Competitive tenders for energy efficiency – lessons learnt in Switzerland

Prof. Dr. Peter Radgen
University of Stuttgart
Institute of Energy Economics and the Rational Use of Energy (IER)
Heßbrühlstr. 49a
70565 Stuttgart
Germany
peter.radgen@ier.uni-stuttgart.de

Dr. Kurt Bisang
Swiss Federal Office of Energy (SFOE)
3003 Bern
Switzerland
kurt.bisang@bfe.admin.ch

Ivan Koenig
Swiss Federal Office of Energy (SFOE)
3003 Bern
Switzerland
ivan.koenig@bfe.admin.ch

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Abstract

Energy Efficiency Auctions are a policy instrument, aiming to achieve energy savings at highly attractive prices and avoiding deadweight effects associated with financial support. The paper starts with an introduction into auctioning mechanisms and the setting of the Swiss Energy Efficiency Auction. It describes the success and challenges based on six rounds of energy efficiency auctions completed in Switzerland. Overall, more than 100 million Swiss Francs have been awarded to projects and programs so far, leading to 5.5 TWh of electricity savings in Switzerland. To address different market segments, two categories of applications, projects and programs are supported. The strength and weaknesses of projects and programs are discussed followed by the description of an approach of efficiency auctions programs within the ProKilowatt scheme, especially addressing technical measures which are requiring funding too small for traditional projects but too large for normal programs. The paper highlights the recently introduced changes in the methodology to calculate the maximum funding and the energy saving to avoid the requirement for the definition of a reference technology in terms of cost and energy consumption. The paper points out as well the importance of projects and program audits to ensure a consistent and correct application of all rules set out for this funding scheme.

Introduction

Since 2010, the Swiss Federal Office of Energy (SFOE) is performing competitive tenders for energy efficiency. So far, 6 rounds of calls have been completed with a total award volume of more than 100 million Swiss Francs (CHF) (about 93 million Euro) and the 7th call for 2016 is currently seeking submissions for energy efficiency measures and programmes. The Swiss parliament decided to introduce competitive tenders as a supplement to the feed-in tariffs for renewables: Through a levy on the electricity transmission grid of currently (2016) up to 1.5 Rappen (about 1.3 Euro cents) per kWh electricity transported, Switzerland augments funds which are mainly used for financing renewable electricity production (photovoltaic, wind, biomass, geothermic plants). A part of the funds, up to 5 % of the maximal levy of currently 1.5 Rappen/kWh, can be used in order to promote energy efficiency measures (Federal Energy Act or "Energiegesetz" (EnG), SR 730.0, Art. 7a all. 4d). As funds are provided by a levy on the electricity grid, only efficiency measures aiming at the more efficient use of electricity can be promoted. Only efficiency measures that would otherwise not have been implemented (principle of "additionality") may be supported, and the market introduction of new efficient technologies should be accelerated (Federal Energy Ordinance, Art. 4). A particular requirement stated is how to implement the promotion of electricity measures: funding has to be attributed through competitive tenders. The competitive tenders are launched annually, auctions are held for projects (measures directly submitted by the owner of an installation) and for programmes (measures implemented for a bundle of different owners of installations through the support of an intermediary). In order to popularise the competitive tenders for electricity efficiency measures to the larger and multi-lingual public

in Switzerland, SFOE, together with its subcontractor CimArk SA, promote the auctions with the shorter name "ProKilowatt". In this paper, we also refer to "ProKilowatt" for the Swiss competitive tenders for energy efficiency.

In order to promote the efficient use of electricity, Switzerland neither has an energy efficiency obligation scheme (EEO) such as white certificates, nor a subsidies scheme for cross-sectional electricity consuming technologies (such as for lighting, motors, electrical appliances, and others). In contrast to white certificates, ProKilowatt is a voluntary instrument. It does not oblige utilities to buy certificates for a certain amount of electricity savings. Whereas the Swiss parliament so far rejected introducing EEO for electricity savings, it supported the competitive tenders of ProKilowatt as a less binding policy instrument. In respect to the voluntariness, ProKilowatt is closer to subsidies schemes for electricity savings. Tendering, however, bears the advantage that the government does not have to grant the same subsidy for each measure, but rather supports those measures which need the least funds. ProKilowatt, therefore, is a voluntary instrument using tendering for price-setting in order to minimize funds needed for energy savings.

Principles of Energy Efficiency Auctions

Auctioning is a process of buying and selling goods and services, where an auctioneer launches an open call for bids and chooses the buyer or seller that submitted the best bid. Whereas auctioning in general is widely used, also by public entities, for example for the attribution of licences for mobile-phones, it is somewhat less common in support schemes for the promotion of renewable energy production or, in particular, for energy efficiency measures. The economist literature on auctions states that auctions in general are a very efficient market-oriented procedure, even if auctions are repeated over the time. However, there are different ways of designing auctions and the design should reflect possible effects on different issues, among other (see below) on expected revenue and entry costs.

