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1 Introduction

The EDGE-consortium has conducted research on the fragmentation and public support for subnational policies as well as these policies' role in the Swiss decentralized renewable energy (RE) transition. Results were noted in various scientific papers (in different stages of the publishing process, see Brückmann and Stadelmann-Steffen, 2023; Brückmann, 2024; Brückmann et al., 2024; El-Ajou, 2024; Freiburghaus et al., 2024; Ruprecht, 2023, 2024a, 2024b; Schmid, 2024), in reports (Schmid, 2023b, 2023c; Schmid and Stadelmann-Steffen, 2023; Stadelmann-Steffen and Brückmann, 2023; Stadelmann-Steffen et al., 2024) and in the first EDGE White Paper (Schmidt et al., 2023). The present policy brief synthesizes the findings, formulates recommendations, and brings forth best practice examples based thereon.

The Swiss political system is often touted to be slow and inefficient with regards to the creation and implementation of innovative policy, a reproach that is ascribed to Swiss federalism and direct democracy, even though there is little empirical evidence to support this claim (Linder and Mueller, 2017, p. 390; Vatter, 2020, p. 369). Indeed, and as the research on Swiss Federalism in the energy policy domain shows, federalism is *not per se* slowing down the energy transition. Rather, it is the *politics* surrounding RE-issues that trigger the extensive use of the involved institutions and thus make problem-solving inefficient and ineffective (Freiburghaus et al., 2024). Hence, there are three dimensions one could consider to deblock: The first one is to address the blockade by adapting the energy competences of institutions to avoid their negative impact if politics leverage them extensively. The second would be to strengthen the institutional potential for positive impact. The third dimension is the reduction of political discord on energy transition issues. This policy brief argues that all three are necessary.

On the reform of competence distribution in the energy sector, two directions of effect have been discerned: Cantons do have the potential to act as a "laboratory", where multiple policy-options can be implemented at the same time and then one's cantons well-performing policy-solution can be adopted by the others that might not have worked so well (Brandeis, 1932; Braun, 2000; Tarr, 2001). However, fragmented institutional structures may also block the generation of policies altogether (Freiburghaus et al., 2024; Scharpf, 1988; Schmid, 2023a). The literature on energy federalism, discerning effects of federal institutional structures on energy policy outcomes, have indeed shown that federalism both helps to innovate and block policy at the same time (Schmid, 2023a). Whether reforming competences in the energy sector is needed can thus not be answered in general, only with regard to specific problems, questions and contexts. For example, a more stringent harmonization of PV feed-in-tariffs (FIT) is unavoidable for higher effectiveness (Freiburghaus et al., 2024; Schmidt et al., 2023). This is even more the case as the social acceptance across cantons and regions in Switzerland does not differ for PV, with remaining differences being due to ideology, not place of residence (Stadelmann-Steffen and Brückmann, 2023; Stadelmann-Steffen et al., 2024). The reform of and harmonization of authorization procedures for wind turbines in Switzerland seems also to be indisputably necessary (Schmid, 2023c; Schmid and Stadelmann-Steffen, 2023). Such harmonization includes pressure on the cantons that have not yet defined suitable (or excludable) areas for wind energy in their cantonal structure plans.

Other findings indicate that instead of harmonization, on certain questions, more cantonal and municipal experimentation is needed: For commercially large, but also for household-sized wind energy installations, or even for middle-sized wind energy turbines in industrial zones directly feeding into energy-intensive production sites, cantons and municipalities have largely remained passive (see Schmid and Stadelmann-Steffen, 2023), even though there would be plenty of opportunity to soften the winter gap with such measures. This includes the special role of oftentimes municipally owned or otherwise (partially) public electricity utility companies that could assume a much more active role in the energy transition.

Additionally, cantons and municipalities also need to engage in generating easy opportunities for the population to participate in the energy transition. For example, even if most urban dwellers are tenants and cannot install a rooftop-PV by themselves, there are options of shared-PV (Ruprecht, 2024a, 2024b; Brückmann et al., 2024). This means that cantons and municipalities, in particular through their ownership of utilities, could push them to develop easy solutions to implement energy communities (ZEV,

LEG). Yet cantons could also require participatory planning beyond the federal minima or define minimal standards for local benefits of larger energy projects. Moreover, cantons could seek out opportunities internally: Greater allocation of resources to land-use planning (Föhse, 2022) or ensuring that authorities can deal with complaints against the building permit in a more efficient and effective manner (Schmid, 2023c) have been proposals of internal reform.

Conversely, lowering the political discrepancies to an appropriate level between relevant public and private actors that decide on the energy transition, only has a single direction of effect: positive, as consensus lifts institutional and policy blockades (for wind energy, see Schmid, 2023a).[1] This seeming obviousness, however, has wide-ranging implications (Schmid, 2023a), e.g. tasking authorities to actively pursue political middle ground and act as facilitators in concrete projects. Such efforts would also include improving communication (strategies) that emphasize the goals of energy policies and clearly delineating the trade-offs involved policy decisions, which has been shown to result in greater acceptance (Brückmann and Stadelmann-Steffen, 2023). Furthermore, improved communication would also require that existing cantonal or municipal PV-subsidies are known, because incentives can only work if the target audience is aware of them (El-Ajou, 2024).

