



# **Data Maturity Assessment of the Energy Administrative Data**

**Department of Energy, Ministry of Energy and Natural Resources**

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**National Statistics Bureau**

**2025**

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# **1 Introduction**

## **1.1 Background**

Bhutan's data ecosystem plays a pivotal role in enhancing governance, planning, and the delivery of citizen services. The Department of Energy (DoE) under the Ministry of Energy and Natural Resources (MoENR) manages key energy data, including electricity generation and demand, hydropower disbursement profiles, export/import data, and transmission/distribution information sourced from Druk Green Power Corporation Ltd, Bhutan Power Corporation Ltd, Electricity Regulatory Authority, and Department of Trade. These datasets are essential not only for maintaining accurate energy records but also for informing policy formulation and supporting national priorities.

Recognizing the strategic importance of data, the National Data Governance Framework (NDGF), 2025 mandates periodic Data Maturity Assessments (DMA) to strengthen institutional capacities and ensure a coordinated national approach to data management. According to the 2024 Baseline Report, about 41% of agencies still lack structured data coordination (GovTech Agency & UN DESA, 2024), underscoring the need for standardized assessment and capacity development across the public sector.

## **1.2 Purpose of the Assessment**

This Data Maturity Assessment evaluates the maturity of DoE's energy data management practices using the Data Maturity Assessment Framework (DMAF) developed by the National Statistics Bureau (NSB). The assessment provides a structured analysis of the department's performance across four key dimensions: Institutional Arrangements, Data Collection and Processing, Data Quality and Metadata, and Data Sharing and Dissemination.

The primary aim is to establish a baseline maturity index for DoE, identify key strengths and improvement areas across the data lifecycle, and recommend actions that align with the Bhutan Statistical Quality Assurance Framework (BSQAF), 2020 and NDGF 2025. Through this process, DoE can better plan strategic interventions, enhance interoperability, and foster a culture of evidence-based decision-making.

### **1.3 Scope**

The scope of this assessment is confined to electricity generation/demand, hydropower disbursement, export/import, and transmission/distribution data maintained by DoE. The data are administrative in nature, with publications including the Power Information System Report, Supply and Demand Forecast Report, Energy Data Directory, and National Transmission Grid Master Plan. The assessment employs the DMAF, which consists of four dimensions and twelve categories, each rated on a 0–4 maturity scale ranging from Initial to Optimized. The evaluation is based on a self-assessment approach, supported by justifications for each score.

## **2 Methodology**

### **2.1 Framework Overview**

The assessment of energy data maturity was conducted using the Bhutan DMAF, developed by NSB. This framework is based on globally recognized models, including the Capability Maturity Model Integration (CMMI), Data Management Maturity (DMM), and DAMA-DMBOK (Data Management Body of Knowledge). It evaluates an organization's data practices across the entire data lifecycle and consists of four dimensions and twelve categories:

- Institutional Arrangements – Governance, leadership, capacity, collaboration, and compliance/ethics.
- Data Collection and Processing – Data mandate, standardization, digitization, integration, processing, and storage.
- Data Quality and Metadata – Quality management, validation, cleansing, metadata management, and reference data.
- Data Sharing and Dissemination – Data access, dissemination, interoperability, user engagement, and privacy.

Each category is scored on a 0–4 maturity scale:

- Initial (0): No formal processes or documentation.
- Developing (1): Practices exist but are ad hoc and inconsistent.
- Defined (2): Processes are documented but applied inconsistently.
- Managed (3): Processes are systematically applied with monitoring mechanisms.
- Optimized (4): Continuous improvement is embedded into processes and practices.

This framework provides a structured, repeatable, and standardized method to assess data maturity and identify areas for improvement across the energy data lifecycle.

## 2.2 Scoring and Analysis

Each of the twelve categories was evaluated using a 0–4 scale, where 0 represents the absence of formal processes and 4 denotes optimized practices with continuous improvement. Narrative justifications were provided for each score to explain the rationale and evidence supporting the rating. All dimensions and categories were assigned equal weights in calculating the overall maturity index, ensuring equal importance is given to each category. Dimension indices were computed as the average of their respective category scores, while the overall maturity index was derived as the average of all four dimension indices. This approach provides a consistent and interpretable measure of data maturity, maintaining clarity in reporting strengths, gaps, and opportunities for improvement across the energy data lifecycle.