Following auction literature (among others: Klemperer 2004, Laffont/Tirole 1989, Laffont/Tirole 1987), ProKilowatt can be described as a *sealed-bid one-shot discriminatory price auction* with SFOE, on behalf of Swiss government, as the buyer, and various corporations and local public entities as sellers of electricity efficiency measures. Each bidder submits its bid without seeing others' bids ("sealed-bid"). The bidder can submit its bid only once in an auction period ("one-shot"). However, if the period is over and the bid did not pass, the bidder can submit its bid again in a later year, but has to take into account that the conditions of the auction may differ significantly from one year to another. In addition, ProKilowatt is a "discriminatory" and not uniform auction. This means that SFOE buys multiple bids, but all to the price asked by the individual seller (and not to one uniform price). Finally, "price" is the only criteria to decide whether a bid wins or does not win in the auction.

In 2015, as an example, SFOE held two auctions for projects and one auction for programs. In the auctions for projects, 76 (and, respectively, 39) bids were submitted; whereas 49 bids were submitted in the program auction. A part of these bids failed to meet the conditions set for entering the auction (for example, measures were economically viable, valid signatures not delivered in time). For each auction, SFOE defined a maximal budget for buying bids in advance. In the case of the program auction, significantly more bids entered the auction than budget was available. As a result, SFOE bought 30 of 49 submitted programs to the price of 33 Mio CHF (€30 Mio), starting with the most efficient program offering electricity efficiency at the cost for ProKilowatt of 1.4 Rp/kWh (1.3 €-ct/kWh) up to all programs asking for 4.2 Rp/kWh (3.8 €-ct/kWh). In the case of the project auctions in 2015, more budget was made available than what the bids were counting for. However, ProKilowatt defined in advance that under such circumstances the budget of an auction will be shortened in order to have bids at least surpassing the available budget by 120 %. As a result, 50 (of 76) and 25 (of 39) projects were supported with 5.3 Mio CHF (€4.8 Mio) and 2.76 Mio CHF (€2.5 Mio), respectively.

Usually, auctions aim at selling or buying a specific amount of a product or service, such as governments tendering for a specific capacity in wind or solar energy. In this case, the *expected revenue* equals the price paid for buying this specific capacity. For ProKilowatt, Swiss parliament has not set a specific quantitative target for a certain quantity of electricity savings that should be attained. Instead, it set a limit for the budget made available for the auctions. Thus, the main aim of ProKilowatt is to trigger electricity efficiency at the lowest cost possible; in other words, at a high cost-efficiency as defined by the ratio of funds divided by electricity savings (Rp/kWh). This cost-efficiency is a specific cost indicator with the aim of making public expenditure as effective as possible by realizing the saving measures with the lowest direct funding requirement for implementation. One should note that it is not a measure of the effectiveness of the scheme from an economic point of view, as this indicator does not include neither the cost for the administration of the overall scheme, nor the cost of the proposers for preparing the proposals.

In the past years, the cost-efficiency fluctuated around 3 Rp/kWh (2.7 €-ct/kWh) for projects and 2.6 Rp/kWh (2.4 €-ct/kWh) for programs (as will be discussed in the following chapter). The revenue of the auction in terms of electricity saved in 2014 amounted to 700 GWh, using a budget of 22 Mio CHF (€20 Mio) and a mean cost-efficiency of 3.3 Rp/kWh (3.0 €-ct/kWh). In the future, cost-efficiency is likely to be constant or somewhat less efficient. With ProKilowatt running for several years, some of the low-hanging fruits of electricity savings will have been harvested and are no longer entering the auctions. On the other hand, the technical potential for electricity efficiency measures is still high. In the future, depending on the overall budget ceiling of ProKilowatt defined by Swiss parliament, and given the cost-efficiency to be between 3 and 4 Rp/kWh (2.7 and 3.6 €-ct/kWh), the expected triggered energy saving is likely to be between 1 and 1.5 TWh (over the life-span of the measures).

ProKilowatt is interested in having a high number of bidders. As in any auction, auctioneers are getting a better revenue by attracting competing bidders. On the other hand, ProKilowatt also aims at maximizing over-all electricity savings with the funds at disposal. In order to convince enough companies to take the time and efforts to submit a bid, the *entry cost* for the auction have to be carefully assessed. The entry cost mainly depends on the risk assessment of getting acceptance of a bid. Bidders encounter the risk of dropping out. This is not the case, for example, in an electricity savings subsidy program, where

