Alerts Use Cases

Use Case UC1: Notify Homeowner for Energy Rebates and Incentives	
Primary Actor	Homeowner
Stakeholders and interests	Homeowner: wants to receive timely and accurate notifications about available programs that could help them save on their energy bills Utility Company: wants to promote energy saving opportunities to users
Preconditions	● The system is connected with local utility companies to access information on available rebate and incentive programs. ● The system has verified the legitimacy of the utility company. ● The user has a registered account in the system and has enabled notifications.
Success guarantees	The homeowner is notified about relevant rebates and incentives
Main success scenario	1. Utility company releases a new washing machine which decreases water intake and electricity and can be bought with a 10% discount within the next 14 days. 2. System receives this information and matches the criteria with the user's energy usage. 3. The system identifies an improvement with the new device and sends a notification to the user with details of the rebate 4. Homeowner receives the notification on their selected platform 5. Homeowner decides to purchase the washing machine based on the information 6. System redirects the homeowner to the utility company web page for further actions required to purchase the device.

Extensions	3a. Does not identify an improvement
	    1) System identifies that the device is not a good match by analyzing that homeowner's current washing machine saves more energy/water.
	    2) Homeowner is not notified of the energy rebate
	4a. Homeowner's device is unreachable
	    1) System tries to send notification to the homeowner, but the homeowner's device is unreachable due to network issues.
	    2) System retries sending the notification in specific time intervals of 10 minutes
	    3) If the device remains unreachable after 3 retries, the system stores the notification and will attempt to send it again the next time the device becomes reachable

Special requirements	● Must support integration with different utility companies to expose homeowner to a variety of options ● System should ensure the security and safety of the homeowner by not sharing personal information. ● System must decide if rebate/incentive matches with the user's energy criteria, decide if rebate/incentive is beneficial to user and send the notification/not send the notification all within 5 seconds
Technology and data list	Homeowners can select how they would like to receive the notification through push notification, email, SMS, or multiple ways.

Use Case UC2:	Alert for high/Abnormal Device Energy Usage
Primary Actor	Homeowner (User)
Stakeholders and Interest	Homeowner: Wants to be notified if a certain device is consuming unusually high energy, so that they can take actions to correct it
Preconditions	- The system is integrated with the device in question and can successfully monitor energy usage - The system has been continuously tracking energy consumption for at least 3 months to establish a baseline pattern for normal usage - The user has an active account and has enabled notifications for high and abnormal energy usage alerts.
Success Guarantee	The user is alerted when a device has a high/abnormal energy consumption, and allows user to take necessary actions

Main Success Scenario	1. The cooling/heating system exceeds the predefined threshold for normal energy use
	2. System tracks this abnormal usage in real time
	3. System calculates an estimate for much the energy is exceeding by
	4. The system sends an alert to the user notifying that the heating/cooling system is taking in 20% more energy than usual
	5. The homeowner opens the notification, which provides a prompt asking if they want to:
	    a. ignore the alert
	    b. investigate further
	    c. turn off the device to conserve energy.
	6. User chooses to turn the device off
	7. System connects to the device and turns the device off
	8. The system informs the user that the device is powered off until further instructions are received.

Extensions	6.b user chooses to ignore the alert
	1. The user chooses to ignore the alert since it's winter which explains the increased energy usage
	2. The system marks the event as acknowledged and resumes monitoring the device.
	
	7.b The device does not respond to the 'turn off' instruction
	1. The system retries sending the instruction in 2 minute intervals
	2. The device responds after the second trial and turns off
	    2.b Device does not turn on at all
	        1) The retrial process reaches the cap amount of 5 minutes
	        2) The system notifies the user that the device could not be turned off remotely and suggests checking the device manually.
	        3) Continue trying to access device controls until gained back
	        4) Notify user that connection to device has been regained

	3. The system informs the user that the device is powered off until further instructions are received.
Special Requirements	The system must respond to user commands within 5 seconds (e.g., turning off the device) and must have robust error handling for unresponsive devices.
Technology and data list	- The user can choose their preferred method of receiving notifications, including push notifications, email, or SMS - Notifications must contain detailed information, including the percentage increase in energy usage and the estimated cost impact. - The system should allow users to customize the thresholds for "high" or "abnormal" energy consumption based on their preferences.

Use Case UC3	Inform user of Variable Electricity Prices
Primary Actor	Homeowner (User)
Stakeholders and Interest	Homeowner: wants real-time pricing to optimize energy usage based on cost Government/Environmental Agencies: Interested in promoting efficient energy usage during peak times, which can reduce overall energy consumption
Preconditions	- Utility companies provide real time variable electricity pricing which is integrated into the system, and continuously updated - User has a predefined threshold - User has signed up for real-time price notifications
Success Guarantee	The user is notified about electricity price changes in real time, allowing them to take advantage of lower prices or reduce consumption during peak pricing periods

