SYSTEM SPECIFICATIONS & PROOF-OF-CONCEPT (POC) EVALUATION CRITERIA FOR PRODUCTION COUNTING SOLUTION IN THE WATER BOTTLING SECTOR

Contents

INDICATIVE SYSTEM SPECIFICATIONS & PROOF-OF-CONCEPT (POC) EVALUATION CRITERIA FOR PRODUCTION COUNTING SOLUTION IN THE WATER BOTTLING SECTOR

1.0 BACKGROUND

1.1. The FBR is undertaking a significant digitalization initiative aimed at enhancing its tax collection capabilities and addressing structural gaps in Pakistan's tax system. As part of this transformation, FBR seeks to deploy a production counting system at all water bottling facilities in Pakistan. As part of the agreement, selected vendors will be responsible for providing and installing production monitoring system. Vendors will also be responsible for providing post installation maintenance and tech support services to the procuring client.

1.2. FBR recognizes the critical role of technology in tackling the challenges of tax evasion, unreported production, and discrepancies in bottled water production data. This production counting project aims to deliver real-time visibility into total production of bottled water manufacturers. A panel of multiple authorized vendors will provide manufacturers access to a pool of competitive vendors.

2.0 SCOPE

This document outlines:

- the indicative solution and system specifications; and
- evaluation criteria for the PoC of the production monitoring in the water bottling sector.

The criteria is intended to enable an objective assessment of the vendors' PoCs against pre-defined technical and functional benchmarks. The primary objective is to assess the vendors' performance, through live demonstration, that their proposed solution is accurate, robust, auditable, and fit for purpose in a real-world production setting, not just under ideal conditions.

PART-I
INDICATIVE SOLUTION AND SYSTEM SPECIFICATIONS

3.0. Business Functions and Performance Requirement from the Solution

Business Functions and Performance Requirement from the Solution	
01.	*The solution specified will enable selection and detection of all SKUs, recognize each unique SKU, count individual units and report key metrics including but not limited to number of units for each SKU and type (e.g. brand) produced in water bottling facilities (Note: System should be able to expand coverage of SKU types through a user- friendly SKU management interface). It will then store the recorded data and transmit to FBR's system. FBR will access the data and should have access to an interactive dashboard. The user should be able to filter across multiple indicators including by SKU, time frame and information of the company (e.g., site, production line). The user can analyze data and compare it to reported quantities by the manufacturer* *The solution comprises the following components:* a. **Registration and management system:** The system will enable loading and registration of SKUs provided by FBR and the manufacturer in the database. The SKU registration and solution management system will provide a user-friendly and secure way of adding new SKUs to authorized users, control and define user administration and rights to the SKU database both on premises and via-cloud to the dashboard interface, and enable SKU management including modules for new product testing and non-commercial production. Vendors are to clearly define the process for new SKU registration and the solution management system in their demonstration. b. **Capture data**: A human-machine interface may also be provided for product/brand/SKU selection. Fixed-mount industrial laser barcode scanners and sensors will be employed to read the barcode label and detect and count the SKU on the conveyor belt. Sensors such as laser or photoelectric sensors will be deployed preferably after the labelling stage within an appropriate distance (to ensure system accuracy and limit human interference) to count individual units being produced under each SKU. The deployed solution components should be integrated and synchronized to cover all unit types. The system will also deploy cameras to capture real-time footage at specified monitoring points. c. **Ingest, transform and load data**: Sensors will be connected to a Programmable Logic Controller (PLC) and an Industrial PC (IPC) which will ingest the data collected from the sensors and allocate it to a database with an associated timestamp. The IPC/PLC will perform data cleaning and cleansing to remove duplicate or irrelevant entries. Vendors must ensure adequate processing power and resilience to varying environmental factors on-site. d. **Store data**: Data will be stored in IPC for a determined period.

e. **Connect data**: Data will be securely published to an internet-based instance, such as a server or cloud-based application. Internet access will be provided by the manufacturing plant (the vendor will be responsible to ensure back-up connectivity), and the system will incorporate warranty cybersecurity features mandated by the FBR, including VPN access and two-factor authentication. The vendor will also ensure seamless integration with FBR's data repositories and enforcement dashboards, enabling automated reporting and analysis i.e., FBR monitoring hub. Vendors are expected to define clear protocols for data storage and transmission during episodes of internet, power, and connectivity outages.

