Of Blind Men and an Elephant
Disentangling Industrial Energy Efficiency Policy Results in the Netherlands

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Abstract

Sound evaluation needs sound figures. But measuring energy saving is measuring something that isn't there anymore and can therefore meet unexpected difficulties. Therefore, the European Commission has made strong efforts to harmonize methods to measure energy efficiency and energy savings. This seemed to be the best way to monitor the progress towards the goals of the Energy Efficiency Directive.

However, at a national level, harmonization is not yet realized. At the moment, the Netherlands have three nationally used energy saving figures. Additionally, several policy instruments present their own results, but these do not add up to national figures and are also not comparable with the national figures when scaled up to national level. Each claims to give an accurate vision of how energy efficiency is progressing. However, they do not present the same. Some of these indicators do not represent pure energy efficiency. They can, for instance, also be a result of changes in economic volume or structure effects. It appears that each figure presents its own vision of reality. The situation resembles the story of blind men touching an elephant and each claiming to know what it is. This paper describes the methods underlying the indicators to give insight in the differences between these methods. It furthermore combines detailed bottom up data from policy instruments aimed at industrial energy saving in the Netherlands with top-down national figures. We show the impact of volume, structure, policy and other effects by using an example. In this way we show how the figures result in a picture of energy efficiency developments in the Netherlands.

1 Introduction

A 20% reduction of primary energy consumption in 2020 is part of the EU 20/20/20 targets, the Climate and Energy package (European Commission 2012). To know whether this target will be accomplished, it is necessary to measure progress towards this target and to know the effect of the policy instruments that are implemented for this purpose. EEA (2013, p135) reported that some progress is made in reducing energy consumption, but in EEA (2015) a gap of 67,9 PJ (1621 ktoe) was expected if current progress would continue towards 2020. The European 20/20/20 goals were translated in the following targets for the Netherlands: 14% renewable energy, a reduction of 482 PJ of final energy use and a reduction of 16% greenhouse gases (for non-ETS sectors) (Schoots and Hammingh 2015). Although overarching targets are discussed, EU targets for 2030 are not yet translated into national targets. Progress on energy saving policy is reported in the 'Nationale Energieverkenning' (Schoots and Hammingh, 2015), which describes general developments, progress in implementation of policy instruments and an expectation of energy savings.

Policy makers can use a range of instruments to realize energy efficiency: financial instruments, voluntary agreements, labelling etc. Together, these instruments should form a 'coherent policy package'; a mix of instruments that strengthen each other. The energy policy in the Netherlands consists of a mix of many instruments, each with different characteristics. There is a large overlap between these instruments, like the long term agreements LTA3 and LEE (Long term agreement on Energy efficiency for ETS-companies) and subsidy schemes that support investments in energy saving equipment.

The table in the appendix shows the development of energy policy instruments for the industry in the Netherlands. For all sectors (industry, buildings, transport, agriculture), the third National Energy Efficiency Action Plan NEEAP3 for the Netherlands identifies 25 individual measures to promote energy efficiency (Ministry of Economic Affairs, 2014). Within these measures, 71 instruments have been identified that can be attributed to either existing or intended policy (ECN 2013). This mix of prescriptive, economic and supportive instruments uses different mechanisms to change the behavior of target groups: threats, seduction and information. A more complete description of the energy policy in the Netherlands can be found in Gerdes (2012).

Naturally, the target of this policy package is to have a significant impact on energy efficiency. Decomposition techniques show the effect of production changes and structural changes in the economy. In most top-down decomposition methods, the policy effect is a residual, remaining when all other possible explanations are removed. In other words: an indirect measurement. Theoretically this top-down effect should be explained by bottom-up data. But the question is whether available bottom-up data match to the top-down national data. In some cases, the difference between volume, structure and policy effects is not obvious. I.e. price-induced energy-intensity improvement is considered autonomous and not policy-induced (Boonekamp 2005). So the question we try to answer here is, how can we best disentangle the effect of policy instruments from other effects?

