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VolTogether

Executive summary

As the European power grid undergoes a deep transformation driven by the growing electrification of homes and industries, the rise of electric mobility, and the large-scale integration of intermittent renewable energy sources, ensuring grid stability has become increasingly challenging. In many urban areas, energy consumption during peak periods now regularly exceeds the distribution capacity of local grids. Simultaneously, distribution networks are becoming more complex due to the decentralization of electricity generation and the digitalization of infrastructure, particularly at the medium- and low-voltage levels.

As a result, this evolving landscape presents significant challenges for energy management. Therefore, conventional methods of planning and operating urban distribution grids must be rethought. In this context, Demand Response (DR) programs have emerged as one of the most effective and scalable solutions. By offering incentives for consumers to reduce or shift their electricity usage during peak demand periods, DR programs alleviate pressure on the grid and reduce the need for costly infrastructure upgrades.

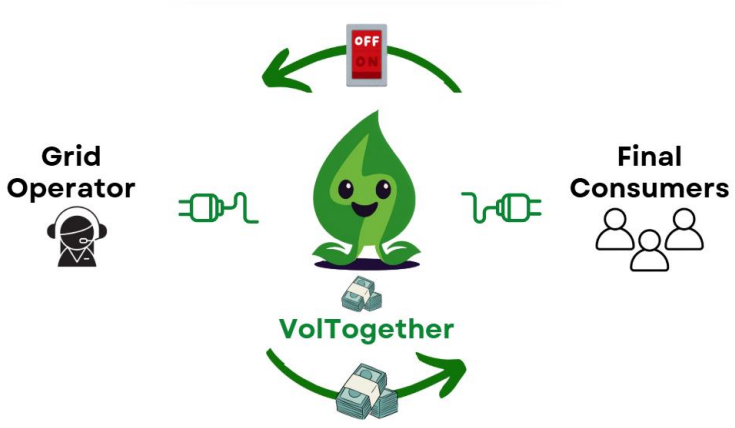
VolTogether addresses this need through a digital platform that aggregates small-scale flexibility from households and medium-sized enterprises, enabling active participation in local energy markets. The project's main objectives were to validate technical feasibility, test user responsiveness, and design a venture-ready business model.

Innovation drivers include gamification, community engagement, behavioural insights, and partnerships with sustainable brands to boost participation and retention. Early pilots demonstrated ~300 W of flexibility per user per event, positive unit economics, and high engagement from environmentally motivated users.

By 2027, VolTogether targets 1 MW of aggregated flexibility, participation in national pilot auctions, and formal registration as a Balancing Service Provider. Expected results include reducing grid stress, avoiding costly infrastructure investments, and positioning VolTogether as a pioneer in consumer-driven flexibility for a resilient, decentralized, and decarbonized energy system.

Key words:

Flexibility, Decentralization, Demand Response, Digital Platform, Innovation.



1. Save Energy

2. Get Rewarded

3. Help the Planet

Project description written by the Principal Academic Tutor

VolTogether aims to address the growing challenge of grid stability and flexibility in an increasingly electrified and decentralized energy system. With the rise of renewable generation, electric mobility, and digitalized infrastructures, urban distribution networks face frequent stress during peak demand, which conventional supply-side solutions alone can no longer manage efficiently.

The project develops a user-centric digital platform that empowers households to actively participate in local Demand Response (DR) programs. By aggregating small-scale flexibility into a reliable and monetizable resource, VolTogether enables consumer-driven contributions to grid stability that reduce reliance on costly and polluting peaking power plants.

The approach combines technological feasibility and behavioral insights: more than 30 stakeholder interviews, five Minimum Viable Products, and real-world testing demonstrated both user responsiveness and the platform's technical soundness. The business model proved economically viable under realistic scaling assumptions, with the potential to reach 1 MW of aggregated flexibility capacity by 2027 (around 3,300 users) and to register as a Balancing Service Provider (BSP).

The project is inherently multidisciplinary, spanning energy engineering, digital technologies, management, and behavioral sciences. It engages stakeholders across the ecosystem, from DSOs and regulatory authorities to NGOs and consumers, bridging societal engagement with technical performance.

A successful outcome will allow system operators to procure distributed flexibility cost-effectively, while enabling citizens to play an active role in the energy transition. Backed by A2A Life Ventures and the Alta Scuola Politecnica, VolTogether has laid the foundations for pilot deployment and future scaling within Italy's emerging flexibility markets, positioning itself as a pioneering initiative in consumer-side flexibility.

Team description by skill

VolTogether was created by a seven-member Alta Scuola Politecnica team, with each member primarily responsible for a specific activity spanning coordination, research, business design, technology, and user experience. The project coordinator managed the initiative end-to-end, integrating outputs and ensuring alignment with the mission of transforming citizen participation into grid flexibility.