f. **Visualize data**: User-friendly and mobile-friendly interface will be provided with interactive buttons to enable filtering of data based on parameters such as time frame or SKU. The interface will also display all relevant information and highlights errors, such as incorrectly read codes. A super user or administrator from the vendor has access to SKUs repository and can add, change or delete based on information shared by the bottler, securing that the system has the latest barcode database. The dashboard should also allow users with appropriate rights to add/change metrics as required. Below is an indictive (non-exhaustive) list of metrics that may be displayed on the dashboard:

Metric Category	Metric
Production volumes	Total units produced (by hours/days/months)
	Total units per SKU / Total units per Production Line / Total Units per Facility/ Production Wastage identified and accounted for
Utilization	Total production time
	Total downtime
Comparative analysis	Hour/day/month comparison of total production and production per SKU/Line/Facility

Note: Internet connectivity will be provided by the manufacturer. However, all vendors must provide reliable back-up internet connectivity at each plant to ensure continuous data transmission and system functionality.

g. **Alert Management System**: Vendors should include effective alerts and reporting system for the production counting solution. The alerts should cover product mismatches, counting errors, system malfunctions, system obstructions, and data discrepancies. The alerts management system should also be customizable to allow for user-defined alerts to be added as required. The alerts system should be capable of issuing audio/visual alerts on- site (e.g. system functionality) as well as through cloud-based integration with FBR systems. Below is an indicative / non-exhaustive list of priority alerts the system should be capable of generating.

Alert Category	Alert
System Functionality	System malfunction
	Scanner / sensor obstruction
	Power / network outage
	Total downtime
System Accuracy	Unidentified SKU
	Discrepancy between SKU at labelling stage and SKU on conveyor belt.
	Non-production item

h. **Automated Reporting:** The vendor must demonstrate the system's ability to automatically generate (and download) the following reports:
   - Production summary report.
   - SKU-wise reconciliation report.
   - Variance / exception report detailing any mismatches.

In order to achieve this, the solution at manufacturer's location may have the following hardware components:

- Barcode scanners: System shall utilize multiple industrial laser barcode scanners. It is recommended for barcode scanners to be deployed at multiple positions to scan labels from all unit types and cross-validate readings from the labelling stage to readings from the production line. The scanning solution should account for variability in the position of the label on the bottles and dynamically detect changes in SKU. It is the vendors responsibility to provide protective covers, guards, and / or screens to protect deployed scanners and to limit human interference or counting of non-production in the vicinity of the conveyor belt.
- Object Detection and Counting Sensor: Object detection and counting sensors should be positioned preferably after the barcode scanner and along the production line to detect/count individual units. These sensors should be able to cross-validate readings across the production line and limit the counting of non- production items. It is the vendors' responsibility to provide protective covers, guards, and / or screens to protect deployed sensors and to limit human or non-production item interference.
- Video Camera: Video cameras will be placed at specified points of interest giving full coverage and visibility to the production line(s) and scanning/sensing equipment with capability to provide live video streaming to FBR. The feed from the video camera should also be securely stored on a Network Video Recorder on premises with a storage capability of a minimum of one month per production line.
- Electrical cabinet: A robust electrical cabinet, compliant with water bottling industry standards (e.g., IP66 or equivalent), houses essential components such as a power supply unit, an industrial Ethernet switch, and at least one Industrial PC (IPC).

- Workstation: A dedicated workstation or table equipped with a mouse, keyboard, and screen enables users to calibrate the sensors or barcode scanners as needed and perform other operational tasks.