There have been many efforts to develop good methods to measure the effect of policy measures on energy efficiency and a wide range of literature on this topic exist (e.g. Phylipsen et al. 1997, Boonekamp 2005, 2006, Cahill and Gallachoír 2012, Farla and Blok 2001). However, users of this information have different requirements regarding the energy efficiency indicators that have to be produced. Some are interested in the development of energy intensity regardless of the cause of this development, others, like policy makers, are more interested in the effect of their policy. This has led to a range of methods, each with their own characteristics. In the Netherlands, three national indicators on energy efficiency exist, next to the results of individual policy instruments focused on specific sectors. In the EU, Odyssee has developed the ODEX indicator to compare energy efficiency in European countries. Table 1 shows indicators on energy efficiency in the Dutch industry since 2000. Striking is the large difference between numbers that one would expect to be reasonably equal. In the last 'official' national report on energy saving (ECN 2012), a mean trend of 1% a year is reported for the industry, while Odyssee reports a total efficiency gain of 27.5% over the period 2000-2012 (>2%/yr) and a decrease of energy use by saving of even 41.1%. The differences between these numbers arise from differences in definitions and scope. The large differences between these reports are a cause for confusion among policy makers. Two observations from Schoots and Hammingh (2015) are illustrative: the 482 PJ EED target in 2020 will be expected to be reached amply, while the 100 PJ EA target will probably not be reached.

Table 1 – Different energy saving numbers in the Netherlands

Source	Aspect	Result
ECN 2012	Primary savings trend in industry 2000-2010	1.0 %/yr
Odyssee*	Energy efficiency progress industry 2000 – 2012	2.6%/yr
RVO 2015	LTA3-Savings by energy projects 2005-2014	2.0 %/yr
	LEE-Savings by energy projects 2010-2014	1.3 %/yr

* http://www.odyssee-mure.eu, Ademe 2015

2 Method

The aim of this paper is to investigate the reasons behind these differences. The main research question is therefore:
How can we compare and interpret the numbers on energy efficiency in the Netherlands, with a focus on industry.
To answer this main question we use the following research questions:
- What are the differences between national and international energy efficiency methods?
- Do bottom-up data match top-down calculations?
- What are the (dis)advantages of these methods?

For this article we first describe the different methods that are used to report on energy saving (§3.1). Not only the top-down methods for national energy savings numbers, but also a bottom-up evaluation method to report on the impact of individual policy instruments: the long term agreements and a subsidy scheme for energy efficient equipment. The latter method is based on savings by implemented energy saving projects. In the end, the combination of bottom up savings should add up to the savings concluded from top-down calculations (§3.2).

Second, to visualize the differences in outcome between the methods, we created a fictitious dataset that describes all factors that influence energy consumption. These data we used for decomposition graphs. The graphs show how different methods come to different results (§3.3), using different elements of the dataset. Lastly, we list the advantages and disadvantages of the different methods in section 3.4.

3 Results and discussion

3.1 Differences between methods

Table 2 describes the different methods that are used to calculate energy efficiency indicators in the Netherlands. Three methods are used nationally (PME, EED and Energy Agreement), while a fourth is used for international comparison (ODEX). Next to these methods, several policy instruments have their individual monitoring instruments.

Table 2. Different methods on energy efficiency used in the Netherlands

What	How
Protocol Monitoring Energy saving (PME)	An energy saving effect is calculated for every main sector, based on data by National Statistics
Energy Efficiency Directive (EED)	Cumulative savings in 2014-2020 as a result of NL policy, on top of EU policy
Energy Agreement	All savings that can be attributed to one of 150 actions to reach 1,5% savings per year, 100 PJ and 14% renewable energy
Odyssee project (ODEX)	Improvement of energy efficiency in 28 EU-countries, measured as weighted average of the variation of unit consumption.
Results of voluntary agreements or subsidy schemes	Savings as a result of implemented projects

The oldest method is the Protocol Monitoring Energy Saving (PME), originating in 2001. The PME was developed on request of the Dutch Ministry of Economic Affairs in order to develop a uniform method to measure energy consumption and saving. The protocol defines energy savings as the difference between actual energy use and a frozen efficiency reference energy use. The saving effect is the residual after correction for volume and structural effects (Boonekamp et al. 2001).

