

AUSTRIA – Municipal Energy Efficiency Programme (SEP) of the City of Vienna

Städtisches Energieeffizienzprogramm (SEP) der Stadt Wien

About the measure

Policy instrument	Sector	Starting date and status
Umbrella programme	General cross-cutting	2006-2015

The SEP was approved in 2006 in a context of continuous increasing trend in energy consumption in Vienna, and taking into account the EU Energy Services Directive (2006/32/EC). It encompasses a number of measure bundles which target increasing energy efficiency with technical or organisational actions or behavioural measures.

Around 100 measures or instruments are aggregated in these measure bundles that target the following sectors:

- Private households
- Private and public services
- Industry and manufacturing
- Cross-cutting measures

The instruments range from subsidy schemes to advice programmes and informational activities. The focus was on policy instruments that are within the immediate competence of the City of Vienna.

A challenge is the high number of departments at the government of Vienna involved in the measures. The department for

energy planning is in charge of coordinating and overseeing the progress of the specific programmes' targets which are:

- Annual end-use savings of 15 GWh in the municipal energy consumption;
- Implementation of a central data base containing energy related data of all municipal buildings until 2008;
- Stabilisation of total energy consumption of office equipment and IT in public administration;
- Reduction of total consumption of municipal street lighting by 5% as compared to 2005;
- Orienting building subsidies stronger in the direction of passive house standards;
- Increasing the number of companies participating in the energy audit programme ÖkoBusinessPlan;
- Including energy efficiency criteria in public procurement procedures.

Expected energy savings in 2020	Benchmark
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The general objective of SEP was to limit the increasing trend in total final energy consumption in Vienna. This translated into the target that SEP should help generate a rate of new annual final energy savings (or first-year savings) of 180 GWh/y on average between 2006 and 2015.

Sub-targets were defined for some of the measures.

For reporting Article 7 energy savings only single policy measures were taken into account. The overall end-use savings of the programme (2006-2014) amount to 1,394 GWh (first year savings).

Total final energy consumption in Vienna amounted to around 38,000 GWh in the last years on average.



Means and outputs

As the SEP is an umbrella programme including a variety of different schemes it is not possible to determine programme costs. This is also due to the fact that many of the instruments have their own source of funding.

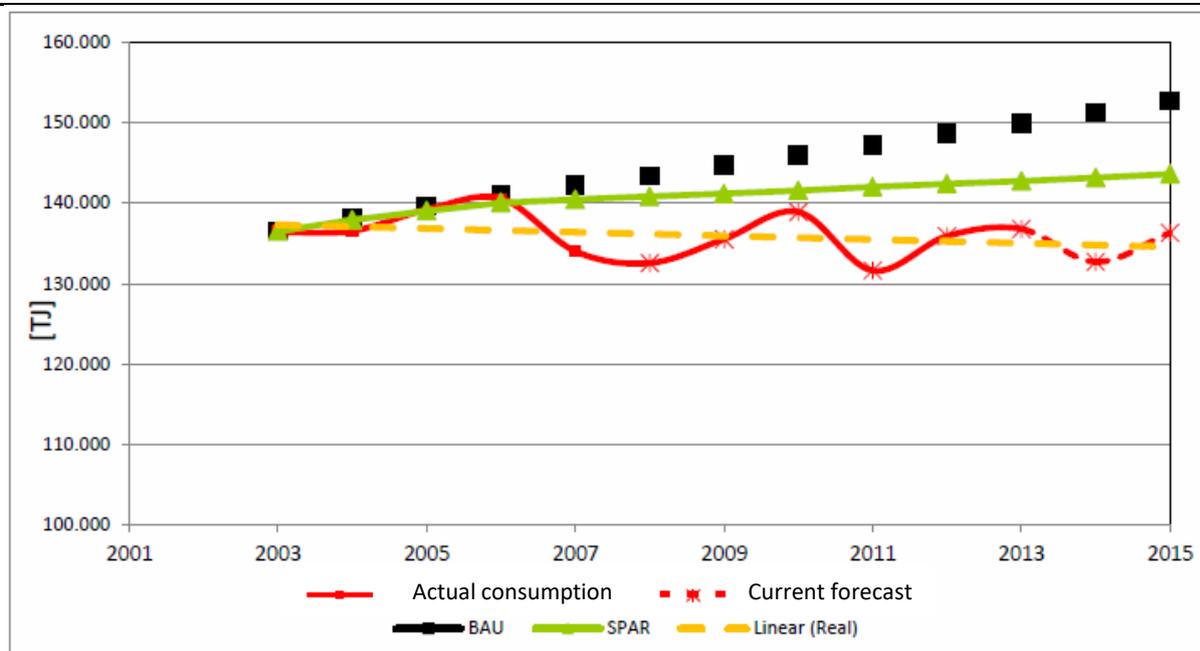
The evaluation report (Karner et al., 2015) does not include data about the budget of the various measures included in the SEP, nor about the investments supported by SEP measures.