In reference to cable management and network components:

- All the hardware must be powered by the Power Supply Source located in the cabinet.
- Local Area Network (LAN): The LAN will consist of the barcode scanner, object detection sensor, Ethernet switch, Industrial PC (IPC) / PLC, and peripherals such as the keyboard, mouse, and screen.
- Internet Connectivity: The Industrial PC /PLC will connect to the internet via an Ethernet cable or, alternatively, through Wi-Fi. However, Ethernet is the preferred method for ensuring reliable connectivity, with Wi-Fi serving as a less favored option. While internet connectivity will be the responsibility of the taxpayer (manufacturer), the vendor will be required to make back-up connectivity arrangements in case primary connectivity at the manufacturer's facility is unavailable.
- Industrial PC / PLC will be connected via ethernet cable or via Wi-Fi to internet. Wi-Fi is less preferred option.

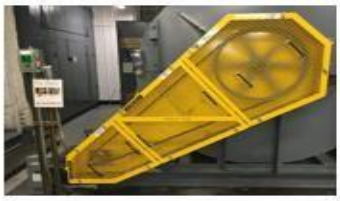
System must be capable to detect and count all kinds of SKUs.
To cover new type of bottles (e.g., changed height of the bottles, position of barcode or different colors in label), system must be user friendly and easy to configure in order to avoid complexities. This warranties that the system is robust enough to cover more variants.

Illustrative positioning of equipment guards and protective casing

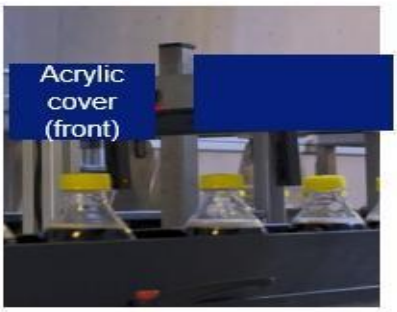
Examples of guards and protective casings

The vendor may include guards / covers around their equipment to:

- Limit human interference and manipulation through manually inserted barcodes /SKUs
- Protect scanning and sensing equipment



Guards for conveyor motor and belt to prevent human manipulation of counting system



Illustrative positioning of acrylic covers to minimize human interference in counting solution

Technical Specification:

General Technical Requirements

i. Language Support: All information technologies with the Barcode scanning and counting system must provide support for English language. Specifically, all display technologies and software must support the ISO 639-1 EN character set and perform sorting according to ISO/IEC 14651

ii. Dates: All information technologies MUST properly display, calculate, and transmit date data, including, but not restricted to 21st-Century date data.

iii. Electrical Power: All active (powered) equipment must operate on 220v +/- 20v, 50Hz +/- 2Hz for V AC. For DC, power must be supplied by an industrial Power Supply Source for 24V or 12 V, depending on the hardware required as IPC, sensors, industrial switch, etc. All active equipment must include power plugs standard in Pakistan.

iv. Environmental: All equipment must comply with food industry standards. Specifically, jigs fixing the sensors, cables, enclosures and electrical cabinets must use connectors and buttons made of stainless steel or food-grade, approved plastics. The equipment must be robust enough to meet IP66.

02. **Computing Hardware Specifications**

The hardware requirements outlined below are indicative specifications for an example of a barcode scanner. The system should meet these specifications provided below or provide equivalent alternatives. It is also advised to use the indicative brands (listed below) or equivalent—for deploying the barcode scanning and counting system, ensuring compatibility and optimal performance.

Industrial PC Operating System Requirements (Indicative)

Operating System	Service Pack / Update
Windows 11 (64-bit) or equivalent	Latest service pack available

Hardware System Requirements (Indicative)

Name	Indicative Requirements	Indicative Brands (or equivalent)
Industrial Barcode Scanner	Resolution:1440 x 1080, 1920 x 1080, Lens: Liquid lens for for High speed production line (i.e. 40,000 – 60,000 bottles per hour) Barcode type: Capable of reading all types of barcodes 1D, 2D and multi-code Technologies: HDR, HDR+ Lighting: Modularity Integrated, External, High Powered Integrated Torch (HPIT) Communications: Serial, Gigabit ethernet, USB IP Rating: IP 67 Additional features: Laser Aimer	Cognex Keyence Banner Zebra
Unit Sensor	Through-beam ultrasonic barrier, laser, or Retro-reflective and photoelectric sensor, 0-3 m to locate reflector, Switching frequency 100/1500 Hz, IP 67	IFM Electronic SICK Pepperl + Fuchs Balluf