## 3 Findings

### 3.1 Summary Findings

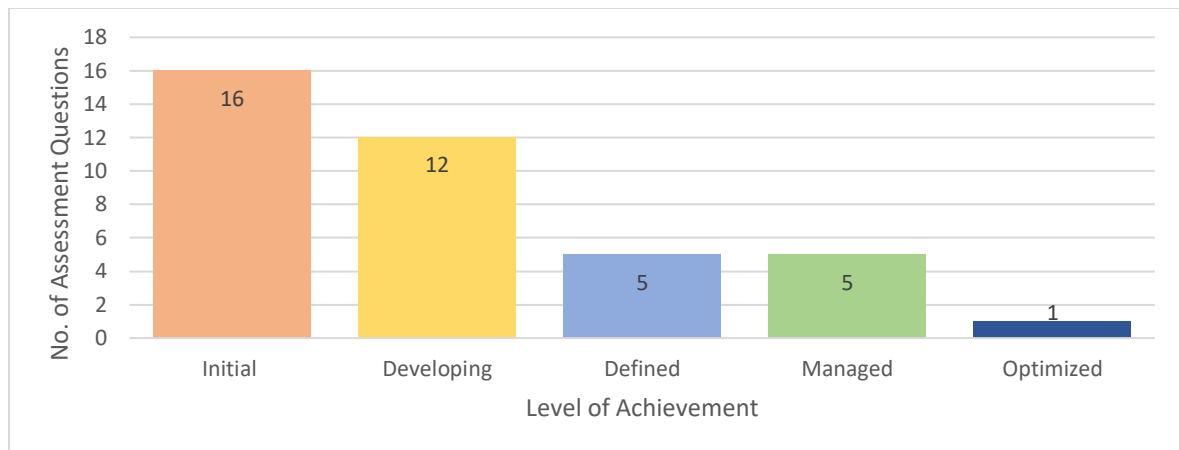
The Data Maturity Assessment for the DoE highlights an overall maturity index of 1, which can be leveled as “Developing”. As shown in the Figure 1, the DoE demonstrates Initial level of data maturity across four dimensions.

Figure 1: Data Maturity Profile



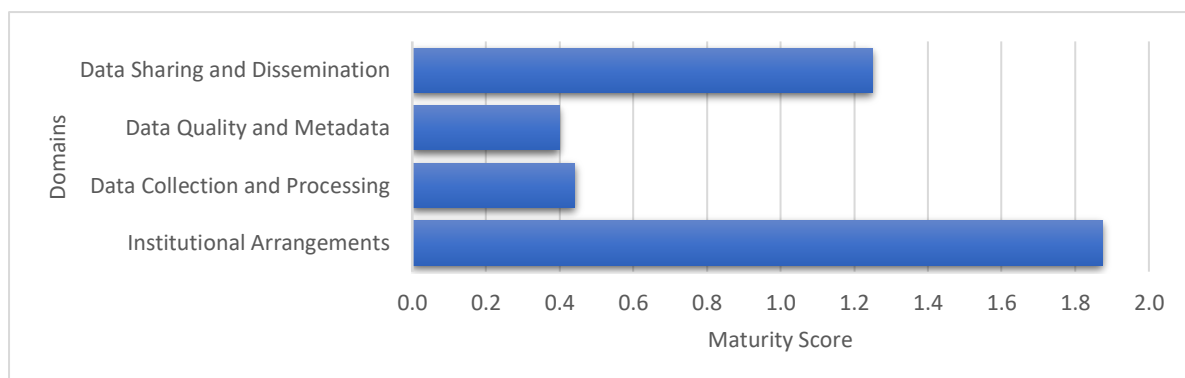
Figure 2 shows the number of assessment questions by the achievement level. Of the 39 assessment questions, 16 were responded as Initial, 12 Developing, 5 Defined, 5 Managed and 1 Optimized, indicating developing level of data maturity. This indicates that there are notable gaps in data collection and processing as most of the assessment questions are rated maturity level developing and below.