The evaluation report includes data about key outputs for some of the measure packages. A few examples are given in the table below. However the description of the measures in the report remains mostly qualitative, highlighting what has worked well and what difficulties were encountered.

Package of measures	Outputs
H1: Energy efficiency improvement in new residential buildings	Support to the construction of about 5.4 million m ² of new residential buildings over 2006-2014. Average heating demand of supported buildings improved from about 38 kWh/m ² .year in 2006 to 22 kWh/m ² .year in 2014.
H2: Improvement of the building envelope (renovations of existing residential buildings)	About 8 000 residential units renovated per year on average, with a significant drop in the last years (2013 and 2014), but with a large increase in the quality of the renovations (average reduction of the heating demand of about 90 kWh/m ² .year in 2013-2014 vs. about 50 kWh/m ² .year in 2006).

Data about energy savings

Unit	Main source of data
New or cumulative annual final energy savings (in GWh/y)	Energy balances and information on implemented measures



Source: Karner et al., 2015 (figure 1)

Figure 1. Total final energy consumption in Vienna over 2003-2015 (in TJ/y).

- The evaluation of energy savings uses a bottom-up as well as a top-down approach:
 - Top-down: The target for the SEP was defined in 2006 as an energy efficiency improvement (SPAR) in relation to a business as usual scenario (BAU) (see *Focus on the top-down approach*). The achievement of this target is shown in the figure above. It can be expected that final energy consumption will be below the target value ("SPAR-scenario").
 - A bottom-up calculation of energy savings was done only taking into account actions that were triggered by policies within the SEP. The calculation used the Austrian ESD and EED calculation methods. This calculation shows that the programme achieves new annual savings of around 150 GWh/y on average over 2006-2014. This is below the 180 GWh/y target. But the evaluators highlighted that the bottom-up calculations do not encompass all the effects of the SEP (especially in industry and private services), and it can be assumed that overall SEP effects were beyond 180 GWh/y (Karner et al., 2015).
- It is noticeable that about 50% of the documented bottom-up savings came from actions to renovate existing buildings (74 GWh/y for improvements of the building envelope). The evaluators pointed that these savings compared to the BAU scenario were due to higher quality and ambition in the renovation actions. Overall, 72% of the annual savings came from the residential sector, 17% from the public sector and 11% from actions in companies (private services and industry). Savings in transports were negligible (around 0.5 GWh/y), as transports are covered by another policy (Transport Master Plan).
- The evaluators also calculated the cumulative annual final energy savings for the period 2006-2014, amounting to 1,394 GWh/y (assuming that savings lifetimes were lasting at least until 2014).

Sources of uncertainties about energy savings

- The top-down analysis shows the overall achievement of the target but does not show the contribution of the SEP or any other causality. However framework conditions (climate, population growth, financial crisis of 2008/2009) are taken into account in the analysis (see *Focus on the top-down approach*).
- To reduce this uncertainty a bottom-up calculation of implemented energy efficiency measures was done. The uncertainties of this bottom-up methodology (mostly deemed savings and engineering estimates) are connected with the underlying ex-ante approach and the need to make certain assumptions on consumer behaviour (incl. room temperature), climate conditions and the technically optimal installation of technologies. In addition not all actions implemented in the framework of the SEP can be evaluated bottom-up.

Evaluation of the energy savings

Calculation method(s) and key methodological choices

For the **bottom-up calculation**:

- Mostly **deemed savings (method 3)** and **engineering estimates** equivalent to scaled savings (**method 5**).
- The type of **baseline** depends on the action. Mainly the baseline is “**stock average**” or “**market average**”. For actions in existing buildings, building codes set the baseline (= **minimum energy performance standards**).
- No further adjustments were made but top-down and bottom-up calculations were combined to check plausibility of energy savings (see “Sources of uncertainties about energy savings”).
- There are municipal incentive programmes in place for all actions evaluated.
- Additionality of savings is achieved by using the official Austrian ESD/EED methods that have been publicly available since 2008 and that are updated regularly (see annex F of NEEAP 2014 for English version). This means in particular that SEP savings are additional compared to minimum energy performance requirements enforced by EU and Austrian regulations, and that double counting with Federal measures is avoided.

It should be noted that the energy savings from SEP measures were calculated according to the methods established by in the frame of the Energy Services Directive (2006/32/EC). These savings were then reported to the *Energieeffizienz-Monitoringstelle* (Energy Efficiency Monitoring Body) managed by the Austrian Energy Agency. This monitoring body, acting on behalf of the Ministry in charge of energy, centralizes data from all measures reported by Austria for the ESD, and now the EED (Energy Efficiency Directive, 2012/27/EU).

