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Data Types:

Household

Attribute	Data type	Nullable
email	char	Not Null
postcode	int	Not Null
home_type	char	Not Null
square_footage	int	Not Null
public_utilities	char	Not Null
tem_setting_cooling(F)	int	Not Null
tem_setting_heating(F)	int	Not Null

Postal code

Attribute	Data type	Nullable
postal_code	int	Not Null
city	char	Not Null
state	char	Not Null
latitude	float	Not Null
longitude	float	Not Null

Appliance

Attribute	Data type	Nullable
manufacturer	char	Not Null
btu_rating	int	Not Null
model_name	char	Null
Appliance_type	char	Not Null

Power Generation

Attribute	Data type	Nullable
Generation_type	char	Not Null
Avg_monthly_kwh	int	Not Null

Water Heater

Attribute	Data type	Nullable
capacity	float	Not Null
current_temp_setting (F)	int	Null
energy_source	char	Not Null

Air conditioner

Attribute	Data type	Nullable
Energy_efficiency_ratio	float	Not Null

Heater

Attribute	Data type	Nullable
Heater_energy_source	char	Not Null

Heat Pump

Attribute	Data type	Nullable
Seasonal_energy_efficiency	float	Not Null
Heating_seasonal_performance	float	Not Null

Business Logical Constraints:

Enter Household Information

- There is no option to return to a previous page while inputting household information.
- There is no option to edit data that was previously entered while inputting household information.
- A household that does not have any utilities is considered “off the grid”.
- The flow of household information input should be Household Info, Appliances, Power Generation, and Done.
- In the Appliances form, the appliance type should be chosen first which populates the form with information specific for that type.
- The user has the ability to add and delete appliances from the Appliances form.
- If an appliance is deleted, then the Order Number assigned to it cannot be reused.
- The user cannot go to the next page until there is at least one appliance.
- If a household is not “off the grid” then the user has the option to skip the Power Generation form, otherwise, it is mandatory, and no option is given to the user.
- If the household is off the grid, the user cannot go to the next page until there is at least one power generation type.
- The user has the ability to add and delete power generation types from the Power Generation form.
- If a power generation type is deleted, then the Order Number assigned to it cannot be reused.

Reports

- Missing or incorrect parameters will prevent a report from executing and will prompt an error message.
- Tables must have header rows.
- If a report does not return any results, then a message should be displayed instead of an empty page.
- NULL values should be treated as empty strings in the reports.
- Ascending is the default sort order in reports.
- Rounding numbers should follow the “half rounds up” method.

Main menu

Task Decomposition

Lock Types: read-only lookup for a Regular User

Number of Locks: multiple

Enabling Conditions: None

Frequency: Around 200 per day

Consistency (ACID): is not critical

Subtasks: Mother task is not required to coordinate subtasks. Order is not necessary.

A blue oval button with the text "Main Menu" inside.

Abstract Code

- Upon:
 - Click **Enter household info** link- Jump to the Household information form.
 - Click **View report/query data** link- Jump to the View report/query data form.

Enter household information

Task Decomposition

Lock Types: Write; need read locks to verify email and postal code

Number of Locks: Multiple

Enabling Conditions: Enabled by user's click on main menu

Frequency: same frequency as Main menu

Consistency (ACID): not critical, even if reports are being created while user inputs relevant info

Subtasks: No subtasks. Only dealing with one schema.

A blue oval button with the text "Enter Household" inside.

Abstract Code

- Use clicks "**Enter Household Information**" on Main Menu
- View Household Info form. Populate home type drop down and display checked boxes for *thermostat heating* and *cooling* as well as the unchecked boxes for *public utility* options.
- Verify *email* input is not already in DB. If email is already in DB display appropriate warning message.

- Validate postal code. If *postal code* is invalid, then display appropriate warning message.
- *Thermostat setting* for heating and cooling in Fahrenheit are required unless the checked boxes indicate otherwise.
- If no *public utility* checkboxes are checked then indicate the user is “off-the-grid”
- If all information is input appropriately by the user and the “**Next**” button is clicked, then the data is saved to the database and the user is taken to the **Appliances** Form.
- If any information is invalid an error message is given and the user remains on the same page.

