

Draft

**GUIDELINES FOR IMPLEMENTATION OF
BATTERY PACK AADHAAR SYSTEM**

TABLE OF CONTENTS

1. INTRODUCTION	5
2. SCOPE	5
3. TERMS AND DEFINITIONS	6
4. ABBREVIATIONS	8
5. CURRENT LEGISLATIONS & INTERNATIONAL BENCHMARKING	9
6. STAKEHOLDERS	10
7. BATTERY PACK AADHAAR REQUIREMENTS	11
8. BATTERY DATA CHARACTERISTICS	11
8.1 Static Data	11
8.2 Dynamic Data	11
9. DATA ACCESS	12
10. METHODOLOGY	12
10.1 Alphanumeric Code Section	12
10.2 QR Code Section	13
10.3 Server based Data	13
11. BATTERY PACK AADHAAR CONTENT	13
11.1 Battery Manufacturer Identifier (BMI)	13
11.2 Battery Descriptor Section (BDS)	14
11.3 Battery Identifier (BI)	14
11.4 Battery Material Composition Section (BMCS)	14
11.5 Battery Carbon Footprint (BCF)	15
11.6 Battery Dynamic Data (BDD)	16
11.6.1 Purpose and Functional Role of BDD	16
11.6.2 Use of Server Data for Monitoring and Validation	16
11.6.3 Future Perspective and Compatibility and harmonization with Global Standard	17
11.6.4 Simplicity, Cost-Effectiveness and Data Integrity	17
12. BATTERY PACK AADHAAR PARAMETERS	18
13. BATTERY DATA EXECUTION	19
14. BATTERY PACK AADHAAR PARAMETER SEQUENCE	20
14.1 Alphanumeric Code Parameters	20
14.2 QR Code Parameters	20
14.3 Server Based Parameters	21
15. BATTERY PACK AADHAAR PILOT	22
15.1 Alphanumeric Data	22
15.2 QR Code Data	23
15.3 Server based Data	24
16. WAY FORWARD	25
ANNEXURE I	27
ANNEXURE II	33

ANNEXURE III	42
ANNEXURE IV	43
ANNEXURE V	47
ANNEXURE VI	48

LIST OF FIGURES

FIG. 1 Battery Pack Aadhaar Concept	12
FIG. 2 Battery Pack Aadhaar Data Categories	13
FIG. 3 Alphanumeric Code Parameters	20
FIG. 4 QR Code Parameters	20
FIG. 5 Server Based Parameters	21
FIG. 6 Battery Pack Aadhaar Pilot	22

LIST OF TABLES

Table 1 Battery Stakeholders	10
Table 2 Data Access	12
Table 3 BMI Parameters	13
Table 4 BDS Parameters	14
Table 5 BI Parameters	14
Table 6 BMCS Parameters	14
Table 7 Life cycle stages of Carbon Footprint	15
Table 8 BCF Parameters	16
Table 9 BDD Parameters	17
Table 10 Battery Pack Aadhaar Parameters	18
Table 11 Battery Data Execution	19
Table 12 Alphanumeric Pilot Data	22
Table 13 QR Code Pilot Data	23
Table 14 Server Pilot Data	24
Table 15 Stakeholder Responsibilities and Associated Activities	25
Table 16 Country Codes	27
Table 17 Manufacturer Identifier	29
Table 18 Battery Chemistry	30
Table 19 Extinguishing Agent	30
Table 20 Manufacturing Year	31
Table 21 Manufacturing Month	31
Table 22 Manufacturing Date	31
Table 23 Factory Name	32
Table 24 Battery Warranty	33
Table 25 Cell Type	33
Table 26 Form Factor Representation of Values	34
Table 27 Type of Construction	34
Table 28 Type of Cooling System	34
Table 29 Dismantling/Disassembly Method	35
Table 31 Battery Circularity Method	35
Table 31 Recyclability	36
Table 32 Anode Material	36
Table 33 Cathode Material	37

Table 34 Electrolyte Material	37
Table 35 Separator Material	38
Table 36 Current Collector Material	38
Table 37 Battery Casing Material	38
Table 38 Battery Potting Material	39
Table 39 Material Content	39
Table 41 Original Power Capabilities	40
Table 41 Usable Capacity Between 80% & 20% SoC (%)	40
Table 42 Carbon Footprint	41
Table 43 Battery Category	42
Table 44 Battery Status	42
Table 45 Parameter Configuration	43

GUIDELINES FOR IMPLEMENTATION OF BATTERY PACK AADHAAR SYSTEM

1. INTRODUCTION

As the world moves toward digitalization and electrification, energy storage cells serve as the foundation for consistent, flexible, and efficient power delivery. As energy storage cells, batteries play a vital role, and lithium-ion batteries in particular are recognized for providing lightweight, efficient, and reliable power. India is rapidly emerging as a global competitor in the electric mobility revolution, driven by its ambitious commitments and strategic initiatives. Amid the global transition toward sustainable transportation, India is rapidly advancing its efforts to become a leader in the clean mobility revolution through targeted research and innovation. Batteries are the crux of EVs, seeing as the primary energy source that powers their operation. The demand for efficient, durable, and sustainable batteries has become critical, with the rapid expansion of electric vehicle market. However, the end of life management of batteries poses significant environmental challenges due to concerns over recycling, disposal, raw materials, electrochemistry, end of life treatment, cell manufacturing, modules, durability and resource depletion.

In addition to electric mobility, batteries play a vital role across a wide range of applications, including energy storage in private and domestic settings, industrial operations, and the generation and distribution of electrical energy. These diverse applications further amplify the need for robust battery management systems and sustainable practices. Recognizing these challenges, the Office of the Principal Scientific Advisor to the Government of India released the “e-Mobility R&D Roadmap for India,” which includes a key initiative titled “Guidelines for Implementation of Battery Aadhaar System.” This initiative aims to leverage indigenous knowledge and resources to tackle these complex issues and support India's sustainable energy future.

Battery Pack Aadhaar is an indigenous digital identification and data storage system developed to ensure end-to-end traceability of batteries throughout their entire lifecycle. It includes a unique identification number for each battery pack, capturing and storing vital information starting from raw material extraction and manufacturing to its usage, recycling, or final disposal. This system aims to bring transparency, accountability, and sustainability to the battery ecosystem by enabling accurate tracking of performance, and environmental impact. Battery Pack Aadhaar plays a crucial role in enabling second-life usage, regulatory compliance, and efficient recycling.

In alignment with the above developments, the Ministry of Road Transport & Highways (MoRTH) has constituted a committee for "Development of Guidelines for implementation of Battery Aadhaar System in India" as outlined in the office memorandum dated 17th September 2025.

2. SCOPE

This document aims to provide comprehensive guidance to organizations that are implementing the Battery Pack Aadhaar. It will help them understand how to interpret the content requirements which may be mandated by the battery Aadhaar regulation and prepare specific data attributes. Moreover, this guidance will be a central and beneficial resource for other participants in the battery value chain who are required to report or intend to access Battery Pack Aadhaar information.

This document refers to the battery categories covered by the Battery Waste Management Rules, 2022 (as amended as on date) published by the Ministry of Environment, Forest and Climate Change. Battery categories, that are required to maintain a Battery Pack Aadhaar as an electronic record include:

- Electric Vehicle Batteries for L category
- Electric Vehicle Batteries for M and N category
- Industrial Batteries with capacity > 2kWh

This guideline focuses exclusively on Electric Vehicle (EV) applications however it may also be referenced, if required, for industrial batteries with a capacity greater than 2 kWh. SLI (Starting, Lighting, and Ignition) batteries and portable batteries are outside the scope of this document.

This document provides general guidelines for implementation and an overview of data attributes, including category specific battery requirements and measurement units, as well as details on stakeholder group access to Battery Pack Aadhaar information.

Battery Pack Aadhaar content requirements are designed to enable comprehensive traceability and foster a circular economy for batteries, especially in the context of electric vehicles. Key information embedded within a Battery Pack Aadhaar includes:

- Battery Manufacturer Identifier (BMI)
- Battery Descriptor Section (BDS)
- Battery Identifier (BI)
- Battery Material Composition Section (BMCS)
- Battery Carbon Footprint (BCF)
- Battery Dynamic Data (BDD)

3. TERMS AND DEFINITIONS

3.1 Battery: means new or refurbished cell or battery, including accumulator, which is any source of electrical energy generated by the direct conversion of chemical energy and includes disposable primary or secondary battery. It may include internal or external storage and comprises one or more rechargeable or non-rechargeable cells, modules, or their assembled packs.

[SOURCE: Battery Waste Management Rules, 2022]

3.2 Battery Cell: A cell is the basic functional unit of a battery, comprising an assembly of electrodes, electrolyte, container, terminals, and separators that is source of electrical energy generated by the direct conversion of chemical energy and includes primary and/or secondary cell.

3.3 Battery Module: means any set of battery cells that are connected together or encapsulated within an outer casing to protect the cells against external impact, which is meant to be used either alone or in combination with other modules. These battery cells may be connected in either series, parallel, or a combination of both configurations.

3.4 Battery Pack: A battery pack refers to any set of interconnected cells or modules, or encapsulated within an outer casing, forming a complete and functional unit which is not meant to be split up or opened by the end-user.

3.5 Battery Pack Aadhaar: Digital record of a battery pack.

3.6 Carbon Footprint: The sum of greenhouse gas emissions and greenhouse gas removals associated with a product system, expressed in terms of carbon dioxide equivalents.

3.7 Recycling: A recovery process in which waste materials are transformed into new products, materials, or substances.

3.8 Battery Status: The current phase of a battery unit within its life cycle, categorized as ‘original’, ‘re-used’, ‘repurposed’, ‘remanufactured’ or ‘waste’

3.9 Static Data: Data that do not change often or not on a regular basis.

3.10 Dynamic Data: Data that change often or on a regular basis.

- 3.11 **Non-rechargeable Battery:** Battery that is not designed to be electrically recharged.
- 3.12 **Rechargeable Battery:** Battery that is designed to be electrically recharged.
- 3.13 **Rated Capacity:** The total capacity, measured in ampere-hours (Ah), that can be drawn from a fully charged battery under reference conditions.
- 3.14 **State of Health:** A metric that reflects the current condition of a rechargeable battery and its ability to deliver the specified performance, in comparison to its initial condition.

3.15 **Waste Battery includes**

- Used and/or End of Life Battery and/or its components or spares or parts or consumables which may or may not be hazardous in nature.
- Pre-consumer Off-Spec Battery and its components or spares or parts or consumables.
- Battery whose date for appropriate use has expired.
- Battery which has been discarded by the user.

[SOURCE: Battery Waste Management Rules, 2022]

- 3.16 **Electric Vehicle Battery:** Any Battery specifically designed to provide traction to hybrid and electric vehicles for road transport.

[SOURCE: Battery Waste Management Rules,2022]

- 3.17 **Industrial Battery:** Any Battery designed for industrial uses, excluding Portable battery, Electric vehicle battery and Automotive battery. These may include sealed Battery (excluding portable battery); unsealed Battery (excluding automotive Battery) and energy storage system Battery.