Market research was carried out by another team member, who combined desk analysis with user and stakeholder interviews to derive requirements and testable hypotheses. The engagement strategy and business model were designed by a third member, who translated research insights into the value proposition, onboarding flows, and participation prompts in line with DSO needs. Business sustainability and operational planning were developed by another teammate, who structured the operating model, financial plan, and adoption targets to ensure long-term viability.

One member identified and framed the core issue of energy flexibility in the grid, highlighting how small-scale resources from residential users could support stability in low- and medium-voltage networks. He translated complex electrical concepts into practical insights for the team, defining data requirements and guiding technical validation. Another member transformed these insights into a digital product, developing the web interface and managing MVP cycles. Finally, branding and UX were shaped by the seventh member, who created the identity and user experience so that every interaction felt simple, credible, and climate positive.

Agile sprints and structured reviews ensured that these diverse contributions advanced coherently, demonstrating the value of a truly multidisciplinary approach.

Goal

The primary goal of the VolTogether project was to develop and validate a scalable, venture-ready solution to address the growing challenge of energy system flexibility. In alignment with the innovation objectives of Alta Scuola Politecnica (ASP) and A2A Life Ventures, the project originated from the challenge: *identify your problem space and generate a venture idea with the potential to become a new business or innovative technology in the energy transition and circular economy field*.

The project's main goal is to activate widespread participation of small consumers in demand response by aggregating their flexible energy use into a reliable service for the grid. VolTogether aims to provide a user-friendly digital platform that makes it easy for households to join DR events and collectively reduce peak demand. This requires mechanisms to coordinate many small load reductions into a monetizable resource for system operators, while ensuring the process remains seamless for users.

Another key objective is to meet all regulatory and technical requirements from compliance with grid standards to safeguarding data privacy, so that the solution can integrate into Italy's emerging flexibility markets. The project also set out to validate user engagement and practical feasibility through iterative prototyping and early tests, ensuring the model is not only technically robust but also socially acceptable and economically viable.

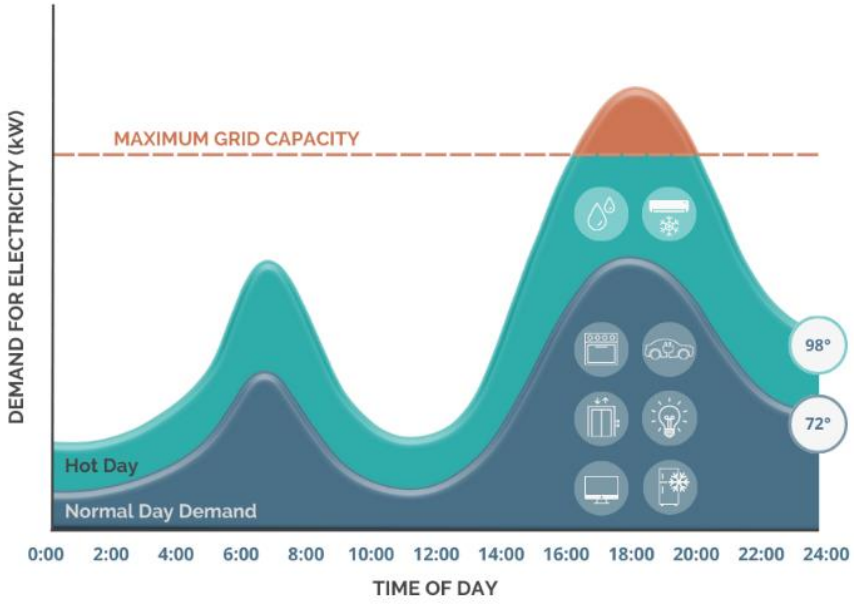
Ultimately, VolTogether's ambition is to deliver a scalable digital solution that turns ordinary consumers into active contributors to grid stability. By unlocking the untapped potential of households, the project aligns with the shift toward participatory energy systems and positions itself as a pioneer in Italy's consumer-side flexibility market.

Understanding the problem

Power grids are undergoing profound transformations. The rapid electrification of homes and industries, the rise of electric mobility, and the large-scale integration of renewable energy sources are pushing demand during peak periods to levels that often exceed the distribution capacity of local grids. At the same time, digitalization and the decentralization of electricity generation are adding complexity to medium- and low-voltage networks, where storage systems, prosumers, and smart devices are becoming more prevalent.

Traditionally, grid operators addressed peaks by activating standby power plants or purchasing extra electricity on the market. With renewables like wind and solar, which are intermittent and less controllable, this supply-side approach is no longer sustainable. Without new tools, grid stability will continue to be at risk, as shown by past national blackouts (e.g., 2003) and more recent localized outages during Italy's summer heatwaves. These events highlight a critical vulnerability: when consumption surges unpredictably, grids lack the flexibility needed to avoid overloads.

Demand Response (DR) has emerged as one of the most effective solutions. By incentivizing consumers to reduce or shift usage during peak hours, DR alleviates stress on feeders and transformers, prevents costly infrastructure upgrades, and improves resilience.