	Industrial PC	At least Intel® Core™ i9 or higher processor (or equivalent) Must be capable of handling multiple data processing requests in parallel Must have reliable and scalable storage for database access and application files Must have defined automated maintenance and backup routines to ensure data integrity and recovery Must be robust industrial design with various ports (ethernet, USB, HDMI, etc.) and necessary peripherals (e.g. monitor, mouse, keyboard, etc.) Must have enough RAM and disk space for backing-up data for a minimum of two months for each production line. Minimum 1 TB of solid-state drive (SDD) Must be able to transmit information to remote or cloud-based server Must be capable of processing barcodes scanned by barcode reader and store it in a SQL database or equivalent	Lenovo Dell Advantech Onlogic
	Programmable Logic Controller	PLC must include an integrated software environment for programming, testing, debugging, and remote access such as Ladder and Function Block support Must support a high number of I/O points (minimum 14/10)	Unitronics Yokogawa Siemens Rockwell Mitsubishi Schneider
	Power Supply	• Power supply must be 1.25 times the system power requirements • Source: AC - DC Single output Industrial DIN rail power supply • Output 24Vdc at 5A; metal case	Eaton Phoenix Contact Mean Well
	Web Browser	Google Chrome™ (or equivalent)	Google Chrome Mozilla Firefox Microsoft Edge

Camera	Camera type: IP camera FPS: 30 fps Video parameter: 1080P(1920*1080), 8 bit, color camera with colored night vision, support for H.264, H.265, and other video compression formats Code rate: > 5 Mbps Power supply: DC24V Material: Erosion protective material, with IP65 protection level	Hikvision Dahua Honeywell Samsung
Network Video Recorder	Support up to 16 channels of IP cameras Code rate should be higher than 120 M bps Video should store for more than 1 month Software: User-friendly interface for managing and viewing video feeds Support for H.264, H.265, and other video compression formats Security: Encryption: Data encryption for secure video transmission and stor age. User Authentication: Multi-level user access control and authentication	Hikvision Unifi VIGI by TP-LINK Reolink Dahua Honeywell Samsung
Display	LED-TV at least 43 inches – latest retail model	Samsung, LG, Dell, Asus
Electric al cabinet	Electrical cabinet IP67	Schneider Electric, APC
Power Backup	UPS with capacity to sustain operations for 2 hours for all on- premises devices	APC, Eaton, Vertiv
Power supply	MW NDR-240-24	MeanWell

Peripherals	Monitor, keyboard and mouse	Dell
Misc. items	Networking and power cabling, industrial grade POE switches, Circuit breaker, Ethernet cables (depends on factory setup)	Schneider Electric, Phoenix Contact, Eaton

Additional requirements include:

1. Industrial switch: unmanaged switch speed with more than 5 ports
2. PoE injector or PoE switch: number of ports depending on number of sensors and requirements for it
3. Protective circuit breakers to protect against overcurrent and short circuit

Barcode Reader System Requirements

Vendors must ensure the installed barcode readers meet the following requirements:

1. Industrial level hardware with standard connectors for a Food industrial environment (e.g., IP66 or equivalent)

2. Capable of capturing barcodes at high-speed production line (i.e. 40,000 – 60,000 bottles per hour) and processing data to a SQL database in real-time

3. Installed with robust and industrial jigs at the production line

4. Capable of being connected to an Industrial PC with Windows or Linux Operating System

5. Capable of reading barcodes in different ambient conditions (e.g., varying light conditions)

6. Capable of dynamically identifying change in barcode and cross-verifying it with units passing through conveyor belt.

Equipment	**Indicative Brands or equivalent**
Barcode reader	Cognex Keyence Banner Zebra
Industrial sensors	IFM Electronic SICK Pepperl + Fuchs Balluf
Barcode Scanner Features Specifications	
Resolution	1440 x 1080 1920 x 1080

Liquid lens	For High speed production line (i.e. 40,000 – 60,000 bottles per hour)
Types of barcodes	1D, 2D and multi-code
Technologies	HDR, HDR+
Lighting Modularity	Integrated, External, High Powered Integrated Torch (HPIT)
Communications	Serial, Gigabit ethernet, USB
IP Rating	IP 67
Additional features	Laser Aimer

Barcode reader must be optimized for omnidirectional barcode reading, even with increased noise, limited contrast, and damage.