Main Success Scenario	1. The utility company updates its real-time electricity price, raising the cost to 25¢/kWh due to high demand on the grid
	2. The system retrieves the updated price from the utility company's real-time pricing feed
	3. The system compares the new price to the user's predefined threshold which is 20 ¢/kWh
	4. The system sends a notification to the homeowner, informing them that the current price is 5 ¢/kWh above their threshold
	5. The homeowner opens the notification and reviews the recommended actions provided by the system which are:
	   a. Reduce usage manually by turning off devices
	   b. Allow the system automatically turn off connected devices chosen by them
	   c. Ignore the alert
	6. The homeowner makes the system manage the devices, and the system successfully sends the instruction to the selected devices
	7. The devices are powered down, and the system confirms the action with the user
	8. The system continues monitoring the electricity prices and will notify the user again if the price drops or further increases

Extensions	2b. System fails to fetch the updated data 1. The system attempts to retrieve the real-time pricing data from the utility company but encounters a connection error 2. The system logs the failure and retries the connection after a minute. 3. The data is successfully fetched after 5 minutes, and the system updates the user on the current electricity prices and any necessary recommendations for managing their energy usage.

	3.b System can't retrieve the data after 5 minutes. 　1. Sends a notification to the homeowner informing them about the disconnection 　2. The system automatically alerts the system administrator about the ongoing data retrieval issue for further investigation. 　3. The system continues attempting to retrieve updated price data every 15 minutes until successful or until notified by the administrator to stop.
Special Requirements	● The system must handle the retrieval, processing, and delivery of real-time pricing updates within 5 seconds to ensure that the user receives the most up-to-date information ● The system must provide security measures to protect sensitive data about the user's electricity usage and preferences, particularly when handling third-party utility data.
Technology and data list	● The system must integrate with the APIs of various utility companies to receive real-time price data ● The system must handle multiple notification channels, ensuring that the user receives information in their preferred format

Use Case UC4	Notify Users about Appliance Issues
Primary Actor	Homeowner (User)
Stakeholders and Interest	Homeowner: wants to be informed of device issues and be notified when a device needs to servicing or replacement Appliance Manufacturers: interested in promoting proper maintenance and replace for product longevity
Preconditions	- Appliances are compatible and connected to the system for status monitoring. - User has enabled notifications for appliance problems and replacement suggestions.
Success Guarantee	The user is notified when an appliance experiences problems or is due for servicing/replacement
Main Success Scenario	1. The system tracks the usage of the homeowner's refrigerator water filter and detects that it has reached its recommended usage limit 2. The system send a notification to the user and to alert them to replace the filter to maintain optimal water quality and appliance performance 3. The user opens the notification and receives a detailed report of when the old filter was installed, how much time there is to install a new filet, and also a link to the manufacturer's site to order a replacement filter 4. The homeowner orders the filter from the redirected site, and notifies the system in 4 days that the new filter has been installed 5. The system logs this action and stops sending further notifications about the filter replacement until the next filter usage period begins
Extensions	4.b Homeowner ignores the filter replacement alert 1. The homeowner receives the notification but chooses not to open or respond to it 2. The system logs that the notification was sent but no action was taken. 3. After a preset amount of 5 days, the system resends the notification with an additional reminder. 4. The system continues to send periodic reminders (e.g., every 7 days) until the homeowner marks the task as complete or snoozes the reminder.
Special Requirements	- The system should send notifications well in advance of a critical need for a filter replacement, so the homeowner has time to purchase and replace the filter before water quality is impacted. - The system should allow the user to customize the frequency and

	timing of reminders. For instance, the user might prefer fewer reminders if they tend to purchase replacement filters at longer intervals. ● The system should be able to recommend authorized vendors or the official refrigerator manufacturer's website for purchasing the correct filter, helping users avoid incompatible filters.
Technology and data list	● The system must retrieve real-time data from the refrigerator's sensor systems regarding the water filter's usage ● System must also verify the installed filter's model number to ensure compatibility

Accounts Use Cases

Use Case: Sign up using email or phone number	
Primary Actor	User
Stakeholders and interests	User: Wants to easily create an account with either an email address or phone number. System Administrator: Ensures the sign-up process is secure and operates smoothly.
Preconditions	The user has a valid email address or phone number that can be used for registration. No existing account is associated with the provided email or phone.
Success guarantees	A new account is created, and the user is logged in.
Main success scenario	1. The user selects the option to register. 2. The system asks for an email or phone number. 3. The user enters the required information. 4. The system checks the validity of the provided email/phone. 5. The user creates a secure password. 6. The system confirms account creation and automatically logs the user in.
Extensions	● 3a. Invalid email or phone: The system informs the user and prompts for a valid entry. ● 4a. Account already exists: The system notifies the user and stops the registration.
Special requirements	● The system must validate email or phone number formats and prevent multiple registrations with the same credentials. ● Passwords must meet security guidelines (e.g., length, complexity).
Technology and data variation list	● Different interfaces (e.g., web or mobile) may slightly change the registration process. ● In some cases, an email/phone verification step (like a code) may be necessary.
Frequency of Occurrence	Common during initial release periods, becoming less frequent as the user base stabilizes.

