.
10) All joints will be of the locked type, which will not be able to be disconnected on their own.
11) All the equipment will be grounded according to the standard. The connection resistance to a central grounding point will not exceed 0.1 ohm. The grounding will be checked by an authorized controller, brought to the site at the expense of the contractor. The controller will issue a written report regarding the status of the tests.
12) Every conductor will be marked at its edges with markings of resistance to outdoor conditions, wear, and dissolvent substances. The brand of markings will be Fleximark or its equivalent. The markings will be installed on a large scale. The markings will match the technical documentation drawings supplied upon completion of the work.
13)
14) Every connection point, joint, fastener, or point on a distribution board will be marked and/or signposted with a durable marking/signpost.
15) There will be a complete separation between high-voltage wiring VAC 230 and wiring whose nominal voltage is lower than 50 volt.
16) All equipment components will be marked and signposted, including all equipment, distribution boxes, and other pieces of equipment.
17) Formulation of the signposting should be approved by the client. The signposting language will be English, according to the client's decision.
18) The marking of equipment installed within the building will be done by posting an engraved and paint-filled signpost or by using a 2-colour PVC board. Signposting by machines that produce soft signposts (e.g. Brother, etc.) will not be authorized.
19) Every transmission box and/or wiring box will be signposted on the outside regarding
20) its designation.
21) All the materials used will be new and of high quality, with a standard mark (for those materials with a binding Kenyan or international standard).
22) All the markings in the field will match the drawings in the plans submitted together with the system literature.

23) Every cable in a distribution box or channels will be marked throughout its length. The edge of each cable will include a resistant marking.
24) Every connection will be sealed and isolated by means of a shrinking sleeve. The connections will only be done by reliable soldering. The use of isolation bands is forbidden.
25) Cables in distribution boxes and/or equipment boxes will be connected by means of reliable connection scales, such as disconnection type KRONE or other scales approved by the client.
26) The wiring will be continuous throughout its entire length without intermediate connections.
27) The full wiring plans will remain on the site together with the documentation.
28) A lightning (conductor) protection system will be installed on the cameras or other devices installed outside in order to prevent lightning sparks from penetrating both the devices and the end points (i.e. instruments) through the information lines or through the feeding lines (i.e. arrestors).
29) Equipment screws installed outside the buildings will be made of stainless steel.
30) Wherever concrete work and/or the fixation of various elements in the ground are required, the contractor will be obligated to dig up to a depth suitable for securing the item with a concrete filling of at least Class 25. The contractor will be responsible for making engineering calculations designed to ensure a stable and lasting reinforcement.
31) The contractor will leave no protruding ends of metal or other items, which may constitute a safety hazard. Every protruding piece of metal will be cut and polished.
32) All metal components installed on the exterior will be of galvanized steel at a minimum width of 80 micron. In installations of up to 500 meters from the seashore, the metalcomponents will be painted with epoxy paint after being galvanized.
33) In case metal ends are cut, the cut edge will be painted with at least 30 microns thick zinc-rich paint in at least two layers, as well as with an at least 30 micron thick tinted paint in two layers.
34) In case there are acoustic ceilings at the site, the contractor is obligated to dismantle them carefully, return them to their place without any breakage at the edges, and clean them. The contractor will be charged for the replacement of tiles with dirt marks on them.
35) Pipelines installed in empty spaces above acoustic ceilings will be of an "automatic turn off" type with a known standard mark. Upon demand, the contractor will present the approval to the supervisor.
36) Cables will be passed through the conduits only after the stabilization and reinforcement of the pipes.
37) Battery cable connections will be done by means of cable shoes and will require a spring ring to ensure reinforcement.
38) Input cables for a network of a 230 AC current will have minimal incision of 1.5 mm.
39) The outline of their installation will be coordinated with the client and they will have dual XLPE coating. If these cables are inserted into a metal box, at the opening where the cable is inserted a Gromets (Protection Gum) protection against damage to cable
40) will be installed. When calculating the thickness of the cable, a safety coefficient will be used at a rate of at least 25% of the measured current consumption.
41) Line protection resistor: For each element requiring line protections, a suitable resistor will be installed. In case the line protection is split up between more than one element, a symmetrical division will be done between the elements. These resistors will be soldered and reinforced against disconnection and breakage. Moreover, they will be isolated by a shrinking sleeve.
42) Protection of a power point of over 240VAC will be done by means of a transparent plastic cover.
43) Each card and/or circuit will be installed in a box or locked cabinet with a tamper switch connected continuously 24-hours a day, even if they are installed in the designated.
44) shaft. The box will be marked with an engraved signpost related to its designation. The signpost wording will correspond to the stipulations in the documentation.
45) Whenever the contractor is required to install equipment on a wall, the contractor is committed (without any financial charge) to provide and neatly and aesthetically install a 20 mm thick wood panel and install the equipment on the panel. The wiring will be interlaced in grooved PVC channels and installed vertically and horizontally.

46) All equipment in the equipment room will be installed (at no additional charge) in a 19 inch aluminum rack mount with wheels and a locked transparent door.
47) The contractor should see to it that the installed cameras are not blinded by lighting elements. The contractor is responsible for coordinating the installation with the onsite supervisor. No complaints about defective video quality due to blinding by light will be accepted.