**Database Design**

The design involves normalization to avoid redundancy while ensuring scalability and efficiency.

Tables and Fields

1. Sites: Stores information about each site.

* Id (Primary Key): Auto-incremented integer.
* site\_id (Unique): Text identifier for the site (e.g., Site\_A, Site\_B).

Script:

CREATE TABLE IF NOT EXISTS Sites (

id INTEGER PRIMARY KEY AUTOINCREMENT,

site\_id TEXT UNIQUE NOT NULL

);

1. Meters: Stores information about each meter.

* id (Primary Key): Auto-incremented integer.
* meter\_id (Unique): Text identifier for the meter (e.g., Site\_A\_Meter\_1, Site\_A\_Meter\_2).
* site\_id (Foreign Key): References the site meter belongs to.

Script:

CREATE TABLE IF NOT EXISTS Meters (

id INTEGER PRIMARY KEY AUTOINCREMENT,

meter\_id TEXT UNIQUE NOT NULL,

site\_id INTEGER NOT NULL,

FOREIGN KEY (site\_id) REFERENCES Sites (id)

);

1. Sensors: Store information about sensors.

* Sensor\_Id (Primary Key): Auto-incremented integer.
* Sensor\_name: Text(e.g., temperature, power\_consumption, humidity).

Script:

CREATE TABLE IF NOT EXISTS Sensors (

 sensor\_id INTEGER PRIMARY KEY AUTOINCREMENT,

  sensor\_name TEXT UNIQUE NOT NULL

);

1. SensorReadings: Store the reading from the sensors.

* reading\_id (Primary Key): Auto-incremented integer.
* Timestamp: Datetime when the reading was recorded.
* sensor\_value: Float value recorded by the sensor.
* Status: Text(e.g., active, inactive, error).
* sensor\_id (Foreign Key): References the sensor.
* meter\_id (Foreign Key): References the meter.

Script:

CREATE TABLE IF NOT EXISTS SensorReadings (

reading\_id INTEGER PRIMARY KEY AUTOINCREMENT,

timestamp DATETIME NOT NULL,

sensor\_value REAL NOT NULL,

sensor\_id INTEGER NOT NULL,

meter\_id INTEGER NOT NULL,

site\_id TEXT NOT NULL,

status TEXT CHECK(status IN ('active', 'inactive', 'error')),

FOREIGN KEY (sensor\_id) REFERENCES Sensors (sensor\_id),

FOREIGN KEY (meter\_id) REFERENCES Meters (id),

FOREIGN KEY (site\_id) REFERENCES Sites(id)

);

ERD Diagram

