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Flexibility for All? Unpacking Readiness and Equity in Demand Side Management

Theme 2, sub-topic 2b

☒ “Academic contribution”

☐ “Policy/practice contribution”

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Extended abstract

Demand Side Management (DSM) plays a key role in the energy transition by helping balance the volatility of decentralized, renewable energy. It allows households to benefit from cheaper, locally produced energy during times of surplus. However, energy flexibility—central to DSM—has a strong social dimension. Understanding how flexibility relates to diversity factors such as income, housing, or family status is essential to designing inclusive programs and avoiding the exclusion of vulnerable groups from affordable energy access. The concept of a social license, originally from the mining sector, highlights the importance of legitimacy, credibility, and trust (Boutilier & Thomson, 2011). Applied to automated DSM (Adams et al., 2021), it underscores that meaningful, ongoing public acceptance depends on recognising social practices, routines, habits, and users’ desire for agency—rather than treating flexibility as a mere commodity.

Assessing residential energy flexibility requires considering both appliance use and user behavior, as identical devices can show different potentials depending on how they're used (Afzalan & Jazizadeh, 2019). Flexibility depends on social, cultural, and economic factors—what Powells and Fell (2019) term “flexibility capital” as “the capacity to responsively change patterns of interaction with a system to support the operation of that system”. Wealthier households typically have more options, so a DSM policy or program that overlooks this matter risks reinforcing existing inequalities. Libertson (2022) adds that flexibility is also tied to social status and critiques demand-side technologies for assuming that all users are rational and equal, an assumption that often disadvantages lower-income households.

To address the social dimension of DSM within its cultural and economic contexts and support a just and inclusive transition, the *Social License to Automate 2.0* task of IEA Users Technology Collaboration Programme developed a *flexibility readiness framework*. The framework builds on several supporting activities including a literature review on how diversity dimensions affect DSM participation (Henriksen et al., 2025), a diversity-focused analysis on energy saving actions of the Flash Eurobarometer 514 data (Eakins et al., 2025), energy profile data analyses to understand diversity-specific consumption differences (Garzon et al., 2023), and research into social dimensions of energy communities (Martin's et al., 2024). The full Task report provides an overview on the complete results (Diamond et al., 2024).

Methodology. The framework was developed through a multi-stage, collaborative process, drawing on findings from other SLA2.0 activities. Based on a synthesis of existing theoretical perspectives, flexibility readiness was defined as "the readiness to modify one's energy use in time, space, or intensity to accommodate specific needs regarding power consumption"—including shifting, relocating, or adjusting the intensity of use (adapted from Libertson, 2022). Diversity dimensions—such as gender, income, age, family status, and housing—were selected based on project research and prior findings (Henriksen et al., 2025). Expert workshops (5–7 participants) identified key flexibility factors per dimension, created expressions of low, medium, and high willingness to support tangible understanding, and mapped socio-demographic traits to these factors, forming the basis for the framework. This mapping informed the definition of three flexibility readiness profiles. The final framework and profiles were validated and refined in a concluding workshop.

Results. Based on insights from the literature and expert knowledge, three core dimensions of flexibility were defined, impacting the *flexibility readiness* of consumers:

- *Flexibility Capacity:* Involves the physical potential for flexibility, including prosumer technologies (e.g., solar panels), household loads (e.g., appliances), enabling technologies (e.g. home energy management systems), and temporal capacity (available time to engage in flexibility).
- *Flexibility Ability*: Considers the awareness, information accessibility, knowledge, skills, energy practices (when, where and what for energy is consumed) and flexibility of said practices. In this context, ability to control energy practices and ability to transform (ability to change conditions to improve flexibility) also play important roles.
- *Flexibility Willingness:* This refers to the user's motivation to engage in flexibility, influenced by perceived benefits (e.g. provided through incentivisation), technology affinity, and social norms.

Our research showed that these dimensions and factors show noticeable variation across social groups: Positively, men often exhibit higher technical flexibility capacity through greater access to enabling and prosumer technologies, while women tend to have higher temporal capacity. Households with young children show increased capacity linked to household loads. Homeownership and higher income boost flexibility capacity via access to advanced technologies and energy loads. Middle-aged individuals display enhanced flexibility ability due to their knowledge and control over energy use, with women showing strong awareness and practice-based flexibility. Men often dominate in skills and

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transformative capacity, supported by financial means and decision-making power. Willingness to engage is higher among men, driven by technology affinity and financial incentives, whereas women are motivated more by environmental and social factors. Higher-income and medium-income households, as well as young, tech-affine individuals, also demonstrate strong willingness, supported by homeownership and access to incentives. Conversely, low-income households, tenants, and those with young children face barriers including limited access to prosumer and enabling technologies, reduced control, lack of information, and skill deficits that constrain flexibility. Older adults show lower willingness due to low digital literacy, while low-income groups often find limited benefits, reducing their motivation to participate.

Flexibility readiness can therefore be grouped into the following three levels:

- *High readiness:* tech-savvy, higher-income, homeowners with flexible schedules; men favour technology and finance incentives, women lean toward manual flexibility and social/environmental motives.
- *Medium readiness:* groups with potential but limited by access or challenging routines, including young people, households with children, and tenants.
- *Low readiness:* low-income and older households facing financial, informational, and routine barriers, especially older women and those affected by language issues.

These profiles show that *flexibility readiness* is shaped by intersecting factors such as income, age, gender, and housing status, shifting household positions up or down the readiness scale.

Conclusion. The *flexibility readiness framework* can offer valuable insights into how households can adapt energy use to support system needs. However, focusing solely on individual flexibility—especially when tied to technological resources—risks reinforcing inequalities and overlooking the broader imperative of reducing overall energy demand. This is where the concepts of sufficiency and sobriety are crucial: DSM should not only aim to shift consumption in time, but also reduce it to ecologically sustainable levels (Guillard, 2021; Thomas et al., 2019). Without this, DSM programs risk privileging high-consumption households with the means to automate, rather than encouraging restrained, conscious energy practices.

Embedding DSM in community contexts can strengthen both flexibility and sufficiency with shared goals like optimizing local renewable energy, autonomy, and energy solidarity fostering more inclusive engagement. Framing flexibility as part of a collective effort to reduce dependence on the grid encourages more conscious and cooperative consumption practices, moving beyond individual performance toward broader ecological responsibility. *Flexibility readiness* should therefore also assess how practices align with sufficiency and social values—not just technical responsiveness—to ensure DSM contributes meaningfully to climate goals and systemic change.

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