Good Energies Chair for
Management of Renewable Energies

University of St.Gallen

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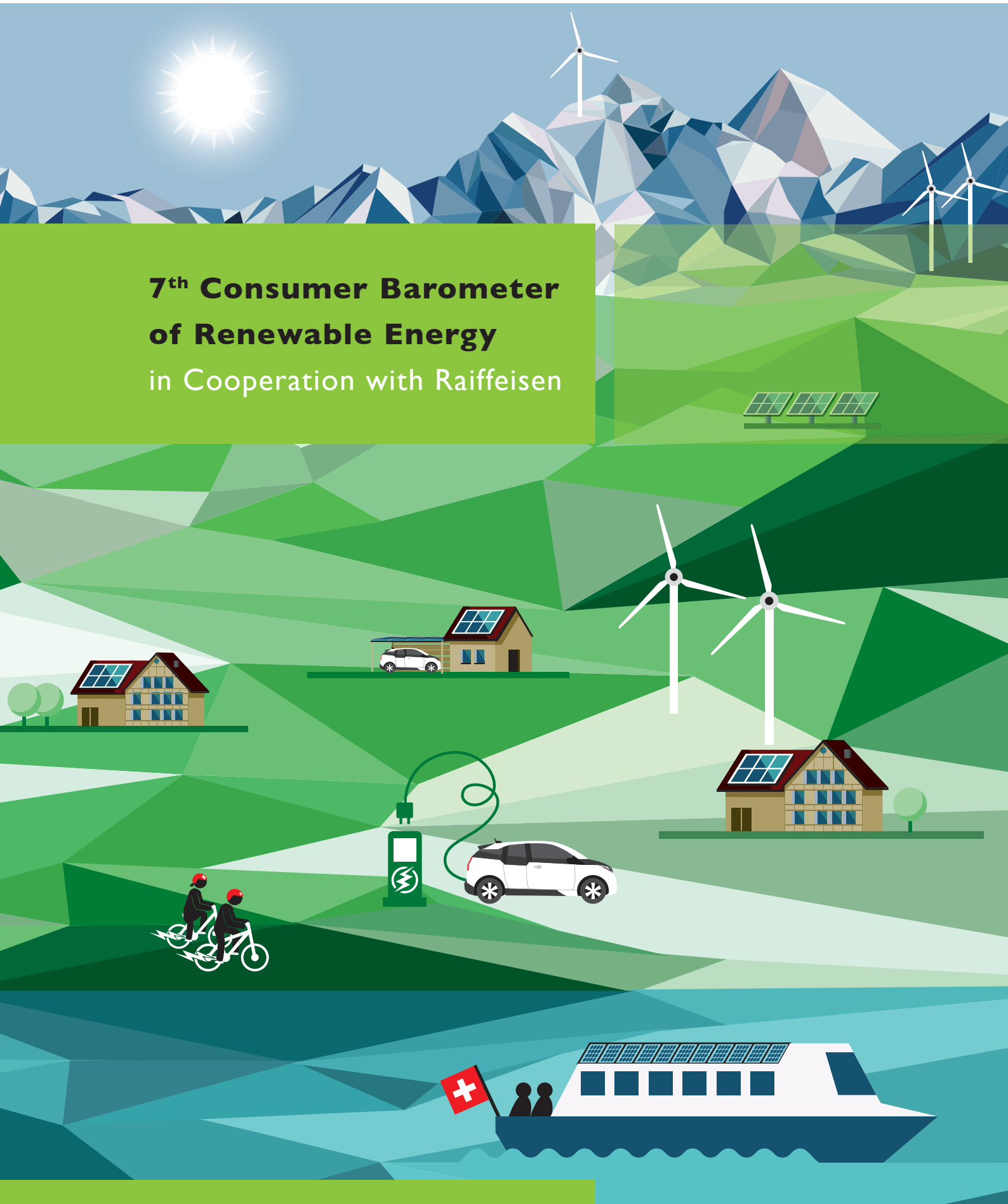
7th Consumer Barometer of Renewable Energy

in Cooperation with Raiffeisen



Chair for Management of Renewable Energies, University of St.Gallen

The Good Energies Chair at the Institute for Economy and the Environment, University of St.Gallen, focuses on issues related to management of renewable energies, including analysis of investment strategies and policy, as well as research on business models and consumer behavior. The Chair's research has been published in leading academic journals in the field and has informed decision-makers in Switzerland and internationally. The Chair was founded in 2009 and is led by Prof. Dr. Rolf Wüstenhagen.
goodenergies.iwoe.unisg.ch

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Web	http://www.iwoe.unisg.ch/kundenbarometer
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Introduction

First issued in 2011, the annual Consumer Barometer of Renewable Energy is one of the most comprehensive reviews of the Swiss population's preferences on energy topics. On the one hand, this year's issue picks up important topics from previous years, such as community financing of renewable energies, energy efficiency in buildings and the population's general perception of renewables and their development in Switzerland. On the other hand, it strengthens the focus on novel themes in the energy sector, such as electric mobility and digitization, and addresses current and important developments in the energy sector. To help you navigate, we included a sidebar on the right indicating the main themes of the study.

The study has been prepared by the Good Energies Chair for Management of Renewable Energies at the University of St.Gallen, with financial support from Raiffeisen. Our special thanks go to the Corporate Social Responsibility department at Raiffeisen, especially to Dr. Ladina Caduff and Dr. Max Wirz for a productive and pleasant collaboration on the concept of the study. We would also like to thank Dr. Michael Schrackmann of intervista AG as well as Célina Wagner of misigno graphic-design for their professional support in preparing this publication.

Data and Methods

The study is based on a representative survey of 1'021 Swiss respondents aged 16 to 74, residing in the German- and French-speaking parts of Switzerland. The data was collected in January and February 2017 and the sample was drawn from the B2C online panel of intervista AG[1]. The sample is representative for gender (51% women) and education, with 32% of respondents having obtained a higher education degree. Geographically, the sample corresponds to the distribution of the overall population among the German- and French-speaking regions of Switzerland. 25% of respondents reside in Western Switzerland, 24% in Alpine/Pre-Alpine regions, 22% in the Western Midlands and 29% in the Eastern Midlands. Starting in 2017, the Consumer Barometer sample is also representative for political orientation according to the results of the latest national elections. 29% of respondents stated their views were best represented by the Swiss People's Party (SVP), 16% by the Liberal Democratic Party (FDP), 4% by the Conservative Democratic Party (BDP), 12% by the Christian Democratic People's Party (CVP), 5% by the Green Liberal Party (GLP), 7% by the Green Party of Switzerland (GPS) and 19% by the Social Democratic Party (SP). The remaining 8% stated that another political party best represented their views and opinions. The sample included 29% homeowners, 13% apartment owners and 58% tenants.

[1] http://www.intervista.ch/en/panel

Executive Summary

- Swiss consumers continue to have **very positive attitudes towards renewable energy**. If they were to decide, the share of renewables in the Swiss electricity mix would rise from its current level (64% in 2015) to 87% in 2030. Furthermore, consumers prefer **domestic power generation** over imports: Their preferred mix in 2030 would include 81% of electricity **"made in Switzerland"**.

- The popularity of renewable energies is also reflected in respondents' willingness to participate in **community solar projects**, which allow investing into renewables even without owning a roof or property. Whereas only 2% of respondents have already participated in such community investments, 61% express interest in doing so in the future.

- In addition to facilitating the financing of renewable energies, **respondents expect banks to lead by example**, for example by installing solar panels on the roof or by providing the charging infrastructure for electric mobility.

- While respondents' knowledge of **energy efficiency standards and certification** schemes has not increased compared to last year, a majority (62%) considers energy assessments for buildings to be important or very important. This is particularly true for individuals who are interested in buying a house (79%). Among tenants, 69% would rather live in a house with a rooftop solar installation than in a house without one.

- The survey provides further evidence that the **transition towards e-mobility is gaining momentum**, with 44% of the respondents considering an electric car for their next purchase. Environmental aspects, comfortable charging at home and lower maintenance costs are the most important drivers for electric mobility. If concerns related to availability of charging infrastructure and range anxiety are overcome, a tipping point may be reached.

- The majority of respondents (81%) approves of the Swiss Federal Council's **commitment to a 50% reduction of greenhouse gases** by 2030 at the United Nations climate conference in Paris. 41% of respondents think that Switzerland should take a leading role in providing low-carbon technologies. To **combat climate change**, 74% are supportive of including transportation fuels in possible increases of CO_2 taxes.

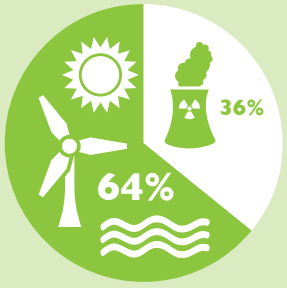
- **Energy literacy** among respondents continues to leave room for improvement. Only one third of respondents could correctly name the top two sources of Swiss electricity generation, hydro and nuclear power. 80% of respondents do not know how much they pay on their electricity bill to contribute to feed-in tariffs for renewable energy. 52% were unaware that CO_2 steering taxes are redistributed to the population through health insurance bills. In a direct democracy, finding ways to effectively impart energy knowledge to the population is of high importance, so that people have a sound basis for decisions about complex issues such as the energy future.