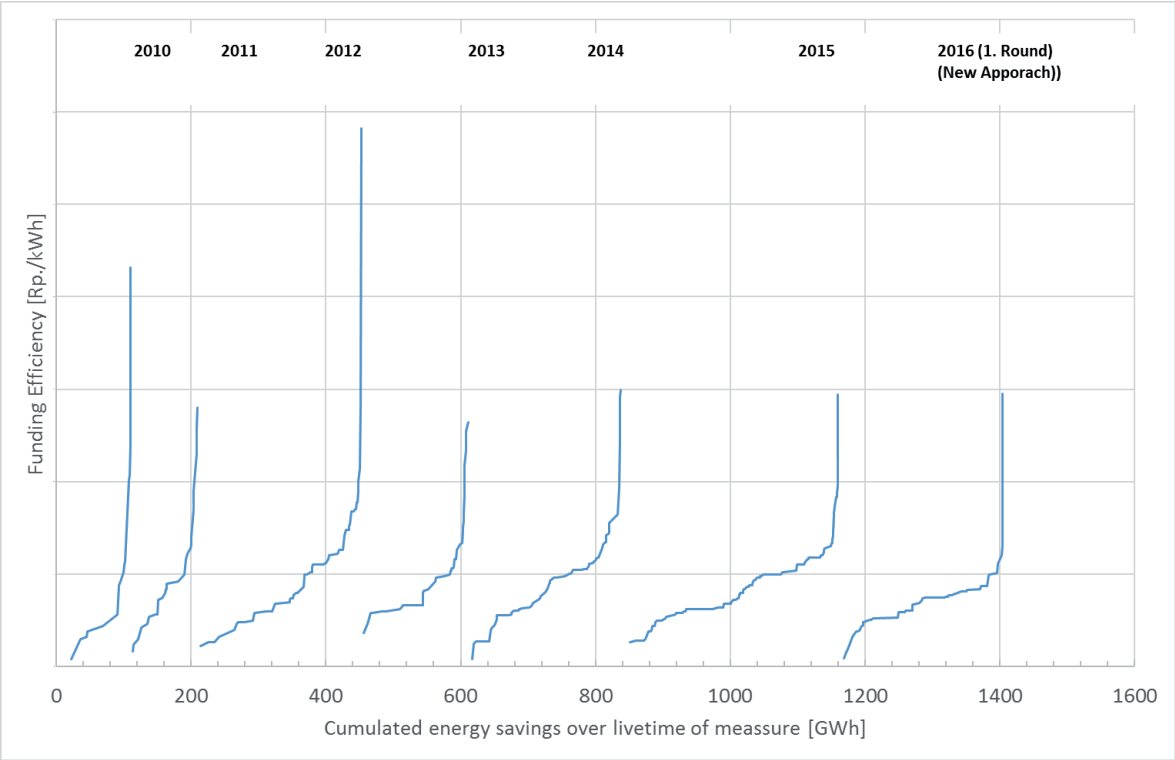

Figure 1. Funding efficiency of projects as submitted to the Swiss energy efficiency auctions since 2010 (source: data provided by SFOE).

public entities allocate funds on a first come first serve basis. In this respect, the definition of the threshold of the minimal number of bids not accepted in the auction, as mentioned above, is crucial. The threshold should not be too high and discourage risk-averse bidders from entering the auction. At the same time, the threshold must be sufficiently strong in order to incite bidders to submit a bid with their actual value, thus with the minimal amount of money needed for realizing the electricity efficiency measure without a windfall profit. In our assessment of the Swiss program, the threshold of ProKilowatt currently is well set: First, the price-span of supported projects and programs is more or less constant and below any subsidies used for promoting electricity production. Second, a significant part of bidders submits a bid that is requesting support below the level of funds maximally attributable to their measures. Third, the number of bids is still increasing, companies are not yet discouraged from submitting bids.

In practice, the entry costs are also determined through transaction costs. ProKilowatt is constantly working on reducing the paper work needed for submitting a bid. Among others, conditions for bidders were made more concrete, simplified (compare the chapter on recent adaptions below), and a web form for submitting projects was made available. Several workshops have been organized in order to popularize and explain ProKilowatt to companies and CimArk SA, the subcontractor, is giving advice to bidders free of charge. ProKilowatt also increased the numbers of projects auctions per year from one to two, in order to save companies time in waiting for submitting a bid. Possible time delays are, however, a disadvantage for such auctions which are much less frequent than common transactions in liquid markets (such as CO_2-markets, or white certificates). This is based on the fact that all bids have to be submitted at a given time and a significant time-span is needed in order to evaluate bids and to conduct the auction (for ProKilowatt currently between three and six months). On the other hand, compared to white certificates, the applicants will receive the full funding when the measure is implemented and do not have to deal with selling certificates over multiple years.

Auction Results and Achievements

Since the start of the energy efficiency auctions in Switzerland, the overall budget available for projects and programs had been significantly increased, from 6 Mio CHF (€5.5 Mio) in 2010 to 45 Mio CHF (€41 Mio) in 2016 and a further increase up to 50 Mio CHF (€45.5 Mio) per year is expected. However, as stated previously, it is important to have in mind that the overall budget provided in a year can only fully be awarded, if the overall requested funding from the applicants is at least 120 % of the provided budget to ensure the competition. Making potential applicants aware of the energy efficiency auction and ensuring a good uptake by stakeholders is therefore crucial to be able to allocate the available budget completely for electricity saving measures with a low specific price per kWh saved.

Figure 1 shows the profile for the specific cost per kWh saved over the lifetime of the projects for the six auction rounds for submitted projects. The results show, that there is a broad range of offers from below 1 Rp./kWh (0.9 €-ct./kWh) up to very high values. It should be noted here, that the price offered by applicants does not necessarily equal the cost of the savings, as the applicant is free to choose the level of funding requested and therefore can decide for which price he is offering the saving. For energy efficiency measures with high costs, an applicant might choose to request lower amounts of funding to achieve a better position in the auction. Through this, he can ensure that he might be successful in the energy efficiency auction

Table 1. Result of the Energy Efficiency Auctions in Switzerland (Source: SFOE 2016).