The European Energy Efficiency Directive (EED), in place since 2012, is a framework directive which sets overarching objectives and targets to be achieved by a coherent and mutually reinforcing set of measures covering virtually all aspects of the energy system (Coalition for energy saving 2013). It is the successor of the Energy Services Directive (ESD). Implementation of the EED in the Netherlands did not lead to one distinct new policy instrument, but rather a series of adaptations on existing instruments. The EED prescribes a method for calculating energy efficiency in article 7. Energy savings are defined as the result of improvements of energy efficiency. Savings are measured as the difference in energy consumption before and after the efficiency improvement has taken place, taking into account the impact of external factors such as weather or level of economic activity. The method for calculating the impact of energy efficiency counts only the savings that are realized during the period 2014-2020, continue to deliver until at least the end of 2020 and are additional to a baseline (business as usual), thus excluding savings from EU product or building standards. Only savings that can be attributed towards new national policy instruments that explicitly aim to improve energy efficiency and whose impact is verified (no general taxation, like VAT, for example) on top of European policy and autonomous developments, may be counted as savings (Coalition 2013). Therefore, only part of the policy effect that is measured in the PME, counts in the EED, as PME also counts the effect of EU-instruments. Double counting (savings that can be attributed to different instruments) is avoided. Article 7 of the EED allows Member states to use a number of exemptions. The Netherlands chose to exclude sales of energy for transport, a progressive phase-in of the 1.5% target and for an exclusion of energy sold to the ETS-sector, resulting in a total reduction of 25% of the article 7 target (Coalition 2013, 2014).

The current Dutch energy policy is largely based on the Energy Agreement (EA), which is the main instrument for implementation of the EED. The EA has set targets for 2020 (the target year for the EED) and 2023 (a 10 year period from the start of the EA). For the period after 2020, the Netherlands strive for a 80-95% reduction of greenhouse gases in 2050, following the 2015 Paris Climate Deal (Ministry of Economic Affairs, 2016). The Energy Agreement (EA) sets a target of saving 100 PJ on top of existing instruments. The EA is not a replacement to other instruments, but rather a collection of 150 agreements that are to be implemented in other instruments in all sectors (built environment, industry, transport and energy) and is a mix of EED-specific and other national and European instruments. Therefore not all of the EA-savings can be counted as EED-savings. For instance, the long term agreements are partly existing policy, but one section of the EA is an intensification of the agreements , which can be counted for the EA.

ODEX is the index used in the ODYSSEE-MURE project to measure the energy efficiency progress by main sector (industry, transport, households) and for the whole economy (all final consumers) for all countries in the EU (Enerdata 2010). Indices here are calculated from variations of unit energy consumption indicators, measured in physical units. If no physical unit is available, an economic unit (J/value added euro) is calculated. For most sectors the method used is comparable with the PME method, but for reasons of comparison and lack of data between member states for some subsectors energy intensity is used as a measure for energy efficiency. Where the first method includes volume effects (services, physical productions units etc.) in the analyses the second does not, or at least to a lesser extent. This difference in approach needs to be kept in mind when looking at the ODEX figures. To give an example, for the chemical sector in the Netherlands (which covers half the total industrial energy use of the Dutch economy) ODEX shows a large efficiency improvement (2.3%/yr) because efficiency is calculated as energy intensity (Odyssee 2012).