Add Air Handler

Task Decomposition



Add Air Handler

Lock Types: write

Number of Locks: multiple, several different schema constructs are needed.

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: All tasks must be done but can be done in parallel. Mother task is required to coordinate subtasks. Order is not necessary.

Abstract Code

- User clicked on **Next** button from **Enter household info** form:
- Run the **Enter Appliance info** task: select *appliance type*, *manufacturer*, enter *Model name*.
- *Air handler* is selected, jump to info about *Energy efficiency ratio*, *heating/cooling method*, *Energy source* are entered.
- Enter *manufacturers*, invalid input returns error message.
- upon:
 - Click **Add** button: save data into database and jump to **Application List** form.

Add Water Heater

Task Decomposition

Lock Types: write

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: All tasks must be done but can be done in parallel. Mother task is required to coordinate subtasks. Order is not necessary.

Add Water Heater

Abstract Code

- User clicked on **Next** button from Enter household info form:
- Run the **Enter Appliance info** task: select *appliance type*, *manufacturer*, enter *Model name*;
- If a *water heater* is selected, jump to info about *Energy source*, *capacity(gallons)*. *BTU rating* and *temperatures* are entered.
- Enter *manufacturers*, invalid input returns error message.
- upon:
 - Click **Add** button: save data into database and jump to Application List form.

View/Delete Appliance

Task Decomposition

Lock Types: write

Number of Locks: multiple

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

View/Delete Appliance

Abstract Code

- User clicked on **Add** button from Add appliance form:
- Run **view/delete appliance list** task.
- display list of added appliances.
- upon:

- Click **delete** button- delete exist appliance info.
- Click **+Add another appliance** link- back to **Add Appliance** form.
- Click **Next** button- Jump to the **Add Power generation** form.

Add power generation

Task Decomposition

Lock Types: write

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.



Add power generation

Abstract Code

- User clicked on **Next** button from **Appliances** form:
- Run the **add power generation** task: collect information about *power generation type*, *monthly kwh* and *storage kwh*.
- upon:
 - Click **Skip** button- finish submitting data and jump to **Wrapping up** form.
 - Click **Add** button.
 - Validate input data matches the data type requested for each field.
 - If valid:
 - save data into database and jump to **view/delete power generation** form.
 - Else:
 - Flag fields that are wrong/display error message, stay on form.

Wrapping Up

Task Decomposition

Lock Types: read-only

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.




Wrapping Up

Abstract Code

- display "Submission Complete!" message
- upon:
 - Click ***Return to the main menu*** button- jump to **Main menu** form.

View reports/query data

Task Decomposition



View reports/
query data

Lock Types: read-only

Number of Locks: multiple, Top 25 popular manufacturers, Manufacturer/model search, Heating/cooling method details, Water heater statistics by state, off-the-grid household dashboard, household averages by radius.

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is needed. No decomposition needed.

Abstract Code

- Lists of reports
- Upon:
 - Click ***Top 25 manufacturers*** link- jump to **Top 25 manufacturers** form.
 - Click ***Manufacture/model search*** link- jump to **Manufacture/model search input** form.
 - Click ***Heating/cooling method detail*** link- jump to **Heating/cooling method detail** form.
 - Click ***Water heater statistics by state*** link- jump to **Water heater statistics by state** form.
 - Click ***off-the-grid household dashboard*** link- jump to **off-the-grid household dashboard** form.
 - Click ***Household average by radius*** link- jump to **Household average by radius input** form.

View/Delete Power Generation

Task Decomposition



View/Delete Power Generation

Lock Types: write

Number of Locks: Single, Power Generator

Enabling Conditions: None

Frequency: same frequency as Enter Household Information

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

Abstract Code

- User clicked on **Add** button from Add power generation form:
 - Or clicked on button: View Power Generation from Main Menu
- Find Power Generators
 - Display Battery Storage
 - Display Average kwh.
 - Display Generation Type
 - Display Order #
- Upon:
 - Clicking *the delete* button.
 - Delete selected power generator.
 - Clicking **+Add more power** button.
 - Redirect to the Add power generation form.
 - Clicking *the Finish* button
 - Validate input data matches the data type requested for each field.
 - If valid:
 - save data into database and jump to view/delete power generation form.
 - Else:
 - Flag fields that are wrong/display error message, stay on form.