[SOURCE: Battery Waste Management Rules,2022]

- 3.18 **Battery Manufacturer:** A person or an entity or a company as defined in the Companies Act, 2013 (18 of 2013) or a factory as in the Factories Act, 1948 (63 of 1948) which has facilities for manufacturing of Battery and/or its components.

[SOURCE: Battery Waste Management Rules,2022]

- 3.19 **Battery Producer:** An entity who engages in:

- i) Manufacture and sale of Battery including refurbished Battery, including in equipment, under its own brand; or
- ii) Sale of Battery including refurbished Battery, including in equipment, under its own brand produced by other manufacturers or suppliers; or
- iii) Import of Battery or equipment containing Battery; or
- iv) Manufacture or assembling of Battery or refurbished Battery including in equipment for sale to the Producer mentioned in sub-clause (ii) without its own brand name.

[SOURCE: Battery Waste Management Rules,2022]

- 3.20 **Portable battery:** A Battery that is sealed, less than five kilograms, not made for industrial purposes, electric vehicle or to be used as an Automotive Battery.

[SOURCE: Battery Waste Management Rules,2022]

3.21 **Automotive battery:** means any Battery used only for automotive starter, lighting or ignition power.

[SOURCE: Battery Waste Management Rules,2022]

3.22 **Battery category:** means any of the battery categories such as electric vehicle battery, or automotive battery or industrial battery or portable battery or waste battery.

3.23 **Type Approval Certificate (TAC):** means type approval certificate issued under Central Motor Vehicle Rules (CMVR), 1989.

3.24 **Type Approval:** means the establishment of initial compliance of model/ variant(s) of the batteries to the provisions of CMVR as defined in the Automotive Industry Standard AIS-037 as amended from time to time.

3.25 **Starting, lighting and ignition battery’ or ‘SLI battery’:** means a battery that is specifically designed to supply electric power for starting, lighting, or ignition and that can also be used for auxiliary or backup purposes in vehicles, other means of transport or machinery;

4. ABBREVIATIONS

BPAN	Battery Pack Aadhaar Number
EV	Electric Vehicle
OEM	Original Equipment Manufacturer
BMI	Battery Manufacturer Identifier
BDS	Battery Descriptor Section
BI	Battery Identifier
BMCS	Battery Material Composition Section
BCF	Battery Carbon Footprint
BDD	Battery Dynamic Data
Ni-Cd	Nickel-Cadmium
Ni-MH	Nickel–Metal Hydride
Li-ion	Lithium-ion
SOH	State of Health
SoC	State of Charge
QR Code	Quick Response code
EOL	End of Life
TAC	Type approval certificate
EPR	Extended Producer Responsibility
BWM	Battery Waste Management
WMI	World Manufacturer Identifier
VIN	Vehicle Identification Number

5. CURRENT LEGISLATIONS & INTERNATIONAL BENCHMARKING

India's battery ecosystem is presently witnessing a phased evolution of regulatory requirements, with multiple frameworks under development or strengthening in parallel covering areas such as Extended Producer Responsibility (EPR) and Battery Waste Management compliance (specified in the Battery Waste Management Rules, 2022 published by Ministry of Environment, Forest and Climate Change), harmful substance restrictions, performance and durability reporting, State of Health (SoH) and lifetime disclosure, carbon footprint declaration, recycled content verification, and supply-chain due diligence. In this context, international initiatives such as the EU Battery Regulation and EU Battery Passport (Regulation (EU) 2023/1542) mechanisms provide useful benchmarking on lifecycle transparency, traceability, and digital compliance approaches; however, the Indian market's scale (especially 2W/3W dominance), cost sensitivity, and diverse stakeholder maturity require an India-first, practical implementation pathway that achieves compliance without imposing EU-level data burden and infrastructure cost on mass-market batteries. Hence, India needs a lean and scalable digital backbone that can support phased regulation roll-out, ensure minimum essential data availability offline when required, and still allow secure digital access and auditability for regulated stakeholders.

Battery Pack Aadhaar is positioned as one such strategic development serving as a foundational “digital identity and data backbone” for batteries through BPAN (alphanumeric), QR code (offline/static dataset), and a lean server layer (dynamic lifecycle events). Importantly, Battery Pack Aadhaar is not intended to be a standalone compliance silo; instead, it is designed to enable and accelerate other emerging regulations by providing standardized reference identifiers, verified baseline attributes, and lifecycle event records that can be reused by respective methodologies/guidelines (e.g., SoH computation approaches, performance/durability reporting formats, circularity and dismantling pathways, carbon footprint accounting boundaries, and recycled content verification). In other words, Battery Pack Aadhaar becomes the “common digital spine” that different regulatory workstreams can reference, reducing duplication of data capture across agencies and stakeholders, improving auditability, supporting enforcement under EPR/BWM rules, and enabling harmonization/interoperability with global standards where required. By keeping a large share of information accessible offline (BPAN + QR) and limiting server dependence mainly to lifecycle updates/events, the approach remains implementable at national scale while still meeting traceability, transparency, and cybersecurity expectations needed for future regulations.

Government initiatives such as the Production Linked Incentive (PLI) scheme are focused on advancing India's manufacturing capabilities in Advanced Chemistry Cells (ACC) by establishing giga-scale ACC and battery production facilities, with a strong emphasis on maximizing domestic value addition. The Battery Pack Aadhaar system will help to enable the government to verify whether the cells used in battery packs are produced domestically as mandated under ACC PLI.

6. STAKEHOLDERS

A digital record tracking a battery's journey, relies on a diverse ecosystem of "stakeholders." These stakeholders, ranging from raw material suppliers to recyclers (shown in Table 1), each contribute vital data throughout the battery's lifecycle. Their collective participation ensures transparency, promotes sustainability, and drives the circular economy for batteries.

Table 1 Battery Stakeholders

Battery Stakeholders	Description
Battery Producer / Battery Manufacturer	A legal entity that produces a battery and sells it under its own brand name or trademark as defined in this document.
Government Authority	Any stakeholder authorized by Government of India
Importer	A responsible person for bringing batteries into a country or region, ensuring compliance with all applicable safety, labelling, packaging, and documentation standards.
Distributor	A legal entity within the supply chain, excluding the manufacturer and importer, that supplies a battery to the market.
Service Provider	Any provider who performs specialized services related to the operation, maintenance, testing, refurbishment, or repurposing of batteries, without necessarily placing them on the market under their own name or trademark
Recycler	Any person who performs recycling operations within a permitted facility
End-user	Any person residing or established in India, to whom a product has been made available either as a consumer outside of any trade, business, craft, or profession or as a professional end-user during its industrial or professional activities.
Waste management operator	Any person dealing on a professional basis with the separate collection or treatment or recycling of waste batteries
Vehicle OEM	A Vehicle Original Equipment Manufacturer (OEM) is an entity that designs and manufactures vehicles, including vehicles equipped with batteries, and is responsible for providing associated support.
Battery repurposing entity	A legally recognized organization or business entity engaged in the collection, assessment, and processing of used or end-of-life batteries for the purpose of repurposing them for secondary applications.
Financier / Insurer / Used vehicle buyer	Any individual or legal entity that, in relation to vehicles including those equipped with batteries, undertakes the following activities: (a) provides financial assistance or credit for purchase or operation; (b) offers insurance coverage for the vehicle and associated risks; (c) purchases a previously owned or operated vehicle for personal use, resale, or other lawful purposes.

7. BATTERY PACK AADHAAR REQUIREMENTS

- 7.1 The Battery Pack Aadhaar shall apply to different battery categories mentioned in the section 2, “Scope” of this document.
- 7.2 The battery producer or importer shall have the obligation of assigning a unique Battery Pack Aadhaar Number (BPAN) to each battery that they introduce in the market and the battery they put to self-use. Battery producer or importer shall also have the obligation of marking the Battery Pack Aadhaar Number (both alphanumeric code and QR code) on the battery pack and also uploading the relevant Battery Pack Dynamic data on the official portal of BPAN established by Government of India.
- 7.3 Each BPAN shall consist of twenty-one (21) characters.
- 7.4 The BPAN shall be in a clearly visible and accessible position. The location shall be chosen in a way that it cannot be destroyed or deteriorate.
- 7.5 Each character in each BPAN shall be one of the letters in the set: [ABCDEFGHJKLMNPRSTUVWXYZ] or a numeral in the set: [123456789].
- 7.6 Any change in attributes of the BPAN due to recycling and repurposing shall result in a new BPAN by the same or a new producer or importer.
- 7.7 Guidelines would be specified to improve the reliability of the information uploaded by the manufacturers/producers in the supply chain. It is recommended that a Government entity to audit the premises of the battery manufacturers/producers to audit them for Battery Pack Aadhaar number generation capabilities.
- 7.8 Suppliers of battery cells and battery modules shall provide the information and documentation necessary to comply with the requirements of this document when supplying battery cells or modules to a manufacturer.

8. BATTERY DATA CHARACTERISTICS

The Battery Pack Aadhaar's technical design requires categorizing its many data attributes with equal behavioral Characteristics. Some attributes, like a battery's manufacturing date, are static and never change. In contrast, attributes like state of health, battery status are dynamic and need frequent updates for their use cases. The Battery Pack Aadhaar uses these ‘static’ and ‘dynamic’ classifications to group data attributes.

8.1 Static Data

In the context of a Battery Pack Aadhaar, static data is defined as the information that's established when the battery or battery pack is manufactured or assembled. This data remains unchanged unless there is a physical replacement of components or a modification to the battery's operational parameters by its management system.

8.2 Dynamic Data

Dynamic data attributes in the Battery Pack Aadhaar are anticipated to evolve consistently throughout the battery's lifecycle, as they capture changes in characteristics influenced by each battery's unique usage patterns.

9. DATA ACCESS

Battery pack Aadhaar methodology enables users to access essential data of battery pack through alphanumeric code, which is static and publicly available. Another set of data is available via a QR code which is also static and available to limited public through an authorized access system. This information can be retrieved using the BPAN or an authorized QR code decoder.

The server-based data is dynamic and restricted to private access, ensuring secure handling of sensitive information. The server utilizes BMI and Battery Identifier (BI) to ensure precise identification and reliable traceability of battery pack data. Table 2 outlines the data access.

Table 2 Data Access

SN	Data Access	Description
1	Private Access	Accessible only to authorized entities such as Service Providers, Recyclers, Producers, or other approved stakeholders.
2	Public Access	Information that is publicly accessible and available to everyone.