In what follows, in chapter 2, these three dimensions are addressed in greater detail: The first section (2.1.) deals with deblocking policies, the second (2.2.) discusses possibilities to further local experimentation (2.2) and the third (2.3.) is on reducing politics (2.3). The sections also contain best-practice examples along the way, indicated by “best practices” marked in bold. The third chapter concludes and provides an outlook.

2 Policy recommendations

2.1. Deblocking policies and institutional configurations

Disentangling incentives and stopping “vertical games” for solar PV

The incentivization of Swiss renewable electricity production has suffered from very high fragmentation on the cantonal level and municipal level (Schmidt et al., 2023). The revenue stream from a rooftop solar PV installation can vary up to 20 Rp/kWh between neighbouring municipalities – and it is difficult to defend that the economic value of 1kWh in one municipality, whose production is highly correlated with the neighbouring municipality’s, could be that much larger (Schmidt et al., 2023). Cantonal autonomy over the introduction of additional incentives for solar PV (same for wind and biomass) has led to a ratcheting down of the level of ambition that cantonal minimal standards define. Vertical blame-games are at play here (Freiburghaus et al., 2024): Cantons use the existence of federal fiscal incentives as an excuse to not go beyond them (“not our competence”), pointing at the necessity of harmonization across cantons (“minimally harmonized is better than an uncoordinated patchwork of cantonal solutions”). Doing so keeps the level of cantonal policy ambitions low. An example here are the striking of PV-subsidies from the harmonized incentive scheme (HFM) from 2015 that is currently enforced. Another is that some cantons still have not adopted the MuKEn 2014 as of September 2023 (EnDK, 2023; Schmidt et al., 2023). This is not to say that some cantons do not try to push the level of ambition upwards, yet they have not had the market power and/or the political influence to convince a critical mass of cantons of their approach.

Another illustration of the rather low mean level of cantonal ambitions is the implementation of the new federal rule, making PV-installations on roofs larger than 300m^2 for new buildings mandatory. The rule has been implemented in each canton differently, resulting in substantial differences in required sizes of rooftop installations (3-24kW$_p$) across the cantons (Energieheld, 2024). This is factor of 8 of difference in installation requirements – for the same rule. Many cantons that had implemented the MuKEn 2014 before the federal rule was applied went beyond this rule, requiring at least 10W/m^2 EBF of energy

[1] Lowest common denominator-solutions are not the aim. In turn, what is envisaged are solutions where potential “losers” of a deal are allowed to be compensated.

production by new buildings and applying to any roof sizes. Moreover, the MuKEn-rule would foresee the installation of a greater number of kWp on a roof of 300m^2 than a low to medium ambitious cantonal implementation of the new federal rule.[2] The federal rule has now allowed those cantons that had not applied the more ambitious rule of the MuKEn 2014 to dodge the ambitious policy and comfortably remain idling. The current political proposition of making it mandatory to install solar PV on roofs that are in the process of renovation could be the next point of debate in this regard.

The cantonal rules on taxing solar PV installations also remain highly fragmented. On income taxes, cantons either apply a net- or gross-rule, or are not taxed at all on the first 10'000 kWh/a. On the issue of whether investment costs count as added value to buildings or as maintenance and hence, value retention, this has been standardized as a rule since 2024, but not regarding its implementation: Some cantons allow the deduction on income tax only after the new building is five years old, for others the delay must be one year, one canton even allows this deduction on new buildings. For some cantons, PV-installations are subject to property taxes, but not in others. It is difficult to imagine that differences in taxing a standardized product such as rooftop solar PV have a specific fiscal purpose for different cantons, as the sums that are to gain or lose are not very large. Still, such differences result in a large variety of break-even or profitability points in time for households. Moreover, such differences are difficult to square with public opinion, but also with the urgency of adding capacity to avoid as much climate change as possible.

Another question is whether federal and cantonal incentives actually work like they are supposed to, without generating windfall gains. Would those households having installed solar PV have invested in the absence of fiscal incentives? The problem here is that researchers cannot observe an alternative Switzerland that would be different only in that it has no subsidies for PV. Hence, what can be done is an international longitudinal and cross-sectional comparison. Schmid's (2024) preliminary results point to a positive federal subsidies effect in international comparison, since the system has changed from feed-in-tariffs to lump-sum payments (EIV, KLEIV, GREIV) in 2014. For municipal subsidies, El-Ajou (2024) using data from the EDGE survey from 2022 about PV adoption behaviour, finds the following: The actual amount of municipal subsidies does not matter for people's ratings of financial attractiveness of PV-investments. Rather, the issue boils down to a matter of perception: People that believe to receive higher subsidies rate investment attractiveness higher. Yet the belief of receiving high or low subsidies does not correlate with the actual amount of municipal subsidies available (El-Ajou, 2024). In other words, the mean potential adopter is not aware of the existence and amount of municipal subsidies. This is crucial as these potential adopters are more likely to make their investment contingent on subsidies than early adopters have already done. Indeed, a recent meta study reveals that while early PV adopters have been driven mainly by environmental concern and technophilia, economic factors have gained in importance among later adopters (Palm, 2020). To put it differently, visible and maybe also stronger financial incentives may be necessary to motivate PV adoption by a broader (if not the large) part of house owners.