Figure 2: Number of Achievement by of Level Achievement Across Dimensions



The Data Maturity Profile reveals an uneven distribution of progress across the four assessed dimensions. As shown in Figure 3, Institutional Arrangements achieves the highest score (1.9), reflecting moderately defined governance and strong collaboration mechanisms. Data Sharing and Dissemination follows with a score of 1.3, indicating limited interoperability and user engagement. Data Quality and Metadata (0.4) and Data Collection and Processing (0.44) exhibit the lowest maturity, highlighting significant gaps in data accuracy, metadata management, digitization, and integration.

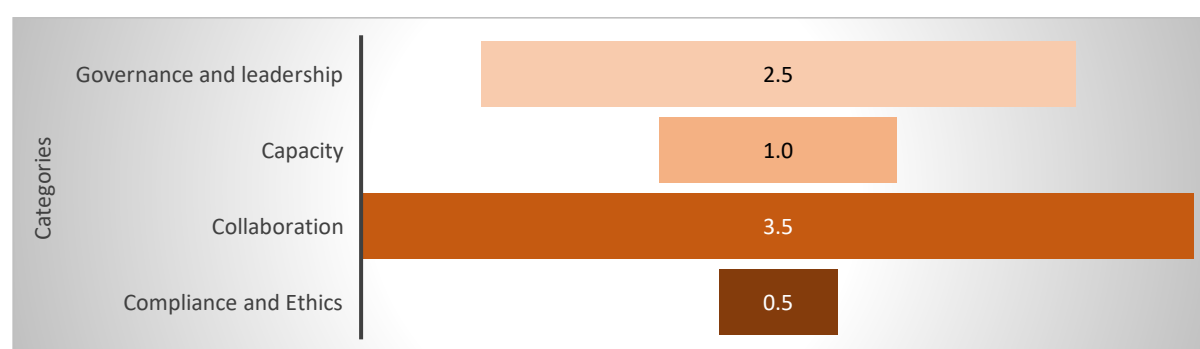
Figure 3: Achievement Across Dimensions



The following section provides a detailed analysis of each dimension, highlighting key strengths and areas for improvement.

**Institutional Arrangements (Index: 1.9 – Defined):** The DoE demonstrates moderate maturity in institutional arrangements, with strong performance in governance and leadership, and collaboration. As illustrated in Figure 4, the department scored 2.5 in Governance and Leadership, 1.0 in Capacity, 3.5 in Collaboration, and 0.5 in Compliance and Ethics. The overall maturity index, calculated as the average of these four categories, stands at 1.9, corresponding to the “Defined” level of maturity. The DoE has a moderately defined governance framework and leadership roles for energy data management. Capacity is developing, without designated staff and limited training. Collaboration is managed through structured coordination among divisions, but external sharing is limited.

Figure 4: Maturity Score by Category under Institutional Arrangements



**Data Collection and Processing (Index: 0.4 – Initial):** The DoE shows initial level of maturity in data collection and processing, with limited strengths in standardization but gaps in integration. As illustrated in Figure 5, the department scored 0.7 in Data Collection and Standardization, 0.5 in Digitization, 0 in Data Integration, and 0.6 in Processing and Storage. The overall maturity index, calculated as the average of these four categories, stands at 0.4, corresponding to the “Initial” level of maturity. The Department is developing National Energy Information System (NEIS) in collaboration with GovTech, which would provide digitized workflows for trade data collection, with standard protocols ensuring consistency. Integration is initial but limited to internal divisions, and storage includes ad hoc backups for historical data.