Energy Efficiency Auction Results	Projects				Programs				Total
	Number	GWh	Rp./kWh	€ ct/kWh	Number	GWh	Rp./kWh	€ ct/kWh	GWh
2010	18	113	Ø 2.3 [0.4–21.6]	Ø 2.1 [0.36–19.6]	8	457	Ø 1.5 [1.0–2.1]	Ø 1.4 [0.9–1.9]	570
2011	32	99	Ø 4.5 [1.5–14.9]	Ø 4.1 [1.4–13.6]	13	548	Ø 1.7 [1.1–10.4]	Ø 1.6 [1.0–9.5]	647
2012	67	242	Ø 3.2 [1.1–8.5]	Ø 2.9 [1.0–7.7]	9	276	Ø 2.4 [1.4–5.0]	Ø 2.2 [1.3–4.6]	518
2013	35	167	Ø 4.1 [1.7–7.1]	Ø 3.7 [1.5–6.5]	23	421	Ø 2.9 [1.5–5.0]	Ø 2.6 [1.4–4.6]	588
2014	61	191	Ø 3.7 [0.7–7.8]	Ø 3.4 [0.6–7.1]	21	509	Ø 3.2 [2.1–4.3]	Ø 2.9 [1.9–3.9]	700
2015	50	150	Ø 3.9 [1.7–6.3]	Ø 3.5 [1.5–5.7]	30	1,270	Ø 2.6	Ø 2.4	1,488
	25	68	Ø 4.0 [1.4–5.7]	Ø 3.6 [1.3–5.2]			[1.4–4.2]	[1.3–3.8]	

and getting at least some funding for the implementation of the measure.

The profile of the funding efficiency over the cumulated energy savings as shown in Figure 1 have changed significantly over the different auction rounds. In the first years, the profile is very steep and near linear, meaning that similar amounts of energy savings are offered for each funding efficiency. From auction round to auction round the total savings offered increased, but with less savings at very high or very low funding efficiency. In the last auction round, the offered energy saving in the middle cost range are very large and therefore minor differences in the funding efficiency can decide whether a project will receive funding or not. This clearly demonstrates the positive effect of a price competition within the energy efficiency auctions.

Besides the auctions for projects, SFOE held auctions for programs independently which are supporting the same measure for different customers. Project and Programs are therefore not competing in the same auction. In 2015, SFOE decided to introduce a second auctioning round for project as industry complaint that having only one auction per year would delay their project or even would trigger installing the cheaper standard technology rather than the energy efficient solution. Given the good experience with two project rounds in 2015 it was decided to continue with two rounds in 2016 as well. Table 1 summarises the outcome of the past auction rounds. Since 2010, the number of successful programs and projects had increased in line with increasing budgets, but still keeping the competition aspect with the cut off during the auctions. The average of the funding efficiencies is calculated by summing up the funding efficiencies and dividing the sum by the number of values for the successful programs and projects respectively, but the average is not weighted by the energy saved per project.

The range of the funding efficiencies for projects decreased significantly over time, indicating that applicants take the auction results from the previous rounds into consideration when setting the requested funding and therefore controlling the funding efficiency of their project. For programs, there is a similar trend but with much less reduction. This may be due to the fact, that program applicants have typically less flexibility with regard to the requested funding. The costs of a program are determined by the management cost of the applicant and the funding forwarded to the end customers. As the individual measures in programs are smaller, the total amount of funding per end customer is lower, which is putting pressure on the ratio of administration cost to implementation costs. In addition, the program manager has no long term advantage from the implemented measures and can therefore not recover any benefit after the end of the funding period.

The significant increase in the electricity saved in 2015 is related to the significant number of projects and programs focussing on two single technologies: Hot water heat pumps and LED street and indoor lighting. Both technologies enable an energy saving of two thirds or more for an attractive cost.

The current six energy efficiency tenders have demonstrated that such schemes can deliver energy savings cost effectively. So far, funding for the replacement of cross cutting technologies has dominated the overall portfolio of technologies. Figure 2 shows the distribution of allocated budgets for programs in the auction rounds 2010 to 2015 by technology. Pumps and circulators have a share of 21.4 %, lighting, electric motors and hot water heat pumps about 9 % each.

To sum up a small number of well-known technologies are taking a very significant part of the funding. This is in line with expectations for energy efficiency tenders, which supports the cheapest energy saving options and therefore risk marks up cannot be included. This is different compared to the funding for pilot and demo projects, where the funding aims for covering the additional risks of new technologies.

Strengths and weaknesses of projects and programs

As has been pointed out above, there are two different approaches used, projects (bids submitted by the owner of an installation subject to electricity efficiency measures) and pro-

grams (bids submitted by intermediaries who realise measure for different end-consumers). Each approach has its strengths and weaknesses, as is pointed out in Table 2.

Most importantly, one has to stress the advantage of having both approaches, as it would otherwise not be possible to address the same wide array of different efficiency measures and end-consumers. As a drawback, it is possible that projects and programs sometimes support the same kind of measure. Thus, situations where an overlap could occur, have to be monitored.