- **Framing of policy choices** can affect voting behavior. When asked in isolation, 29% of the respondents are critical of the Parliament's decision to phase out feed-in tariffs for renewable energies in five years' time. This share rises to 43% if respondents are previously asked to assess the Parliament's decision not to set a phase-out date for nuclear power plants. If both aspects are combined in one question, the share of respondents critical of the decision to phase out support for renewables rises to 55%.

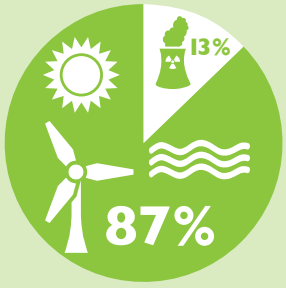
- Throughout this year's Consumer Barometer, we find that women care more about renewable energies and environmental issues than men. For 91% of women – compared to 77% of men – it is important that their electricity comes from renewable sources. **Gender differences** also become apparent when it comes to trade-offs between public health and individual freedom: 79% of women, in contrast to 62% of men, would support the idea of banning diesel cars from cities by 2025. Male respondents, in turn, show stronger support for technological solutions, such as electric mobility.

PREFERENCES FOR RENEWABLES

renewables non renewables

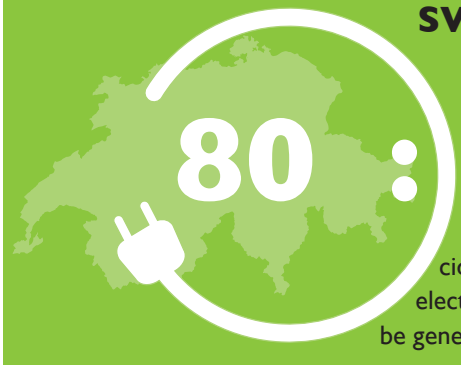


Swiss electricity mix 2015



Desired electricity mix 2030

ELECTRICITY „MADE IN SWITZERLAND“



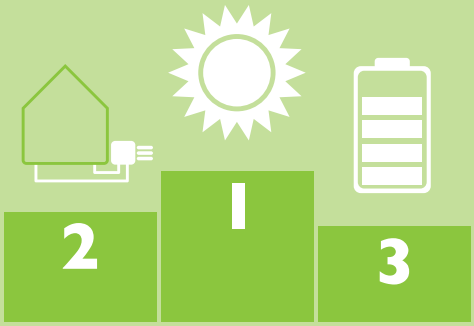
If consumers were to decide, more than 80% of Swiss electricity consumption would be generated domestically by 2030

COMMUNITY FINANCING OF RENEWABLES

61% are interested to invest in a community project for renewables

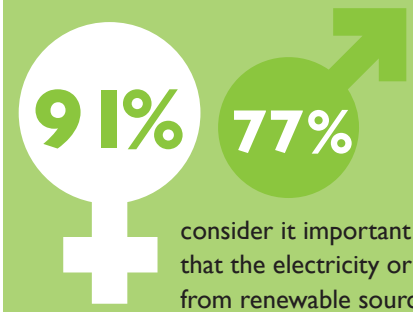
MOST POPULAR RENEWABLE ENERGY TECHNOLOGIES

houseowner intent to install



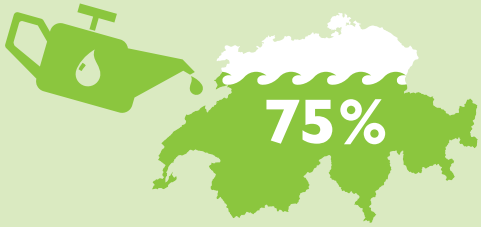
heat pump | solar | electricity storage

GENDER PREFERENCES FOR RENEWABLES



consider it important that the electricity originates from renewable sources

ENERGY LITERACY



Only 4% knew that 75% of Swiss energy demand (heat, electricity and fuels) is covered through imports

RENTAL PREFERENCES

69% of tenants prefer to rent a place in a house with a photovoltaic roof

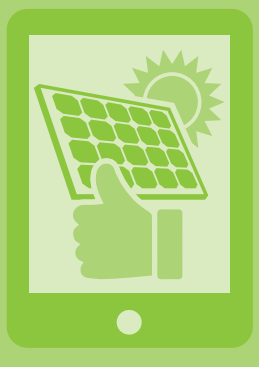
CONTRIBUTION TO CLIMATE CHANGE MITIGATION

81% approve Switzerland's commitment to reducing greenhouse gases by 50% until 2030

BAN OF DIESEL VEHICLES IN CITIES BY 2025

71% would approve if Switzerland followed the example of metropolitan cities (Paris, Athens, Madrid, Mexico City) to ban diesel vehicles

DIGITIZATION



83% welcome digital energy services which allow a better integration of solar power

E-MOBILITY

44% could imagine their next car to be electric

BANKS CAN LEAD BY EXAMPLE

72% expect banks to take a more active role in supporting renewables, e.g. by installing solar panels on their rooftops

Consumer Preferences for Renewable Energy

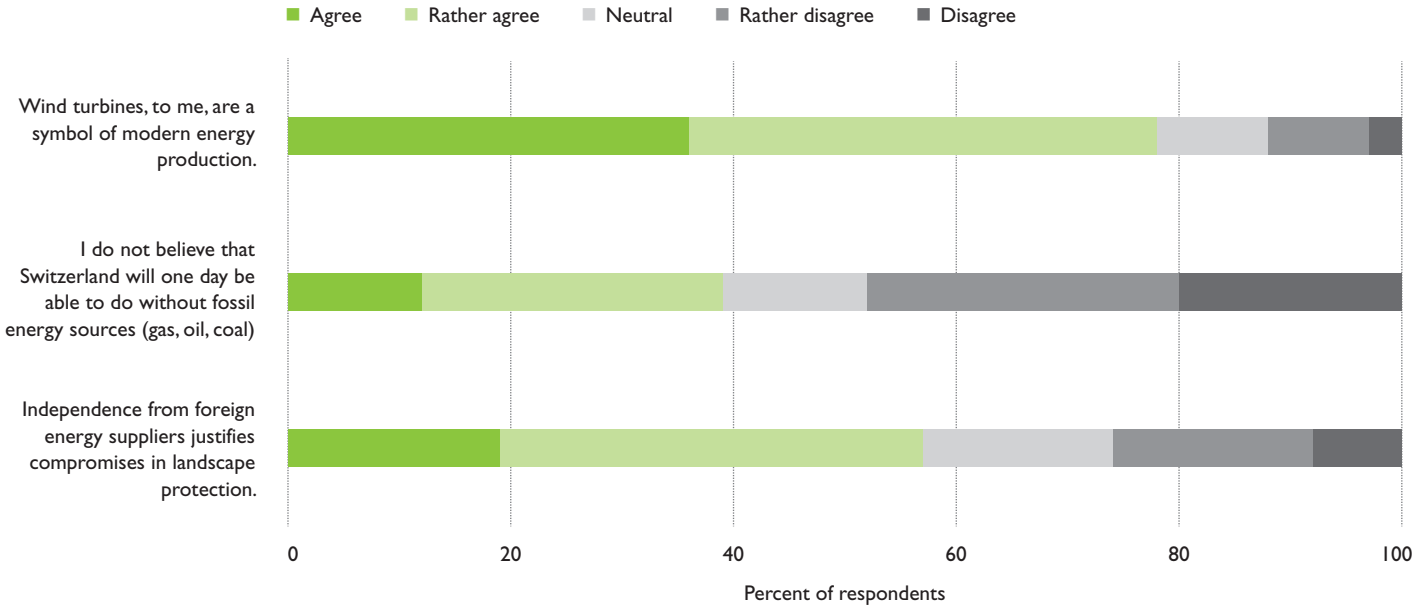
Renewable energy continues to enjoy a positive reputation among Swiss consumers. 84% of respondents consider it rather (40%) or very important (44%) that their **electricity originates from renewable sources**. This is even more pronounced among women than men. 91% of female (versus 77% of male) respondents prefer green electricity. This high share of preferences for renewable energy sources is confirmed by other results, such as that energy supply should primarily be climate friendly (rank 1). Characteristics such as reliability and affordability follow occupying rank 2 and rank 3 respectively.

This **preference for a climate friendly energy supply** may be one reason why respondents wish the **electricity mix in 2030** contained more renewable (87% instead of the current share of 64%) and less non-renewable energy (13% instead of 36%) than today. Further, respondents would prefer a more diversified electricity mix. While hydropower remains the preferred source of electricity, contributing 32% to the preferred mix in 2030, respondents would like to see a significantly increased share of solar (21%) and wind energy (14%). Biomass and geothermal energy combined should contribute another fifth of supply in the preferred 2030 mix. If consumers were to decide, the share of nuclear power would decline to 8% by 2030, while – consistent with concerns about climate change – fossil fuels' role in the Swiss electricity mix would be limited to 4%.

Despite the positive outlook for renewable electricity, some skepticism with regard to moving beyond fossil fuels remains. 39% of all respondents do not believe that Switzerland will be able to overcome dependence on oil, gas and coal. Compared to the same question five years ago, this number has decreased by ten percentage points, indicating a slow, but steady rise in **optimism about the feasibility of a cleaner energy future**. A similar trend can be observed with regard to the share of respondents who see wind turbines as a symbol of a modern energy supply: Here, the share has increased from 72% in the previous year to 78% in 2017, which indicates a rise in social acceptance of renewable energies.

57% of respondents indicated that compromises in landscape protection are justifiable to achieve energy independence, a view shared by more men (62%) than women (51%).