However added value in this sector has increased faster than physical production (Prodcom 2012, Statistics Netherlands). In the PME method, the reference energy use in the chemical sector is based on physical production of several products (via Prodcom). A change in the product-mix will in PME therefore be visible as a structure effect or –if no data on subsectors are available- as a lower volume-effect. PME therefore results in a lower energy efficiency effect (1.1%/yr). ODEX cannot establish structural changes within the chemical industry, as data on the (physical) amount of produced chemicals is not collected for ODEX. Compared to bottom-up evaluations, efficiency gains measured in Odyssee have a broader scope and include all sources of energy efficiency improvements: policy measures, price changes, autonomous technical progress, other market forces, etc. (Odyssee 2015).

Lastly, several policy instruments have their own system to monitor results, like the voluntary agreements LTA and LEE, and the subsidy scheme EIA (Energy Investment Deduction Scheme). These differ from the above mentioned methods in that they do not provide a figure on national level, but are limited to the scope of their own instrument. These methods are based on bottom up saving by individual projects implemented by companies, reported in yearly monitoring reports or subsidy request forms. These methods could help in providing explanations of developments.

Table 3 shows the differences between the four national methods described above and a bottom up method used for the long term agreements (LTA/LEE). Important differences between the methods are the choice for a target in final or primary energy use, the choice for a reference energy use, and the extent to which policy induced savings from different instruments are separated from each other and from autonomous developments. The many aspects on which the methods can differ, make comparison difficult. The only aspect on which the three national methods agree is that decrease of the final energy use and the effects of national policy counts as savings. In most other aspects the methods differ so much that comparison is impossible (Schoots & Hammingh 2015).

Table 3. Differences between methods used in the Netherlands. Adapted from (Schoots and Hammingh, 2015)

	PME	EA	EED	ODEX	LTA/LEE
Target	No	100 PJ in 2020	482 PJ 2014-2020 (1.5%/yr)	No	30% in 2020 (LTA) No (LEE)
Primary/final	Primary	Final	Final	Final	Primary
Absolute reduction energy use	Yes	Yes	Yes	Yes	No
In house renewables ('behind the meter')	No	Yes	Yes	Yes	No (counts as RE)
Reference energy use	Frozen efficiency	EA-free	Autonomous + EU-policy	Frozen efficiency	Energy use + Savings
Physical production data	Yes	-	Option	Partly*	Yes
Monetary production data	No	-	Option	Yes	No
Intersectoral structural changes	Yes	-	No	Yes	No
Intrasectoral structural changes	Yes	-	No	Partly	No
Autonomous	Yes	No	No	Yes	Yes
EU-policy	Yes	Yes	No	Yes	Yes
NL-policy	Yes	Yes	Yes	Yes	Yes
Project savings	No	No	No	No	Yes

Other company level factors	**No**	**No**	**No**	**No**	**Yes**
Residual	**No**	**-**	**No**	**Yes**	**Yes**

*only for steel, cement and pulp&paper

3.2 Combining bottom-up with top-down data

Combining bottom-up with top down data is an approach to provide good insight in the measure of energy savings in the Netherlands. However, this is not a straight forward task, as explained in this section.

Annex V of the EED describes methods and principles for calculating the impact of energy efficiency obligations schemes or other policy measures (European Commission, 2012). As the Netherlands have opted for 'other policy measures' instead of obligation schemes, it is obliged to report savings using one of the following methods:

a) Deemed savings
b) Metered savings
c) Scaled savings
d) Surveyed savings

Other important reporting principles are:

- Correcting for climate variations;
- The activities of the obligated, participating or entrusted party must be demonstrably material to the achievement of the claimed savings;
- Savings from an individual action may not be claimed by more than one party;
- Calculation of energy savings shall take into account the lifetime of savings.

The first National Energy Efficiency Action Plan (ECN 2007) gives a detailed description of the calculation methods used for different policy measures in the Netherlands. The Netherlands opted to use the following definition of saving:

- Saving: excluding autonomous saving (or policy-related saving only)
- Scope: excluding all saving on the consumption of companies falling within the scope of the ETS.