Actually, the program approach accounts for more electricity savings than the project approach. In our view, this can be mainly explained by the revenues possible for bidders and the importance of entry costs:

- In the case of programs, bidders are intermediaries who can use a part of the funds to finance own staff or who can use programs to foster contacts to end-consumers. Intermediaries usually dispose over more capacity and expertise to tailor electricity efficiency measures as is usually the case in small or medium companies.
- Project bids face the risk of dropping out, whereas in programs, end-consumers submit for funds on a first come first serve basis. This difference in entry costs is important.

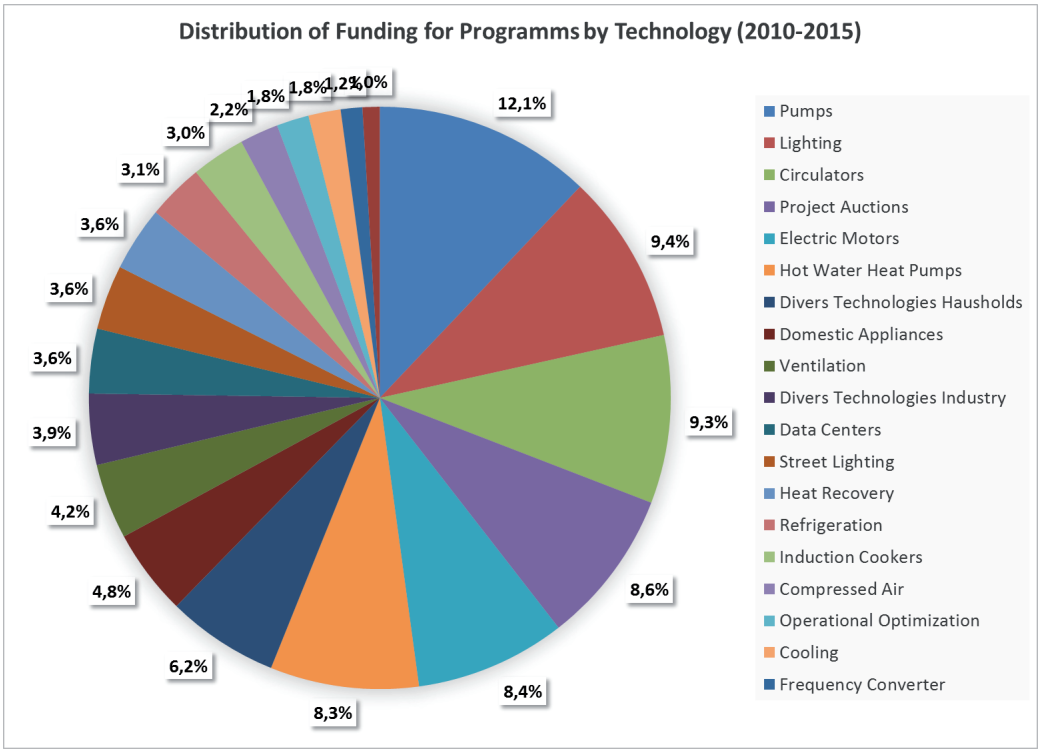

Figure 2. Allocations of budgets for successful programs by technology (source: SFOE 2016).

Table 2. Strengths and weaknesses of projects and programs.

	Strengths	Weaknesses
Projects	Offer can be custom-tailored by a company and fits its particular situation. Risk that planned project and realisation differ is low. Auctioneer can assess planned technical measures in advance and in detail.	Entry costs for bidders relatively high (risk of dropping out of the auction). Costs of assessing the offer on behalf of the auctioneer only economically justifiable for large measures.
Programs	Allows realising small-scale technical measures (i.e. in households and small companies). Almost no entry costs for end-consumers as they can participate in a program that already passed the auction. Existing customer-basis or members of an intermediaries can be reached.	Overhead costs on behalf of intermediaries incur Risk that planned and realised measures (in numbers) differ is significant. Auctioneer cannot asses all situations where measures are planned and realised in advance.

Programs with internal Auctioning Scheme: Synergies with Cantonal Obligations

In 2013, the utility "Groupe E Greenwatt" applied with a program remunerating the electricity saving via an additional internal auctioning scheme. At the auction, the participating clients were given four options to bid on: between 0.5 Rp./kWh (0.45 €-ct/kWh) and 3.5 Rp./kWh (3.2 €-ct/kWh). The total subsidy reserved amounted to the achieved electricity savings of the measure, times the bidding price. The approach proofed the potential for rapid acquisition of clients and a high rate of participation at the auctioning day.

The program has an "open technical approach", meaning that not a specific technical measure is in the focus, but all kinds of measures achieving electricity savings. The approach profits from synergies due to the coexistence of regulation, which is implemented in a growing number of cantons. According to the so-called "large consumer obligation", program participants (≥0.5 GWh/a) are required to undergo an energy audit and to proceed on a reduction pathway of about 2 % per annum or to implement the energy savings measures which have a payback of up to four years.

Due to the compulsory audits, measures with a payback higher than the minimum threshold are identified and long listed. The utility carrying out the audit is consequently in an advantageous position to convince the client to take on additional measures, while offering the reward of financial support. The obligatory audit showed to be a catalyst to gain the clients interest for energy efficiency issues and favors commitment to invest in further energy saving measures.