Use Case: Delete Account Information	
Primary Actor	User
Stakeholders and interests	User: Wishes to permanently remove their account and associated data. System Administrator: Ensures the deletion process is irreversible and complies with legal standards.
Preconditions	User is logged in. User understands that account deletion is final and non-reversible.
Success guarantees	User's account and all data are removed from the system.
Main success scenario	7. The user selects the option to delete their account. 8. The system prompts the user to confirm the action. 9. The user confirms the account deletion. 10. The system removes the user's data and account. 11. The system displays a confirmation of the successful deletion.
Extensions	● 3a. User decides not to delete the account: The system cancels the process, keeping the account intact. ● 4a. Deletion fails due to technical issues: The system informs the user and suggests trying again later.
Special requirements	● The system must adhere to legal and privacy requirements when deleting user data. ● Once an account is deleted, it cannot be restored.
Technology and data variation list	● Different device types or platforms may require different deletion confirmation methods (e.g., mobile apps vs web). ● In some cases, an email/phone verification step (like a code) may be necessary.
Frequency of Occurrence	Infrequent, as users typically delete accounts occasionally.

Use Case: Update Account Information	
Primary Actor	User
Stakeholders and interests	User: Needs to change their account details, such as contact information or password. System Administrator: Ensures that changes are made securely and that sensitive data is properly managed.
Preconditions	User is logged into their account. User has valid new details ready for the update (e.g., a new email address or password).
Success guarantees	The user's account details are successfully updated.
Main success scenario	12. User selects the option to modify account details. 13. The system presents fields for the information the user wishes to update (e.g., email, phone, password). 14. User enters the new details. 15. The system verifies the new information (e.g., correct email format, secure password). 16. The system applies the updates. 17. User receives a confirmation of the changes.
Extensions	● 3a. New email or phone number is invalid: The system requests the user to provide valid information. ● 4a. Password does not meet complexity rules: The system informs the user and requests a new password.
Special requirements	● The system must ensure the security of any sensitive information updates, especially for password or email changes.
Technology and data variation list	● Interfaces might vary between the web version and mobile apps. ● Changes in password may require entering the old password for verification.
Frequency of Occurrence	Occurs occasionally as users update their information over time.

Use Case: Automatic Calibration when moving into a new house	
Primary Actor	User
Stakeholders and interests	User: Wants the system to recalibrate automatically after moving to a new home, with minimal input. System Administrator: Ensures the system recalibrates correctly, based on location changes, to maintain optimal performance.
Preconditions	User has moved to a different house. System is capable of detecting the location change or movement.
Success guarantees	System recalibrates itself based on the new environment and location.
Main success scenario	18. User relocates to a new home. 19. System automatically recognizes the location change. 20. The system initiates the recalibration process. 21. The system adjusts its settings to suit the new environment (e.g., device locations, energy usage settings). 22. The system notifies the user once calibration is complete.
Extensions	● 3a. System cannot detect the move: User manually triggers the recalibration. ● 4a. Calibration process fails due to device issues: System suggests troubleshooting steps or informs the user to try again.
Special requirements	● System must accurately detect significant location changes (e.g., through GPS or network). ● Calibration should adapt to the new environment, taking into account different variables.
Technology and data variation list	● Interface differences between devices or platforms may affect how calibration is presented to the user. ● Future calibration methods might use AI or machine learning to optimize performance.
Frequency of Occurrence	Occurs infrequently, only when users change their residence.

Devices Use Cases

Use Case: Add/Remove a Device Through a Serial Number	
Primary Actor	User
Stakeholders and interests	User: Wants to easily add or remove devices using a serial number. System Administrator: Ensures the system can handle device additions and removals efficiently.
Preconditions	User is authenticated. User has the serial number for the device.
Success guarantees	Device is successfully added or removed from the user's account
Main success scenario	23. User selects the option to add/remove a device. 24. System prompts for the serial number. 25. User enters the serial number. 26. System verifies the number. 27. System adds/removes the device. 28. System confirms the action to the user.
Extensions	● 3a. Serial number is invalid: System notifies the user and prompts for re-entry. ● 5a. Device has already been added: System notifies the user and cancels the addition.
Special requirements	● System must securely validate the serial number format
Technology and data variation list	● User interface variations (web, mobile app) ● Devices are identified by unique serial number, but future devices may be added by bluetooth, NFC, etc.
Frequency of Occurrence	Multiple times an hour during initial setup, then sporadically every few months

Use Case: Software Updates for a Specific Device	
Primary Actor	User
Stakeholders and interests	- User: Wants to ensure their device has the latest software updates. - Device Manufacturer: Ensures devices are running the latest software for security and performance.
Preconditions	- Device is added to user's account - User is authenticated.
Success guarantees	Device software is updated to the latest version.
Main success scenario	1. User selects the option to update software. 2. System checks for available updates. 3. System notifies the user of available updates. 4. User confirms to proceed with the update. 5. System downloads and installs the update. 6. System confirms the update is successful.
Extensions	2a. No updates available: System notifies the user. 5a. Update fails: System rolls back to the previous version and notifies the user.
Special requirements	System must ensure the update process is secure and reliable.
Technology and data variation list	Different update methods (over-the-air, manual download).
Frequency of Occurrence	Monthly