But in the second NEEAP (Ministry of Economic Affairs 2011) this definition was updated, defining saving as the total saving, in other words both policy-related and autonomous saving. Furthermore, it is also now accepted that the majority of the saving on the electricity consumption of ETS companies may be included. The same approach is used in the third NEEAP, which was drafted as part of the obligation to report to the EU under the EED (Ministry of Economic Affairs 2014).

Reporting rules for the ESD ask for total savings and savings by sector. Here the basis is national statistics and evaluation models. For selected measures, the savings are then mapped in more detail with bottom-up monitoring, allowing more direct connections to be made with policy measures. Policy measures monitored with bottom-up monitoring account for a large part of the total savings achieved. Well above 30% of total savings follows from bottom-up monitoring (Ministry of Economic Affairs 2014). All main sectors: buildings, industry, agriculture and transport, are covered with policy instruments that involve bottom-up monitoring. The remaining of the total savings however has to be estimated from top down methods. The combination of the two results in some methodological issues.

To give some insight in the troubles that arise of combining top-down and bottom up data, we now focus on the realized savings effect of the long term agreements as part of the total reported savings. These instruments have extensive monitoring systems with detailed information on individual projects realized in companies. An overview of possible differences (see table 4) between the savings as reported by an individual instrument (bottom up) and the national top down methods as described earlier will shed light on this matter. In some cases these differences result in small effects, in other cases the effect can be very large.

Table 4. Difficulties arising from combining LTA results and top down methods.

Nr	Difficulty
1	Supply chain efficiency and renewable energy are sometimes misinterpreted as energy savings
2	Implemented saving projects give no information on other effects. Dissaving factors are not counted as an efficiency effect but as 'other effect'
3	Difference in in- or excluding losses during energy production
4	Definition of industry can vary. For instance not all companies in a certain sector join LTA, so the remaining of the sector has to be estimated
5	National Statistics count part of CHP installations as energy sector. Whether CHP count as savings depends on choice 3
6	Possible differences in default conversion factors
7	Possible differences in definition what part of energy is used as feedstock
8	About 10% of LTA-projects are awareness projects, of which the effect usually subsides after a few years, but LTA counts the effects until 2020 in contrast to the top-down approaches. Double counting can therefore appear
9	Part of savings by saving projects is not a result of policy instruments but is considered to be autonomous saving
10	Part of LTA projects is also reported under other instruments, especially EIA and MIA/Vamil, adding up can result in double counting
11	Lagging companies will not join a voluntary agreement or apply for subsidies, leading to a positive bias if conclusions based on these populations

3.3 Disentangling factors influencing energy efficiency

To know why energy consumption has changed and what impact energy policy has had on this change, all factors influencing consumption have to be known. In Dutch industry, growth of value added is structurally higher than the increase in physical production (Schoots and Hammingh 2015), resulting in a decrease in energy intensity for the whole sector even while production of individual products is not becoming more efficient. The industrial subsectors have known a decrease of energy consumption (2000-2010), in line with a lower energy intensity within these sectors as a result of a structural change towards less energy intensive production (Gerdes 2012), even though there was an increase in the contribution of the (energy-intensive) chemical sector in the Netherlands between 2000 and 2008 (Ademe 2012).

The level of detail of the source data can have a large effect on the size and distribution of the different decomposition factors. For example, if there is only one number known for the production volume in a sector (i.e. tons of paper in the paper industry), a shift in production from low to high quality paper (a structure effect) will be hidden in the volume-effect. A shift in production between companies or subsectors with different energy characteristics will be hidden if energy and production data are only known on sectoral level. The resulting estimated energy savings effect can differ significantly in the two cases.