Recommendation 1: We conclude that the strong fragmentation of cantonal and municipal policies at a rather low level of ambition are not optimal. For cantonal policy to have a larger impact on PV growth, two measures are proposed: First, a higher level of ambition coupled with greater cantonal harmonization is necessary. Second, to motivate houseowners that are less motivated by ideological and more by economic reasons, the visibility, transparency and maybe also the level of subsidies needs to be increased.

Reforming the wind energy authorization procedure

With regard to the promotion of wind energy, Schmid and Stadelmann-Steffen (2023) show that cantons barely financially incentivize the installation of wind turbines beyond the federal investment scheme.

[2] For a single-family home with 200m^2 EBF, a minimal production of 2 kWp would be required. For a multiple family home with three stories and a roof area of 300m^2 and assuming a 1000m2 EBF (at the very low end of realistic values), the MuKEn rule would foresee the installation of 10 kWp, the federal rule in a canton that foresees only minimal installation sizes, the installation of 3kWp would suffice.

According to Energiefranken.ch, a platform grouping all subsidy programs for residents and companies, only two cantons know wind subsidy programs (as of 31.7.2023). On the municipal level, only four municipalities out of 2136 (as of 1.1.2023) financially support the installation of wind turbines (0.2%). Small wind turbines have not yet been popular, but especially in more mountainous areas, household-sized turbines might bring some much-needed winter-kWhs. Moreover, the design of such incentive programs would not cost much, as the market for small wind turbines has not yet gained traction.

The “elephant in the room” for (large and more efficient) wind energy, however, is its regulation. Cantons exhibit no less than 18 different procedural differences on the way to a building permit (Schmid and Stadelmann-Steffen, 2023). Coupled with the evolving legislation on the federal and cantonal level over time, this means that each project’s authorization procedure is near to unique: every project has its own procedure. Such an approach does not allow for any economies of scale or intercantonal diffusion of best practices. Moreover, there are still a few cantons that have not yet defined suitable (or exclusion) areas for wind energy in their Cantonal Structure Plans (KRIP). This shows that the political will on the cantonal level for wind parks is not present in all cantons – and here, the federation has no instruments to pressure the cantons to do so, as spatial planning essentially remains a barrage of cantonal competence (even though the density of federal rules is exclusive concerning the building of infrastructure outside of construction zones (Griffel, 2017), where most large-scale wind turbines are planned). In the acceleration-proposition by the Federal Council that is currently on the agenda in the Council of States, this is only partially addressed.

The debate on reforming the wind energy authorization procedure on the federal level centres on whether municipalities should be allowed to vote on the local land-use plan or not. Proponents argue that the municipality is not the right level of government to decide on projects of “national interest” (>20GWh/a). Others, including some municipal councillors talking off the record, maintain that municipalities are actually “happy” about being relieved from their planning duties in such controversial projects, as there is evidence that it tears the social fabric in municipalities apart (Schmid, 2023a). The controversial nature also deters municipalities from taking on such projects in the first place. From a developer perspective, having the municipality as a planning partner is not necessarily easy as well: Authorization procedures of such projects take 3-5 legislatures, with constantly changing personnel, making for very high transaction costs. Moreover, proponents argue, in many smaller and rural municipalities, councillors lack the procedural knowledge, as they “do” planning for municipalities in their spare time and many municipalities must work very closely with the cantonal land-use offices anyway already. This speaks to Föhse’s (2022) argument that ties procedural inefficiency of wind energy-projects to a general lack of resources in land-use planning. Opponents argue that taking the vote away from the municipal level amounts to a reduction in municipal autonomy, denying local residents the capacity to decide upon the future of their territory.

This is a politically very powerful argument against possible shifts to cantonal votes instead of municipal ones. Opponents often reason that cantonal and national politicians want to vote on the cantonal level, because “they are afraid of the municipality’s decision and therefore, want to circumvent the institution of popular votes.” Another commonly voiced argument is about incongruence: “Those who bear the costs” would have a disproportionately smaller say than those who benefit only, they argue.[3] Hence, overall, there needs to be a discussion on the appropriate level of consultation and decision-making. Should the cantonal-level be favoured to decide on construction permits, one could think about possible compensatory measures, such as working with the municipal populations on various options, letting them choose among them, not about whether there is a project or not, which would be decided on the cantonal level after the municipality’s preferred options have been selected (Schmid, 2023c). In practice, most, if not all cantons know the instrument of cantonal land-use plans already, they would just need to apply it, which they do not for political reasons. The exception is the canton of NE, whose population voted in 2014 on such a plan and accepted it. The procedure could serve as a **best cantonal practice**

[3] Inversely, however, the regional benefit is underestimated with municipal-level votes.

if, and this remains unclear to the authors, the municipalities have been duly included in the phase leading up to the vote.

