Data Availability and Analysis

Barrier Description: Data availability refers to the need to have spatiotemporal data and/or device-specific data on building energy use available to end users, digital applications, and service providers. Some datasets are low quality due to a lack of robustness, missing entries, or poorly calibrated sensors (accuracy issues). Data are not intrinsically valuable without analysis that informs and enables program implementation, from automated load shifting to behavioral change.

Phase 1: *Data acquisition, infrastructure, and pilot project implementation*		**Phase 2:** *Adoption through policy and augmentation*		**Phase 3:** *Quality assessment and optimization*	
Challenges	**Practices**	**Challenges**	**Practices**	**Challenges**	**Practices**
Data collection infrastructure is underdeveloped: Smart metering networks must have the capacity to collect large sums of data at high resolution across many devices in a secure and interoperable manner. In addition, behind-the-meter data is also challenging to collect. *[For information on smart meters, see Section 3.1.2 of the report.]*	**Subsidize installation of smart metering networks to incentivize participation.** For example, Brazil has implemented several subsidized pilot projects aimed at integrating smart metering systems in buildings [1]. **Develop secure information exchange technologies**. For example, Germany's Smart Meter Gateway (SMGW) program has successfully secured data sharing among devices [2] [3].	**End-user data sharing may not exist:** Encouraging users to share energy consumption data can help drive policy and contribute to greater understanding of the energy system.	**Introduce data release mandates** and **data sharing incentives.** Denmark has implemented data release mandates that have proven effective for extensive data collection across the building energy system [7]. Additional incentives for building renovation include tax deduction schemes for the inclusion of new energy-saving smart devices [8]. **Establish public-private partnerships** around data sharing that consider behind-the-meter data. These partnerships can involve **building owners** and **tenants** [9] [10].	**Current datasets may be too broad or lack the resolution needed for some analysis:** Improvement of data granularity is key to improving the ability for new policy, technology, and research domains.	**Deploy new technologies, incentives, and comprehensive certification schemes** that can help improve the granularity of energy consumption monitoring.
Data analysis methods are not standardized: Methods must be developed to analyze large quantities of data and to enact the appropriate analysis.	**Support machine learning and advanced control algorithms R&D** to ensure data can be analyzed to accurately inform how consumers use energy [4]. **Develop energy certification schemes** to ensure there are standardized methods for implementing policy based on energy consumption data [5].	**Consumer awareness is low:** Consumers may not know how to use and interpret their energy consumption data in accordance with existing policies and practices.	**Carry out information awareness campaigns** to help improve the accessibility of energy consumption data and ensure consumers know how to adequately make dynamic decisions on energy use based on their consumption data [8].	**Necessary data for building energy efficiency policy is unavailable or kept private:** Data must be accessible to adequately inform large-scale policy.	**Improve privacy and cybersecurity measures** to ensure data can be transmitted and used at large scale to inform new policy decisions.
Computational infrastructure is insufficient: Infrastructure to store and transmit large amounts of data in a way that is accessible to **utilities**, **consumers**, and **policymakers** must exist.	**Develop databases that host analytics of building energy usage from a broad range of devices** to make building energy use information more accessible and meaningful [6].	**Cooperation between public and private sector is lacking:** These partnerships are required to ensure that policy is backed by technology.	**Incentivize industry-led participation in the development of new energy data management technologies** to help improve technological development and ensure that policy and technology are aligned [11].		

Key Objectives

- Develop infrastructure capable of accommodating many devices across the energy system and delivering granular data in real time.
- Equip consumers with the data and resources to make decisions regarding their energy consumption.
- Incentivize government-industry partnerships to lead improvements in data availability, quality, and analysis.

Description of Phases

Phase 1: *Data acquisition, infrastructure, and pilot project implementation*

Government and industry must collaborate to develop infrastructure capable of collecting, analyzing, certifying, and distributing data from a wide range of devices across the energy system. Computing power is also needed to process large quantities of information and make it actionable to consumers and policymakers.

Phase 2: *Adoption through policy and augmentation*

Policy mandates must support meaningful data collection and analysis procedures. Data-release mandates are vital in ensuring that relevant data can be collected and distributed to all parties who need access to it.

Phase 3: *Quality assessment and optimization*

Greater deployment of energy use monitoring devices will improve the granularity and quality of data. Additionally, new energy use certification schemes can ensure data is being applied in a useful manner.

Examples cited in the report and other sources:

[1] Brazil: Law 9991 of 2000 (Report sections 5.2, C.2)
[2] Germany: Smart Meter Gateways (Report sections 5.7, C.4)
[3] Australia: NatHERS (Report section: 5.0)
[4] Australia: i-Hub (Report sections 5.1, C.1)
[5] Germany: AI Strategy of the Federal Government (Report section 5.7)
[6] Denmark: Energy Performance Certificate database (Report sections 5.5., C.3)
[7] Denmark: Releasing Electricity Distribution Data (Report sections 5.5., C.3)
[8] Denmark: Implementation of the "Energy Performance of Buildings Directive" in Denmark, https://epbd-ca.eu/ca-outcomes/outcomes-2015-2018/book-2018/countries/denmark
[9] United States: Smart Energy Analytics Campaign, https://betterbuildingssolutioncenter.energy.gov/alliance/technology-campaigns/smart-energy-analytics-campaign
[10] New York State Energy Research and Development Authority (NYSERDA) Real Time Energy Management, https://www.nyserda.ny.gov/All-Programs/real-time-energy-management
[11] United States: Green Button Initiative (Report sections 5.9, C.6)