Figure 5: Maturity Score by Category under Data Collection and Processing

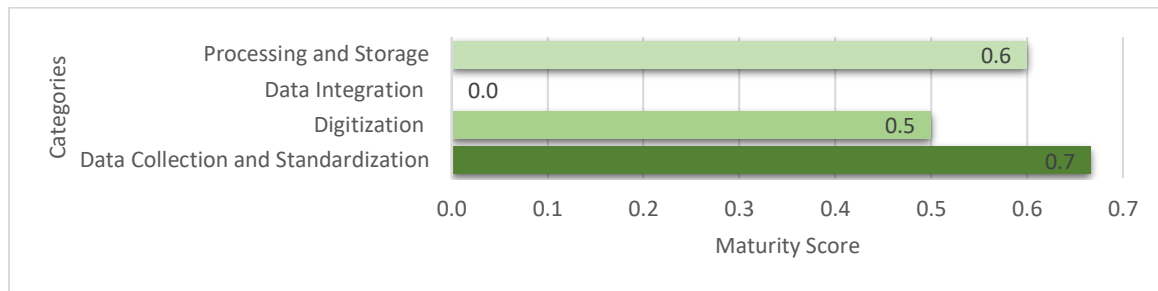
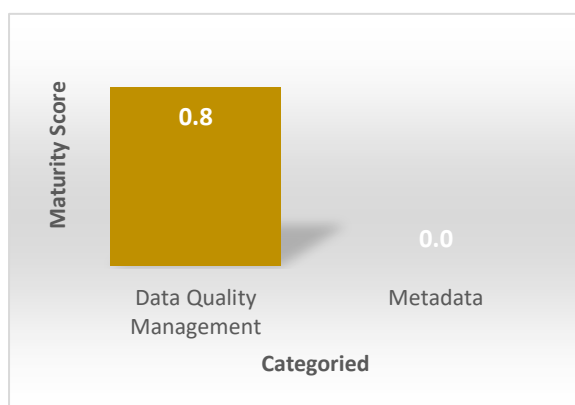


Figure 6: Maturity Score by Category under Data Quality and Metadata

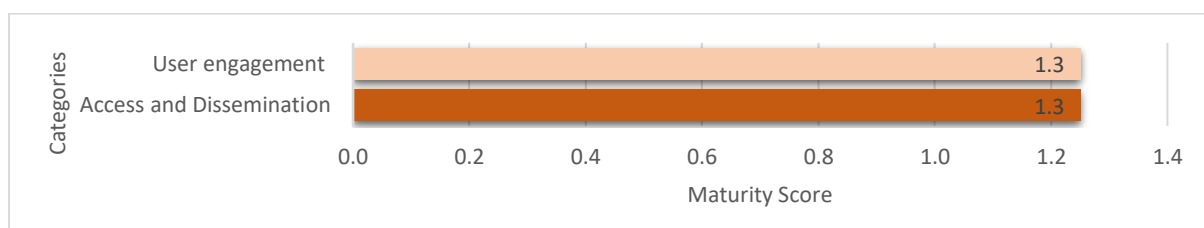


**Data Quality and Metadata (Index: 0.4 – Initial):** The DoE demonstrates low performance in data quality and metadata management, supported by ad hoc monitoring but limited documentation. With the National Energy Information System in place, the department is expecting to solve most of the data quality management. As shown in Figure

6, the department scored 0.8 in Data Quality Management and 0 in Metadata, resulting in an overall maturity index of 0.4 for this dimension. Metadata and reference datasets are managed with limited efficacy, with limited documentation and sharing.

**Data Sharing and Dissemination (Index: 1.3 – Developing):** The department shows developing level of maturity in this dimension, reflecting low progress in both access and user engagement. As illustrated in Figure 7, the department scored 1.3 in Access and Dissemination and 1.3 in User Engagement, resulting in an overall maturity index of 1.3. Current data sharing is developing for select stakeholders, with reports published on DRC/MoF website. User engagement is developing, with ad hoc feedback mechanism.