Concerning the issue of reducing the number of possible legal cascades, Schmid (2023a) has demonstrated that based on the wind energy projects of 1999-2021, more cascades are indeed detrimental to the efficiency and effectiveness of authorization procedures. Importantly, Schmid (2023a) also found that perceptions of fairness and transparency contribute significantly to an authorization procedure's efficiency and effectiveness. Thus, cantons could think about how to improve the fairness and transparency of the projects they host, maybe using neutrally-led focus groups, legislating greater transparency or evaluate possibilities for popular co-decision aspects of projects (Schmid, 2023c).

Recommendation 2: Wind power regulation needs to be streamlined and harmonized. This reduces legal cascades, allows for learning effects and best-practise examples, eventually increasing the security of expectations for planners and municipalities alike through shorter processes.

Recommendation 3: There needs to be a debate about what role municipalities should or want to play in the permitting process. While in most cantons, municipalities currently primarily have a veto role in deciding whether a project could be built or not, it would be more expedient to give them a stronger role in choosing between alternatives instead of "yes" or "no" to a project.

Activate cantons and municipalities regarding biogas-plants

Concerning fiscal incentives for agricultural or industrial biogas-plants, cantonal authorities have also largely been inactive. There are only two cantons that have defined fiscal support programs for such plants (Schmid, 2023b). Regarding wood-incineration or pyrolysis, all cantons have defined rebates for fossil fuel heating replacements, which includes in rather few cases, the production of electricity in addition to heat. Schmid (2023b), testing the effects of various institutional and policy-factors on added biogas-capacity found that such predictors fare rather badly. The only reasonable explanation of added biogas-based electrical capacity, he found, is that the construction of biogas-plants is very much due to farmer's or a collective's motivation to engage in a project. As the research project "ICARE"[4] seeks to demonstrate (see Bombenger et al., 2022), permitting procedures of agricultural biogas-plants are also fraught with difficulties, similarly to authorization procedures of wind energy projects.

Recommendation 4: For biogas-plants, cantons could devise programs of support (beyond the federal investment grants) to motivate farmers or agricultural collectives to (collectively) take on such projects.

2.2. Furthering local experimentation

Promoting local initiatives

While seeking to deblock policies on the issues mentioned above, where harmonization is in focus, on some other questions, experimentation could still prove to be valuable. Cantonal and municipal project support has been rather rigid and could need some flexibility to be applicable to unstandardized projects. For example, recommended as a **best practice**, some cantons have gone beyond defining catalogues of standardized support for renewable energy installations: "Residual" programs, such as the one of the canton of GE, are open to receiving a request for financial support for projects that remain uncaptured by the standards. With an application "sur dossier", cantons are open to support innovative renewable energy-projects that they themselves have not foreseen.

Either the municipality and/or the canton are often (partial) owners of utilities. In the representative EDGE survey from 2022, over half of the respondents indicated that they are either unsure about their

[4] Led by Prof. Dr. Marie-Joëlle Kodjovi (BFH), Prof. Dr. Pierre-Henri Bombenger (HES-SO) and Dr. Adeline Cherqui (canton of VD, HEIG-VD). The publications of the project remain forthcoming.

utility's engagement against climate change or think their utility is not committed to fight against it. Through their role as owners, cantons and municipalities could help incentivize local energy projects or help design efficiency programs for their customers. Other anecdotal possibilities include that utilities could be pushed to honour energy efficiency: For example, in a "gameful" competition approach, a household could not receive a bill in a year if it saved at least 20% of electricity in comparison to the year before. More importantly, however, utilities could be pushed to change the standard electricity-product from "all electricity sources" to "renewable sources only", with possibilities for customers to opt out, instead of asking customers to "opt in" to the electricity product comprising renewable sources only. For Germany, changing the default option has resulted in much higher demand for green electricity (Kaiser et al., 2020). For Switzerland, there is evidence for a large effect of consumer demand for green default products as well: Liebe et al. (2021) have shown that 80% of households and business customers whose utilities have changed to a green default, did not switch back in a period of four years after the switch. The latest available data from 2021 indicates that there is still large potential: Only 40% of kWh's sold stem from a green default product (VUE, 2023).[5]

Regarding wind energy, especially regarding small wind turbines (1-100kW), cantons have remained passive, because the market has not matured. Yet has it not matured because there is no demand and there has been no push to increase demand? Germany reported 17'000 small-scale installations with a total capacity of 26 MW in 2015 (WWEA, 2017) and there are no data available for Switzerland.[6] Intermediate-sized vertical wind turbines (100kW-1MW) could be interesting for industrial zones of wind-rich municipalities, as they do not require large distances from buildings or large heights. There are currently 13 of these intermediate-sized turbines installed in Switzerland. Cantons could debate to what extent policies promoting small and intermediate-sized turbines could help to reduce the winter gap. They could further champion pilot-projects of such scales in industrial zones, should the wind potential allow it.