"To what extent do you agree with the following statements?"

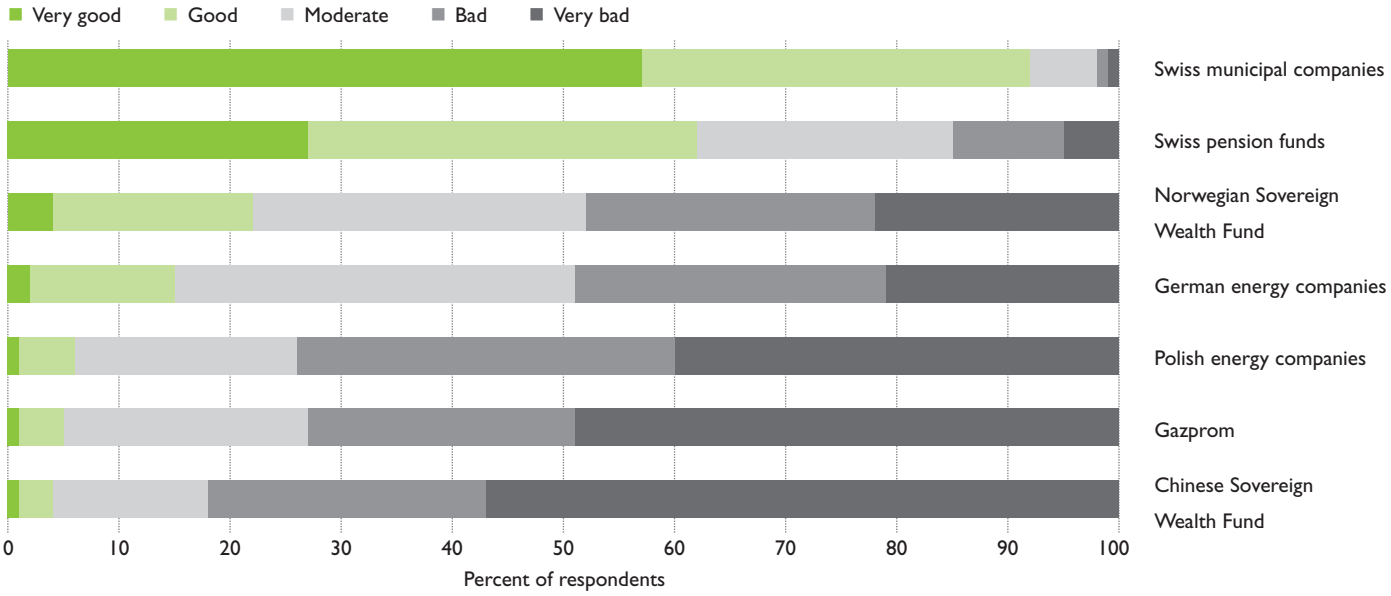


Preference for Energy "Made in Switzerland"

Swiss consumers express clear preferences for **electricity "Made in Switzerland"**. If respondents of this year's Consumer Barometer could decide, 81% of the electricity in 2030 would be generated within Switzerland and only 15% would be imported[2]. While Swissness is important to a large majority of our respondents, some express a preference for even more regional solutions. 46% would prefer to use electricity produced within their region, and another 10% go even further, preferring electricity generated within their local community. Among those consumers who were more internationally minded, importing electricity from neighboring countries ranked somewhat higher (11%) than importing it from any European country (4%).

A preference for Swissness is also expressed concerning the **ownership of hydropower plants**. In 2016, large Swiss energy companies were looking for new investors for their hydropower plants[3]. We asked respondents of this year's Consumer Barometer for their opinion about potential new investors who might be interested in acquiring such stakes. The results document a clear preference for domestic ownership. 92% of the respondents would approve Swiss municipal utilities and 62% would approve Swiss pension funds as new shareholders, again underlining the positive reputation enjoyed by municipal utilities. When it comes to foreign investors, approval rates show a sharp decline and only reach 22% in the case of a Norwegian Sovereign Wealth Fund, 15% for German energy companies, and 6% for Polish energy companies. A mere 4-5% of respondents support the idea of Gazprom or a Chinese Sovereign Wealth Fund acquiring a stake in Swiss hydropower plants.

"Large Swiss energy companies announced that they are looking for new investors for their hydropower plants. How would you evaluate the option that the following investors would acquire shares in Swiss hydropower plants?"



[2] The remaining 4% could either be produced inside or outside Switzerland as respondents had the option to indicate indifference with regard to place of electricity production.

[3] http://www.handelszeitung.ch/unternehmen/axpo-will-wasserkraftwerke-verkaufen-1215377 http://www.tagesanzeiger.ch/wirtschaft/unternehmen-und-konjunktur/Deshalb-verkauft-Alpiq-49-Prozent-seiner-Wasserkraftwerke/story/19357382

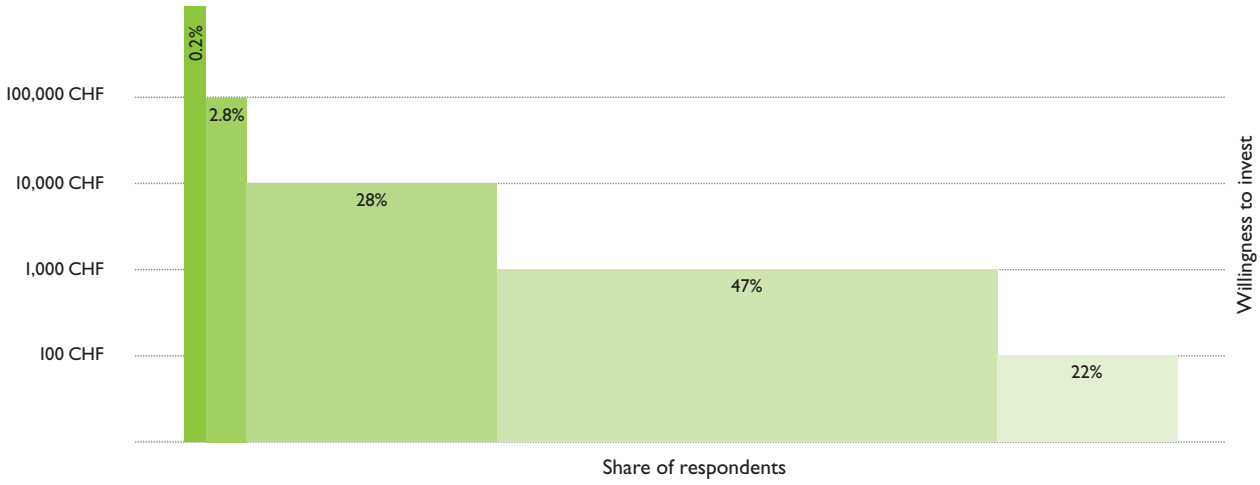
Community Financing of Renewable Energies

Since 2010, **community projects for renewable energies** have become increasingly popular in several countries. The most popular form is community solar, which has its origin in the US and allows people to invest even if they do not have their own roof to install solar panels on. Also in Switzerland, where one of the first suppliers of community solar was the utility of Zürich (EWZ)[4], the number of community projects is growing. This is not surprising as consumers are largely supporting such projects. While only 2% of respondents have already participated in such community investments, 61% express an interest in doing so. These two groups of respondents (N=646) indicate that the **main reasons to participate in such projects are a contribution to environmental protection and the "Energiewende" (65%)**, to become more independent of electricity imports (54%) and to support the local community (26%). Only 21% of respondents listed financial returns as one of the top two reasons to participate in a community renewable energy investment.

In terms of how much money they would invest, the largest share of potential community investors (47%) could imagine an investment of between 100 and 1'000 CHF, which corresponds well to results of our survey two years ago and is also the typical size addressed by community solar projects in Switzerland and other European countries – allowing retail investors to acquire one or two solar panels. Nearly a third of potential **community investors** could imagine investing more than 1'000 CHF. At the lower end of the market, 22% could imagine investing less than 100 CHF into a community project, which may be a challenge for financial service providers in terms of keeping transaction costs manageable. In terms of **technology preference**, 54% would choose investment in solar power, which is also currently the most popular form of community projects. However, our results also point to some scope for new product development, as respondents also expressed an interest in community financing of hydro (46%) and windpower (40%) projects.

Who should realize such a project? Cooperatives and local utilities are the preferred intermediaries. 35% of respondents would like to buy shares in a solar cooperative. 29% would prefer a model where the local utility develops the project and provides green electricity, whereas another 28% would prefer being co-owners of the solar plant with the local utility. Only 8% indicated that a bank and the possibility to participate in an investment fund would be the best way to realize a community project.