Use Case: Turn Off/On a Device	
Primary Actor	User
Stakeholders and interests	- User: Wants to control the power state of their device remotely. - System Administrator: Ensures the system can handle power state changes efficiently.
Preconditions	- Device is added to user's account - User is authenticated.
Success guarantees	Device is successfully turned off or on.
Main success scenario	1. User selects the option to turn off/on the device. 2. System sends the command to the device. 3. Device changes its power state. 4. System confirms the action to the user.
Extensions	2a. Device is not reachable: System notifies the user of the failure. User may retry
Special requirements	System must ensure the command is securely transmitted.
Technology and data variation list	Different control interfaces (web, mobile app).
Frequency of Occurrence	Many times a day, hourly

Use Case: Schedule Device Operations Based on Predefined User Settings	
Primary Actor	User
Stakeholders and interests	- User: Wants to automate device operations based on their preferences. - System Administrator: Ensures the system can handle scheduled operations efficiently.
Preconditions	- User is authenticated - Devices being scheduled are added to user's account
Success guarantees	Device operations are executed as per the schedule.
Main success scenario	1. User selects the option to schedule device operations. 2. System displays predefined user settings. 3. User configures the schedule. 4. System saves the schedule. 5. System executes the operations as per the schedule. 6. System confirms the execution to the user.
Extensions	3a. Invalid schedule configuration: System notifies the user and prompts for correction. 5a. Operation fails: System retries and notifies the user if it continues to fail.
Special requirements	System must ensure the scheduling process is reliable and accurate.
Technology and data variation list	- Different scheduling interfaces (web, mobile app). - Scheduling can be granular down to the minute
Frequency of Occurrence	Uncommon

Data Uses Cases

Use Case 5: Display Total Energy Consumer by User	
Primary Actor	User
Stakeholders and interests	● User: Wants to be aware of the total amount of energy they are using
Preconditions	● User is authenticated ● All devices have been added and the user has been utilizing the application for longer than a week
Success guarantees	● The total energy consumption of the user will be displayed since joining the application
Main success scenario	1. User logs into the app and selects the Analytics tab 2. The user clicks on the Total Consumption option and it displays the energy usage since joining the application
Extensions	● Unable to Get Total Consumption: The app displays an error signifying that there was a problem in retrieving the data
Special requirements	● System must track and record all the data from each device
Technology and data variation list	● Interface changes depending on how much data is available to display
Frequency of Occurrence	● Once a month

Use Case 6: Display User Cost Reduction Patterns over a Specific amount of Time	
Primary Actor	User
Stakeholders and interests	● User: Wants to see how they have changed in energy spending
Preconditions	● User is authenticated ● Information for cost of energy is available in the area
Success guarantees	● Metrics for changes in energy spending will be displayed
Main success scenario	1. User logs onto the application 2. Selects the Analytics tab and clicks on the Cost Pattern option 3. Sees 3 metrics(e.g. you have saved 30% over the past 6 months on your HVAC bill) of their cost changes over a certain time period
Extensions	● Unable to Get Cost Reduction data: The app displays an error signifying that there was a problem in retrieving the data
Special requirements	● System must receive all the data of the usage cost
Technology and data variation list	● User is able to select the timeframe to look at and it will display that time frame so data can have slight variability in querying
Frequency of Occurrence	● Once a month

Use Case 7: Rank devices by Energy Usage for Current Month	
Primary Actor	User
Stakeholders and interests	● User: Data is able to show the devices which are using the most amount of energy for the month
Preconditions	● User is authenticated ● The devices have been in use for a month or longer
Success guarantees	● Ranking of Energy Usage by Device will be displayed
Main success scenario	1. User logs onto the application 2. Selects the Analytics tab and clicks on the Device Usage Ranking option 3. A ranking of each device is provided
Extensions	● Unable to Get Device data: The app displays an error signifying that there was a problem in retrieving the data for some/all devices
Special requirements	● System must update once a month with the total cost of each device
Technology and data variation list	● Usage by device will vary and may result in longer query times for larger data sets
Frequency of Occurrence	● Once a month

Use Case 8: Estimate Carbon Footprint based on Usage	
Primary Actor	User
Stakeholders and interests	User: Data is able to show the carbon footprint of the user
Preconditions	- User is authenticated - There is readily available data based on how each device affects the carbon footprint
Success guarantees	Displays a rating based on how minimal the user's carbon footprint is based on appliances
Main success scenario	4. User logs onto the application 5. Selects the Analytics tab and clicks on the Carbon Footprint option 6. A rating is displayed reflecting the user's carbon footprint and then an explanation of how to interpret the rating
Extensions	Unable to Get Carbon Footprint: The app displays an error signifying that there was a problem in retrieving the data for the carbon footprint
Special requirements	Carbon Footprint calculations need to be as accurate as possible
Technology and data variation list	Estimations on Carbon footprint per device may change depending on new environmental guidelines or devices
Frequency of Occurrence	Once a month