A further point suggestive of public engagement has been the label "Energiestadt," certifying municipalities that have adopted programs for the efficient use of energy, promoting the expansion of renewables, applying measures for climate protection and for environmentally friendly mobility. It is accorded to municipalities every four years anew.[7] Concerning subsidy programs for the expansion of wind energy, it was found that all four municipalities offering subsidies also carry the Energiestadt-Label. In turn, however, most Energiestadt-municipalities (99.4%) do not offer wind energy subsidies.[8] For PV, of the 625 municipalities with the label, 177 municipalities offer lump-sum payments (28.3%), and 7 municipalities offer additional feed-in-tariffs (1.1%). Of the 1'511 municipalities[9] without the label, 211 offer lump-sum payments (14%) and a single municipality offers a feed-in-tariff. Hence, looking at the percentages, the Energiestadt-label looks as if it promotes incentives for PV and to a lesser extent for wind. However, the majority of municipalities independent of whether they carry the label of "Energiestadt" or not, have not defined such measures.

Recommendation 5: Cantons could make their programs of support more flexible. For example, «residual" programs of support could be set up, where cantons check how and if an innovative project that does not fit the standard categories could be supported.

Recommendation 6: Cantons and municipalities, through their ownership of utilities, could incentivize a greater use of "green default" products and for customers who show strong progress regarding efficiency.

[5] The data are based on a survey from 2021 with 273 electricity suppliers (or 46% of all Swiss suppliers). These 273 together have a market share of about 75% of the Swiss total market for electricity. The report also indicates that participants in the survey tend to be "greener" than those who did not participate, leading to the reasoning that they're impact on the share of green default projects would have rather pulled it down at the time. However, the latest data are from three years ago, and the business of electricity supply has been profoundly changing.

[6] Micro-turbines can be bought on Digitec or in hardware stores, for example.

[7] See https://www.energiestadt.ch/de/startseite-2.html.

[8] Data was scraped from energiestadt.ch on 10.10.2024 and merged with in-house subsidies data by El-Ajou (2024).

[9] The full BFS-list of municipalities is dated 1.1.2023, see BFS (2023).

Recommendation 7: The use and benefit of small- (1-100kW) and medium-sized (100kW-1MW) wind installations could be debated. Especially industrial zones in mountainous regions might be potential benefactors here.

Recommendation 8: Municipalities and intermunicipal associations could be further encouraged to be part of the "Energiestadt"-association. The Energistadt-label could integrate the measure of defining municipal incentives for renewable energy installations more strongly in its catalogue of requirements to get the label.

Generating easy opportunities for the local population

Cantons are in the business of creating easy opportunities for the local population to assist them in "owning" or at least partaking in the efforts the energy transition entails. The first recommendation is embracing so-called "Community-PV" projects. Such often larger-scale projects offer ownership/investment opportunities for those "who do not own a roof," i.e., tenants. As a **best practice**, Sunraising,[10] an initiative in the city of Bern, can be mentioned: The local utility (ewb) and the sunraising-association scout for available (public) roofs and provide crowdfunding to build it. A person who is living in Bern (and hence, her or his electricity provider is ewb) may buy some square meters of solar PV at 350 CHF/m^2. Over the next 20 years, "what her or his square meters produce"[11] is being deducted from the electricity bill. This represents a cost of 15.9 cents per kWh over 20 years, slightly higher than the 2024 ewb-prices for renewable electricity (ewb.Öko.STROM).[12] However, with an upfront payment of 350 CHF, the investor hedges against price increases in the next 20 years. Hence, it becomes profitable if one expects prices to rise in the next 20 years. To date, such offers that tap into the willingness of tenants to invest in PV remain a niche occurrence in Switzerland, and much could be gained by utilities championing such projects to a greater extent and/or more aggressively.