"How much money can you imagine investing in a community energy project" (N=646)



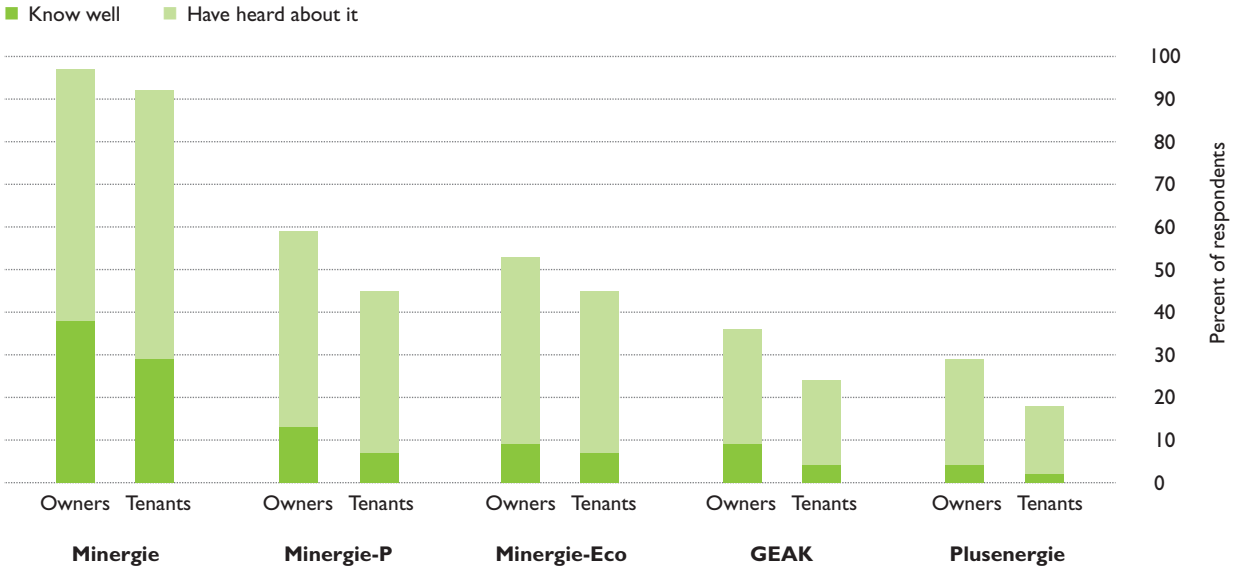
[4] https://www.ewz.ch/de/private/energie-produzieren/an-solaranlage-beteiligen.html

Energy Efficiency in Buildings – Standards and Certification

Energy labels and certification are widely used to inform consumers about the energy efficiency of certain goods, such as electric appliances or cars. In the building sector, such certification schemes serve the same purpose. They provide an opportunity for homeowners or potential buyers to get reliable information about a building's energy performance and related costs. Compared to last year, the familiarity with existing energy certification schemes has not changed among the Swiss population, thus there is still room for improvement in communicating such standards. The **Minergie** standard is still the most widely known with 61% of respondents "having heard about it" and 33% "knowing it well". Related standards, such as **Minergie-P** or **Minergie-Eco**, or the **Plusenergie** label are less well known among respondents. The same holds true for the **Swiss building energy performance certification scheme** (GEAK[5], *Gebäudeenergieausweis der Kantone*) which is voluntary in most cantons. 23% of respondents have heard about the GEAK certification and 6% know it well. In general, owners are more familiar with the different energy certification schemes than tenants.

Similar to last year's Consumer Barometer, 59% of respondents support the idea of GEAK certification becoming mandatory. Interestingly, tenants are more in favor of mandatory **GEAK certification** (66%) than owners (49%) despite being less aware of the current certification scheme of their residence (56% do not know it) compared to owners (37% do not know it).

"How familiar are you with the following energy efficiency standards /certification for buildings?"



The remaining percent of respondents indicated that they did not know the energy efficiency standard/certification

[5] https://www.geak.ch

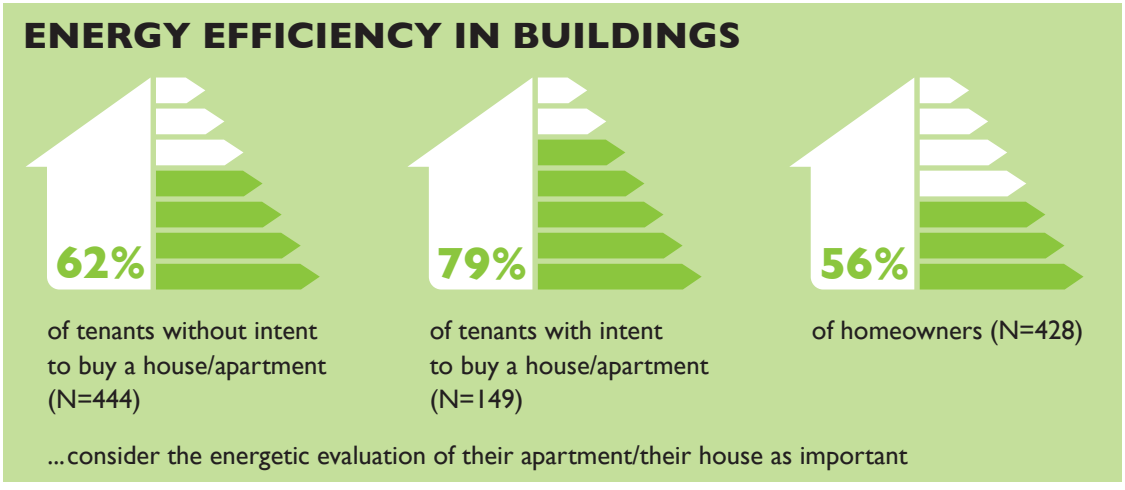
Building Energy Assessments and Refurbishments

The majority of respondents (62%) consider the **energetic evaluation of a property** as important. However, the degree to which this is the case differs among the respondents with respect to whether they own a home (N=428), are tenants (N=444) or are tenants with plans to become homeowners (N=149). The energetic evaluation is most important for those respondents who indicated that they intend to buy a home within the next years (79%), followed by tenants (62%) and property owners (56%). The higher demand of the building energy assessment among potential owners is also reflected in their willingness to pay more for such an evaluation. Potential owners would pay on average 500 CHF for a building energy assessment, whereas current owners would pay on average half of this amount (250 CHF).

For potential owners, the three main reasons for the importance of the energetic evaluation of a property are information about operating costs (rank 1), information about the necessity of energy efficiency refurbishments (rank 2) and affordability of the property (rank 3). The most important information sources about the energetic condition of the property are the seller (56%), the broker (44%) or the architect (33%)[6]. Other information sources such as the bank or the general contractor are considered less important.

Homeowners would mainly rely on **independent sources**, such as an independent consultant (57%) or friends and colleagues (43%), **to gather information about energy efficiency refurbishments**. When deciding to renovate, homeowners would first of all consider whether it is reasonable from an economic point of view, in other words whether resulting savings exceed the renovation costs. The second most important aspect is whether the renovation reduces the building's CO_2 footprint. Affordability and an increase in comfort share the third rank.

Homeowners feel well informed about a range of aspects related to energy efficiency refurbishments, such as achievable energy savings, the cost-benefit ratio of energy efficiency investments, financing opportunities, and tax incentives. In contrast, less than 25% of homeowners feel well informed about available subsidies for an energy performance certification of the property, which may hinder a more widespread diffusion.



[6] Respondents could indicate more than one information source.

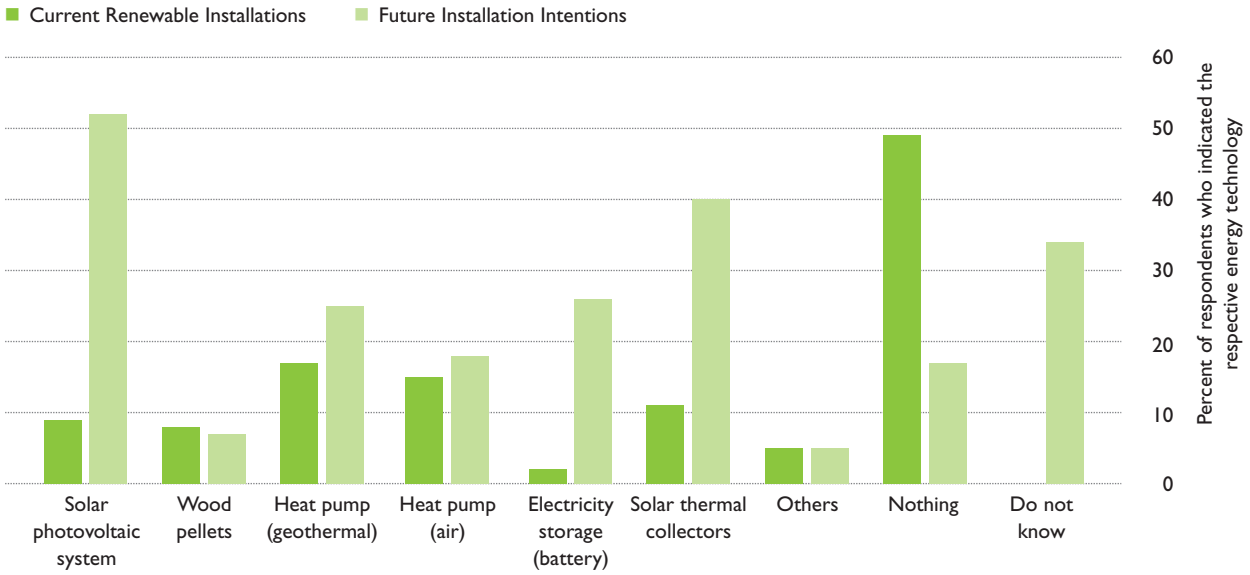
Renewable Energy in Buildings

This year's Consumer Barometer inquired once more about the use of **renewable energies in buildings**. While 49% of homeowners have not yet installed any renewable energy technology, 32% have installed a heat pump, 11% solar thermal collectors, 9% a solar photovoltaic system, 8% technologies to use wood pellets and 2% a battery for electricity storage.