The fact that the utility supports the clients in all the steps of the process, starting from identification, technical and economical evaluation, over to implementation to the final monitoring, increased clients' willingness to participate in the scheme.

55 % of the participants in this program do not meet the minimal threshold of 20,000 CHF (€18,182) in subsidy needed to participate the auction carried out by SFOE. Figure 3 illustrates the importance of this program activity to aggregate the smaller measures.

This model of program activity was scaled up with the volume of similar applications increasing from 1 million CHF (€0.9 Mio) in 2013, to 6.2 million CHF (€5.6 Mio) in 2015.

There are also some possible risks associated to this approach:

- First, the auctions provided by further auctioneers could cannibalize the existing project auction, as well as existing programs focusing on a single technology. This could be detrimental to the expected revenue, i.e. the overall cost-efficiency and electricity savings realized, if bidders would strategically opt for the auction where they anticipate the highest financial aid. So far, however, the programs with internal auction schemes rather helped to further overcome entry costs. Bidders did not receive higher funds than in other programs or the ProKilowatt project auction.
- Second, it is important to carefully assess the approaches used in the programs with auctioning schemes. The measures realized have to meet the same quality criteria and have to be subject to audits (see below) as any other measures receiving financial aid. It is also important that the programs are strictly additional to the large consumer obligations.

So far, there is not yet sufficient experience with different programs with internal auction schemes. Whereas it increases the complexity of ProKilowatt, it will allow to compare different auctioning schemes used by different auctioneers. In the future, this will further increase our knowledge about strengths and weaknesses of different auction schemes.

Recent Adaption of Application Requirements and Financial Support

Public support for investment into energy efficient equipment can only be justified, if the public support triggers additional measures. Whereas everybody would agree in general to this statement, it is rather difficult to avoid any deadweight effect in funding programs. This means that the additionally of a measure needs to be identified and quantified in a generalised way to make this manageable in funding schemes. The general Swiss law dealing with public financial support limits the maximum funding rate to 40 %. If a measure would be implemented anyway without funding, the 40 % would however still cause a deadweight effect.

For the energy efficiency auction therefore investments had been classified in four categories: New installation; Additional Investment; Anticipated Replacement and Replacement, for which different calculation methods for the possible amounts

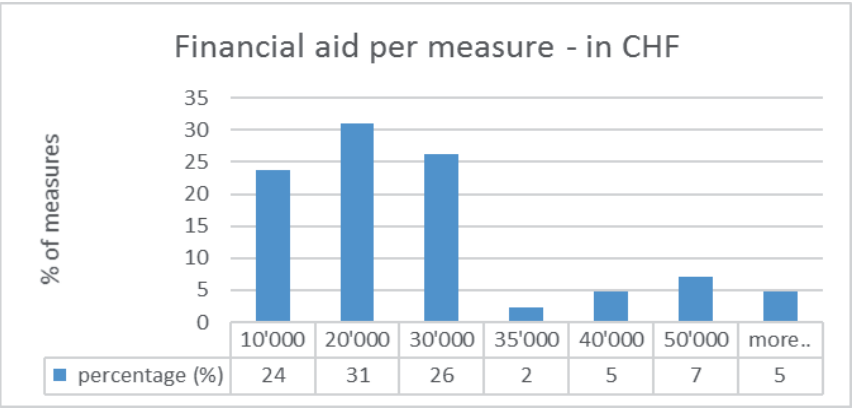

Figure 3. Distribution of financial aid per measure in a program with internal auctioning scheme (Source: Groupe E Greenwatt 2016).

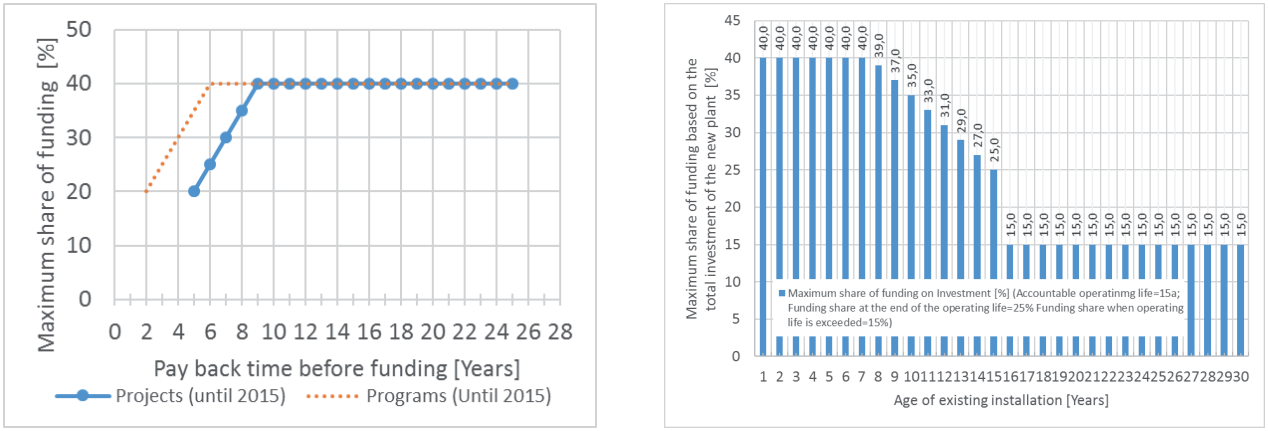

Figure 4. Approached to calculate the maximum possible funding rates in the old (≤2015, left) and new (≥2016, right) energy efficiency auctions (Source: SFOE 2014 and SFOE 2015).