10. METHODOLOGY

Battery Pack Aadhaar system consist of various digital identification methods such as QR code, and alphanumeric code that are utilized to store and access battery-specific data throughout its lifecycle shown in FIG 1. This methodology can support offline as well as on-site access to battery data, making it suitable for diverse field and industrial applications. A Battery Pack Aadhaar consist of three different sections as follows:

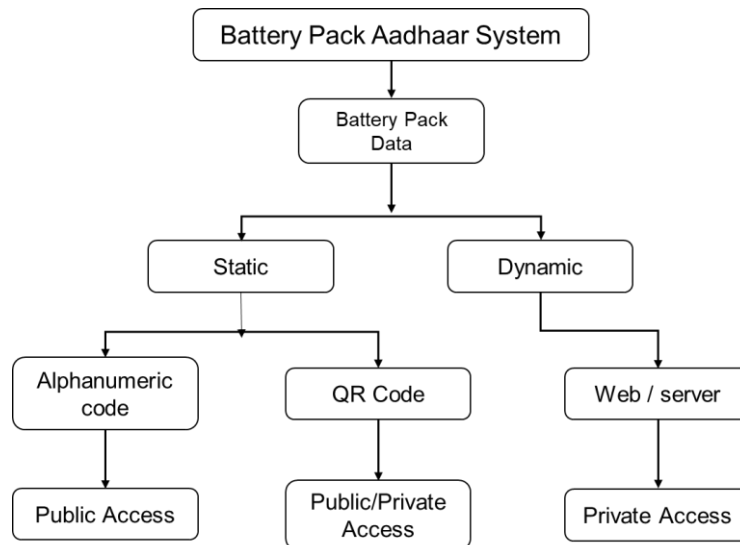


FIG. 1 Battery Pack Aadhaar Concept

10.1 Alphanumeric Code Section

Alphanumeric code involves a 21- character alphanumeric code physically affixed to the battery. Using this code, basic battery details can be decoded even without an internet connection. Each battery is assigned a distinct alphanumeric code, with each character representing specific information and these details can be decoded in accordance with the BPAN Regulation.

The parameters in alphanumeric code of BPAN are outlined in Annexure I.

10.2 QR Code Section

The QR code functions as a non-internet-based method, allowing access to essential static data such as battery material, descriptor, and carbon footprint parameters. These details are made available to recyclers, facilitating more efficient recycling processes and contributing to overall battery waste reduction. QR code parameters represented by a specific character are defined in Annexure II.

10.3 Server based Data

The server-based data of Battery Pack Aadhaar comprises the battery dynamic data (BDD), which is maintained and updated via a server. This server-based data includes critical parameters and operates as an internet-based method, where data is stored on a centralized server. This allows second-hand battery pack users to assess the battery pack's condition before purchase or reuse. This data is designed for scalability, allowing seamless integration of future upgrades and enhancements with each parameter in server represented by a specific number of digits as outlined in Annexure III.

11. BATTERY PACK AADHAAR CONTENT

Battery Pack Aadhaar information is systematically organized into six distinct categories. Five of these categories are dedicated to static data parameters, capturing fixed and unchanging details essential for identification and foundational understanding of the battery shown in FIG 2. In contrast, the last category (Battery Dynamic Data) is allocated for dynamic data parameters, designed to record real-time or frequently updated information that reflects the battery's current status and performance.

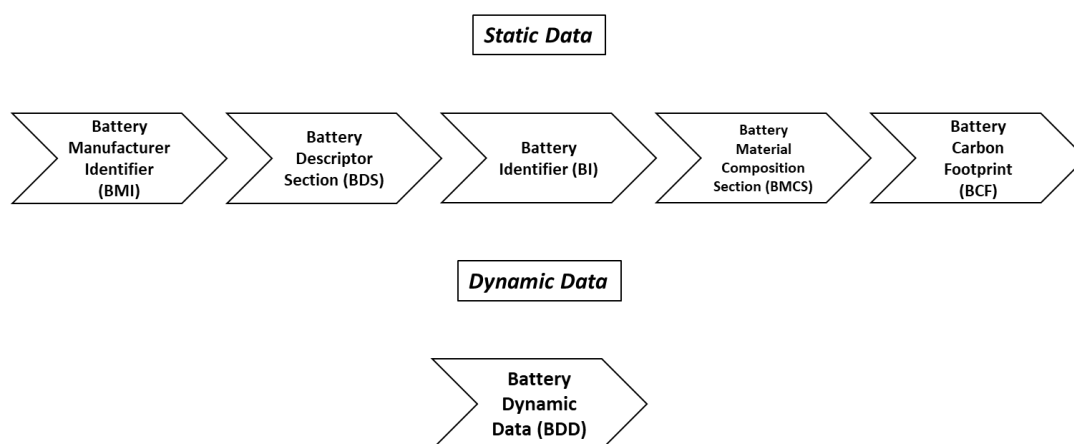


FIG. 2 Battery Pack Aadhaar Data Categories

11.1 Battery Manufacturer Identifier (BMI)

The Battery Manufacturer Identifier (BMI) shall be the first section of the BPAN and shall consist of Five characters pre-assigned by the national organization of the country shown in Annexure I. The first five characters uniquely identify the country and manufacturer of the battery pack. The first two characters of the BMI typically represents the region in which the manufacturer is located and remaining 3 characters represents the manufacturer. Table 3 outlines the BMI parameters.

Table 3 BMI Parameters

SN	Parameter
1	Country code
2	Manufacturer identifier

11.2 Battery Descriptor Section (BDS)

The Battery Descriptor Section (BDS) is designed to provide a concise summary of essential battery specifications, enabling quick access to critical information. It includes key parameters such as battery capacity, chemistry, voltage, and cell configuration, facilitating easy comparison across different battery models. This section consists of eight battery parameters shown in Table 4.

Table 4 BDS Parameters

SN	Parameter
1	Battery Capacity
2	Battery Chemistry
3	Nominal voltage
4	Cell Origin
5	Extinguisher Class

11.3 Battery Identifier (BI)

The Battery Identifier (BI) is an 8- character alphanumeric code designed to uniquely identify each battery. This code is structured into three distinct segments. The first segment encodes three-character manufacturing date, representing the year, month, and day of production. The second segment comprises a one-character factory code, indicating the manufacturing location. The third segment is a Four-digit sequential number that serves as a unique identifier for each battery, as detailed in Annexure I. Table 5 outlines the BI parameters.

Table 5 BI Parameters

SN	Parameter
1	Date of manufacturing
2	Factory code
3	Sequential Production Number

11.4 Battery Material Composition Section (BMCS)

The Battery Material Composition Section (BMCS) presents a comprehensive summary of the materials and performance characteristics that define the battery's structural and functional integrity. It details the composition of key components including the anode, cathode, electrolyte, separator, and current collector, providing clarity on the material types used shown in Table 6. This section includes the recyclability percentage, supporting environmental impact assessments and end-of-life planning. Additionally, the section specifies the content percentages different materials, enabling precise analysis for compliance, safety, and optimization purposes.

Table 6 BMCS Parameters

SN	Parameter
1	TAC Number
2	Number of cells per battery
3	Internal Resistance of Battery Pack
4	Battery Weight
5	Battery warranty

6	Cell Type
7	Cell form Factor
8	Type of construction of battery pack
9	Type of construction of Module
10	Type of Cooling System
11	Original power capability at 80% SoC
12	Original power capability at 20% SoC
13	Usable capacity between 80% & 20% SoC
14	BMS Hardware Version
15	BMS Software Version
16	Disassembly Method
17	Circularity Method
18	Recyclability
19	Material: Anode
20	Material: Cathode
21	Material: Electrolyte
22	Material: Separator
23	Material: current collector
24	Material: Battery casing
25	Material: Potting
26	Material 1 content
27	Material 2 content
28	Material 3 content
29	Material 4 content

11.5 Battery Carbon Footprint (BCF)

The Battery Carbon Footprint (BCF) aims at determining and validating relevant standards for the consistent collection of the greenhouse gas (GHG) footprint of batteries. This assessment covers the entire lifecycle, from raw material extraction (mine) through manufacturing, product distribution, and even includes the impact of using recycled (secondary battery) materials. Table 7 outlines the specific lifecycle stages required for this declaration. Table 8 outlines the BCF parameters.

Specifically, the Distribution stage accounts only for transportation up to the point of sale. The End-of-Life (EOL) and recycling stage encompasses collection, dismantling, and actual recycling processes. Beyond this, the regulation doesn't provide further specifics, except to exclude the manufacturing of battery recycling equipment. The carbon footprint calculation outlined in the EU battery passport regulation can be used for the measuring the carbon footprint parameter outlined in Table 8.

Table 7 Life cycle stages of Carbon Footprint

Stage	Life Cycle Stage	Description
Stage 1	Raw material acquisition and pre-processing	Includes mining and other relevant sourcing, pre-processing and transport of active materials, up to the manufacturing of battery cells and batteries components (active materials, separator, electrolyte, casings, active and passive battery components), and electric/electronics components.
Stage 2	Main product production	Assembly of battery cells and assembly of batteries with the battery cells and the electric/electronic components
Stage 3	Distribution	Transport to the point of sale
Stage 4	End-of-life and recycling	Collection, dismantling and recycling

Table 8 BCF Parameters

SN	Parameter
1	Total Battery Carbon Footprint Scaled (kgCO ₂ e/kWh)
2	kgCO ₂ e/kWh during Raw material acquisition stage (%)
3	kgCO ₂ e/kWh during manufacturing stage (%)
4	kgCO ₂ e/kWh during distribution stage (%)
5	kgCO ₂ e/kWh during end of Life and Recycling stage (%)

11.6 Battery Dynamic Data (BDD)

The Battery Pack Aadhaar incorporates dynamic parameters that provide real-time insights into the battery's performance and health. Among the most critical of these parameters are the battery status, battery category, and State of Health (SOH), as detailed in the Annexure III. These parameters shown in Table 9, offer a dependable overview of the battery's current condition, enabling timely diagnostics and preventive maintenance. Continuous or periodic tracking of these parameters is vital for ensuring system reliability, maximizing performance, and supporting sustainable lifecycle management.

The Battery Pack Aadhaar framework relies on a central server to hold battery information that evolves over time, such as operational history, State of Health, usage conditions, safety incidents and end-of-life outcomes. This information cannot be kept reliably in a QR code or on-board memory alone, because those elements are either static or accessible only to a limited set of tools. The BDD serves as the dynamic counterpart to the static identifiers embedded in the Battery Identifier (BI) and Battery Manufacturer Identifier (BMI). While the QR code contains immutable information, BDD captures all lifecycle-dependent, safety-critical, and performance-driven information that must be updated as the battery progresses through different operational environments.

11.6.1 Purpose and Functional Role of BDD

The fundamental role of BDD is to provide a single, authoritative, tamper-proof representation of a battery's technical state at any point in its life. A suitable storage and access mechanism to be designed so that interoperability across the software platforms used by the various stakeholders such as OEMs, recyclers, service centers and government authorities is ensured.

BDD enables the following technical functions:

- State of Health (SOH) validation: Using cumulative metrics such as charge throughput, temperature history, imbalance events and cell-level anomalies, BDD supports both OEM-calculated SOH and regulator-validated SOH checks. The detailed methodology for validating SOH needs to be separately developed by the Government.
- Traceability and compliance: BDD form the digital chain-of-custody for ensuring that batteries entering the recycling ecosystem have undergone appropriate handling, dismantling and material recovery.
- Interoperability with international digital passport systems: The structured representation allows BDD to be mapped into European battery passport schemas, enabling cross-border regulatory integration without major redesign.