8% of the homeowners have decided to install (additional) renewable energy technologies, and another 41% are considering it but have not decided yet. 34% have not yet considered this issue and only 17% have decided against installing renewable energy technologies in their building. From those homeowners who want to install or consider installing (additional) renewable energy technologies (N=210), **most would opt for a photovoltaic system (52%)**, followed by solar thermal collectors (40%). Heat pumps occupy the second place with 43% of homeowners considering this technology. Battery storage is an emerging technology option, with 26% of all homeowners indicating that they consider investing.

The positive reputation of renewable energy technologies is also reflected in **preferences of tenants** who do not intend to buy a property (N=444). If they have the choice between an apartment in a house with a photovoltaic system and one without one (all else being equal), 69% would rather choose the one with a photovoltaic system (20% are undecided). Given the choice to rent a flat with or without charging infrastructure for electric cars, 39% would prefer the option that allows them to charge an electric car (27% are undecided). We also find that tenants are willing to pay for such new technologies. When offered a choice between an apartment with a solar roof and charging infrastructure for electric cars and an apartment without both, 38% of tenants preferred the former even at a premium of 50 CHF per month (32% were undecided).

"Which of the following energy technologies are installed in your property?/ Which (additional) energy technologies do you intend to install?"



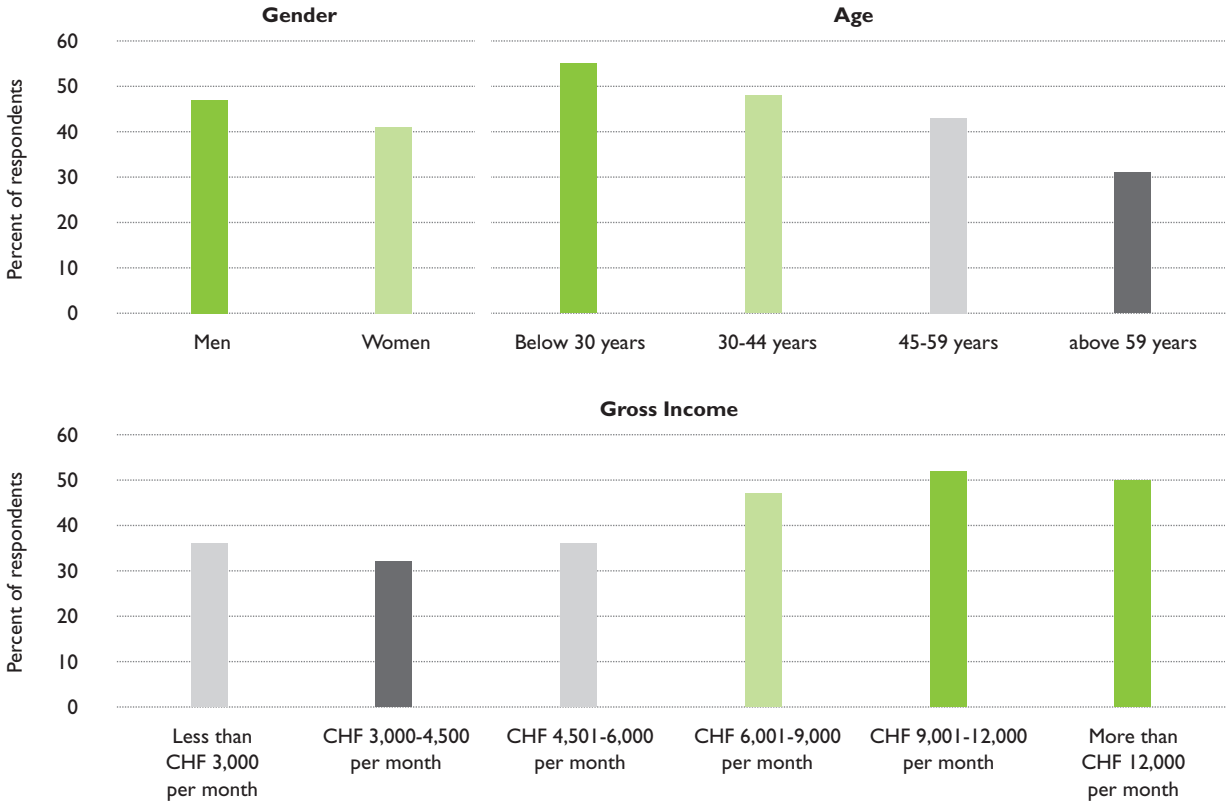
The Rise of Electric Mobility

News from the automotive industry in 2016 and early 2017, such as the collaboration of BMW, Daimler, Ford and Volkswagen to build a fast charging network in Europe[7], give reason to believe that **electric mobility** is about to reach a tipping point. To hear the **voice of the consumer**, this year's Consumer Barometer picks up on this important development. While 42% of respondents indicated that they are interested in electric mobility, only 2% already own an electric car[8]. 14% of respondents have tried out an electric car or even requested an offer from a car dealer. From those respondents who do not yet own an electric car (N=1005), 44% say they could imagine their next car to be electric. In last year's edition of the Consumer Barometer of Renewable Energy, 25% of respondents had said they could imagine buying an electric car within the next two years.

In terms of the **socio-demographic profile of the electric mobility target group**, we find once more that willingness to purchase an electric vehicle positively correlates with income. While the share of respondents who can imagine to by an electric car amounts to up to 36% in the three lowest income groups (income below CHF 6,000 per month), this share rises to above 50% in the two highest income groups (monthly income of more than CHF 9,000).

Further, the **willingness to purchase** an electric car is higher among men (47%) than women (41%) and decreases with age. Whereas 55% of respondents below 30 years and 48% of respondents between 30 and 44 years are willing to purchase an electric car, only 43% of respondents aged 45 to 59 and 31% of respondents above the age of 59 years are considering to buy an electric car. Just like in last year's Consumer Barometer, voters of the Green Liberal Party (GLP) stand out with 63% showing interest in electric mobility and 58% willing to purchase an electric car, compared to 34% of the supporters of the Swiss People's Party (SVP) interested in and 39% willing to buy an electric car[9].

"Could you imagine to choose an electric car the next time you buy a car?"



[7] http://www.handelsblatt.com/unternehmen/industrie/daimler-bmw-vw-deutsche-autohersteller-planen-schnellladenetz-fuer-e-autos/14907786.html

[8] This number corresponds to the Swiss statistics of passenger cars, which shows that in 2016 2% (rounded value) of all passenger cars in Switzerland were either electric or hybrid (https://www.bfs.admin.ch/)

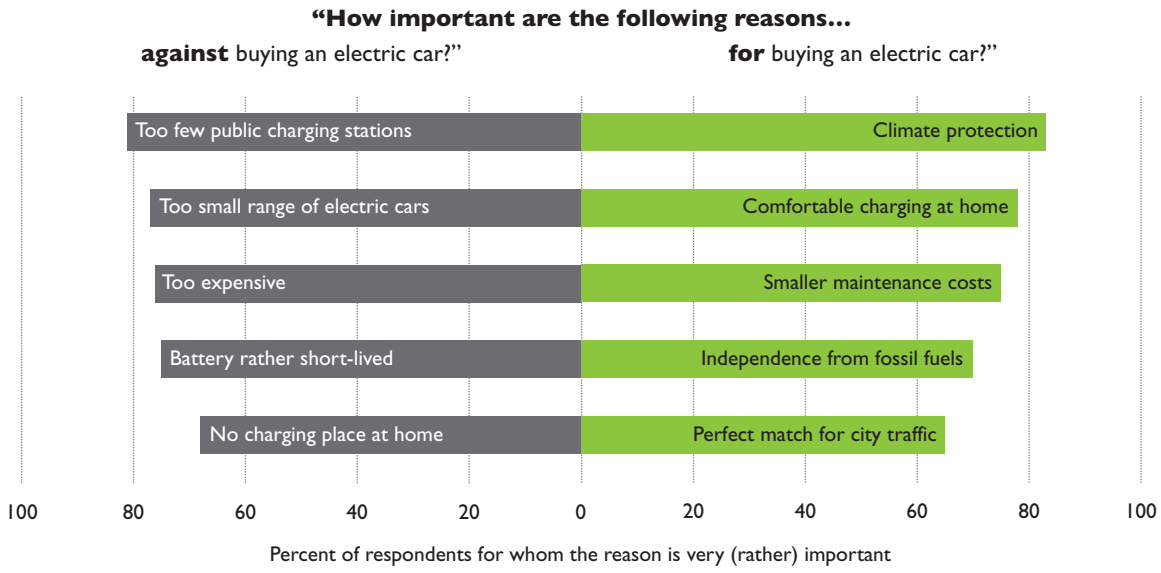
[9] Between 42% (CVP and FDP) and 50% (GPS) of the voters of the other political parties could imagine their next car to be electric.

E-Mobility – Drivers and Barriers

In terms of how **the diffusion of electric mobility can be supported**, charging infrastructure is again the clear winner with 46% of respondents voting for a nationwide fast charging network on highways. This pre-purchase perception is somewhat in contrast to studies of post-purchase driver behavior in countries with high penetration of electric cars, such as Norway, which show that 83% of charging is actually done at home.[10] 39% think a tax incentive would be an effective way to support the diffusion of electric mobility, 34% would welcome free public charging and 29% a cash bonus for buying an electric car. Charging stations at the workplace would be appreciated by 23% of respondents.