of funding and the related energy savings had to be applied (SFOE, 2014). To quantify the additional investment ($I_{eligible}$) and the additional energy savings ($\Delta E_{eligible}$), a comparison was made between the current state of the art for this technology and technology to be applied by the applicant. For the case of the replacement, only the cost difference between the state of the art and the new technology was eligible for funding ($I_{eligible} = I_{new} - I_{State\ of\ the\ art}$) and for the energy saving ($\Delta E_{eligible} = E_{new} - E_{State\ of\ the\ art}$).

While this approach in principle eliminates the deadweight effect in project funding as only additional costs and additional savings are accounted for, as it would be required on a European level to be in line with the Commission Regulation (EU651/2014), it places a significant burden on project and program applicants as well as on the evaluators for the applications. The program applicants have to define the reference technology in terms of cost and energy consumption and the evaluators have to judge if the assumptions made by the applicant are plausible. This is not a trivial case and especially project applicants have significant difficulties to set the reference values. Applicants typically ask a vendor for an offer for the technology replacement and the possible savings, as they might place an order based on this offer. Vendors on the other hand do not like to make a second offer for a state of the art technology, as company marketing is always selling the products as the best in class, even if this might be not the case and typically vendors will calculate the savings compared to the existing plant. Normally vendors will not guarantee the energy saving that could be achieved by the replacement of the equipment.

From an evaluator's perspective, it is difficult to validate the assumptions made by the applicant. This would typically require a detailed technical understanding of the technology under consideration and the industrial framework in which it will work. This is out of scope for a proposal evaluation, especially if funding is applied for measures linked to process technologies. There is a certain but limited chance to identify wrong assumptions in the applications and results can therefore be highly dependent on the cleverness of the project applicant, as there is never a single answer to the question of what is the correct cost and energy consumption of the reference technology. The difficulty to define the reference technology was also identified as an important barrier to submit an application, especially for small and medium sized companies. It was therefore decided to revise the funding conditions in such a way, that the knowledge and the definition of a reference technology is no longer required but still the deadweight effect is avoided.

At SFOE a method was developed which enables the calculation of the eligible costs and savings on values that can be easily obtained by the applicant. For the eligible cost is was decided to take all costs associated with the project implementation into account, but cutting back the maximum funding ratio for most projects and programs. This was achieved by replacing the payback time as key parameter for the funding rate by the age of the existing equipment, c.f. Figure 4. The age of the equipment to be replaced should be proven with a photo of the nameplate. However, in more complex systems to be replaced, where different pieces of equipment might have different ages, the age should be determined using the major component. To avoid that economic measure, i.e. measures with a short payback time, can obtain funding, a threshold value for the minimum payback time of 4 years for projects and programs has been implemented.

For the eligible energy saving, the difference between the consumption of the new plant and the old plant is used in the new scheme. However, this approach would overestimate the energy savings triggered by the financial support, as it would neglect the autonomous improvement of the energy efficiency over time. Instead of trying to calculate this autonomous development of energy efficiency by technology and sector, a single reduction factor of 25 % was introduced, meaning that only 75 % of the achieved savings by replacing the old plant are accounted for. As this new approach has been implemented in 2016 only, it is still to earlier to evaluate its impact on bids.

Audits of Project and Programme Achievements

Given the significant budgets provided for the energy efficiency tenders, SFOE has started to perform in-depth audits of completed projects and programs which is complementing the normal control of intermediate and final reports. During the first audits undertaken for completed programs, some flaws made by the program applicants have been identified. Audits typically focus on four parts: Organisational, technical, financial and saving achievements have to be cross-checked.

In regards to the organisational aspects, it is important to ensure that program owners have the funding cases well documented and contact details and contact persons clearly identified. The information and documentation of implemented measures including customer contact details was sometimes only available on paper and not electronically. This made it difficult to examine the details, as the documentation cannot be searched for key words or addresses electronically, but each folder has to be taken in hand and looked at manually. This can be highly time consuming and therefore expensive. Consequently, SFOE included an explicit condition for the new applications that documents need to be provided in electronic form.

For some technical measures supported by programs, SFOE had been looking in more depth to analyse if the solutions proposed and implemented were sound and that the realisation was in line with the conditions of ProKilowatt. For some cases, SFOE went to see final customers having received the funding for the implementation of the measures and checked if the measure was successfully implemented. For this step, it is important to have the necessary technical competence in house or to have a partner to support this step. This can cause some challenges, as the variety of technologies supported by ProKilowatt is large.