The following outlines two types of sensors that may be utilized as part of the barcode scanning and counting solution. However, this list is non-exhaustive, and additional sensor types may be considered. The specifications for the aforementioned examples are provided below.

Sensor features for example 1	**Specifications**
Brand	Pepperl-Fuchs
Part number	UBE1000-18GM40-SE2-V1
Description	Through-beam ultrasonic barrier
Operating voltage [V]	10-30 DC
Type of reflector	Not applicable since ultrasonic barrier has a sender and receiver
Distance to locate reflector [m]	0-1
Switching frequency [HZ]	100
Protection norm	IP 67

Sensor features for example 2	**Specifications**
Brand	IFM
Part number	O5G500
Description	Retro-reflective and photoelectric sensor for the detection of transparent objects
Operating voltage [V]	10-26 DC
Type of reflector	Prismatic
Distance to locate reflector [m]	0-3
Switching frequency [HZ]	1500
Protection norm	IP 67

Examples of possible noise in barcodes:

03. **Specific Technical Requirements – Network and Communication Specifications**

1. Local Area Network(S):

a) Equipment and software: [for example, specify: as appropriate, for each type of equipment and software: protocols supported; performance levels; expandability, fault tolerance, administration, management and security features; etc.]
Industrial Switches
Ethernet, serial, I/O,
Industrial protocols as Ethernet/IP and PROFINET
IP whitelisting

b) Cabling: [for example, network, ethernet, power); cable protectors, channels and other installation standards (e.g., ANSI / EIA / TIA 598); cable labeling schemes, references to premises drawings; etc.]
Cables labeled according to electrical diagrams

2. Wide-Area Network:

a) ISO: 5021-1:2023

b) Equipment and software: Industrial PC must be connected to internet with REST API or similar in order to reach external server or cloud. Cybersecurity best practices must be ensure in order to warranty data protection (e.g., demilitarized zone, VPN Tunnel)

c) Other communications equipment: If manufacturer is not capable to provide internet access, the vendor must deploy a standard modem with internet access that fulfills application requirements (e.g., data transmission speed)

04.	**Software Specifications** 1. Networking and Communications Software: a) Domain Name System (DNS): Offered across the infrastructure to resolve domain names to IP addresses b) Virtual Networking: Ability to create your own networks (subnets), firewall rules, etc., providing flexible and secure network configurations c) Physical Networking Segmentation: Segmentation between production and development environments to enhance security and manageability 2. Communication software: a) Proxy and NTP Services: Networking protocol for clock synchronization between computer systems, ensuring accurate timekeeping b) WAF Services (Web Application Firewall): Firewall that helps protect web applications by filtering and monitoring HTTP traffic c) Remote Access Services: Access to the infrastructure from different locations, enabling remote management and operations d) Internet Access through Proxy: A gateway to connect the infrastructure to the internet, update packages, and apply security patches 3. General-Purpose Software: SQL (Structured Query Language) to be used in all systems. Description: A language used for managing and manipulating relational databases. It allows users to create, read, update, and delete database records efficiently. Example: MySQL, PostgreSQL and Python or equivalent 4. Database Software and Development Tools: Example: SQL Database, MySQL or equivalent 5. Business Application Software: Vendor must use an interactive and user-friendly software to display data within a friendly user interface. Example: HTML and CCS languages or equivalent
05.	**System Management, Administration, and Security Specifications** i. General Requirements: In addition to the management, administration, and security requirements specified in each section covering the various hardware and software components of the System, the System must also provide for the following management, administration, and security features at the overall system level. a. Technical management and troubleshooting b. User and usage administration c. Maintenance protocols and training of manufacturer's staff d. Security
06.	Service Specifications Training and Training Materials: User: Professional Trainings & Certifications (Inland and International) of Barcode scanning and