11.6.2 Use of Server Data for Monitoring and Validation

Because the data is online, regulators and authorized entities can use it for live tracking of fleets, trend

analysis, and targeted inspections. The same data stream supports automated State of Health calculations based on real-world usage and temperature history, rather than only design assumptions. Service centers authorized by Government or Battery Producer can retrieve the record before working on a battery, verify whether any abnormal events were recorded, and then upload new diagnostic results back to the server. Recyclers authorized by Government can add the outcome of treatment and material recovery, closing the loop. This continuous feedback allows Battery Pack Aadhaar to become a living record of each battery's life rather than a static label.

11.6.3 Future Perspective and Compatibility and harmonization with Global Standard

The Battery Pack Aadhaar design deliberately keeps the server schema simple and focused on a small set of high-value variables so that implementation remains robust, lightweight, and cost-effective for manufacturers and recyclers. At the same time, the data model is intentionally extensible. If, in future, if global-style battery passport becomes global requirement, the Battery Pack Aadhaar server can be mapped to that structure through standard APIs and data-field mapping, without changing anything on the physical battery or QR code. Additional fields required by the global battery passport system can be added on the server side as optional extensions, and Indian data fields can similarly be exposed to external systems if needed. This approach preserves compatibility in both directions, i.e., Battery Pack Aadhaar data can be translated into a global passport record, and a global passport carried by an imported product can be mapped into the Indian Battery Aadhaar schema.

11.6.4 Simplicity, Cost-Effectiveness and Data Integrity

By storing only, the essential dynamic parameters centrally, the system avoids the complexity and cost of managing very large datasets while still meeting the key objectives of safety, traceability, and sustainability. This lean design reduces the overhead on smaller manufacturers and recyclers, lowers integration costs, and makes nationwide roll-out more practical. Overall, the server-centric architecture offers a simple, scalable, and future-ready foundation that can grow with technology and regulatory needs while remaining compatible with emerging international battery passport frameworks.

Table 9 BDD Parameters

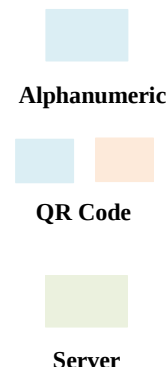
SN	Parameter
1	BPAN (Alphanumeric Code)
2	Battery Category
3	Battery Status
4	State of Health (SOH)
5	Actual Disassembly Method
6	Actual Circularity Method
7	Date & Time Stamp
8	QR code Recovery Data without BPAN
9	Reserved Field 1 (for future use)
10	Reserved Field 2 (for future use)

12. BATTERY PACK AADHAAR PARAMETERS

The following Table 10 lists the key parameters included in the Battery Pack Aadhaar.

Table 10 Battery Pack Aadhaar Parameters

SN	Categories	Parameters	Data Access
1	Battery Manufacturer Identifier (BMI)	Country code	Public
2		Manufacturer identifier	Public
3	Battery Descriptor Section (BDS)	Battery Capacity	Public
4		Battery Chemistry	Public
5		Nominal voltage	Public
6		Cell Origin	Public
7		Extinguisher Class	Public
12	Battery Identifier (BI) (Unique Serial Number)	Date of manufacturing	Public
13		Factory code	Public
14		Sequential Production Number	Public
15	Battery Material Composition Section (BMCS)	TAC Number	Public
16		Number of cells per battery	Public
17		Internal Resistance of Battery Pack	Public
18		Battery Weight	Public
19		Battery warranty	Public
20		Cell Type	Public
21		Cell form Factor	Public
22		Type of construction of battery pack	Private
23		Type of construction of Module	Private
24		Type of Cooling System	Private
25		Original power capability at 80% SoC	Private
26		Original power capability at 20% SoC	Public
27		Usable Capacity between 80% & 20% SoC	Private
28		BMS Hardware Version	Private
29		BMS Software Version	Private
30		Disassembly Method	Private
31		Circularity Method	Private
32		Recyclability	Private
33		Material: Anode	Private
34		Material: Cathode	Private
35		Material: Electrolyte	Private
36		Material: Separator	Private
37		Material: current collector	Private
38		Material: Battery casing	Private
39		Material: Potting	Private
40		Material 1 content	Private
41		Material 2 content	Private
42		Material 3 content	Private
43		Material 4 content	Private
44	Battery Carbon Footprint (BCF)	Total Battery Carbon Footprint Scaled (kgCO ₂ e/kWh)	Public
45		kgCO ₂ e/kWh during Raw material acquisition stage (%)	Private
46		kgCO ₂ e/kWh during manufacturing stage (%)	Private
47		kgCO ₂ e/kWh during distribution stage (%)	Private
48		kgCO ₂ e/kWh during end of Life and Recycling stage (%)	Private
49		BPAN (Alphanumeric Code)	Private



50	Battery Dynamic Data (BDD)	Battery Category	Private
51		Battery Status	Private
52		State of Health (SOH)	Private
53		Actual Disassembly Method	Private
54		Actual Circularity Method	Private
55		Date & Time Stamp	Private
56		QR code Recovery Data without BPAN	Private
57		Reserved Field 1 (for future use)	Private
58		Reserved Field 2 (for future use)	Private

13. BATTERY DATA EXECUTION

Battery data execution section outlines the structured flow of battery-related information along with the designated authorities responsible for updating each data type shown in Table 11.

Table 11 Battery Data Execution

Element	Function	Who Executes
BPAN Assignment	21- character unique Battery Pack Aadhaar number is generated including the categories BMI, BDS, & BI.	Battery Producer
Static Data Upload	Upload of fixed data.	Battery Producer
QR Code Generation	QR code linked with BPAN, encodes essential data.	Battery Producer
Public Access Interface	Provides read-only access to identity and battery data.	Authorized Stakeholder
Private Access Interface	Access to sensitive details like material composition, carbon footprint and dynamic data.	Recyclers / Authorized Stakeholder
Dynamic Data update	Event based updates during usage.	Service Provider / Recycler / Producer / Authorized Stakeholder

14. BATTERY PACK AADHAAR PARAMETER SEQUENCE

14.1 Alphanumeric Code Parameters

The 21-character BPAN alphanumeric code provides publicly accessible general information about the battery, with each parameter encoded using a specific alphanumeric character as illustrated in the FIG 3.

Char	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Parameters	Country code		Manufacturer identifier assigned within India			Battery Capacity		Battery Chemistry	Nominal voltage		Cell Origin		Extinguisher Class	Manufacturing Year	Manufacturing Month	Manufacturing Date	Factory Name	Unique Serial Number			

FIG. 3 Alphanumeric Code Parameters

14.2 QR Code Parameters

The QR code contains essential battery information that supports recyclers during the recycling process, with each parameter encoded using a specific alphanumeric character as shown in the FIG 4.

22..27	28..32	33..36	37	38	39	40	41..49	50	51	52	53	54	55	56	57	58	59..64	65..70	71	72
→ TAC Number	Number of Cells	Internal Resistance of Battery Pack	Battery Weight	Battery warranty	Cell Type	Cell form Factor	Type of construction of battery pack	Type of construction of Module	Type of Cooling System	→ Original power capability at 80% SoC	→ Original power capability at 20% SoC	Usable Capacity between 80% & 20% SoC	BMS Hardware Version	BMS Software Version	Disassembly Method					

73	74	75	76	77	78	79	80	81	82	82..87	88..92	93..97	98..102	103	104	105..108	109..112	113..116	117..120
Circularity Method	Recyclability	→ Material: Anode	→ Material: Cathode	→ Material: Electrolyte	→ Material: Separator	→ Material: Current collector	→ Material: Battery casing	Material: Potting	→ Material 1 content	→ Material 2 content	→ Material 3 content	→ Material 4 content	Total Battery Carbon Footprint Scaled kgCO ₂ e/kWh	→kg CO ₂ e during Raw material acquisition stage	→kg CO ₂ e during manufacturing stage	→kg CO ₂ e during distribution stage	→kg CO ₂ e during end of Life and Recycling stage		

FIG. 4 QR Code Parameters

14.3 Server Based Parameters

The battery’s dynamic data captures real-time operational parameters essential for monitoring performance and supporting end-of-life processes, with each parameter encoded using a designated alphanumeric character as shown in the FIG 5.

121..141	142	143	144	145	146	147	148	149..162	163..283	284..294	295..305
BPAN (Alphanumeric Code)	Battery Category	Battery Status	State of Health (SOH)		Actual Disassembly Method		Actual Circularity Method	Date & Time Stamp	QR code Recovery Data without BPAN	Reserved Field 1 (for future use)	Reserved Field 2 (for future use)

FIG. 5 Server Based Parameters

15. BATTERY PACK AADHAAR PILOT

FIG. 6 shows one of the Battery pack Aadhaar pilot.



FIG. 6 Battery Pack Aadhaar Pilot

15.1 Alphanumeric Data

Alphanumeric information of the BPAN Pilot given in FIG. 6 is decoded as given in Table 12 in accordance with BPAN guidelines.

Table 12 Alphanumeric Pilot Data

Categories	Parameters	Battery Original Data	Aadhaar Code	Aadhaar Data From BPAN Regulation
Battery Manufacturer Identifier (BMI)	Country code	India	MY	India
	Manufacturer identifier	Company 8	008	Company 8
Battery Descriptor Section (BDS)	Battery Capacity	30 kWh	A6	30 kWh
	Battery Chemistry	NMC	F	NMC
	Nominal voltage	307 V	KK	307 V
	Cell Origin	Korea	KL	KL - Korea
	Extinguisher Class	Class C	C	Class C
Battery Identifier (BI)	Unique Serial number = Date of manufacturing (3 digit) + factory code (1 digit) + sequential production number (4 digits)	Date: 250417 Factory code: 08, Sequential No: 0001	1DH80001	1 = 2025 D = April H = 17 8 = 8 (Factory code) 0001 = Serial No.

15.2 QR Code Data

QR Code information of the BPAN Pilot given in FIG 6 is decoded as given in Table 13 in accordance with BPAN guidelines.