View Top 25 Manufacturers request

Task Decomposition

View Top 25 Manufacturers request

Lock Types: read-only

Number of Locks: single, top 25 manufacturer with most appliances.

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

Abstract Code

- User clicked on **Top 25 manufacturers** link from View reports/query data form:
- Run **view top 25 manufacturers request** task, show list of top 25 manufacturers with the most appliances.

Manufacturer drilldown report request

Task Decomposition

Manufacturer drilldown report request

Lock Types: read-only

Number of Locks: multiple, drilldown table for each manufacturer with count of appliance type.

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is needed. No decomposition needed.

Abstract Code

- User clicked on ***Top 25 manufacturers*** link from **View reports/query data** form:
- Click each ***manufacturers name*** link- display table about count of appliance type for this manufacturer name.

Manufacturer/model search

Task Decomposition

Manufacturer/model search

Lock Types: read-only

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed.

Abstract Code

- User clicked on ***Heating/cooling method detail*** link from **View reports/query data** form:
- User input valid string and search manufacturer/model name from database, invalid input will return error message.
- Upon:
 - User clicked on ***submit*** button-run ***manufacturer/model search request*** task, display table with manufacturers' name and its models' name; matched string must highlight with light green background.

Heat/cool Stats Request

Task Decomposition

Lock Types: read-only

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

Heat/Cool Stats Request

Abstract Code

- User clicked on **Heating/Cooling Stats Request** link from **View reports/query data** form:
- Run **report of Heating/Cooling Stats Request** task
- Display table of count of air conditioners, with average BTUs and average EER.
- Display table list of count of heater, with average BTUs and most common energy source.
- Display table of count of heat pumps, with average BTUs and average SEER and average HSPF.

Water heater stats Request

Task Decomposition

Lock Types: read-only

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

Water Heater Stats Request

Abstract Code

- User clicked on **Water heater statistics by states** link from **View reports/query data** form:
- Run **water heater stats request** task.
- display table with water heater statistics for each state, including average water heat capacity, average BTUs, count of water heater w/o temperature setting.

State drilldown report request

Task Decomposition

State drilldown report request

Lock Types: read-only

Number of Locks: multiple, for each state, table about minimum, average, and maximum of water heater capacity and temperature setting for each energy source in this state which will be table title.

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is needed. No decomposition needed.

Abstract Code

- User clicked on **Water heater statistics by states** link from **View reports/query data** form:
- Click **state name** link- run **state drilldown report request** task, display table about minimum, average, and maximum of water heater capacity and temperature setting for each energy source in this state which will be table title.

Off-the-grid household request

Task Decomposition

Off-the-grid household request

Lock Types: read-only

Number of Locks: multiple

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.

Abstract Code

- User clicked on **Off-the-grid household request** link from **View reports/query data** form:
- Run **off-the-grid household info** task
 - Display state with most off-the-grid household and count of its household.
 - Display table of average battery storage capacity, the percentage for each power generation type.
 - Display table of average water heater gallon capacity of all off-the-grid household and all on-the-grid household.
 - Display table of Minimal, average and maximum BTUs for all off-the-grid households' appliances, grouped by appliance type.

Household average request

Task Decomposition

Lock Types: read-only

Number of Locks: single

Enabling Conditions: None

Frequency: same frequency as Main menu

Consistency (ACID): is not critical

Subtasks: Mother Task is not needed. No decomposition needed.



Household average request

Abstract Code

- User clicked on ***household average request*** link from **View reports/query data** form:
- User input valid postal code and radius, run **search for postal code** task.
- Invalid input will return error message.
- Upon:
 - User clicked on ***submit*** button:
 - Run **reports by searching postal code and radius** task.
 - display postal code and radius.
 - Display table with count of household, count of household type, average square footage, average heating temperature and average cooling temperature of public utilities are used, count of “off-the-grid” homes, count of homes with power generation, the most common generation method, average monthly power generation, count of households with battery storage.