Moreover, and importantly, cantons could further define standards for participation in larger energy infrastructure projects. For example, they could define participation standards going beyond the federal minima, take part or lead focus groups that accompany a project throughout its authorization procedure, or define innovative ownership structures ("Bürgerwindparks"). They could also help create benefits for the local population by supporting municipalities and their population in negotiating them. One innovative approach, named as a **best practice**, has been led by L. Debrot, former member of the cantonal legislature of NE, on the project of "Quatre Bornes" in the cantons of NE and BE and the municipalities of Sonvilier and Val-de-Ruz. "L'éolienne des enfants" is a program where parents or guardians can buy shares of the wind energy companies for their children, with one turbine having been designated as the "children's turbine." Beyond annual returns, this gives parents (and children) a sense of "investing in the future (of our kids)," and may contribute to a sense of belonging in the municipality and a satisfaction about "taking matters in our own hands."[13]

Further opportunities for the local population could be granted if the extension to the already existing federal instrument of the "groupment for self-consumption" (called "ZEV- Zusammenschluss zum Eigenverbrauch") is implemented in a simple manner. The extension to it that is currently being debated is the so-called local energy community ("LEG" – Lokale Energiegemeinschaften). Instead of sharing infrastructure behind only a single grid connection point on private land, a LEG would allow the congregation of multiple grid connection points, also using public lands (Schaub and Müller, 2024). This brings great opportunities of sharing costs of e.g. storage or production infrastructure, but is also highly complex because of the use of the public distribution grid and due to easements (Schaub and Müller, 2024). Here again, it is the local and cantonal energy utilities that could "sit in the driver's seat" of discussing options and implementation solutions with the federal authorities. The utility BKW has already positioned itself

[10] See https://sunraising.ch/.

[11] Currently fixed at a mean of 110kW/m^2 and year.

[12] See https://www.ewb.ch/angebot/strom/beziehen/strompreise-grundversorgung.php.

[13] See https://leoliennedesenfants.ch/, see also Schmid (2023a).

against a LEG (BKW, 2024), despite the energy strategy 2050 incorporating the promotion of decentralized electricity production. There is a further use-case besides the sharing of home-scale production infrastructure costs, with regard to the expansion of electric mobility: Private charger stations are often put at a different grid connection point than the house, because of higher voltage and current requirements. This means that houseowners could not supply their electric car with "their own" electricity and thus profit from lower costs. The downside, however, is that such communities tend to lessen the number of kWh's needed from the grid, reducing the overall number of kWh's on which the grid costs can be rolled over.

Recommendation 9: Citizen-financed energy projects are a promising way to better integrate the population into the energy transition – aside from financial returns, knowledge, and feelings of being able to participate in the energy transition empowers people, may reduce opposition, and may even generate enthusiasm.

Recommendation 10: Implementing the ZEV and LEGs could be easy for residents and companies, keeping in mind the potential "desolidarization" of grid costs rolled over to customers that are not in such a local energy collective.

2.3 Getting to yes – reducing "politics"

While the previous sections have mostly dealt with the question what measures to take and how to design them, this section focuses on the implementation process. The best regulation and subsidy scheme is only effective, if it is introduced, and the optimal infrastructure project does not produce any electricity if not built. This section therefore focuses on the implementation process, and in particular on two groups that play a crucial role in this context, namely stakeholders and the voting public. These are now discussed in turn.

Find and use effective tools to collaborate with stakeholders

Conflictuality of land-use with regard to siting electricity infrastructure project is one of the main drivers of inefficiency and ineffectiveness of renewable energy deployment (Schmid, 2023a; Freiburghaus et al., 2024). Schmid (2023a) specifically found that stakeholders evaluate wind energy authorization procedures that are more transparent and more fair as more effective. Higher conflictuality regarding land-use also leads to significantly lower efficiency (longer duration) of authorization procedures (Schmid, 2023a).

An illustrative example for great conflictuality has been visible in local efforts in the canton of ZH against wind energy installations that have been proposed in the KRIP (Freiburghaus et al., 2024). Upon announcement of the possibility of a later project by cantonal councillor Martin Neukom (ZH/Greens) in 2022, opponents have quickly developed some "role model legislation" on minimal-distance requirements, spreading across municipalities in 2023. It started in the municipality of Hagenbuch, where former national councillor Schläpfer (ZH/SVP), who had previously also been a municipal councillor, worked to enter a local initiative requiring that planners respect a minimal distance of 1000m between a home and a wind turbine. This would significantly lessen the availability of land for wind turbines, quite possibly eliminating the possibility of building them altogether. Ms. Schläpfer (ZH/SVP) had pushed the topic at the federal level while she was a national council member (2022). The initiative can be downloaded from the website of the association against wind energy "Freie Landschaft Schweiz (SG)"[14] and prospective issuers only need to fill in certain gaps, like the name of the municipality before handing it in. Cantonal legislators in ZH also took up the exact same issue, attempting to regulate minimal distances on a cantonal level (Weidmann et al., 2023). This happens even though the legality of municipal

[14] See https://www.freie-landschaft-sg.ch/mindestabstandsinitiativen.

minimal-distance rules remains unclear in the canton of ZH (legal in the canton of BE, but cantonal domain of legislation). Hence, there are legal cases even before a project actually exists.

This example is a testament to professionalized opposition politics, characterized by two main tenants: First, opponents seek to make their interests heard at every level of government, federal, cantonal and municipal.[15] Second, the creation and wide diffusion of model legislation has become a hallmark of opposition politics, also in other federal countries, such as the United States (Grumbach, 2022).