To illustrate these effects on the outcome of the different methods mentioned in §3.1, we created a fictitious dataset for a sector (table 5). This dataset stands model for a sector like the chemical industry in the Netherlands, which in the last decade featured a shift towards more specialized products, with a higher added value. This means that added value grows faster than physical production. Both increase faster than energy use. While both 'physical' energy intensity and 'monetary' energy intensity decrease, monetary intensity decreases faster. Furthermore, the dataset contains 5 TJ savings on primary energy as a result of a upgrade of a CHP-installation and 1 TJ of 'other' effects, in this case an increase of energy use by for instance extra cleaning needed for increased hygienic or safety standards. These last factors are based on realistic bottom up information reported by companies. Figure 2 shows how the four different methods on basis of this dataset result in different figures. The EA is not shown, as decomposition is not relevant in this case. Only relevant is the fact that savings as a result of CHP are not counted as savings for the EA, as CHP is not part of the EA agreements. PME is more strict in its definition on savings than the EA. As the EA is aimed towards lowering final energy use, instruments that result in a decrease in the activity level or in a shift towards a less energy-intensive mix of activities, will be seen as a policy effect by the EA, but will in PME not be counted as a savings effect, but as a volume or structure effect (Schoots &Hamming 2015).

Table 5. Basic data set (fictitious) for a sector

Basic data	Unit	Base year (0)	Reporting year (1)
Production	ton	1,000	1,050
Added value	€	5,000	5,350
Consumption (final)	TJ	55,0	58,8
Consumption (primary)	TJ	100	101
Unit consumption (f)	TJ/ton	0,055	0,056
Unit consumption (p)	TJ/ton	0.100	0.096
Unit consumption (f)	TJ/€	0,011	0,011
Unit consumption (p)	TJ/€	0.020	0.019
Project savings	TJ		5
Other factors (dissaving)	TJ		1

PME is (for this sector) based on physical production and primary energy and therefore calculates a volume effect of 5 $((P_1/P_0)*E_0-E_0)$=(1050/1000)*100-100). As ODEX for the industry is based on added value, the volume effect in this method is 3,9 $(AV_1/AV_0*E_0-E_0)$=(5350/5000)*55-55). As this dataset contains only one sector, and no changes in the produced physical unit(s) are assumed, the structure effect is 0. Note that if data of subsectors would be available, an intrasectoral structure effect would be possible. For both ODEX as PME the saving effect is the difference between actual energy use and the energy use after volume and structure correction. Neither of these methods use bottom up information on project savings or other effects. For ODEX, the savings effect is 58.8-58.9=-0,1 TJ. For PME the savings effect is 101-105=-4TJ. In this case, the savings effect for PME is much larger than for ODEX, as ODEX uses final energy and therefore does not count savings as a result of CHP.

The LTA method calculates the same volume effect as PME (+5TJ), but bases the effect of project savings (-5TJ) and other effects (+1TJ) on bottom up information from companies. If factors combined do not add up to the total difference in energy use, there might be a residual.

The EED method calculates a volume effect of 2.8 TJ (1050/1000*55-55) and a saving effect of 1 TJ (58.8-57.8=1TJ). Note: this is actually a negative (dissaving) effect. The savings effect for EED is lower, a.o. because EED uses final energy, but also because EED does not count savings as a result of CHP, but does count the dissaving effect of other factors.