Ex-post verifications and evaluations

Ex-post verification is done in each part of the umbrella programme separately. The level of ex-post verification is highest for subsidy schemes.

The Vienna City Council decided when approving the SEP in 2006 that the SEP coordination unit will have to report to the City Council about the progress of SEP every three years, i.e. in 2009, 2012 and 2015. The evaluations done in 2012 and 2015 were commissioned to the same consortium of external evaluators.

Other indicators monitored and/or evaluated

No quantitative indicators other than energy savings were evaluated in the evaluation reports (Karner et al., 2015). But the evaluators noted that the next programme, SEP 2030, had to be compatible with all aspects of Viennese energy policy, whose key points are energy efficiency, environmental and climate protection, security of supply, economic efficiency and social justice. They also recommended to consider the interactions between energy efficiency and other policy objectives, mentioning for example affordable housing and urban planning.

Moreover, the top-down analysis looked at the influence of economic and population growth and other factors on total final energy consumption (see *Focus on top-down approach*).

Other aspects evaluated

The structure of the program was also looked at both with a view on overlaps of instruments as well as on data collection and other administrative issues.

Overall, the objectives of the final evaluation done in 2015 were:

- to assess and document the implementation progress and overall results for the whole SEP period (from July 2006 to the end of 2015), including a description of each measure included in the SEP and an analysis of the development of relevant legal framework conditions (at European and Federal levels);
- to evaluate the existing catalogue of measures based on objective and comprehensible criteria;
- to quantify the overall impact of the SEP measures to reduce energy consumption growth and update the SPAR scenario (see *Focus on top-down approach*);
- to comply with the reporting requirements of the Energy Services Directive (2006/32/EC);
- to provide recommendations for the design of a successor program ("SEP 2030").

The authors come to the conclusion:

- to adapt some of the requirements of schemes as to increase their effectiveness;
- that the programme should rather concentrate on key instruments and reduce the number of instruments without considerably reducing the effectivity of the programme. One of evaluators' main observations was indeed that the large number of measures included in the SEP did not necessarily cover the main areas of energy consumption (or target the largest savings potentials). However they also acknowledge that some sectors were covered by other programmes (for example, transports are covered by the Transport Master Plan).
- that SEP measures on buildings should be focused on existing buildings, as the savings potential in new buildings is now limited due to strengthened legal minimum requirements.
- that the next programme should consider more the savings potentials in transports, and look for synergies with transport programmes (for example the electric mobility strategy).
- that the need to implement SEP measures within limited budgets had a big impact on their success, particularly about information and awareness campaign.

One of the objectives of the final evaluation done in 2015 was to provide recommendations for the preparation of the next programme, SEP 2030. Evaluators' recommendations were firstly focused on the programme itself, but some of the recommendations also dealt with monitoring and evaluation:

- defining as far as possible impact targets and indicators (in the sense of specifically formulated outputs and outcomes) that could serve as basis for the monitoring and evaluation;

- to provide the City departments or services in charge of SEP measures with tangible monitoring parameters (for example, specifying energy indicators or other specific metrics) for data collection, which would to a certain extent guide or standardize the collection and calculation of savings and directly monitor the implementation of the measures;
- disseminating the results of the programme, both within the municipalities and towards the general public, to raise awareness.

Focus on monitoring and data collection

A high number of different departments in the government of the City of Vienna are involved in the programme with different policy instruments. Due to this high number of involved actors, data collection on implemented actions is one of the main challenges.

To achieve a consistent approach along departments a coordination body was installed that overlooks progress of the programme and is in charge of evaluation and reporting the results. The external evaluators emphasised that the coordination body has a very good overview of the status of SEP implementation due to the regular contacts with the relevant services. However, they also pointed that despite the intensive efforts of the coordination body and most departments to continuously improve the data collection and document the results on a regular basis, there was still a lack of data availability to quantify on a reliable basis the energy savings of some measures. This applied for example for measures targeted at private service buildings.

Another issue pointed by the evaluators was the reporting frequency (every three years), that was not harmonized with other reporting obligations for other City programmes or to Federal state. Which created additional work for several City departments. However it is also very likely that without the intermediate reporting, the final evaluation would have been much more difficult to perform.

For all three evaluation reports (2009, 2012, 2015) the external evaluators and the coordination body developed standardised templates to report actions and other data on the instruments that were sent to the respective departments. For the third report this process was complemented by interviews with persons in charge of the instruments to sort out open questions and verify the submitted information.

In addition, when setting the initial monitoring and evaluation framework in 2009, there were several coordination meetings of the SEP coordination body with the national monitoring body and the external evaluators. This approach has been used to continuously improve the quality of monitoring.