Optimization Fully Dressed Use Cases

Use Case 9: Setting Choice to Automatically Switch to Low Power Mode during energy crisis	
Primary Actor	User
Stakeholders and interests	- User: User wants to reduce their energy consumption during an energy crisis without actively thinking about where they could reduce energy - Electricity Provider: Can work towards stabilizing the energy grid with less demand from users
Preconditions	- User is authenticated - The device must support low power mode - The user has enabled the setting to automatically switch to low power mode - There is an energy crisis/grid strain
Success guarantees	- Device modes switched to low power mode and a significant amount of energy is saved - Device can still perform all basic tasks
Main success scenario	7. User logs onto the application 8. User goes to settings and toggles the "automatically switch to low power mode" setting 9. The application saves this setting 10. During a grid strain, the application remembers the user's preferences and automatically switches compatible devices to low power mode, and notifies the user. The user is able to switch off this mode, and change their settings. 11. The user is clearly alerted about which devices were affected by this change. The user has the option to override these changes for specific devices, or all devices 12. When the grid is restored, low power mode is switched off and the user is notified about the change 13. The user has the option to switch low power mode on even when there is not a grid strain
Extensions	Override switch to low power mode:

	○ The system switches back to normal but notifies the user that their consumption levels are high ● Encourage low power mode setting ○ If the user does not have low power mode enabled, the application may recommend the user to enable it during a grid strain
Special requirements	● System must clearly notify the user when low power mode is enabled ● Low power mode should not interfere with any basic functionalities of the device
Technology and data variation list	● Devices may have different energy saving capabilities ○ Some devices may not be as efficient as saving power in "low power mode as others"
Frequency of Occurrence	● Not often

Use Case 10: Set Monthly Goals for Energy Consumption	
Primary Actor	User
Stakeholders and interests	- User: User wants to reduce their energy consumption but is unsure of what an attainable reduction goal is - Electricity provider: wants to encourage users to reduce consumption through goal setting
Preconditions	- User is authenticated - User must have been using the application for a month so that enough data is collected to provide attainable goals for energy reduction
Success guarantees	Device provides a detailed analysis on ways that the user can reduce their consumption and calculates an attainable goal for the next month
Main success scenario	14. User logs onto the application 15. User navigates to the "optimization" tab and presses the "goals for next month" tab 16. The application displays next month's goals based on previous trends 17. Application sends the user notifications if they are approaching their monthly goal, and alerts them about how they can alter their consumption to meet goals 18. Application displays the number of times the user has met their goals, and any rewards they are eligible for
Extensions	- The user is able to give the application feedback if they believe that the goal set by the application is not attainable - Some reward system may be implemented if the user is able to meet the goal provided by the application - The user can give feedback regarding which devices they struggle to reduce consumption for, so the goals can be updated accordingly
Special requirements	- System must clearly display the goals calculated by the application and provide information on how these goals can be met - System should recalculate goals that are attainable by observing trends in energy consumption

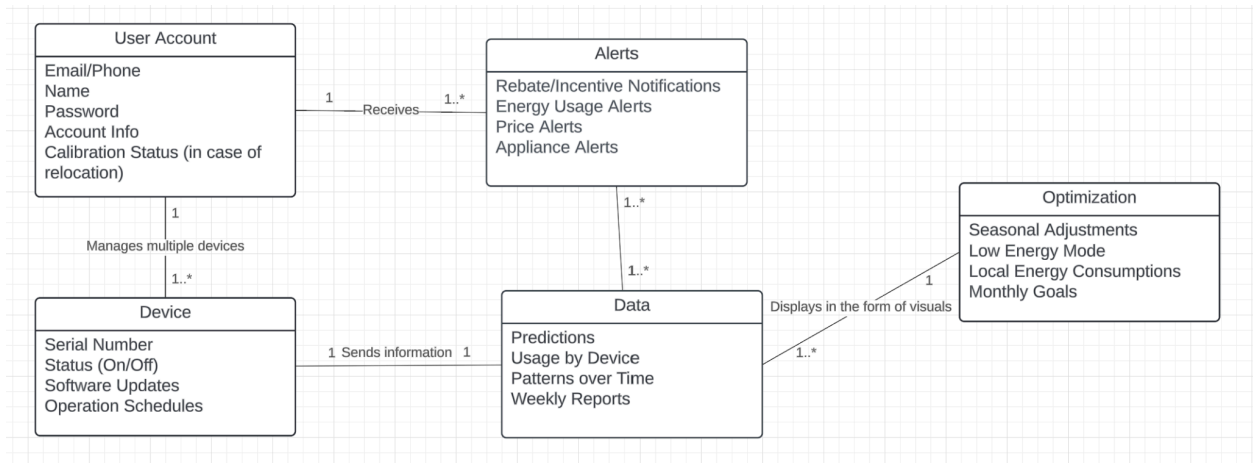|	
	● System must keep track of how many times the user has met their monthly goals
Technology and data variation list	● Different users will be provided different goals based on their personal energy usage ● System should be connected to a rewards program in the user's area
Frequency of Occurrence	● Once a month

Use Case 11: Display information on average price and usage of energy in the area, and compare to homeowner data	
Primary Actor	User
Stakeholders and interests	● User: User wants to compare their energy usage patterns to those of the surrounding area so they can adjust their usage accordingly
Preconditions	● User is authenticated ● User has given consent to data sharing ● There is a sufficient sample of energy data from the surrounding area, so comparisons can be accurate and meaningful
Success guarantees	● Application provides a detailed comparison between the homeowner's energy consumption patterns and the surrounding area averages for energy consumption patterns