	counting system management, etc. for Bottlers and FBR officers to manage/handle/enhance/develop system. To build a minimum curriculum covering the following topics: General overview of the solution How to run the solution on site and confirm if it is working properly How to run the web-based application and perform an analysis against reported data How to perform regular maintenance on the solution How to add new SKUs How to calibrate or adjust for new barcodes Most common troubleshooting procedures Technical Support: Vendor shall provide the technical support during the operationalization of the deployed equipment for at least 03 years, which may be further extended if required. Compliance Sheet with every proposed product name and model number (for Scanners, Computing machines & software integrations) should be presented on separate sheet with soft copy. All software and network devices shall be compatible with well-known international brands/third party. The Vendor will be responsible for the services, replacement of faulty parts and issue diagnostic after handing over the equipment for the standard warranty periods. Validity of all the equipment will be at least 03 Years including Critical, Important & Security updates, firmware / Version Up- gradation when released. Vendor shall be liable to install, configure, check and commission the barcode scanning system at all the water bottling facilities. Vendor will replace, restore, reinstall, and reconfigure failed components/ devices, firmware, software and allied components without any additional cost during the warranty period. Vendor shall provide the technical support during the operationalization of the deployed equipment for at least 03 years, which may be further extended if required. User support / hot line to be available 24 hours – 6 days a week Data Conversion and Migration: Responsibilities and solution details will be mutually agreed upon between the vendor and the FBR during implementation Post-deployment maintenance services: The vendor will provide immediate support for the first 3 months for troubleshooting and improving the performance of the solution in a real working environment as well the web-based application. Support shall particularly be provided when the auditor is cross checking data from bottlers versus data received in FBR's system After the 3 months, the vendor will be supporting in a planned way in the following ways: • Adding new SKUs provided by the bottler • Calibrating the sensor for new SKUs

	• Improve data capturing from the sensor (evaluate installation of new sensors) • Improve data visualization in web-based application • Training of manufacturing teams on regular maintenance of solution
07.	**Documentation Requirements** i. End user documents: ii. Technical Documents: Documentation should be shared in paper (located in the electrical cabinet) and digital. Documentation must cover the following: a) User Manual b) Maintenance Manual c) Electrical diagrams d) Network diagrams e) Mechanical drawings f) Bill of Material: list of all components used, with manufacturer, part number, number of parts used g) Datasheet of most relevant materials used h) Spare parts and consumables (if needed) i) Warranties
08.	**Consumables and other recurrent cost items** **Vendors shall provide the details of all consumables and Other Recurrent Cost items as per the proposed solution.** Example of possible consumables and other recurrent cost items are: • Costs for hosting the application online: cloud or server-based installation • Costs for software licenses: Integrated Development Environment (IDE) such as Visual Studio, other software tools for frontend development or database management. Nonetheless, it is highly recommended Open-source tools are more recommended • Costs for software licenses involving hardware: necessary software needed for developing and maintaining the different hardware such as barcode readers • Costs for Operating System: Windows license in installed machines or Windows Server for hosting the application

02.	The Project Plan submitted by the Authorized Vendor shall comprehensively address the following subjects for the barcode scanning and counting solution or an alternative solution proposed by the vendor: 1. **Project Organization and Management Plan** o Define the roles, responsibilities, and governance structure for effective project execution. o Include escalation pathways and points of contact for smooth communication and issue resolution. 2. **Equipment Details** o Detailed specifications, quantities, and brands of all equipment being used to deploy the system (including hardware and software). o Indicative price per installation point and breakdown of price per component of deploying the bidder's proposed production count solution 3. **Delivery and Installation Plan** o Detailed timelines and logistics for delivering and installing all components of the barcode scanning system. o Specify dependencies (e.g., on-site readiness, power, and connectivity requirements). 4. **Disaster Recovery Plan** o Detailed disaster recovery plan which includes details of primary contact, response team, post-mortem analysis of incident, and plan for restoration of operations in case of an on-site disaster. o Detailed communication plan including disaster recovery calling tree with escalation levels and contacts information o Detailed activation criteria which include conditions or events that trigger the activation of the disaster recovery plan o Detailed recovery runbook which includes guidelines to follow to restore all operations for all components