Gaining **first-hand driving experience** with an electric car can be a promising way to overcome initial concerns, such as range anxiety, and to promote advantages such as instant torque or comfortable charging at home. Even though the share of respondents selecting this support measure is currently low (15%), we find that more women (18%) than men (12%) would like to have the opportunity to change their car for a weekend in order to try an electric car. There might be an opportunity for initiatives to promote electric mobility through providing first-hand driving experience – such as the eCar4Car[11] initiative – to specifically target women.

The most important **reason for buying an electric car** is climate protection, with 83% of respondents considering it very or rather important. Comfortable charging at home is seen as very or rather important by 78% of respondents. Lower maintenance costs (75%) and independence of fossil fuels (70%)[12] occupy rank 3 and 4. 65% of respondents consider the perfect match with city traffic as an important reason for electric mobility.
The top **reasons not to buy** an electric car are related to charging infrastructure, the range of electric cars and the price. For 81% of respondents, low availability of public charging stations[13] is an important reason against buying an electric car. 77% indicated the low range of electric cars as the second most important barrier[14] and 76% of respondents think that electric cars are too expensive. While 75% of respondents are concerned about battery lifetime, 68% of respondents see the lack of possibility to charge the car at home as a barrier.



[10] http://wpstatic.idium.no/elbil.no/2016/06/paper-evs29-norwegian-ev-success.pdf
[11] http://www.swiss-emobility.ch/de/swiss-eday/Swiss-eDay-2016/eCar4Car.php
[12] 83% of respondents believe that the gasoline price will increase until 2020 which may be one reason why independence from fossil fuels is considered an important driver of electric mobility.
[13] It does not surprise that charging infrastructure remains a main barrier in the eyes of most respondents as more than 50% think that there are less than 1,000 public charging stations in Switzerland. However, according to EnergieSchweiz and the Swiss Federal Office of Energy Switzerland has the densest network of public charging stations worldwide with more than 1'600 publicly accessible charging stations in 2016 (Energieeffiziente Fahrzeuge, Markttrends 2017, https://energeiaplus.com/2017/03/09/wie-entwickelt-sich-der-automarkt/ & https://chargemap.com/about/stats/switzerland).
[14] 64% of respondents require a range of 250 km or more (24% even require at least 500 km range of the electric car). Men and SVP voters require more range than women or supporters of other political parties.

The Role of the Financial Sector: Products and Processes

Banks play a pivotal role in advancing renewable energies, and indeed this year's Consumer Barometer shows that consumers expect banks to act in accordance and step up their efforts.

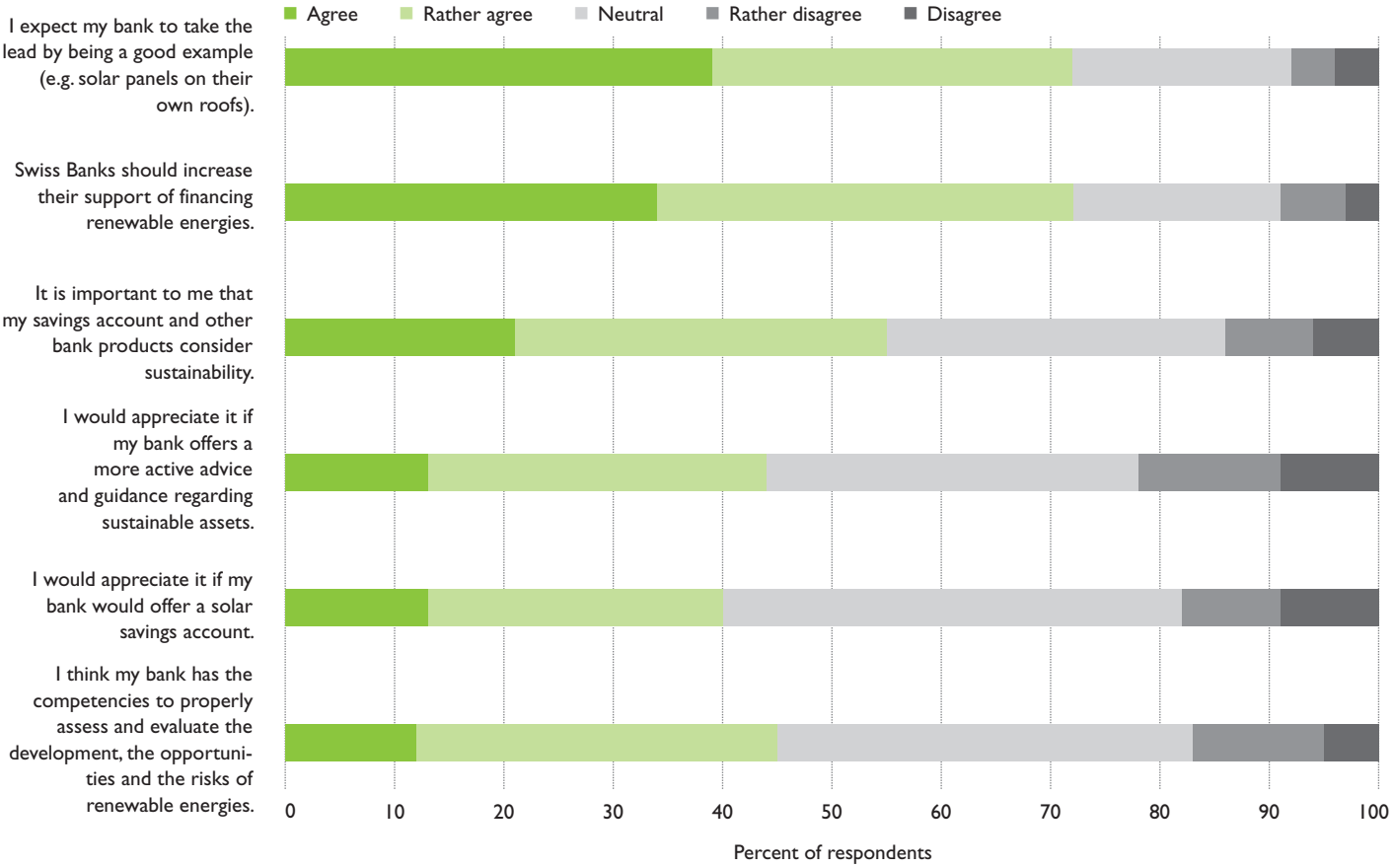
This includes banks' classical role as financial intermediaries - 56% of consumers expect **innovative & sustainable investment products** while 72% think **financing of renewable energies** should be increased – and as investment advisors, with 44% of the respondents expecting better guidance regarding risks and opportunities associated with sustainable investments.

These results demonstrate that sustainable finance offers untapped market potential. Innovative renewable energy products, e.g. in the form of a solar saving account (compare community financing of renewable energies) would be welcomed by 44% of the respondents. Developing their competence in renewable investments – 45% of the consumers believe their bank is competent enough to evaluate the risks and opportunities of renewable energies – will likely be a promising strategy for banks to build a lasting source of competitive advantage.

But consumers' expectations are not limited to banks' classical financing and advisory roles. 72% of all respondents would further like to see their banks **lead by example**, for instance by installing solar panels on office roofs or by providing the infrastructure for clients or employees to charge their electric vehicles. Such initiatives can help banks demonstrate a sustainability-oriented mindset and as such bolster credibility and perceived competence as drivers of sustainability.

Further analysis of the data shows that women have higher expectations from their bank regarding support for renewable energies and sustainability than men. This finding goes hand in hand with women's general preferences for green electricity and environmental protection.

"To what extent do you agree with the following statements about the role of the financial industry regarding renewable energies?"



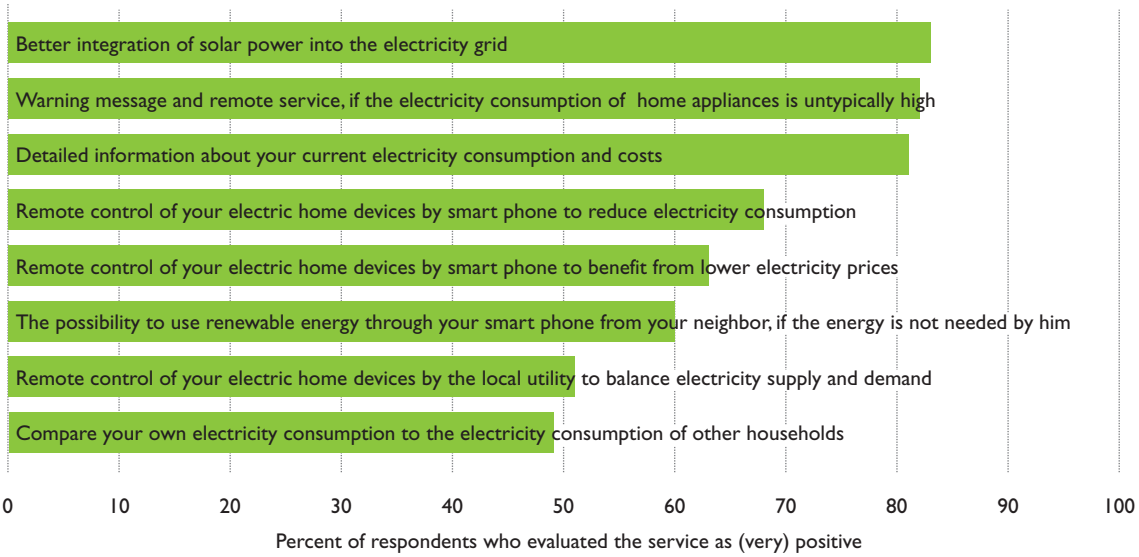
Benefits of Digitization in the Energy Market

In recent years, **digital services** to manage electricity supply and demand have been widely adopted by traditional energy market players, such as utilities, and new market entrants, such as telecommunication (e.g. Swisscom) and internet companies (e.g. Google). Smart-home services and devices that automatically control lights or heating systems (e.g. the NEST thermostat) are no longer known by early technology adopters alone, but also appeal to people who want to increase convenience.