Focus on the top-down approach

Trends in energy consumption previous to 2003 were analysed when preparing the SEP, showing an increase in final energy consumption of about 24% between 1993 and 2003 (i.e. an increase of about 6,700 GWh/y). Based on this analysis, the objective of the SEP was set by defining two forecast scenarios up to 2015, using as base year 2003 (latest year for which data were available at this time), as shown in the table below.

Table 1. Scenarios defined when preparing the SEP.

Scenario	General assumptions	Specific assumption	Energy consumption trend
BAU: business-as-usual	(common to both scenarios) average annual economic growth: 2.5%/y average annual population growth of 0.9%/y	Does not include the measures planned in SEP	Increase of 12% between 2003 and 2015
SPAR: energy efficiency improvement		includes the expected effects of the measures planned in SEP	Increase of 7% between 2003 and 2015

Source: Karner et al., 2015.

Similar to the scientific preparatory work done when preparing the SEP in 2005-2006, a model was developed to simulate the total final energy consumption in Vienna. The aim was to obtain a better understanding of the main factors influencing the development of energy consumption in Vienna and to present an updated scenario for the period 2004-2015 reflecting the actual consumption over the period under evaluation ("REAL" scenario).

Final energy consumption in Vienna in the years 2004 to 2006 was roughly in line with the BAU and SPAR scenarios (see Figure 1). Then, the final energy consumption was slightly below the BAU and SPAR forecasts in years 2007 and 2008. The evaluators analysed that this was mainly due to the fact that 2007 in particular, but also 2008, were extremely warm years and therefore the heating demand was significantly below the long-term average. To a lesser extent, lower energy consumption is also due to lower-than-expected economic growth.

The REAL scenario showed an increase of 2.5% (about 970 GWh) in final energy consumption between 2003 and 2015, with a level in 2015 equivalent to the one in 2006. The main factors affecting the trend are economic development (GDP growth rate), climatic factors (annual heating degree days), population growth and energy efficiency gains as a result of various policy measures.

Experience feedback from stakeholders

Interview with Herbert Ritter (City of Vienna, Department for energy planning, evaluation customer)

1. What is the role of evaluation in the management of the scheme?

There is an obligation to report on the progress of the programme every 3 years to the city council.

In addition to this formal requirement the evaluation is important for the scheme from an operational point of view. The evaluation gives feedback about the progress of the implementation of the single measures and it helps to get quantitative information on energy savings.

2. What were the main lessons learnt from the evaluations (about the impacts of the scheme and what could be improved)?

The evaluation was very important and helpful in order to optimise the programme management and to focus on the important tasks and measures.

The interim evaluation reports included recommendations for the next implementation period. So it was possible to focus on specific important measures and to learn from experiences made.

3. What were the lessons learnt in terms of evaluation practices?

Evaluation is time-consuming for both the evaluator and the evaluation customer. External evaluation is

definitely helpful and recommended as it gives an outside view.

The evaluation of some measures (e.g. soft measures) was not possible due to missing or too complex methodologies. Thus standardised calculation methods (e.g. according to ESD an EED) were helpful to quantify the energy savings and to limit the effort for evaluation.

4. In parallel of the ex-post evaluations, are there other evaluations or studies that provided insights about the impacts of the scheme and/or possible interactions with other policies or drivers (or barriers) for energy efficiency?

Not explicitly, but the evaluation reports themselves are very detailed and are used as information sources for other programme evaluation reports (e.g. for the municipal Climate Protection Programme).

5. What would you like to highlight about your experience related to the evaluations of the scheme?

External evaluation is very helpful and is recommended. The quantification of energy savings makes sense, but should not be the only focus. Other appropriate indicators showing the success to specific measures have to be found and used.

To go further

About the measure

- SEP-Website (in German):
<https://www.wien.gv.at/stadtentwicklung/energie/sep-endbericht.html>
- Summary about SEP in NEEAP 2014 (pp.46-47, in English) and NEEAP 2017 (pp.52-53, in German):
<https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans>

References of the evaluation(s)

- Karner, A., Buchmayr, A., Strubegger, M., Alkhatib, A.A., 2015. Evaluierung und Monitoring des Städtischen Energieeffizienz-Programms (SEP) der Stadt Wien für die Jahre 2006-2015 [*Evaluation and monitoring of the Municipal Energy Efficiency Programme (SEP) of the City of Vienna for years 2006-2015*]. Final evaluation report by ConPlusUltra, Ögut and TemaPlan for the Department for Energy Planning of the City of Vienna, December 2015.
<https://www.wien.gv.at/stadtentwicklung/energie/pdf/sep-endbericht.pdf>

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