- Detailed backup and restoration procedures to ensure daily backups in place while ensuring minimal production disruption

5. **Training Plan**
    - Comprehensive training modules for the FBR and manufacturer staff covering system operation, maintenance, data analysis, and troubleshooting.
    - Include follow-up refresher sessions.
6. **Pre-Commissioning and Operational Acceptance Testing Plan**
    - Testing protocols to validate system functionality, integration, and compliance with performance benchmarks prior to commissioning.
    - Include criteria for Operational Acceptance.
7. **Warranty Service Plan**
    - Details of warranty coverage, including response times, replacement policies, and periodic maintenance schedules.
8. **Task, Time, and Resource Schedules**
    - A Gantt chart or similar representation of key tasks, milestones, and associated timelines.
    - Resource allocation details (e.g., personnel, equipment).
9. **Post-Deployment Service Plan (if applicable)**
    - Outline post-deployment service provisions, including options for extending support agreements.
10. **Technical Support Plan**
    - 24/7 support infrastructure, escalation matrix.
    - Availability of spare parts and maintenance procedures.
11. **System Development Plan**
    - Detailed customization plan for the barcode scanning system or an alternative solution proposed by the vendor to meet the specific needs of the FBR.
    - Include integration with existing systems, data security protocols, and scalability provisions.
12. **Compliance and Certification Plan**
    - Ensure adherence to relevant regulatory and security standards (e.g., PTA-approved equipment, evaluation certifications).
    - Provide documentation and timelines for obtaining all necessary certifications.

	13. **Reporting and Monitoring Plan** o Mechanism for regular progress updates to the FBR. o Include provisions for dashboards or analytics reports to monitor system performance.

	E. **Testing and Quality Assurance Requirements**
01.	**Inspections** i. The vendor must demonstrate the viability and capability of their proposed solution by conducting an operational test at a designated water bottling plant prior to license award. ii. The vendor shall be responsible for the safe and sound delivery of all hardware and other products as per the Purchase Order, at the FBR's designated locations as per Schedule within the timescales stated in the Purchase Order. iii. The FBR or its authorized representatives shall have the right to inspect and test the Product being supplied and installed by the vendors on or after delivery as per the Purchase Order. iv. The FBR shall inspect and/or test the Product agreed to be supplied by the Vendor as per the Purchase Order to verify their conformity to the specification given in this agreement and the purchase Order. This shall include comprehensive tests provided by the Vendor and performed by the FBR to prove that the Product operate in accordance with the requirements of the FBR as per the Purchase Order and this Agreement. v. Should any inspected or tested Products fail to conform to the specifications as required by the FBR and as per the Purchase Order, the FBR may reject them and the Vendor shall either replace the rejected Products or make alterations necessary to meet specification requirements of the FBR at no cost to the FBR

02.	**Operational Acceptance Tests** i. Pursuant to GCC Clause 24 and related SCC clauses, the FBR (with the assistance of the Supplier) will perform the following tests on the System and its Subsystems following Installation to determine whether the System and the Subsystems meet all the requirements mandated for Operational Acceptance: Proof of Concept tests as stated in Sub-section E (2) in Section V of Scope of Work will be conducted to test the entire solution and will serve as the Operational Acceptance Tests.

A soft copy should also be maintained by the vendor to share with the FBR and concerned field formation of need basis.

PART-II
Proof of Concept (POC) Evaluation Criteria

This section details the comprehensive framework for the PoC evaluation.