Effective coordination between Distribution System Operators (DSOs) and the Transmission System Operator (TSO) is essential for grid stability. The TSO manages the national balance between generation and demand, while DSOs deal with local issues such as feeder overloads, transformer stress, and congestion in medium- and low-voltage networks. If unmanaged, these problems can escalate into system-wide imbalances.

By unlocking local flexibility from households, DSOs can reduce peaks and stabilize distribution grids, directly supporting the TSO. Initiatives like MindFlex in Milan and RomeFlex show how local markets can relieve congestion and make national balancing more efficient. This coordination is crucial for the large-scale integration of variable renewables such as solar and wind, ensuring their reliable deployment across the grid.

Exploring the opportunities

Historically, grid operators managed peaks by increasing supply through standby plants or market purchases. With the growing integration of intermittent renewables such as solar and wind, this approach is no longer sustainable. The grid now urgently requires **flexibility**: the ability to dynamically reduce or shift consumption when stress occurs.

On the policy side, the EU Clean Energy Package (Directive 2019/944) mandates equal market access for demand response aggregators, accelerating new business models. In Italy, the UVAM pilot opened ancillary services to aggregated small resources, even below 55 kW, paving the way for household participation.

At the local level, DSOs are testing Local Flexibility Markets (LFMs) to manage congestion and defer costly infrastructure. Initiatives such as RomeFlex (Areti) and MindFlex (Unareti) allow aggregated household units, even as small as 3 kW, to provide flexibility services. These pilots highlight DSOs' growing interest in distributed flexibility as an alternative to traditional grid reinforcements.

With Italy's widespread smart meter rollout, accessible consumption data, supportive regulation, and proven international benchmarks, the context for consumer- driven demand response has never been more favorable. VolTogether is ready to seize this opportunity, enabling households to become active contributors to a more resilient and decarbonized grid.

Generating a solution

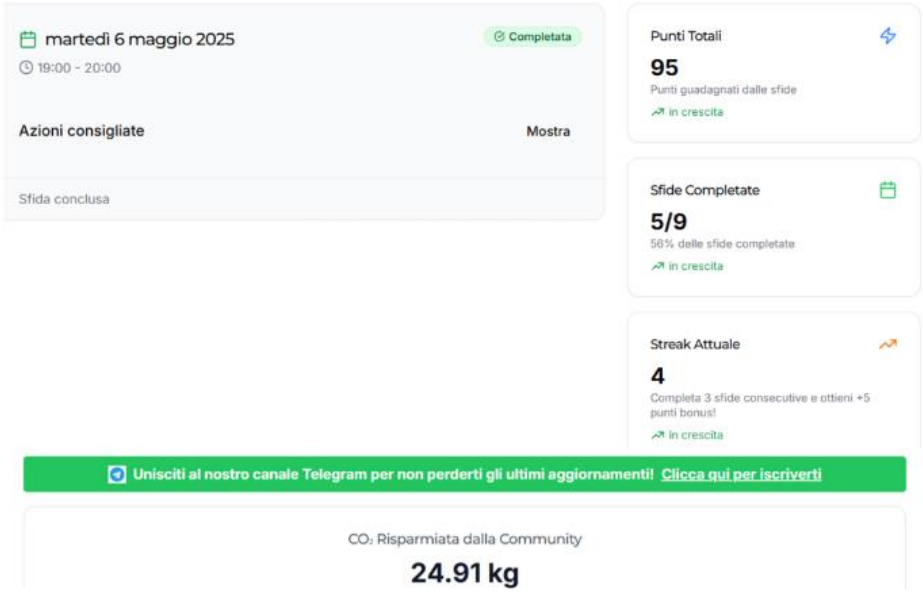
VolTogether developed a web-based platform that engages households in cutting peak demand through simple, game-like participation. During peak hours, the platform sends "flexibility challenges" asking users to briefly reduce consumption in exchange for rewards. For example, a user may receive a notification to lower usage from 7–8 PM and earn credits for doing so.

Behind the scenes, the platform aggregates individual reductions into a virtual pool of flexible load, verified via smart meter data. This aggregated flexibility can then be offered in national (UVAM) or local markets (e.g. MiNDFlex, RomeFlex), generating revenue to sustain user incentives. Importantly, no special hardware is required, ensuring low barriers to entry.

Several MVP trials (2024–2025) validated the solution. Users consistently reduced demand when prompted, with each active participant contributing around 0.3 kW (300 W) per event. At scale, these small contributions add up: 1,000 users can provide ~300 kW, and the 2027 target of 3,300 users equates to 1 MW of flexible capacity.

Participants also showed high engagement, demonstrating that community-driven demand response can sustain user interest while delivering measurable system benefits.

In short, VolTogether is a citizen-powered flexibility service that bridges everyday consumers with advanced energy markets. It makes demand response easy, rewarding, and scalable, supporting both DSOs and the TSO in maintaining grid stability and enabling the integration of renewables.



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