Table 13 QR Code Pilot Data

Categories	Parameters	Aadhaar Code	Aadhaar Data From QR
Battery Manufacturer Identifier (BMI)	Country code	MY	India
	Manufacturer identifier	008	Company 8
Battery Descriptor Section (BDS)	Battery Capacity	A6	30 kWh
	Battery Chemistry	F	NMC
	Nominal voltage	KK	307 V
	Cell Origin	KL	KL - Korea
	Extinguisher Class	C	Class C
Battery Identifier (BI)	Unique Serial number = Date of manufacturing (3 digit) + factory code (1 digit) + sequential production number (4 digits)	1DH80001	1 = 2025 D = April H = 17 8 = 8 (Factory code) 0001 = Serial No.
Battery Material Composition Section (BMCS)	TAC Number	AP5184	AP5184
	Number of cells per battery	00096	96 Cells
	Internal Resistance of Battery Pack	1000	1000(factor)*1
	Battery Weight	NZ	420
	Battery warranty	J	9
	Cell Type	B	Prismatic
	Cell form Factor	18,65,20	Length, Width, Height(mm)
	Type of construction of battery pack	A	Cell-to-Module-to-Pack (CTMTP)
	Type of construction of Module	A	Series
	Type of Cooling System	A	Air
	Original power capability at 80% SoC	AZ	24 kW
	Original power capability at 20% SoC	AF	6 kW
	Usable Capacity between 80% & 20% SoC	4	4
	BMS Hardware Version	V1.0.6	V1.0.6
	BMS Software Version	V1.2.1	V1.2.1
	Disassembly Method	AA	Standard Manual Disassembly & Full Separation
	Circularity Method	A	Material Circularity Indicator (MCI)
	Recyclability	CD	70 %
	Material: Anode	A	Graphite
	Material: Cathode	A	lithium iron phosphate
	Material: Electrolyte	B	LiBF4 (Lithium Tetrafluoroborate)
	Material: Separator	B	Polypropylene (PP)
	Material: current collector	E	Copper (Cu)
	Material: Battery casing	A	Aluminium
	Material: Potting	A	Epoxy Resins
	Material 1 content	Li060	Lithium - 60%
	Material 2 content	Cb010	Cobalt - 10%
	Material 3 content	Ni015	Nickel - 15%
	Material 4 content	Gr028	Graphite - 28%
Battery Carbon Footprint (BCF)	Total Battery Carbon Footprint Scaled kgCO ₂ e/kWh	010	010

	kgCO ₂ e/kWh during Raw material acquisition stage	A050	50%
	kgCO ₂ e/kWh during manufacturing stage	B020	20%
	kgCO ₂ e/kWh during distribution stage	C010	10%
	kgCO ₂ e/kWh during end of Life and Recycling stage	D020	20%

15.3 Server based Data

Table 14 Server Pilot Data

Categories	Parameters	Aadhaar Code	Aadhaar Data from server
Battery Dynamic Data (BDD)	BPAN (Alphanumeric Code)	MY008 A6FKKKLC 1DH80001	MY008 A6FKKKLC 1DH80001
	Battery Category	A	Electric Vehicle battery
	Battery Status	A	Operational
	State of Health (SOH)	080	80%
	Actual Disassembly Method	AA	Standard Manual Disassembly & Full Separation
	Actual Circularity Method	A	Material Circularity Indicator (MCI)
	Date & Time Stamp	20112025 15:20	20112025 15:20
	QR code Recovery Data without BPAN	AP51849610NZJ B18,65,20 AAA AZAF4V1.0.6V1.2.1 AAACDAABBEAALi060Cb010 Ni015Gr02810A050B020C010D020	String max 120 char
	Reserved Field 1 (for future use)	0000000001	
	Reserved Field 2 (for future use)	0000000002	

16. WAY FORWARD

Electric vehicle applications account for approximately 80–90% of the total lithium-ion battery demand in India, significantly exceeding demand from industrial or non-automotive applications. Accordingly, while the guideline recommends applicability of Battery Pack Aadhaar for industrial batteries above 2 kWh, it is proposed that electric vehicle batteries be given priority during standard formulation, considering their scale, safety implications, and regulatory relevance. This approach will ensure that the Battery Pack Aadhaar framework addresses the most impactful segment of the Indian battery ecosystem in its initial phase.

It is further recommended that the Battery Pack Aadhaar framework be taken forward through the Automotive Industry Standard (AIS) route under the Automotive Industry Standards Committee (AISC), following the established multi-step standardization process. This will enable structured stakeholder consultation, technical validation, and harmonization with existing automotive regulations while ensuring national uniformity and regulatory acceptance.

The AISC committee may include representatives from relevant stakeholders such as battery manufacturers, electric vehicle manufacturers, recyclers, testing agencies, and regulatory bodies, to ensure that practical implementation aspects across the battery lifecycle are adequately addressed.

To support effective implementation, the roles and responsibilities of various stakeholders across the battery lifecycle such as battery manufacturer registration, battery manufacturer identifier allocation, QR and alphanumeric marking, lifecycle data updates, and end-of-life reporting are proposed to be clearly defined.

Table 15 provides an illustrative example of stakeholder responsibilities and associated activities for typical electric vehicle battery applications, ensuring clarity, accountability, and traceability.

Table 15 Stakeholder Responsibilities and Associated Activities

Responsibility	With	Activity
Battery manufacturer	National Agency	Registration of Battery Manufacturer identifier and factory code (Like World Manufacturer Identifier (WMI) number used in Vehicle Identification Number (VIN)) One-time registration.
Battery manufacturer	Various suppliers & sub suppliers	Take relevant information required for Battery Pack Aadhaar number from cell, BMS, etc. supplier.
Battery manufacturer	Authorised Test Agency	Technical conformity assessment or Type approval (AIS 156/ AIS 038).
Battery manufacturer	Authorised Test Agency	Verification of Battery Pack Aadhaar number generation capability during plant audit /inspection. (AIS 037 COP standard).
Battery Manufacturer	NIC & National Agency	Generation of Battery Aadhaar number and QR code. Entering Initial Dynamic data on server.
Vehicle manufacturer	VAHAN Database	Through dedicated field for Battery Pack Aadhaar number in Form 20, which will feed data to VAHAN database, managed by MoRTH.
Vehicle manufacturer	End customer	Printing of Alphanumeric number and QR code on windshield / vehicle body/ as per prescribed guidelines.

Vehicle manufacturer	VAHAN Database	In use phase: change in Battery Pack Aadhaar number with new Battery Pack Aadhaar number in case battery pack is replaced with new battery pack.
Authorized operator	NIC & National Agency	Change in battery status from EV to stationary storage or second use or Recycle to dispose.
Authorized operator	NIC & National Agency	Recycler/waste operator adds dismantling + recovery outputs.

The proposed approach enables a phased and scalable rollout, beginning with electric vehicle batteries and subsequently extending to other battery categories. The supporting digital infrastructure shall remain lightweight and secure, with server-based usage limited to dynamic lifecycle events, while the majority of identification, safety, and material information remains available offline through physical alphanumeric marking and QR codes. Data implementation may be carried out in a phased manner as: Phase-1 (BMI+BDS+BI) for identification and key descriptors; Phase-2 (BMCS and BDD) for material composition/circularity attributes for dynamic lifecycle events such as status, SoH and end-of-life reporting with time stamp; and Phase-3 (BCF/Carbon Footprint) as an advanced requirement, recognizing the carbon footprint.

ANNEXURE I

Alphanumeric Code Parameter Configuration

1. Battery Manufacturer Identifier (BMI)

1.1. The region and country codes has been assigned from the reference of ISO 3779 as shown in Table 16, from here Country code and cell origin can be assigned.

Table 16 Country Codes

A-H (AFRICA)	J-R (ASIA)	S-Z (EUROPE)	1-5, 7F-50 (North America)	8-9 (South America)	6-7E (Oceania)
AA-AH South Africa	J Japan	SA-SM United Kingdom	1, 4, 5 or 7F-70 United States	8A-8E Argentina	6 Australia
AJ-AN Côte d'Ivoire	KA-KE Sri Lanka	SN-ST Germany (formerly East Germany)	2 Canada	8F-8K Chile	7A-7E New Zealand
AP-A0 unassigned	KF-KK Israel	SU-SZ Poland	3A-3X Mexico	8L-8R Ecuador	
AR-AL Algeria	KL-KR Korea (South)	S1-S2 Latvia	3Y-37 Costa Rica	8S-8W Peru	
BA-BE Angola	KS-KT Jordan	S3 Georgia	38-39 Cayman Islands	8X-82 Venezuela	
BF-BK Kenya	L China (Mainland)	S4 Iceland	30 unassigned	82-82 Bolivia	
BL-BR Tanzania	MA-ME, MY-M0 India	S5-S0 unassigned		83-80 unassigned	
BU Uganda	MF-MK Indonesia	TA-TH Switzerland		9A-9E Brazil	
BS-B0 unassigned	ML-MR Thailand	TJ-TP Czech Republic		9F-9K Colombia	
CA-CE Benin	MS Myanmar	TR-TV Hungary		9L-9R Paraguay	
CF-CK Madagascar	MU Mongolia	TW-T2 Portugal		9S-9W Uruguay	
CL-CR Tunisia	MX Kazakhstan	T3-T0 unassigned		9X-92 Trinidad & Tobago	
CS-C0 unassigned	NA-NE Iran	UA-UG unassigned		93-99 Brazil	
DA-DE Egypt	NF-NK Pakistan	UH-UM Denmark		90 unassigned	
DF-DK Morocco	NL-NR Turkey	UN-UT Ireland			
DL-DR Zambia	NS-NT Uzbekistan	UU-UZ Romania			
DS-D0 unassigned	NU-N0 unassigned	U1-U4 North Macedonia			
EA-EE Ethiopia	PA-PE Philippines	U5-U7 Slovakia			
EF-EK Mozambique	PF-PK Singapore	U8-U0 Bosnia and Herzegovina			
EL-E0 unassigned	PL-PR Malaysia	VA-VE Austria			

FA-FE Ghana	PS-PT Bangladesh	VF-VR France			
FF-FK Nigeria		VS-VW Spain			
FL-F0 unassigned		VX-V2 Serbia			
GA-G0 unassigned		V3-V5 Croatia			
HA-H0 unassigned		V6-V0 Estonia			
		W Germany (formerly East Germany)			
		XA-XE Bulgaria			
		XF-XK Greece			
		XL-XR Netherlands			
		XS-XW Russia (former USSR)			
		XX-XY Luxembourg			
		XZ-X0 Russia			
		YA-YE Belgium			
		YF-YK Finland			
		YL-YR Malta			
		YS-YW Sweden			
		YX-Y2 Norway			
		Y3-Y5 Belarus			
		Y6-Y0 Ukraine			
		ZA-ZU Italy			
		ZV-ZW unassigned			
		ZX-ZZ Slovenia			
		Z3-Z5 Lithuania			
		Z6-Z0 Russia			

1.2. Manufacturer Identifier has been assigned with five character alphanumeric as shown in Table 16, It consists of a two-character country code (e.g., for India: MA, MB, MC, MD, ME, MY, MZ, and M0) followed by a three-character manufacturer code. For India, this system allows for up to 2,87,496 unique manufacturer identifiers.

Table 17 Manufacturer Identifier

Code	Manufacturer
001	Company 1
002	Company 2
003	Company 3
004	Company 4
005	Company 5
006	Company 6
007	Company 7
008	Company 8
009	Company 9
010	Company 10
011	Company 11
012	Company 12
013	Company 13
014	Company 14
015	Company 15
016	Company 16
017	Company 17
018	Company 18
019	Company 19
020	Company 20
021 – ZZZ	Reserved

2. Battery Descriptor Section (BDS)

2.1 Battery Capacity (kWh) is provided in two-character alphanumeric code as per ANNEXURE IV.

2.2 Table 18 outlines the configuration of battery chemistry codes, the remaining characters in this table are reserved for future use.