In order to examine, if the financial support provided by ProKilowatt is correctly spent by the program owner, cash flows related to implemented measures and the completeness and correctness of invoices have to be checked. For programs, all these aspects have to be checked not only for the relation "ProKilowatt – Program Owner", but in addition also for the relation" program owner – end customer". During the audits performed so far, SFOE has found weaknesses on both aspects. As a possible weakness in the relation between program owner and end customer SFOE identified the fact, that the payment of the funding by the program owners was in some cases made on the basis of upfront estimated costs instead of the real cost spend for the implementation of the measure. If the real cost for the implementation has been much lower than planned, the funding has to be reduced as well in order to keep the funding ratio constant.

Another key component of an audit is the check, whether the calculation or measurement of the energy saving achieved in the program is transparent and correct. This is an important parameter as the achieved saving is a key factor in the calculation of the funding efficiency. Lower energy savings would make savings more expensive and such programs might not be awarded funding in the auction. If project or programs do not achieve their saving target, therefore funding is cut back in such a way, that the same level of funding efficiency is maintained. This put pressure and some risks to the program applicants as a program failure means also less money for the program management. Audits are a useful tool to check if measurement, calculation and aggregation of the energy savings have been correctly handled by program owners.

Overall, audits are needed to ensure that the significant amounts of funding are spent correctly and in line with the conditions. The first audits conducted by SFOE helped to identify specific weaknesses and have led to changes in the requirements for the program management and the saving calculations. It should be noted, that no signs for planned frauds was found. From a Government perspective, the required time efforts to run such audits and the technical competence necessary to evaluate technical measures should not be under estimated. Currently SFOE is working on a standardisation and implementation of audits in the framework of ProKilowatt.

Finally, ProKilowatt is also subject to external evaluations and monitoring. Two evaluations, taking account of the first two years of ProKilowatt, pointed out the importance of creating a strong enough competition between bidders and made recommendations for further types of auctions, such as for specific technologies or for innovative measures (SFOE 2012, State Secretary of Economy 2012). The progress of ProKilowatt is monitored annually (SFOE 2016). Currently, the Swiss Federal Audit Office is considering an evaluation of ProKilowatt in 2016/2017.

Conclusions and Outlook

Six years of energy efficiency auctions in Switzerland proved that this instrument is delivering energy savings at low cost. Switzerland intends to continue this funding scheme with slightly increasing budgets over the coming years. In addition, other countries such as Great Britain (DECC 2015) and Germany (BMWi 2014, Seefeldt et al. 2015) have started or are planning to start up similar schemes. At the time of writing the paper, Germany is searching for a service provider to run the head office for the German Energy Efficiency Auctions.

In the case of ProKilowatt, one advantage but also a big challenge is the openness to technologies, which do not need to be defined upfront for the funding scheme. The auction system with nearly all electricity saving technologies included enable technologies to get funding which are not the cheapest but still be cost attractive, even if there is not a separate auction for different technologies. However, one should not confound the openness to technologies with the auction principle. Theoretically, it is also possible to either concentrate an auction to only one technology (for example, cold appliances) or to have a more traditional subsidies schemes open to numerous technologies. The auction bears the advantage that bidders submit the actual value of their measure and not *per se* the maximal price limit set by the government.

An alternative approach to this could be the payment of a flat rate per kilowatt-hour saved. As in this case there would be no competition through the bidding price in the auction, more stringent requirements for the different technologies need to be made and regularly revised, a possible disadvantage of the flat rate approach.

As compared to subsidies schemes for energy savings, competitive tenders allow governments to get more energy savings for the funds put at disposal. In comparison to white certificates, competitive tenders are a voluntary approach and might therefore be more likely to find political acceptance. However, both white certificates and competitive tenders use market mechanisms (demand and supply, and auctions, respectively) to set a price for energy savings. One can thus suppose both instruments should lead to similar results. Even though we did note systematically evaluate the cost-effectiveness of white certificates in comparison to competitive tenders, a comparison to the results of different EEO schemes show that the present cost/kWh indicators are in line with the Swiss ProKilowatt scheme (ENSPOL 2015). Even if the development of the bidding prices

(min, max, mean) show some trend, there is no evidence for strategic bidding, trying to get the maximum possible financial support instead of biding based to the expected costs of the program. Auction mechanism for which there is sufficient competition in the auction is limiting the room for strategic bidding. With the clause that the total requested support should be at least 1.2 times the provided funding it is ensured that competition play a role in the auctions. On the other hand, the auction rule guarantees also that some applicants will not receive funding but have spent time and effort to prepare and submit a proposal and might lead to some frustration. However, with the increasing available budget for ProKilowatt over time it is important to work on broadening the number of applicants and motivating those who had not yet been successful to prepare new proposals for the next auction rounds. It is necessary to conduct information sessions and communication activities in order to gain the managing entities to participate in the scheme.

Even if energy efficiency auctions have proven to be an efficient instrument to achieve energy savings, other possible policy instruments are also useful and necessary for achieving the maximum results. Auction programs have to have fixed deadlines for submissions. After the submission deadline, the analysis and evaluation of the proposals in regards to their eligibility, the completeness and their correctness take time, so that it typically takes 6 to 9 month form the submission until funding is awarded or the proposal is rejected. This is especially critical for measures implemented by industry. Thus, auctioneers should consider to run two or more auction rounds per year for efficiency projects that potential applicants do not have to wait too long before they can apply.

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