Figure 7: Maturity Score by Category under Data Sharing and Dissemination



## 4 Recommendations

### 4.1 Category Specific Recommendations

This Recommendation Matrix summarizes the key priority actions based on the DoE's energy data Maturity Assessment. It highlights the current maturity scores, target achievements, and recommended actions for short- and medium-term implementation.

| Dimension / Category         | Current Score | Target Score | Key Recommendations / Actions                                                                                                                                                                       | Timeline (Priority)  |
|------------------------------|---------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Governance & Leadership      | 2.5           | 3            | <ul style="list-style-type: none"><li>Periodically review and update SoPs, data policies, and accountability mechanisms in line with NDGF</li></ul>                                                 | Short-Term (Ongoing) |
| Capacity                     | 1.0           | 3+           | <ul style="list-style-type: none"><li>Strengthen technical capacity through regular training on analytics, integration, and reporting</li><li>Create division-level data capacity/skills.</li></ul> | 2026–2027            |
| Collaboration                | 3.5           | 4.0          | <ul style="list-style-type: none"><li>Expand API-based data integration agreements with other agencies, particularly while developing National Energy Information System (NEIS).</li></ul>          | 2026-2027            |
| Compliance & Ethics          | 0.5           | 3+           | <ul style="list-style-type: none"><li>Conduct annual privacy and ethics refresher training.</li></ul>                                                                                               | 2026-2027            |
| Collection & Standardization | 0.7           | 3            | <ul style="list-style-type: none"><li>Standardize definitions and data update protocols to maintain consistency.</li></ul>                                                                          | 2026-2027            |
| Digitization                 | 0.5           | 3            | <ul style="list-style-type: none"><li>Continue system optimization by introducing automated error-flagging for real-time anomaly detection, particularly while developing EIS.</li></ul>            | Ongoing              |
| Data Integration             | 0             | 3            | <ul style="list-style-type: none"><li>Explore secure APIs</li><li>Develop a data integration roadmap in collaboration with GovTech.</li></ul>                                                       | 2026-2028            |

|                           |      |          |                                                                                                                                                                                                    |           |
|---------------------------|------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Processing & Storage      | 0.6  | 3.5      | <ul style="list-style-type: none"> <li>• Develop SoPs for data processing, analysis and visualization.</li> <li>• Implement archiving and retention policy</li> </ul>                              | 2026-2027 |
| Data Quality Management   | 0.8  | 4.0      | <ul style="list-style-type: none"> <li>• Expand automated validations</li> <li>• Create real-time data quality monitoring dashboards and institutionalize periodic reviews.</li> </ul>             | 2026-2027 |
| Metadata & Reference Data | 0    | Maintain | <ul style="list-style-type: none"> <li>• Continue maintaining and improving a comprehensive metadata</li> </ul>                                                                                    | Ongoing   |
| Access & Dissemination    | 1.25 | 3.0      | <ul style="list-style-type: none"> <li>• Review and develop dashboard to enhance dissemination</li> <li>• Continue to provide data access to users with enhanced data sharing mechanism</li> </ul> | Ongoing   |
| User Engagement           | 1.25 | 3        | <ul style="list-style-type: none"> <li>• Establish user feedback channels</li> <li>• Organize inter-agency engagement sessions.</li> </ul>                                                         | 2026-2027 |
| Cross-Cutting             | 1    | 3        | <ul style="list-style-type: none"> <li>• Align actions with BSQAF 2020 and NDGF 2025</li> <li>• Conduct periodic reassessments using the DMA tool.</li> </ul>                                      | 2026–2027 |

## 4.2 General Recommendations

To accelerate progress based on the assessment (<3), DoE should prioritize a set of strategic initiatives designed to strengthen data governance, interoperability, quality, and user engagement:

1. **Develop dataset sensitivity classification and formalize data dissemination protocols:** Implement a structured framework to categorize datasets based on sensitivity, confidentiality, and regulatory requirements. This will guide secure access, sharing, and usage of data, ensuring compliance with privacy standards and reducing the risk of unauthorized disclosures.

2. **Expand API-based interoperability with key agencies through secure integration agreements:** Deliver secure, standardized APIs to enable seamless data exchange with partner institutions, particularly while developing National Energy Information System. Formal integration agreements will clarify roles, responsibilities, and security protocols, improving timeliness and accuracy of shared information while supporting cross-agency analytics and reporting.
3. **Establish data quality monitoring dashboards and real-time validation systems:** Deploy automated dashboards and validation tools to continuously monitor the completeness, consistency, and accuracy of datasets. As the Department is in the process of developing a system, incorporating such process/protocol will ensure data quality and information dissemination. Real-time alerts and analytics will allow for rapid identification and correction of data issues, enhancing trust and reliability of the information.
4. **Conduct targeted capacity-building programs for technical and operational staff on data analytics, governance, and ethics:** Deliver training programs tailored to strengthen skills in data management, analytical techniques, ethical handling of sensitive information, and governance best practices. Investing in staff capacity will build institutional expertise and sustain long-term improvements in data maturity.