Table 18 Battery Chemistry

Code	Battery Chemistry	Code	Battery Chemistry	Code	Battery Chemistry
A	Lead Acid	M		Y	
B	Nickel-Cadmium (Ni-Cd)	N		Z	
C	Nickel-Metal Hydride (Ni-MH)	P		1	
D	Sodium-Ion	Q		2	
E	LFP	R		3	
F	NMC	S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

2.3 Nominal Voltage (V) is provided in two-character alphanumeric code as per ANNEXURE IV.

2.4 Cell Origin is provided in two-character alphanumeric code, referenced from Table 16.

2.5 Table 19 defines the configuration of Extinguishing agent, with the remaining characters reserved for future enhancement.

Table 19 Extinguishing Agent

Code	Extinguisher Class	Code	Extinguisher Class	Code	Extinguisher Class
A	Class A	M		Y	
B	Class B	N		Z	
C	Class C	P		1	
D	Class D	Q		2	
E	Class K	R		3	
F		S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

3. Battery Identifier (BI)

3.1 Table 20 specifies the alphanumeric code structure for representing the manufacturing year.

Table 20 Manufacturing Year

Code	Manufacturing Year	Code	Manufacturing Year	Code	Manufacturing Year
1	2025	C	2036	P	2047
2	2026	D	2037	Q	2048
3	2027	E	2038	R	2049
4	2028	F	2039	S	2050
5	2029	G	2040	T	2051
6	2030	H	2041	U	2052
7	2031	J	2042	V	2053
8	2032	K	2043	W	2054
9	2033	L	2044	X	2055
A	2034	M	2045	Y	2056
B	2035	N	2046	Z	2057

3.2 Table 21 outlines the alphabetical code format used to represent the manufacturing month.

Table 21 Manufacturing Month

Code	Manufacturing Month
A	January
B	February
C	March
D	April
E	May
F	June
G	July
H	August
J	September
K	October
L	November
M	December

3.3 Table 22 specifies the alphanumeric code structure for representing the manufacturing date.

Table 22 Manufacturing Date

Code	Manufacturing Date	Code	Manufacturing Date	Code	Manufacturing Date
1	1	C	12	P	23
2	2	D	13	Q	24
3	3	E	14	R	25
4	4	F	15	S	26
5	5	G	16	T	27
6	6	H	17	U	28
7	7	J	18	V	29
8	8	K	19	W	30
9	9	L	20	X	31
A	10	M	21		
B	11	N	22		

3.4 Table 23 details the alphanumeric code format used to represent the factory name.

Table 23 Factory Name

Code	Factory Name	Code	Factory Name	Code	Factory Name
1	1	C	12	P	23
2	2	D	13	Q	24
3	3	E	14	R	25
4	4	F	15	S	26
5	5	G	16	T	27
6	6	H	17	U	28
7	7	J	18	V	29
8	8	K	19	W	30
9	9	L	20	X	31
A	10	M	21	Y	32
B	11	N	22	Z	33

ANNEXURE II

QR Code Parameter Configuration

1. Battery Material Composition Section (BMCS)

1.1 Battery Weight (kg) is provided in two-character alphanumeric code as per ANNEXURE IV.

1.2 Table 24 defines the configuration of battery warranty codes, with the remaining characters reserved for future enhancements and classifications.

Table 24 Battery Warranty

Code	Battery Warranty	Code	Battery Warranty	Code	Battery Warranty
A	1	M	12	Y	
B	2	N	13	Z	
C	3	P	14	1	
D	4	Q	15	2	
E	5	R	16	3	
F	6	S	17	4	
G	7	T	18	5	
H	8	U	19	6	
J	9	V	20	7	
K	10	W		8	
L	11	X		9	

1.3 Table 25 provides the structure for cell type code configuration, the remaining characters reserved for future updates and classifications.

Table 25 Cell Type

Code	Cell Type	Code	Cell Type	Code	Cell Type
A	Cylindrical	M		Y	
B	Prismatic	N		Z	
C	Pouch	P		1	
D	Blade	Q		2	
E		R		3	
F		S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.4 Cell form factor is represented in table 26 the format by which the form factor is represented in the QR code.

Table 26 Form Factor Representation of Values

Type	Dimensions
Cylindrical	Diameter × Length (mm)
Prismatic	Length × Width × Height (mm)
Pouch	Length × Width × Thickness (mm)

1.5 Table 27 details the one-character alphabetic code format used to represent the type of construction of battery pack and module.

Table 27 Type of Construction

Type of Construction	Code	Information
Battery Pack	A	Cell-to-Module-to-Pack (CTMTP)
	B	Cell-to-Pack (CTP)
Module	A	Series
	B	Parallel

1.6 Table 28 details the type of cooling system used in the battery Pack

Table 28 Type of Cooling System

Type of Cooling System	Code	Information
Battery Pack	A	Air
	B	Liquid

1.7 Table 29 details the two-character alphanumeric code format used to represent the dismantling/disassembly method.

Table 29 Dismantling/Disassembly Method

Code	Dismantling/Disassembly Method
AA	Standard Manual Disassembly & Full Separation
AB	Direct Shredding Pre-Treatment
AC	Repurposing / Second-Life Pathway
AD	Emergency / Damaged Pack Procedure
AE	Module-Level Input Disassembly
AF	AI-Guided SoH Triage
AG	Electrolyte Extraction & Neutralization
AH	Robotic Automated Disassembly
AJ	Cryogenic / Inert-Atmosphere Disassembly
AK	Direct Cathode Refunctionalization (Direct Recycling)
AL	Biometallurgical Recycling
AM – 9Z	Reserved

1.8 Table 30 details the one-character alphanumeric code format used to represent the battery circularity method.

Table 30 Battery Circularity Method

Code	Circularity Method
A	Material Circularity Indicator (MCI)
B	Carbon Footprint (PEF Method)
C	Recycled Content & Recovery Metrics
D	Design for Circularity Score
E	Second-Life Utilization Index
F	Water / Resource Footprint Analysis
G	Full Life Cycle Assessment (LCA)
H	Pyro-Metallurgical Recovery
J - 9	Reserved

1.9 Table 31 details the two-character alphanumeric code format used to represent the recyclability percentage.

Table 31 Recyclability

Code	Recyclability (%)	Code	Recyclability (%)	Code	Recyclability (%)
AA	1	BH	41	CQ	81
AB	2	BJ	42	CR	82
AC	3	BK	43	CS	83
AD	4	BL	44	CT	84
AE	5	BM	45	CU	85
AF	6	BN	46	CV	86
AG	7	BP	47	CW	87
AH	8	BQ	48	CX	88
AJ	9	BR	49	CY	89
AK	10	BS	50	CZ	90
AL	11	BT	51	C1	91
AM	12	BU	52	C2	92
AN	13	BV	53	C3	93
AP	14	BW	54	C4	94
AQ	15	BX	55	C5	95
AR	16	BY	56	C6	96
AS	17	BZ	57	C7	97
AT	18	B1	58	C8	98
AU	19	B2	59	C9	99
AV	20	B3	60	DA	100
AW	21	B4	61		
AX	22	B5	62		
AY	23	B6	63		
AZ	24	B7	64		
A1	25	B8	65		
A2	26	B9	66		
A3	27	CA	67		
A4	28	CB	68		
A5	29	CC	69		
A6	30	CD	70		
A7	31	CE	71		
A8	32	CF	72		
A9	33	CG	73		
BA	34	CH	74		
BB	35	CJ	75		
BC	36	CK	76		
BD	37	CL	77		
BE	38	CM	78		
BF	39	CN	79		
BG	40	CP	80		

1.10 Table 32 defines the configuration of anode material codes, with the remaining characters reserved for future enhancements and classifications.

Table 32 Anode Material

Code	Anode	Code	Anode	Code	Anode
A	Graphite	M		Y	
B	Silicon	N		Z	
C	LTO	P		1	
D		Q		2	
E		R		3	
F		S		4	

G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.11 Table 33 defines the configuration of Cathode material codes, with the remaining characters reserved for future enhancements and classifications.

Table 33 Cathode Material

Code	Cathode	Code	Cathode	Code	Cathode
A	lithium iron phosphate (LiFePO ₄ or LFP)	M		Y	
B	lithium cobalt oxide (LiCoO ₂)	N		Z	
C	lithium manganese oxide	P		1	
D	lithium nickel manganese cobalt oxide (LiNiMnCoO ₂ or NMC)	Q		2	
E	NCA	R		3	
F	LMFP	S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.12 Table 34 defines the configuration of electrolyte material codes, with the remaining characters reserved for future enhancements and classifications.

Table 34 Electrolyte Material

Code	Electrolyte	Code	Electrolyte	Code	Electrolyte
A	LiPF ₆ (Lithium Hexafluorophosphate)	M		Y	
B	LiBF ₄ (Lithium Tetrafluoroborate)	N		Z	
C	LiClO ₄ (Lithium Perchlorate)	P		1	
D	Solid State Electrolyte	Q		2	
E		R		3	
F		S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.13 Table 35 outlines the configuration of separator material codes. The remaining characters in this table are reserved for future use.

Table 35 Separator Material

Code	Separator	Code	Separator	Code	Separator
A	Polyethylene (PE)	M		Y	
B	Polypropylene (PP)	N		Z	
C	Polyethylene-Polypropylene (PE/PP) Blend	P		1	
D	Glass Fiber Separators	Q		2	
E	Ceramic-Coated Separators	R		3	
F	Polyvinylidene Fluoride (PVDF) Separators	S		4	
G	Ion-Exchange Membranes	T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.14 Table 36 outlines the configuration of current collector material codes. The remaining characters in this table are reserved for future use.

Table 36 Current Collector Material

Code	Current Collector	Code	Current Collector	Code	Current Collector
A	Aluminium (Al)	M		Y	
B	Nickel (Ni)	N		Z	
C	Stainless Steel	P		1	
D	Aluminium-Copper Alloy	Q		2	
E	Copper (Cu)	R		3	
F	Graphene-Coated Copper	S		4	
G	Carbon-Based Materials	T		5	
H	Metal Nanoparticle Thin Film	U		6	
J	Carbon Fiber & Nanotubes	V		7	
K	Polymer-Based Composites	W		8	
L		X		9	

1.15 Table 37 outlines the configuration of battery casing material codes. The remaining characters in this table are reserved for future use.