This year's Consumer Barometer shows that the two aspects of digitization most highly valued by customers are (1) **better integration of solar energy into the electricity grid** and (2) more **detailed information about electricity costs and consumption**, including alerts in case of unusual consumption patterns. Overall a great majority of respondents (above 80%) would appreciate such digital services. Technical gadgets to reduce or optimize electricity consumption and costs, such as remote control of electric appliances, are still perceived as positive but by a smaller share of respondents (60%-68%). 51% of respondents would welcome it if the energy company could remotely control home appliances to balance electricity supply and demand. 49% would welcome peer comparisons of electricity consumption with other households.

Overall, digital services have been evaluated similarly by women and men. However, gender differences can be found for the financial motivation to adopt digital services and some technical gadgets. More men (67%) than women (60%) consider digital services as positive in order to benefit from lower electricity costs. Further, more men (64%) than women (56%) judge the possibility to use a renewable energy surplus from their neighbor through a smart phone app as positive.

"Evaluation of new possibilities which are enabled by digital technologies and services in the energy sector"



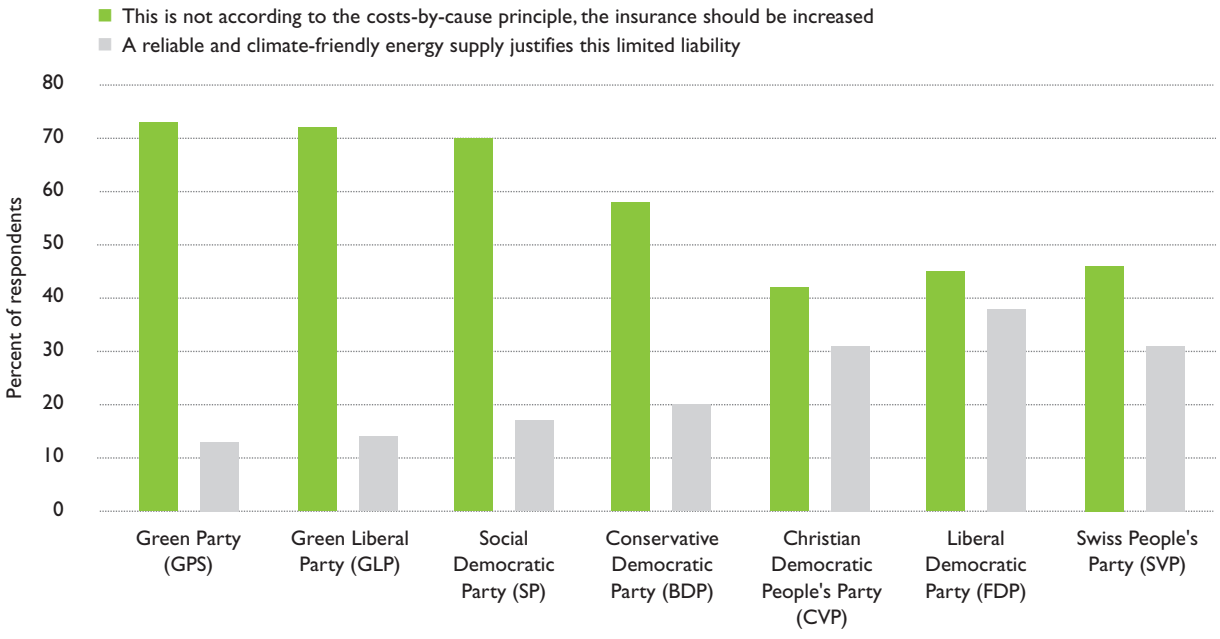
Nuclear Energy: Who should bear the risk?

Although a majority of Swiss voters rejected in November 2016 a popular initiative requesting an ambitious timeline for phasing out nuclear power[15], our survey provides evidence for widespread concerns about nuclear risk and external costs.

While the **cost of the Fukushima nuclear accident** is estimated at more than 100 billion Euros,[16] Swiss operators of nuclear power plants only have to insure against damages of up to 1.8 billion CHF.[17] 54% of respondents think that this limited liability is inadequate and nuclear operators should increase their coverage. In contrast, 26% of respondents think that although the coverage is insufficient, the limited liability is justified in light of the benefits of a reliable and climate friendly energy supply. The remaining respondents either do not care (14%) or have another opinion (6%). In terms of political preferences, this topic clearly reflects the traditional left-right cleavage on nuclear issues, with more than 70% of supporters of the Green party (GPS), the Green Liberal Party (GLP) and the Social Democratic Party (SP) favoring a higher insurance coverage, whereas supporters of other parties, including those who tend to support market solutions in other domains, are less critical of the externality.

In Germany, the federal government and large energy companies struck a **nuclear waste disposal agreement** which would allow nuclear operators to transfer the risk of long-term nuclear waste disposal to the government in exchange for paying 23 billion Euros[18]. Would a similar agreement find approval in Switzerland? Our results show a mixed picture. 34% of respondents are rather in favor of a similar agreement: 12% because it finally creates a solution to the problem, and 22% because it allows electric utilities to focus on renewables. On the other hand, 47% think such an agreement would be wrong because energy companies have profited for a long time, therefore they should also bear the risks. Another 7% have a very different opinion: They feel that instead of the utilities paying for offloading the liability, they should rather be compensated by the government if it changes the rules.

"While the cost of the Fukushima nuclear accident is estimated at about 100 billion Euros, Swiss operators of nuclear power plants only have to insure against damages of up to 1.8 billion CHF. What is your opinion?"



The remaining percent of respondents were indifferent or had other opinions.

[15] http://www.iwoe.unisg.ch/aai-studie
[16] http://www.reuters.com/article/us-tepco-fukushima-costs-idUSKBN13Y047
[17] https://www.kernenergie.ch/de/unfall/haftpflicht.html
[18] https://www.bundestag.de/presse/hib/201611/-/481400 - At the time of writing, the agreement was still subject to EU approval.

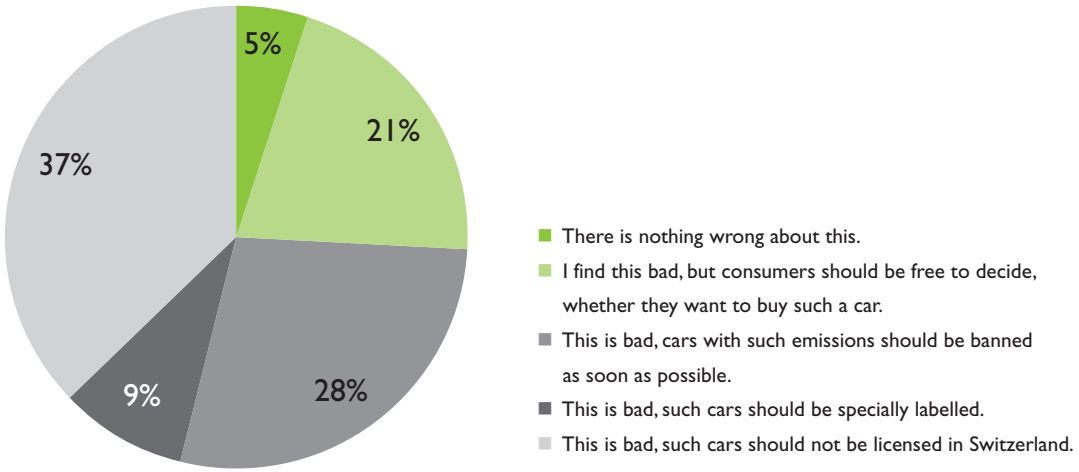
CO_2 Reduction & the role of Switzerland in mitigating climate change

So far 143 countries ratified the Paris Agreement to limit global temperature increase to well below 2°C above pre-industrial levels, as was agreed upon during the United Nations' climate conference in December 2015[19]. 81% of respondents approve **Switzerland's commitment to a 50% reduction of greenhouse gases until 2030**. 32% of respondents think that Switzerland should take a leading role in limiting global warming because as a wealthy country, we can afford it. 41% see this as a huge opportunity – while Switzerland is too small to save the climate on its own, Swiss firms can develop low-carbon technology. 10% of respondents see the Paris Agreement as a sign of alarmism, and question the scientific evidence about human influence on climate change[20].

To reach the climate goals, policy makers consider **increasing CO_2 taxes** excluding transportation fuels. However, in Switzerland fuels contribute 16.4 Million tons of CO_2 emissions per year and in contrast to other sectors, transportation-related emissions have not decreased in recent years[21]. 74% of respondents think that transportation fuels should not be exempted from CO_2 taxation, mainly because everybody should contribute according to the polluter-pays-principle.

Asked whether the government should generally be allowed to constrain individual choices if public welfare was at risk, 56% agree, while 19% disagree. Along similar lines, 71% of respondents would approve it if Swiss cities would follow the example of Paris, Athens, Madrid and Mexico City to **ban diesel cars from city traffic from 2025 onwards** in order to protect human health and the climate[22]. In terms of demographics, women are clearly more in favor of such a ban (79%) than men (62%)[23]. When made aware of a recent study of the International Council on Clean Transportation (ICCT), according to which modern diesel cars emit more than twice as much harmful pollutants as trucks because they are not subject to the same strict tests[24], 74% of respondents think that this is a serious problem and would support a ban or at least a labelling of such cars.