Main success scenario	19. User logs onto the application
	20. User navigates to the "optimization" tab and presses the "compare to area" tab
	21. If the user has data sharing enabled, they will be able to compare their data to neighborhoods around them
	    a. If data sharing is not enabled, the user will be alerted to share their data to access this page
	22. Application displays a detailed comparison between their energy consumption patterns and those in the surrounding area
	    a. Graphs, charts, percentages
	23. The system highlights whether the user is using more/less energy than average

Extensions	● User is able to specify the mile radius that their energy consumption patterns are being compared to ● System may also display information how the user's energy consumption compares to households of a similar size ● If there is not enough energy data from the area, the application will provide a warning to the user

Special requirements	- The system needs to handle all energy consumption data securely and with permissions from the user - Data from the surrounding areas should be updated regularly to provide more accurate comparisons - System should calculate trends in patterns
Technology and data variation list	- Some areas may have more energy data available than others - Energy usage patterns could vary drastically by season or time of day
Frequency of Occurrence	Often > Data should be updated once/twice a week

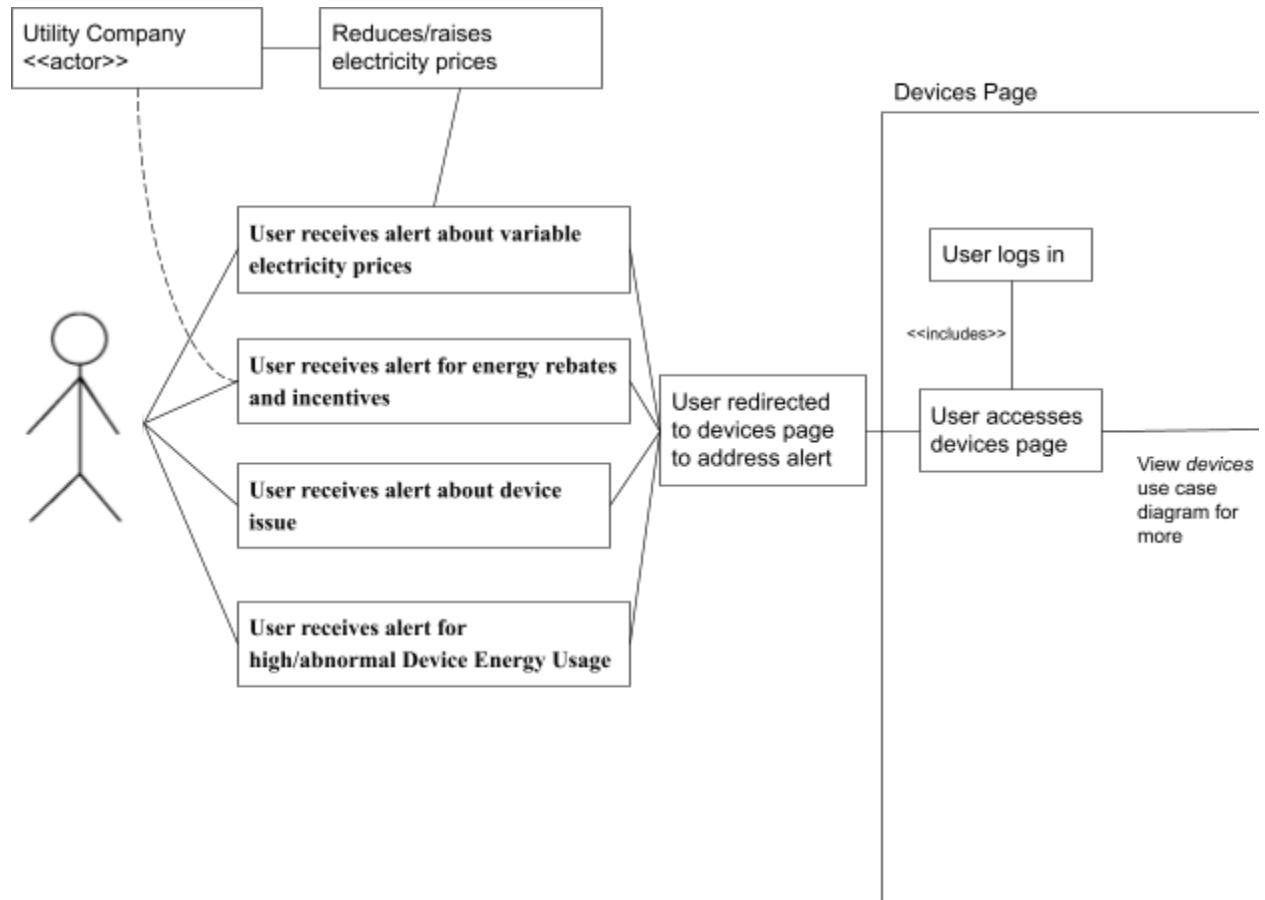| Use Case 12: Provide Recommendations on how to adjust consumption patterns by season	
Primary Actor	User
Stakeholders and interests	- User: User wants personalized recommendations on how they can optimize their energy usage through each season - Winter energy usage may be higher because of heaters, etc. - Application should take that information into account when providing optimization recommendations for each season
Preconditions	- User is authenticated - User has given consent to data sharing - The system has access to historical energy usage trends by season - The system has information on the user's consumption patterns through season
Success guarantees	- Application provides a detailed analysis of seasonal consumption data and provides a clear, personalized recommendation to reduce energy usage - The applications recommendations are able to guide the user towards reducing their energy consumption during the specific season

