Project Synopsis

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Description

The Virtual Power Plant Project aims at integrating various distributed energy resources (DERs) into a unified cont. Maintaining stability and reliability is one of the prime challenges faced by power grids resulting in a lot of inefficiencies, monetary losses and thus it is imperative to ensure that the traditional model of centralized power generation and distribution evolves rapidly, necessitating new approaches to grid management and control. This project introduces an advanced virtual power plant solution that aggregates multiple distributed energy resources (DERs) to maintain grid stability and optimize energy distribution.

The DRX VPP acts as an intelligent orchestration platform that bridges the gap between high-level grid operators and diverse energy resources. The system is architected in a hierarchical structure, with System Administrators at the top maintaining overall system integrity, followed by Utility Grid Operators managing grid stability, DER Asset Operators handling resource-specific controls, and end-users interfacing with individual systems like EV charging stations.

This is achieved through sophisticated demand response mechanisms that can adjust power consumption and generation patterns across the network.The system enables real time monitoring and control of multiple resource types including EV charging stations,solar charging stations,industrial loads,batteries,etc.
While traditional grid management systems usually focus on single-resource types, the DRX VPP tries to leverage the different capacities and features of a bunch of resources. This allows for more efficient grid balancing and resource optimization. For example, when grid frequency deviates from optimal levels, the system can simultaneously adjust EV charging rates, modify industrial process schedules, and utilize battery storage systems to provide a coordinated response.
The system uses OpenADR 3.0 protocol to enable standardized communication between the utility and connected resources. This protocol ensures reliable and secure transmission of critical signals such as price information, demand response events, and emergency commands.

Profile of Users

1. Utility Grid Operators:
    a. Monitor entire DER network
    b. Manage multiple resource types
    c. Coordinate grid balancing across varied assets
    d. Implement demand response strategies
2. DER Asset Operators:
    a. EV Charging Station Managers (Most prominent, others are extra,similar)
        i. Add charger
        ii. Subscribe to load reduction
        iii. Configure charger, price limits, etc
    b. Solar Farm Operators
    c. Building Energy Managers
    d. Home Users
    e. Industrial Facility Managers
    f. Battery Storage System Operators
3. System Administrators:
    a. Configure VEN for different resource types
    b. Manager all other operators
    c. Full access to all grids, superset access of all Utility Grid Operators
4. EV Charging Customers
    a. Authenticate, pay
    b. Swipe card, click mobile button to activate charger