Dynamic KPI & Product Versioning Guide

For the Replit Development Agent

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1. Objective

This document provides a detailed technical guide for the Replit Agent to build a **Dynamic, Time-Series KPI Tracking** system. This involves three core components: **1) a module for monthly facility data entry**, **2) a product versioning system**, and **3) an enhanced KPI dashboard** to visualize historical performance and the impact of initiatives.

2. Part 1: Backend & Database Enhancements

2.1. Database Schema Modifications

- **New Table: monthly_facility_data**
    - This table will store the user's operational data on a monthly basis.

Column Name	Data Type	Constraints	Description
id	UUID	PRIMARY KEY	Unique ID for the monthly record.
company_id	UUID	FOREIGN KEY (companies.id)	Links to the company.
month	DATE	NOT NULL	The first day of the month this data applies to.
electricity_kwh	NUMERIC	NULLABLE	
natural_gas_m3	NUMERIC	NULLABLE	
water_m3	NUMERIC	NULLABLE	
production_volume	NUMERIC	NULLABLE	In the company's standard unit.
utility_bill_url	VARCHAR(255)	NULLABLE	Link to the uploaded verification document.

- **New Table: product_versions**
    - This table will store the different versions of a user's product. The existing products table will now act as a parent container.

Column Name	Data Type	Constraints	Description
id	UUID	PRIMARY KEY	Unique ID for this specific version.
product_id	UUID	FOREIGN KEY (products.id)	Links to the parent product.
version_number	INTEGER	NOT NULL	e.g., 1, 2, 3.
effective_date	DATE	NOT NULL	The date from which this version is considered active.
lca_questionnaire_id	UUID	FOREIGN KEY (lca_questionnaires.id)	Links to the

specific LCA data for this version. |
- **New Table: kpi_snapshots**
  - This table will store the calculated value of each KPI at the end of every month.

Column Name	Data Type	Constraints	Description
id	UUID	PRIMARY KEY	Unique ID for the snapshot.
company_id	UUID	FOREIGN KEY (companies.id)	Links to the company.
kpi_definition_id	UUID	FOREIGN KEY (kpi_definitions.id)	Links to the KPI being measured.
snapshot_date	DATE	NOT NULL	The date of the snapshot (e.g., end of the month).
value	NUMERIC	NOT NULL	The calculated value of the KPI at that time.

2.2. New Backend Services & API Endpoints

- **New Service: TimeSeriesEngine**
  - This service will contain the new "date-aware" calculation logic. When asked for a footprint for a specific month, it will use the monthly_facility_data for that month and query the product_versions table to find the correct product version based on the effective_date.
- **New Scheduled Task (Cron Job):**
  - A monthly task that runs on the 1st of every month. It will calculate the value for all active KPIs for all companies for the previous month and save them to the kpi_snapshots table.
- **New API Endpoints:**
  - POST /api/company/monthly-data: To submit the monthly facility data form.
  - POST /api/products/<product_id>/new-version: To create a new product version.
  - GET /api/kpis/<kpi_id>/history: To get the time-series data from kpi_snapshots for a specific KPI.

3. Part 2: Frontend Implementation

3.1. Monthly Facility Data Entry Module

- **Location:** A new sub-section in the 'Company Data' module (/app/company) called "Monthly Performance Data."
- **UI:** A simple interface where the user can select a month and year, then fill in a form with the fields from the monthly_facility_data table. An "Upload Bill" button will be included.

3.2. Product Versioning & Change Tracking

- **Location:** The main 'Products' page.
- **UI Change:** The "Edit" button for each product will be replaced with a **"Create New Version"** button.
- **Workflow:**
  1. User clicks "Create New Version".

2. A modal appears, confirming the action and asking for an **"Effective Date"** for the new version.
3. The system duplicates the product's most recent LCA questionnaire, creating a "v2".
4. The user is taken to the LCA questionnaire for this new version, where they can edit the specific details that have changed (e.g., update the bottle weight in the packaging tab).

3.3. The Enhanced KPI Dashboard

- **Location:** The KPI & Goal-Setting Dashboard (/app/kpis).
- **UI Change:** Each KpiProgressCard component must now be a clickable element.
- **The Trend Analysis View (Modal or New Page):**
  - **Trigger:** Clicking on a KpiProgressCard.
  - **UI:** A large view displaying a **line graph** (using Recharts).
  - **Logic:** The graph will be populated with the historical data from the GET /api/kpis/<kpi_id>/history endpoint, showing the KPI's value over the last 12-24 months.
- **Initiative Overlay:**
  - **Logic:** The component will also fetch the start dates of any initiatives linked to this KPI goal.
  - **UI:** The graph will display a vertical line or an icon annotation at the point on the timeline where each initiative began, with the initiative's name in a tooltip. This will create a powerful visual link between actions and results.