A promising pathway to reduce the politics of energy planning, while still hearing everyone, could be round tables. At the end of such round tables, a convention or agreement could be signed, where stakeholders legally promise to refrain from taking legal measures against projects that were negotiated in the convention (if the convention is upheld). Obviously, they require the lead, preparation and post hoc activities of a neutral arbitrator, but who would be better positioned than the cantonal experts? As promising **best-practice examples**, the former federal Councillor Sommaruga's round table on hydropower, where participants defined 15 storage hydropower projects "of priority" (UVEK, 2021), or the Bernese alpine PV-roundtable in 2023 (BE, 2023) come to mind.

Recommendation 11: Use and find stakeholder participation modes, e.g., round tables, that help to find effective compromises with stakeholders and record their binding consent (i.e., waiver of objection or referendum).

Communication to and information of the general (voting) public needs to be improved

Recent political science research has shown multiple pathways to communicate more effectively. Brückmann and Stadelmann-Steffen (2023) have thereby emphasized the need to make visible the goals that measures are intended and likely to reach. In particular, support for ambitious policies increases if goals and aligning policy measures are communicated together. That is, if the population learns why a certain, maybe not so popular, measure is taken and what positive effect it will have, citizens will more likely support it. It can be argued that the more visible benefits, in this situation, can compensate for the (perceived) short-term costs these measures are typically associated with.

In line with this finding, it seems important for energy infrastructure deployment, to "communicate in alternatives" much more strongly to induce greater acceptance of infrastructure projects. Currently, most such projects are framed in terms of a "yes or no"-decision, e.g., supporting the wind turbine or not. In reality, however, not building anything is not really a suitable option because this would generate a lack of electricity (in winter) in the medium term. Hence, if one is against wind energy, consequently, one must thus accept an alternative, e.g. open-space PV. More generally, focusing on the trade-offs of technologies, instead of yes or no to a single technology seems a promising communicational approach (see Stadelmann-Steffen, 2019).

EDGE-research has further discovered evidence for group-specific communication being beneficial for the social acceptance of open-space solar PV (Brückmann et al., 2023). This finding stems from the recognition that different people value different attributes of a PV-project. For those with left-green attitudes, doing something against climate change is important, and they react less to material costs and benefits. In contrast, high income groups prefer a market environment that focuses on profitability (Brückmann et al., 2023). For the group of less educated people,[16] there are two findings: First, based on the general population by the EDGE-consortium, Ruprecht (2024a) found that they tend to be generally less supportive of community solar-PV projects (income controlled) than their more educated peers. However, in Ruprecht's other study on accepting environmental taxes (2023), she discovered an information effect: Less educated demonstrate a higher willingness to pay environmental taxes if they receive information about why it is for. For more highly educated people, willingness to pay remains

[15] Commonly referred to as "venue-shopping" or even "state capture", see Baumgartner and Jones (1993) and Fazekas and Tóth (2016).

[16] This group refers to people that have no education completed, compulsory education or an apprenticeship or vocational school (see Ruprecht, 2024a).

largely the same, independent of whether they receive information on it or not. In a similar vein, Brückmann et al.(forthcoming) show that a promising way to promote the investment intentions among those with lower general propensity to support citizen-funded PV projects is to emphasize the collective dimension of the energy transition – this seems to more strongly motivate right-wing individuals, while not significantly deterring left-leaning and centrist individuals.

When discussing group-specific communication, it is also important to shed light on the urban-rural conflict that has plagued the Swiss debate on energy policy at least since the negative vote outcome on the CO2-law in 2021 (Sotomo, 2021). Based on findings from Stadelmann-Steffen et al. (2024) using the EDGE-survey, a tendency could be found that urban dwellers support energy independence a little less strongly (~3%) and are more in favour of European cooperation (~6%). Regarding general support of electricity technologies, this study also found small differences between urban and rural residents regarding wind turbines and open-space PV. For both technologies, urban residents are a bit more likely to support them. This might be an artefact of which region will need to host them, as these two technologies are often discussed as requiring land – and for the urban dwellers, this would remain out of sight. Interestingly, however, there is no difference for hydroelectric, nuclear, gas-fired combined cycle, geothermal or biomass plants – even though they require lots of land as well. Urban and rural respondents are also similar with regard to the acceptance of imports: About 75% are strongly or rather against importing more electricity from abroad in the future. Hence, overall, there are small and statistically significant differences, but by and large these are by no means hard facts and should only be interpreted as tendencies. The actual message from Stadelmann-Steffen et al.'s (2024) paper should thus lie in the general similarity between rural and urban residents regarding energy (policy) preferences.