## 5 Conclusion

The Data Maturity Assessment of the Department of Energy (DoE) reveals an overall maturity index of 1, categorized as "Developing," indicating significant gaps in data management practices across the four assessed dimensions. Despite some strengths, such as managed collaboration (3.5) and systematic encouragement of data use in decision-making, the DoE's data ecosystem is predominantly characterized by ad hoc and reactive practices, with 16 of 39 questions rated as Initial and 12 as Developing. Institutional Arrangements (1.9, Defined) stands out but with limited progress. However, Data Collection and Processing (0.4, Initial), Data Quality and Metadata (0.4, Initial), and Data Sharing and Dissemination (1.3, Developing) exhibit low maturity, with critical weaknesses in digitization, integration, metadata management, and dissemination mechanisms.

The assessment highlights substantial opportunities for improvement, particularly in standardizing data collection, enhancing digitization, and establishing metadata practices. The absence of dashboards, limited metadata sharing, and lack of data integration restrict

interoperability and the DoE's ability to support national priorities. To achieve a Managed maturity level (index  $\geq 3.0$ ) by 2027, the DoE must prioritize capacity building, API-based interoperability, and real-time quality monitoring, as outlined in the recommendation matrix. The department has the opportunity in these area since the National Energy Information System is in the developing phase. Aligning with BSQAF 2020 and NDGF 2025, these actions will enhance the reliability, accessibility, and impact of energy data for policy and operational purposes, fostering evidence-based decision-making and a more integrated national data ecosystem.

## 6 References

- GovTech Agency & United Nations Department of Economic and Social Affairs. (2024). *Bhutan National Data Governance Baseline Report 2024* [PDF]. <https://tech.gov.bt/wp-content/uploads/2025/03/Bhutan-National-Data-Governance-Baseline-Report-2024-FINAL.pdf>
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## 7 Annexures

### Annexure I: Key of Justification provided by the Department of Civil Registration and Census

| SL No | Category                       | Justification                                                                                                                                                                      |
|-------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Governance and leadership      | No data governance policy/framework exist, data is collected as an when required<br>Each focal person maintains data of the respective departments                                 |
| 2     | Capacity                       | No designated skilled professional staff with limited capacity building opportunity                                                                                                |
| 3     | Collaboration                  | Structured coordination among different division under the department but lack with external agency                                                                                |
| 4     | Compliance and Ethics          | No standards and security exist. Informal and ad hoc process for consistency is maintained.                                                                                        |
| 5     | Collection and Standardization | No standard exists, its maintained on ad hoc basis                                                                                                                                 |
| 6     | Digitization                   | Data collection is done through Google sheets. However, the department is in the process of developing the National Energy Information System (NEIS) in collaboration with GovTech |
| 7     | Data Integration               | No system exists but the NEIS is under development with GovTech which will enable digitization, integration, collection, automation and to convert to machine readable datasets.   |
| 8     | Processing and Storage         | No system exists but NEIS is expected to improve the system. Ad hoc backup are performed without formal processes and, historical data is maintained but inconsistently.           |
| 9     | Data Quality Management        | No quality management structure exists and monitoring and correction are done on ad hoc basis to ensure timeliness/completeness. No automation for verification processes.         |
| 10    | Metadata                       | No metadata is captured for datasets or master/reference data domains are documented.                                                                                              |
| 11    | Access and Dissemination       | Both external and internal reports are published regularly but are shared to selected agencies.<br>Collaboration with agencies are done in ad hoc basis.                           |
| 12    | User engagement                | Collaboration with agencies are done on need basis. Data use is encouraged and user feedback is collected on ad hoc basis.                                                         |

## Annexure I: Achievement Level by Number of Questionnaires in Each Category