2.1 Core Performance Metrics under which PoC will be judged are as under:

Metric Category	Core Requirement	Qualification Criteria
Unit-Level Tile Counting Accuracy	The system must accurately detect and count bottles, correctly associating each count with the relevant SKU. The SKU should be clearly attributed to the concerned production line as well.	**≥ 99%:** Preferred **≥ 95% & < 99%:** Satisfactory (Pass) **< 95%:** Unsatisfactory (Fail)
SKU Changeover Without Reset	The system must automatically detect the new SKU, ceases attributing counts to the old SKU, and begins accurately counting under the new SKU classification in near-real time.	**100% Pass required**
System Stability & Real-Time Performance	The system must operate continuously without crashes or freezes, with count latency of ≤ 1 second. No manual intervention or resets should be required during the test period.	**Pass:** Stable, real-time operation demonstrated. **Fail:** Observable lag, freezes, or required resets.
Live Dashboard	The system must display a dashboard showing, in real time: o Current production count. o SKU-wise breakdown of production. o Operational status of the IoT devices and other processing pipeline and other hardware and software.	**Pass:** Dashboard working **Fail:** Dashboard not working
Alert Management	The system must prove its ability to generate automated alerts, at a minimum, for the following events: o IoT devices obstruction or tampering o System downtime or processing failure	**Pass:** Alerts generated **Fail:** Alerts not generated

	○ Demonstrating more alert types would result in a plus for a vendor	
Addition and Deletion of SKU with log and Timestamps	Addition and Deletion of SKU with log and Timestamp	100% required Pass
Power / Network Interruption Scenario	The vendor must demonstrate that counts are buffered locally during an interruption and are automatically reconciled upon restoration of connectivity. The system must also maintain a log of these events with proper timestamps.	100% required Pass
Playback	The vendor must demonstrate an immediate playback capability of video stream whereby each individual production count is displayed on the dashboard.	100% required Pass
Demonstration of Role-based Access (RBA)	The vendor must demonstrate a clearly defined role-based access control mechanism, showing that system privileges are segregated by user role (e.g., administrator, operator etc.). Any access, login attempt, or privilege escalation must be fully logged with user identity, timestamp, and action performed.	100% required Pass

Note: The FBR may, at its discretion, refine the PoC component requirements subject to the PoC results and performance validation. POC dates and venues will be published in a separate letter.

PART III
DEFINITIONS

In this document, unless there is anything repugnant in the subject or context:

a. **"FBR" or "Board"** refers to the Federal Board of Revenue, responsible for authorizing vendors to deploy the specified system and ensuring compliance with the technical and operational requirements as specified.
b. **"Authorized vendor" or "Vendor" or "Supplier"** refers to any registered company authorized by the Board to deploy a production counting system specified by FBR after solution is finalized.
c. **"Client" or "Manufacturer" or "Taxpayer"** refers to water bottlers that are required to implement the specified system.
d. **"Bottling facility(ies)"** refers to water bottling sites.
e. **"Bottling lines"** refers to the end-to-end production line of water bottles from raw materials preparation to final warehousing.
f. **"Installation point(s)"** refers to the exact point in the bottling production chain where the vendor will deploy their proposed solution for production counting
g. Any term or expression not specifically defined herein shall have the same meaning as assigned to it under the TORs, Chapter XIV-BA of the Sales Tax Rules, 2006, and, where not defined therein, under the Sales Tax Act, 1990 and Sales Tax Rules, 2006, generally.

PART IV
ABBREVIATIONS

Term	Explanation
AI	Artificial Intelligence
API	Application Programming Interface
Bps	bits per second
Cps	characters per second
DBMS	Database Management System
DOS	Disk Operating System
Dpi	dots per inch
Ethernet	IEEE 802.3 Standard LAN protocol
GB	Gigabyte
Hz	Hertz (cycles per second)
IEEE	Institute of Electrical and Electronics Engineers
IPC	Industrial Personal Computer
ISO	International Standards Organization
KB	Kilobyte
kVA	Kilovolt ampere
LAN	Local area network
Lpi	lines per inch
Lpm	lines per minute
MB	Megabyte
MTBF	Mean time between failures
NIC	Network interface card
NOS	Network operating system
ODBC	Open Database Connectivity
OLE	Object Linking and Embedding
OS	Operating system
PCL	Printer Command Language
PoE	Power Over Ethernet
Ppm	pages per minute
PS	PostScript -- Adobe page description language
PSS	Power Supply System

RAID	Redundant array of inexpensive disks
RAM	Random access memory
RISC	Reduced instruction-set computer
SCSI	Small Computer System Interface
SKU	Stock-Keeping Unit
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
TCP/IP	Transmission Control Protocol / Internet Protocol
V	Volt
VPN	Virtual Private Network
WLAN	Wireless LAN

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