Table 37 Battery Casing Material

Code	Battery Casing	Code	Battery Casing	Code	Battery Casing
A	Aluminium	M		Y	
B	Steel	N		Z	
C	Extruded Aluminium	P		1	
D	Die-Cast Aluminium	Q		2	
E	Glass Fiber Composites	R		3	
F	SMC (Sheet Moulding Compound) Composites	S		4	
G	Carbon Fibre Composites	T		5	

H	Thermoplastics	U		6	
J		V		7	
K		W		8	
L		X		9	

1.16 Table 38 outlines the configuration of battery potting material codes. The remaining characters in this table are reserved for future use.

Table 38 Battery Potting Material

Code	Potting Material	Code	Potting Material	Code	Potting Material
A	Epoxy Resins	M		Y	
B	Polyurethane (PU)	N		Z	
C	Silicone resins	P		1	
D	Acrylics	Q		2	
E		R		3	
F		S		4	
G		T		5	
H		U		6	
J		V		7	
K		W		8	
L		X		9	

1.17 Table 39 outlines the material content, assigned with two-character alphanumeric code.

Table 39 Material Content

Code	Material Content	Code	Material Content	Code	Material Content
An	Antimony	Ga	Gallium	Pr	Phosphate rock
Ar	Arsenic	Ge	Germanium	Pg	Platinum group metals (PGM)
Ba	Bauxite/Alumina/Aluminium	Ha	Hafnium	Sc	Scandium
Br	Baryte	He	Helium	Si	Silicon metal
Be	Beryllium	HR	Heavy rare earth elements (HREE)	St	Strontium
Bi	Bismuth	LR	Light rare earth elements (LREE)	Ta	Tantalum
Bo	Boron	Li	Lithium	Ti	Titanium metal
Cb	Cobalt	Mg	Magnesium	Tu	Tungsten
Cc	Coking coal	Mn	Manganese	Va	Vanadium
Co	Copper	Gr	Graphite	An	Phosphorus
Fe	Feldspar	Ni	Nickel – battery grade	Ph	Antimony
Fl	Fluorspar	Nb	Niobium		

1.18 Original power capabilities code assigned as per the total energy code configuration in Table 40.

Table 40 Original Power Capabilities

Parameter	Description
Original power capability at 80% SoC (kW)	Refer ANNEXURE IV for the corresponding coding configuration.
Original power capability at 20% SoC (kW)	Refer ANNEXURE IV for the corresponding coding configuration

1.19 Table 41 details the two-character alphanumeric code format used to represent the usable capacity between 80% & 20% SoC

Table 41 Usable Capacity Between 80% & 20% SoC (%)

Code	Usable Capacity Between 80% & 20% SoC (%)	Code	Usable Capacity Between 80% & 20% SoC (%)	Code	Usable Capacity Between 80% & 20% SoC (%)
AA	1	BH	41	CQ	81
AB	2	BJ	42	CR	82
AC	3	BK	43	CS	83
AD	4	BL	44	CT	84
AE	5	BM	45	CU	85
AF	6	BN	46	CV	86
AG	7	BP	47	CW	87
AH	8	BQ	48	CX	88
AJ	9	BR	49	CY	89
AK	10	BS	50	CZ	90
AL	11	BT	51	C1	91
AM	12	BU	52	C2	92
AN	13	BV	53	C3	93
AP	14	BW	54	C4	94
AQ	15	BX	55	C5	95
AR	16	BY	56	C6	96
AS	17	BZ	57	C7	97
AT	18	B1	58	C8	98
AU	19	B2	59	C9	99
AV	20	B3	60	DA	100
AW	21	B4	61		
AX	22	B5	62		
AY	23	B6	63		
AZ	24	B7	64		
A1	25	B8	65		
A2	26	B9	66		
A3	27	CA	67		
A4	28	CB	68		
A5	29	CC	69		
A6	30	CD	70		
A7	31	CE	71		
A8	32	CF	72		
A9	33	CG	73		
BA	34	CH	74		
BB	35	CJ	75		
BC	36	CK	76		
BD	37	CL	77		
BE	38	CM	78		
BF	39	CN	79		
BG	40	CP	80		

2. Battery Carbon Footprint

2.1 Table 42 outlines the battery carbon footprint, assigned with one alphabetic code.

Table 42 Carbon Footprint

Code	Parameters
A	Raw material acquisition stage
B	Manufacturing stage
C	Distribution stage
D	End of Life and Recycling stage

ANNEXURE III

Server Based Parameter Configuration

1. Table 43 outlines the battery category, assigned with one alphabetic character.

Table 43 Battery Category

Code	Battery Category
A	Electric Vehicle battery L category
B	Electric Vehicle battery M and N category
C	Industrial Battery> 2kwh
D-Z	Reserved

2. Table 44 outlines the battery category, assigned with one alphabetic character.

Table 44 Battery Status

Code	Battery Status
A	Operational (above 80 %)
B	Second Life (60-80%)
C	End of Life (below 60%)

ANNEXURE IV

1. Table 45 details the two-character alphanumeric code format used to represent the Battery capacity, Nominal voltage, Battery weight, and original power capability at 20% and 80% SoC.

Table 45 Parameter Configuration

Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter
AA	1	BT	51	DB	101	EU	151	GC	201
AB	2	BU	52	DC	102	EV	152	GD	202
AC	3	BV	53	DD	103	EW	153	GE	203
AD	4	BW	54	DE	104	EX	154	GF	204
AE	5	BX	55	DF	105	EY	155	GG	205
AF	6	BY	56	DG	106	EZ	156	GH	206
AG	7	BZ	57	DH	107	E1	157	GJ	207
AH	8	B1	58	DJ	108	E2	158	GK	208
AJ	9	B2	59	DK	109	E3	159	GL	209
AK	10	B3	60	DL	110	E4	160	GM	210
AL	11	B4	61	DM	111	E5	161	GN	211
AM	12	B5	62	DN	112	E6	162	GP	212
AN	13	B6	63	DP	113	E7	163	GQ	213
AP	14	B7	64	DQ	114	E8	164	GR	214
AQ	15	B8	65	DR	115	E9	165	GS	215
AR	16	B9	66	DS	116	FA	166	GT	216
AS	17	CA	67	DT	117	FB	167	GU	217
AT	18	CB	68	DU	118	FC	168	GV	218
AU	19	CC	69	DV	119	FD	169	GW	219
AV	20	CD	70	DW	120	FE	170	GX	220
AW	21	CE	71	DX	121	FF	171	GY	221
AX	22	CF	72	DY	122	FG	172	GZ	222
AY	23	CG	73	DZ	123	FH	173	G1	223
AZ	24	CH	74	D1	124	FJ	174	G2	224
A1	25	CJ	75	D2	125	FK	175	G3	225
A2	26	CK	76	D3	126	FL	176	G4	226
A3	27	CL	77	D4	127	FM	177	G5	227
A4	28	CM	78	D5	128	FN	178	G6	228
A5	29	CN	79	D6	129	FP	179	G7	229
A6	30	CP	80	D7	130	FQ	180	G8	230
A7	31	CQ	81	D8	131	FR	181	G9	231
A8	32	CR	82	D9	132	FS	182	HA	232
A9	33	CS	83	EA	133	FT	183	HB	233
BA	34	CT	84	EB	134	FU	184	HC	234
BB	35	CU	85	EC	135	FV	185	HD	235
BC	36	CV	86	ED	136	FW	186	HE	236
BD	37	CW	87	EE	137	FX	187	HF	237
BE	38	CX	88	EF	138	FY	188	HG	238
BF	39	CY	89	EG	139	FZ	189	HH	239
BG	40	CZ	90	EH	140	F1	190	HJ	240
BH	41	C1	91	EJ	141	F2	191	HK	241
BJ	42	C2	92	EK	142	F3	192	HL	242
BK	43	C3	93	EL	143	F4	193	HM	243
BL	44	C4	94	EM	144	F5	194	HN	244
BM	45	C5	95	EN	145	F6	195	HP	245
BN	46	C6	96	EP	146	F7	196	HQ	246
BP	47	C7	97	EQ	147	F8	197	HR	247
BQ	48	C8	98	ER	148	F9	198	HS	248
BR	49	C9	99	ES	149	GA	199	HT	249
BS	50	DA	100	ET	150	GB	200	HU	250

Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter
HV	251	KM	309	MD	367	N5	425	QW	483
HW	252	KN	310	ME	368	N6	426	QX	484
HX	253	KP	311	MF	369	N7	427	QY	485
HY	254	KQ	312	MG	370	N8	428	QZ	486
HZ	255	KR	313	MH	371	N9	429	Q1	487
H1	256	KS	314	MJ	372	PA	430	Q2	488
H2	257	KT	315	MK	373	PB	431	Q3	489
H3	258	KU	316	ML	374	PC	432	Q4	490
H4	259	KV	317	MM	375	PD	433	Q5	491
H5	260	KW	318	MN	376	PE	434	Q6	492
H6	261	KX	319	MP	377	PF	435	Q7	493
H7	262	KY	320	MQ	378	PG	436	Q8	494
H8	263	KZ	321	MR	379	PH	437	Q9	495
H9	264	K1	322	MS	380	PJ	438	RA	496
JA	265	K2	323	MT	381	PK	439	RB	497
JB	266	K3	324	MU	382	PL	440	RC	498
JC	267	K4	325	MV	383	PM	441	RD	499
JD	268	K5	326	MW	384	PN	442	RE	500
JE	269	K6	327	MX	385	PP	443	RF	501
JF	270	K7	328	MY	386	PQ	444	RG	502
JG	271	K8	329	MZ	387	PR	445	RH	503
JH	272	K9	330	M1	388	PS	446	RJ	504
JJ	273	LA	331	M2	389	PT	447	RK	505
JK	274	LB	332	M3	390	PU	448	RL	506
JL	275	LC	333	M4	391	PV	449	RM	507
JM	276	LD	334	M5	392	PW	450	RN	508
JN	277	LE	335	M6	393	PX	451	RP	509
JP	278	LF	336	M7	394	PY	452	RQ	510
JQ	279	LG	337	M8	395	PZ	453	RR	511
JR	280	LH	338	M9	396	P1	454	RS	512
JS	281	LJ	339	NA	397	P2	455	RT	513
JT	282	LK	340	NB	398	P3	456	RU	514
JU	283	LL	341	NC	399	P4	457	RV	515
JV	284	LM	342	ND	400	P5	458	RW	516
JW	285	LN	343	NE	401	P6	459	RX	517
JX	286	LP	344	NF	402	P7	460	RY	518
JY	287	LQ	345	NG	403	P8	461	RZ	519
JZ	288	LR	346	NH	404	P9	462	R1	520
J1	289	LS	347	NJ	405	QA	463	R2	521
J2	290	LT	348	NK	406	QB	464	R3	522
J3	291	LU	349	NL	407	QC	465	R4	523
J4	292	LV	350	NM	408	QD	466	R5	524
J5	293	LW	351	NN	409	QE	467	R6	525
J6	294	LX	352	NP	410	QF	468	R7	526
J7	295	LY	353	NQ	411	QG	469	R8	527
J8	296	LZ	354	NR	412	QH	470	R9	528
J9	297	L1	355	NS	413	QJ	471	SA	529
KA	298	L2	356	NT	414	QK	472	SB	530
KB	299	L3	357	NU	415	QL	473	SC	531
KC	300	L4	358	NV	416	QM	474	SD	532
KD	301	L5	359	NW	417	QN	475	SE	533
KE	302	L6	360	NX	418	QP	476	SF	534
KF	303	L7	361	NY	419	QQ	477	SG	535
KG	304	L8	362	NZ	420	QR	478	SH	536
KH	305	L9	363	N1	421	QS	479	SJ	537
KJ	306	MA	364	N2	422	QT	480	SK	538
KK	307	MB	365	N3	423	QU	481	SL	539
KL	308	MC	366	N4	424	QV	482	SM	540

Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter
SN	541	UF	600	V8	659	X1	718	ZT	777
SP	542	UG	601	V9	660	X2	719	ZU	778
SQ	543	UH	602	WA	661	X3	720	ZV	779
SR	544	UJ	603	WB	662	X4	721	ZW	780
SS	545	UK	604	WC	663	X5	722	ZX	781
ST	546	UL	605	WD	664	X6	723	ZY	782
SU	547	UM	606	WE	665	X7	724	ZZ	783
SV	548	UN	607	WF	666	X8	725	Z1	784
SW	549	UP	608	WG	667	X9	726	Z2	785
SX	550	UQ	609	WH	668	YA	727	Z3	786
SY	551	UR	610	WJ	669	YB	728	Z4	787
SZ	552	US	611	WK	670	YC	729	Z5	788
S1	553	UT	612	WL	671	YD	730	Z6	789
S2	554	UU	613	WM	672	YE	731	Z7	790
S3	555	UV	614	WN	673	YF	732	Z8	791
S4	556	UW	615	WP	674	YG	733	Z9	792
S5	557	UX	616	WQ	675	YH	734	1A	793
S6	558	UY	617	WR	676	YJ	735	1B	794
S7	559	UZ	618	WS	677	YK	736	1C	795
S8	560	U1	619	WT	678	YL	737	1D	796
S9	561	U2	620	WU	679	YM	738	1E	797
TA	562	U3	621	WV	680	YN	739	1F	798
TB	563	U4	622	WW	681	YP	740	1G	799
TC	564	U5	623	WX	682	YQ	741	1H	800
TD	565	U6	624	WY	683	YR	742	1J	801
TE	566	U7	625	WZ	684	YS	743	1K	802
TF	567	U8	626	W1	685	YT	744	1L	803
TG	568	U9	627	W2	686	YU	745	1M	804
TH	569	VA	628	W3	687	YV	746	1N	805
TJ	570	VB	629	W4	688	YW	747	1P	806
TK	571	VC	630	W5	689	YX	748	1Q	807
TL	572	VD	631	W6	690	YY	749	1R	808
TM	573	VE	632	W7	691	YZ	750	1S	809
TN	574	VF	633	W8	692	Y1	751	1T	810
TP	575	VG	634	W9	693	Y2	752	1U	811
TQ	576	VH	635	XA	694	Y3	753	1V	812
TR	577	VJ	636	XB	695	Y4	754	1W	813
TS	578	VK	637	XC	696	Y5	755	1X	814
TT	579	VL	638	XD	697	Y6	756	1Y	815
TU	580	VM	639	XE	698	Y7	757	1Z	816
TV	581	VN	640	XF	699	Y8	758	2A	817
TW	582	VP	641	XG	700	Y9	759	2B	818
TX	583	VQ	642	XH	701	ZA	760	2C	819
TY	584	VR	643	XJ	702	ZB	761	2D	820
TZ	585	VS	644	XK	703	ZC	762	2E	821
T1	586	VT	645	XL	704	ZD	763	2F	822
T2	587	VU	646	XM	705	ZE	764	2G	823
T3	588	VV	647	XN	706	ZF	765	2H	824
T4	589	VW	648	XP	707	ZG	766	2J	825
T5	590	VX	649	XQ	708	ZH	767	2K	826
T6	591	VY	650	XR	709	ZJ	768	2L	827
T7	592	VZ	651	XS	710	ZK	769	2M	828
T8	593	V1	652	XT	711	ZL	770	2N	829
T9	594	V2	653	XU	712	ZM	771	2P	830
UA	595	V3	654	XV	713	ZN	772	2Q	831
UB	596	V4	655	XW	714	ZP	773	2R	832
UC	597	V5	656	XX	715	ZQ	774	2S	833
UD	598	V6	657	XY	716	ZR	775	2T	834
UE	599	V7	658	XZ	717	ZS	776	2U	835

Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter	Code	Parameter
2V	836	5G	895	7T	954				
2W	837	5H	896	7U	955				
2X	838	5J	897	7V	956				
2Y	839	5K	898	7W	957				
2Z	840	5L	899	7X	958				
3A	841	5M	900	7Y	959				
3B	842	5N	901	7Z	960				
3C	843	5P	902	8A	961				
3D	844	5Q	903	8B	962				
3E	845	5R	904	8C	963				
3F	846	5S	905	8D	964				
3G	847	5T	906	8E	965				
3H	848	5U	907	8F	966				
3J	849	5V	908	8G	967				
3K	850	5W	909	8H	968				
3L	851	5X	910	8J	969				
3M	852	5Y	911	8K	970				
3N	853	5Z	912	8L	971				
3P	854	6A	913	8M	972				
3Q	855	6B	914	8N	973				
3R	856	6C	915	8P	974				
3S	857	6D	916	8Q	975				
3T	858	6E	917	8R	976				
3U	859	6F	918	8S	977				
3V	860	6G	919	8T	978				
3W	861	6H	920	8U	979				
3X	862	6J	921	8V	980				
3Y	863	6K	922	8W	981				
3Z	864	6L	923	8X	982				
4A	865	6M	924	8Y	983				
4B	866	6N	925	8Z	984				
4C	867	6P	926	9A	985				
4D	868	6Q	927	9B	986				
4E	869	6R	928	9C	987				
4F	870	6S	929	9D	988				
4G	871	6T	930	9E	989				
4H	872	6U	931	9F	990				
4J	873	6V	932	9G	991				
4K	874	6W	933	9H	992				
4L	875	6X	934	9J	993				
4M	876	6Y	935	9K	994				
4N	877	6Z	936	9L	995				
4P	878	7A	937	9M	996				
4Q	879	7B	938	9N	997				
4R	880	7C	939	9P	998				
4S	881	7D	940	9Q	999				
4T	882	7E	941	9R	1000				
4U	883	7F	942						
4V	884	7G	943						
4W	885	7H	944						
4X	886	7J	945						
4Y	887	7K	946						
4Z	888	7L	947						
5A	889	7M	948						
5B	890	7N	949						
5C	891	7P	950						
5D	892	7Q	951						
5E	893	7R	952						
5F	894	7S	953						

ANNEXURE V

ACKNOWLEDGEMENT

COMMITTEE	
Members	Designation & Organization
Dr. Tata Narasinga Rao	Adjunct Professor, Indian Institute of Technology, Hyderabad
Sh. K C Sharma	Advisor, MVL, Ministry of Road Transport & Highways
Mr. S. A Sundaresan	Prof. of Practice, Indian Institute of Technology, Madras
Prof. Sagar Mitra	Professor, Indian Institute of Technology, Bombay
Sh. Abhijit Mulay	Deputy Director, The Automotive Research Association of India
Sh. Ravi M	Lead-Regulations, Centre of Excellence for Zero Emission Trucking, IIT Madras
Sh. Suresh Babu Muttana	Scientist E/Director, Department of Science & Technology
Prof. Satishchandra Ogale	Director, Research Institute for Sustainable Energy, TCG-CREST
TECHNICAL CORDINATION AND CONTRIBUTION	
Dr. Ravindra Kumar	Sr. General Manager, The Automotive Research Association of India
Mr. Sreekumar U	General Manager, The Automotive Research Association of India
Ms. Bharati V. Mandekar	Deputy Manager, The Automotive Research Association of India
Mr. Mohammad Akramkhan	Research Engineer, The Automotive Research Association of India

ANNEXURE VI

No. RT-11036/137/2025-MVL
Government of India
Ministry of Road Transport & Highways
(MVL Section)
Transport Bhawan, 1, Parliament Street, New Delhi-110001

17th
Dated the September, 2025

OFFICE MEMORANDUM

Subject: Constitution of Committee for "Development of Guidelines for Implementation of Battery Aadhar System in India".

A battery Aadhaar is a digital record that contains data about every battery available in the market, providing details about the manufacturer, localization, material composition, durability, performance, recycling information, etc. India needs such kind of technology/system to localize and enable appropriate traceability and transparency in data so that battery manufacturers, consumers and recyclers may make well informed decisions. There is a definite need to develop the battery Aadhaar in the Indian context and to address requirement of comprehensive digital record of a battery's life cycle, from raw material extraction to manufacturing, usage, and recycling or disposal. A Committee may be constituted for Development of Guidelines for Implementation of Battery Aadhar System in India.

Committee

1. Dr. Tata Narasinga Rao, Adjunct Professor, IIT Hyderabad	Chair
2. Sh. K C Sharma, Advisor, MVL, MoRTH	Member Convenor
3. Mr. S. A Sundaresan, Prof. of Practice, IIT Madras	Member
4. Prof. Sagar Mitra- IIT Bombay	Member
5. Sh. Abhijit Mulay, ARAI, Pune	Member
6. Sh. Saravanan.B, CoEZET	Member
7. Sh. Suresh Babu Muttana, Scientist E/Director, DST	Member
8. Prof. Satishchandra Ogale, Director, RISE, TCG-CREST	Member
9. Representative from Niti Aayog	Member
10. Representative from MHI	Member

2. Terms of Reference (TOR) for the Committee

2.1 To study and benchmark similar international initiatives to understand all provisions related to circularity, supply chain due diligence, Carbon footprint, material composition and its performance/durability.

2.2 To decide boundary conditions and implementation strategy for the applicability of this regulation based on the Indian context.

2.3 To define digital framework, data attributes, parameters and comprehensive traceability considering India battery landscape.

2.4 To align Battery Aadhar System scheme with other government initiatives like ACC PLI, Phase manufacturing program, Battery Waste Management Rules, etc., to position it as a strategic enabler of Atmanirbhar Bharat and Make in India.

2.5 To prepare a consolidated report suggesting guidelines for the Implementation of the Battery Aadhar System in India.

2.6 Further the Committee may co-opt members from relevant stakeholders like battery manufacturers, researchers, recyclers, EV manufacturers, etc. in working committee to formulate a standard/regulation for the Implementation of the Battery Aadhar System in India.

3.0 The Committee is to submit its report within three months from the date of this letter.

2. This issues with the approval of the Competent Authority.



(Sandeep Kumar Singh)

Under Secretary to the Government of India

Tele/Fax: 23739074

e-mail: sandeepkr.singh@nic.in

To,

All Committee members

Copy to:

1. PPS to AS (MVL, T & RS)

2. PPS to CE(MVL)