What should, however, be further investigated is the very low acceptance of imports across rural and urban residents (~25%, see Stadelmann-Steffen et al., 2024). It is certainly the case that the EDGE-survey was fielded in 2022, when the Russian invasion in Ukraine caused massive upheavals in energy prices in Europe. Even though some of the magnitude of the effect might be driven by this, it would also be surprising, if the finding turned into high support for imports in the absence of a geopolitical European conflict. The energy markets have since calmed down, yet the geopolitical and energy price volatility is still there. Hence, the measurement, although maybe a bit extreme, remains within the bounds of reason. This would indicate that in general – most people want the deployment of additional capacity for greater energy independence, the question is "only" what, how, when, where, to what price and to which environmental and human impacts. When communicating, cantons and municipalities could really capitalize on this strong finding.

Communication is also a strong factor when seeking to investigate the effects of solar PV-subsidies on one's estimation of financial viability of solar PV-projects. As previously mentioned, El-Ajou (2024) has shown that it is primarily perceptions that matter. The fact that municipal subsidies exist has no effect on people's perception of financial attractiveness. Rather, it is the perception of municipal subsidies alone that influences the perception of financial attractiveness. This calls municipal subsidies into question: Do people actually know about their (non-)existence? Or are they too small to matter? Or are they overshadowed by cantonal and federal subsidies for solar PV? It is true in general that if one doesn't know about incentives, they cannot fulfil their function of incentivizing people to do something (see e.g. Mildenberger et al., 2022). What this points to most importantly, is that municipalities should make themselves heard, as it seems that today, municipal subsidies do not have the steering function they were designed to have.

Recommendation 12: When communicating planned policy measures to the population, information could be added that tells the population about the goals the implementation of these measures are likely to reach.

Recommendation 13: Instead of framing renewable energy infrastructure projects as yes/no decisions, the public could be asked to decide about alternatives, e.g., choosing between different technologies.

Recommendation 14: Emphasizing the energy independence argument (besides the energy transition argument) can help to motivate a broader population for renewable energy investments.

Recommendation 15: The population needs to be better informed about existing PV subsidy schemes.

3 Conclusions and Outlook

This report has sought to summarize as well as make recommendations based on the findings by studies of the EDGE-consortium on the fragmentation and popular support of subnational policies and how these policies affect and influence the decentralized renewable energy transition. The present policy brief has argued that public authorities have three levers (called “dimensions”) in hand to support it: Cantons could focus on (1) deblocking policy- and institutional configurations to reduce a negative institutional impact, (2), on facilitating and championing local initiatives. Additionally, cantons could also seek (3) to reduce the politics in both concrete projects and general voting and communicational settings:

(1) More harmonization at a higher ambition level: Cantonal policymakers have shown limited ambition to prioritize subsidies and harmonize taxing solar PV, using the well-known federal blame-game structure of arguing about competences. Regarding wind energy, it is high time that the authorization procedure for larger wind turbines be reformed substantially. This calls for a debate on the most salient issue of local autonomy of municipal decisions. Against this background we have formulated 5 recommendations to avoid and reduce blocking policy- and institutional constellations.

(2) Greater championing of local initiatives and innovative support schemes: For wind energy, a debate on medium-sized (100kW-1MW) wind energy in industrial zones would be in order. Regarding biomass, most cantons have remained inactive regarding the promotion of biogas-plants. Cantons could further be more active regarding the championing of local initiatives and push utilities (which they often own) to switch to green default-products and incentivize efficiency. Cantons and municipalities are further in the business of creating easy opportunities to participate in the energy transition, be it through crowdfunding, local benefit (co-)creation, minimum transparency and participation rules, and local energy communities. In total, we have formulated 6 recommendations to turn the “federal laboratory” into a force for innovation.

(3) Reducing politics to a constructive level: To reduce politics and the number of legal cases, we have derived five recommendations that either entail “concrete action” or “improved communication”, while taking preferences of different social groups into account. Regarding concrete actions, cantons or municipalities could serve as neutral arbiters in round tables on projects large and small. In this capacity, they take professionalized opposition politics into account. Concerning communication with the general population, it is important that there is alignment between the named goals and the measures designed to reach them. Communicating and debating in trade-offs has also been shown to be beneficial for constructive discussions. Targeted communication is also relevant as different social groups value different attributes of a renewable energy project (“know the recipient”). What is more, people generally do not like imports – and communication could capitalize on that. Regarding subsidies on the municipal level, there is evidence that people do not know about them and do not factor them in regarding their evaluation on whether a PV-project is financially attractive or not.

In view of the presented research and discussion, we conclude that there are some knowledge gaps related to the role of policies for decentralized energy deployment that should be addressed in future research: First, a greater focus or research on alpine PV and nuclear energy is required, given the changing times. Second, distributional (economic) effects and how they influence policy support would

be a further topic of investigation. Third, preferences for technologies including trade-offs and preferences on how to generate co-benefits for the population in project-design could also be worthy of investigating. Fourth, people's adoption behaviour of different technologies given a policy-environment remains underresearched. Fifth, topics like energy independence, European collaboration and CO2-compensation preferences should further be addressed. Sixth, a focus on the behaviour of utilities, essential but so far analytically not well-understood entities, would further seem appropriate.

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