"According to a study of the International Council on Clean Transportation (ICCT) modern diesel cars emit more than twice as much harmful pollutants than modern trucks or busses. This is mainly due to trucks being subject of stricter controls. What is your opinion?"



[19] http://unfccc.int/paris_agreement/items/9444.php (as of April 2017)
[20] Swiss People's Party (SVP) voters represent with 20% the highest share of climate change skeptics, followed by Christian Democratic People's Party (CVP) supporters (11%) and Conservative Democratic Party (BDP) voters (10%). All other voters show a share of climate change skeptics of 6% or less.
[21] https://www.bafu.admin.ch/bafu/de/home/themen/klima/daten-indikatoren-karten/daten/co2-statistik.html
[22] http://www.auto-motor-und-sport.de/news/athen-madrid-mexiko-stadt-paris-diesel-fahrverbot-2025-715069.html
[23] Although the share of supporters for a diesel car ban in Swiss cities is lower among Swiss People's Party (SVP) and Liberal Democratic Party (FDP) supporters (58% and 60% respectively), compared to Green Party (GPS) (92%) and Green Liberal Party (GLP) (88%) voters, it still represents a majority.
[24] http://www.zeit.de/mobilitaet/2017-01/icct-studie-diesel-pkw-stickoxide-ausstoss

Framing of Policy Choices

As part of the debate on the Energy Strategy 2050, the Swiss parliament has decided to **phase out feed-in-tariffs for renewable energies** (KEV, Kostendeckende Einspeisevergütung), with no new contracts being signed after 2022. This was one of the cases where the final outcome of the legislative process differs from the government's original proposal, reflecting widespread concern among members of parliament about containing the cost of the energy transition. At the same time, 71% of respondents in our politically representative sample agree or rather agree that the **government should provide more money to support households in installing renewable energies** and only 39% agree or rather agree that free markets, rather than government programs, are the best way to promote renewable energies and electric mobility.

While setting a time limit for renewable energy incentives, the Swiss parliament finally dismissed the idea of defining a timeline for phasing out nuclear power plants[25]. These two elements of the Energy Strategy 2050 are rarely discussed in combination. In order to better understand how voters evaluate these important elements of the policy formation process, we conducted an experiment. All respondents were randomly assigned to one of three groups[26].

- In group 1, we only asked respondents what they think about the time limit for feed-in tariffs.
- In group 2, we asked two separate questions on phasing out nuclear power plants and phasing out feed-in tariffs.
- In group 3, both aspects were integrated in one question.

The results reveal that framing matters. **Presenting both pieces of information simultaneously leads to a different evaluation of the parliamentary decision than presenting only one part of the information or both pieces of information in separate questions**. When only asked about the time limit for supporting renewables, slightly more respondents (34%) consider this to be positive rather than negative (29%), and a relatively high share (37%) is undecided. The share of respondents critical of the parliamentary decision to phase out renewable energy incentives rises to 43% when they have previously been asked about their opinion of the decision not to determine a timeline for phasing out nuclear power plants, and culminates in 55% when both aspects are asked together. These differences are even more pronounced for women than for men, with the share of critical respondents rising from 25% in the single-question group to 61% in the simultaneous group.

These experimental results show that the way in which questions are asked and information is presented may significantly influence voters' choices. This might be less of an issue if people are well informed. However, our results show that an overwhelming majority (96%) did not know that 75% of Swiss energy consumption (heat, electricity and fuels) is today covered through imports[27]. 80% of respondents did not know the amount they pay for feed-in tariffs on their electricity bill and only 31% of respondents could correctly indicate the top two sources of Swiss electricity generation (hydropower and nuclear energy)[28]. **In a democracy, closing such information gaps should be a priority**.

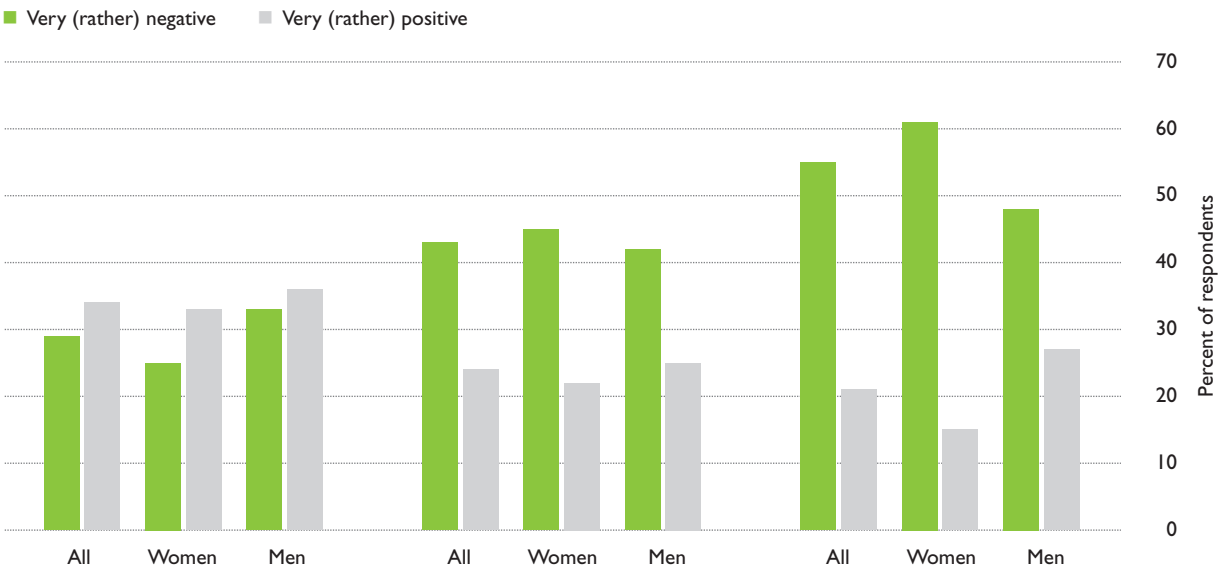
[25] http://www.ee-news.ch/de/article/33111/nationalrat-unterstutzt-grosswasserkraft-kippt-effizienzmassnahmen-begrenzt-forderung-und-lasst-akw-laufen

[26] There are no differences in terms of demographics for the three groups.

[27] Bundesamt für Energie. Schweizerische Gesamtenergiestatistik 2015 (http://www.bfe.admin.ch/themen/00526/00541/00542/00631/index.html?lang=de&dossier_id=00763)

[28] Bundesamt für Statistik. Energie - Das wichtigste In Kürze, 2016 (https://www.bfs.admin.ch/bfs/de/home/statistiken/energie.html)

"In the first package of the Energy Strategy 2050, the Swiss Parliament has limited the subsidies for renewables. How do you evaluate that?"



Group 1: Only time limit for feed-in tariffs

Group 2: Previous question about no timeline for phasing out nuclear power plants

Group 3: Both aspects asked in one question (additional half-sentence: "but the lifetime of nuclear power plants is not limited")

The remaining percent of respondents had a neutral opinion.

From Attitudes to Behavior: A Note on Interpreting Survey Data

The 7th Consumer Barometer shows – similar to previous years – positive consumer attitudes towards renewable energies. Decision-makers who take the study results as a starting point for strategy development should be aware of the following points.

Consumer behavior materializes in situational contexts, in which several factors beyond basic preferences play a role.

- **Status Quo Effect:** Overcoming the status quo is a time-consuming and emotional effort for the consumer. In the electricity market, only about 10% of customers actively choose a different product than the pre-defined default (*Litvine & Wüstenhagen 2011*, *Kaenzig et al. 2013*, *Chassot et al. 2017*).
- **Lack of Supply:** In a new market (such as electric mobility) there is often only a limited number of suppliers. Under such circumstances, existing products may not correspond to consumer preferences with regard to aesthetics, price or other attributes.
- **Peer Group Effect:** Human decision-making is based not only on individual preferences, but also on social influence. The opinion of relevant reference groups may, for example, affect voter behavior (*Rinscheid & Wüstenhagen 2016*). Conversely, the probability of purchasing solar panels can be increased by neighborhood effects (*Bollinger & Gillingham 2012*, *Dharshing 2017*).
- **Interest-based Communication:** Markets and the political process are characterized by competition between different communication strategies. Established players may influence preferences for change in favor of the status quo through deficit-oriented communication (*Longchamp 2008*).
- **Emotional Influences:** Decision-making is a complex interplay of rational and emotional factors (*Kahneman 2011*, *Brosch et al. 2014*). Successful energy communication must also appeal to the emotional level.

It should also be noted that surveys can only cover a part of the population. Concerning **representativeness of the sample**, the Consumer Barometer meets the highest standards with regard to the Swiss population. However, differences can occur if an observed sample does not correspond to the overall population (e.g. if less than half of the voters participate in a referendum). When using the results in marketing, it should be considered that usually only part of the consumers (the so-called target group) consider the purchase of a given product. Observing the preferences of the overall population helps to identify the market potential, but should be supplemented by target group-specific analyses (*Kaenzig & Wüstenhagen 2008*, *Tabi et al. 2014*, *Salm et al. 2016*).

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