Main success scenario	24. User logs onto the application
	25. User navigates to the "optimization" tab and presses the "view seasonal trends" tab
	26. If the user has data sharing enabled, they will be able to compare their data
	   a. If data sharing is not enabled, the user will be alerted to share their data to access this page
	27. The application detects the current season and analyzes historical data of that season, or past seasonal energy usage patterns for that user in previous years
	28. The system provides personalized recommendations based on past data and the current season
	   a. For example, in the summer season, the application could recommend the user to reduce cooling costs by

	shading their house, or closing their blinds 29. User is able to view these trends and make changes based on the information
Extensions	● User is able to specify the mile radius that their energy consumption patterns are being compared to ● System may alert the user if there is a cold front/warm front so they can adjust their usage accordingly and be prepared ● User can provide data on their energy budget by season so the system can try to provide recommendations that fall within the budget ● This could be connected to a rewards system that rewards the user when they make season-specific optimizations ● The system may be integrated with certain devices (thermostats, etc) to automatically reduce consumption if the user has that setting enabled
Special requirements	● The system needs to handle all energy consumption data securely and with permissions from the user ● System should provide energy recommendations and provide direct links to information on actions that the user can take ● The system should store the user's seasonal data to provide more accurate recommendations in the future
Technology and data variation list	● Different areas may experience varying degrees of seasonal changes. This data should be taken into account when providing season-based recommendations ● Houses with solar panels/other renewable energy sources should get recommendations based on the renewable source availability during that season (example: winter, less sunlight in the evenings)
Frequency of Occurrence	● Often > Data should be updated at least once a week so seasonal data can be accurate enough to provide meaningful recommendations

Class Diagram:

User Account

Email/Phone
Name
Password
Account Info
Calibration Status (in case of relocation)

Alerts

Rebate/Incentive Notifications
Energy Usage Alerts
Price Alerts
Appliance Alerts

1 —— Receives —— 1..*

Optimization

Seasonal Adjustments
Low Energy Mode
Local Energy Consumptions
Monthly Goals

1

Manages multiple devices

1..*

1..*

Device

Serial Number
Status (On/Off)
Software Updates
Operation Schedules

1 Sends information 1

Data

Predictions
Usage by Device
Patterns over Time
Weekly Reports

1..*

Displays in the form of visuals

1

1..*

Use Case Diagrams

Alerts Use Case Diagram:

Accounts Use Case Diagram:

Accounts Page

- Sign up using email or phone number
- User accesses accounts page
- Delete Account Information
- Update Account Information
- User indicates they are moving houses
- Automatic calibration when moving into a new house

Devices Use Case Diagram:

Devices Page

Add Device Through a Serial Number

User logs in

<<includes>>

Remove device from account

User accesses devices page

Select Device

Turn Off/On a Device

Software Updates for a Specific Device

Schedule Device Operations Based on Predefined User Settings
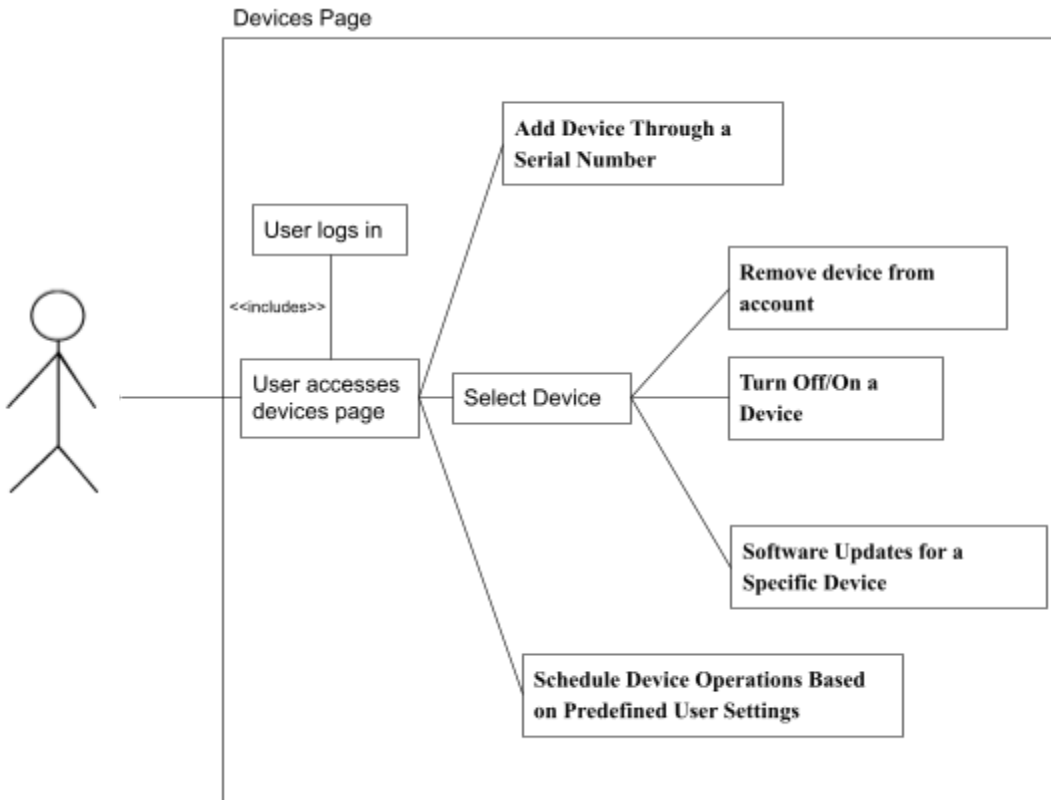
Data Use Case Diagram:

Data Page
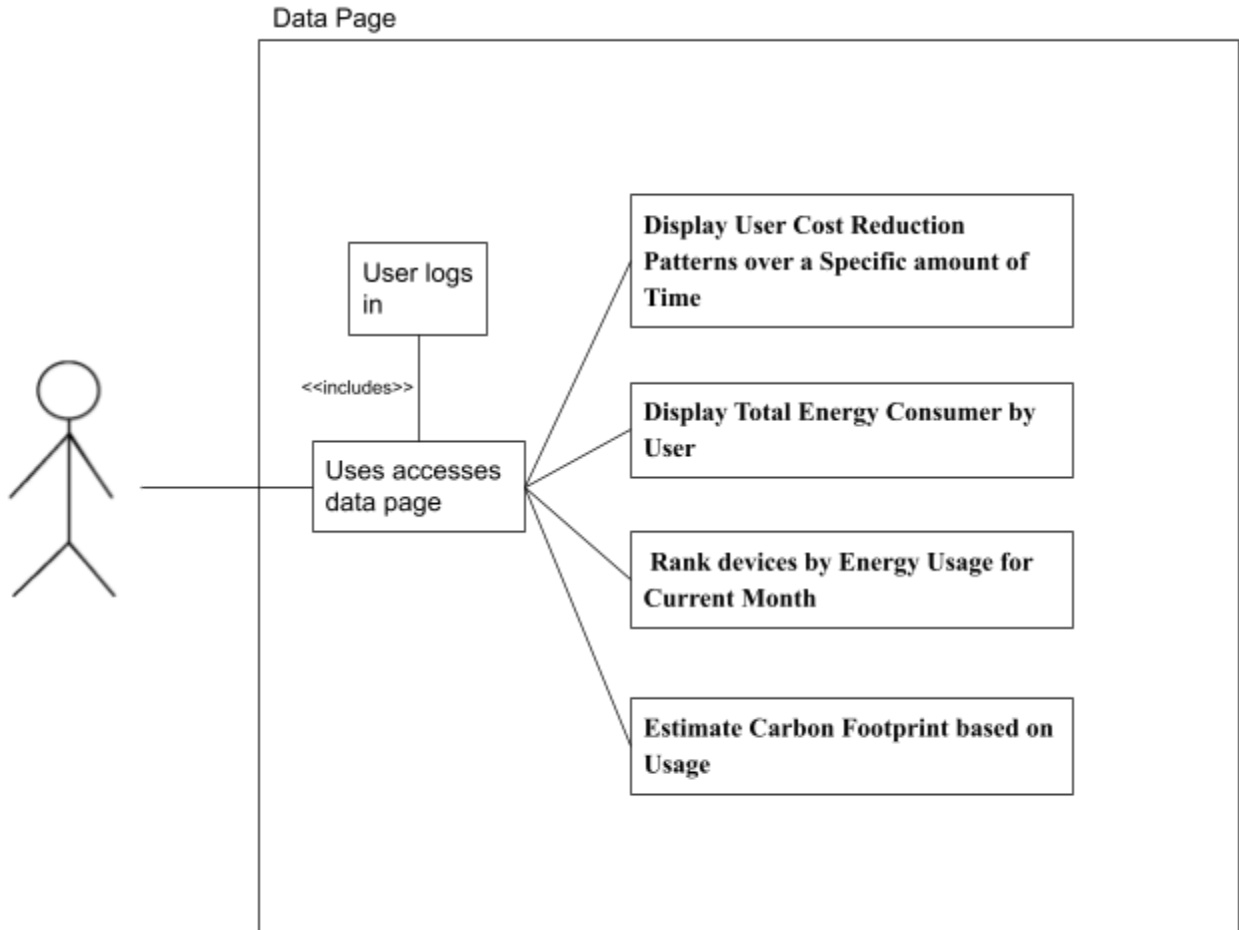
Optimization Use Case Diagram:

Optimization Page

User logs in

<<includes>>

User accesses optimization page

User views information on average price and usage of energy in the area compared to their data

User receives recommendations on how to adjust consumption patterns by season

User can set monthly goals for energy consumption

User can turn on setting to automatically switch to low power mode during energy crisis

Uses redirected to devices page to optimize device usage

User receives monthly updates on goal progress

Device automatically switches to lower power mode

View devices use case diagram for more

Energy crisis occurs