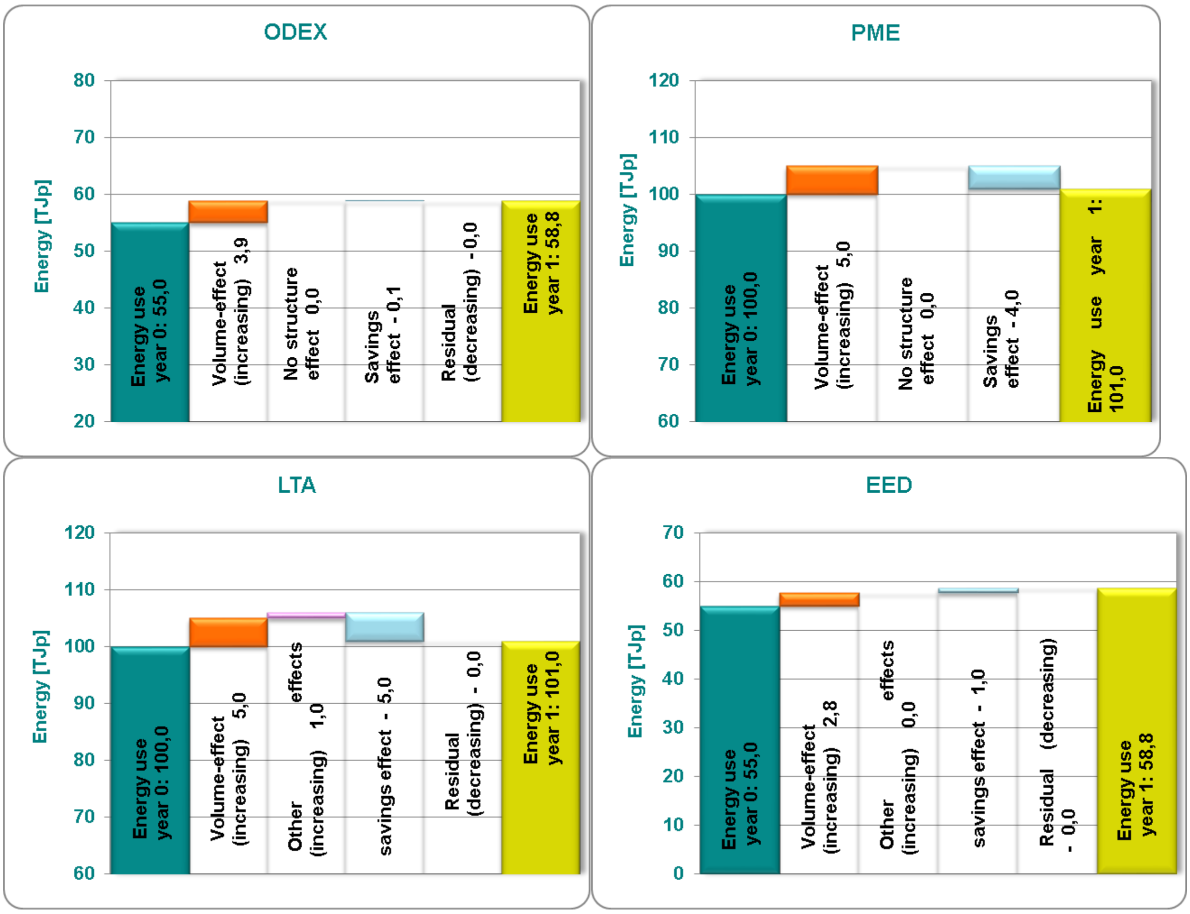

Figure 2. Comparison of decomposition of different methods

As it is, all four methods come to a different savings effect, depending on choices between final or primary energy, physical or economic production data and use of bottom up or calculated savings data. Policy makers will be interested in those savings that are induced by their policy instruments. However, instruments will not only influence savings, but possibly also volume and sector structure. Whether an effect is shown as a volume, structure or a saving effect, depends among others on the level of detail of volume and structure information available and used in the particular method. Take the example of car transport. The policy target is a decrease of emissions by cars. Possible instruments are (a.o.) a fuel tax or subsidies for more efficient cars. A fuel tax will decrease the number of kilometres travelled and therefore contribute to the policy target. However, it will not increase the efficiency of individual cars and therefore will not be visible as a savings effect but as a volume effect. A subsidy for more efficient cars will have an impact on the mix of cars (the 'product mix'). If one observes the average fuel efficiency of all cars, we see an increase in efficiency, and therefore a savings effect. However, if one observes the car mix in more detail, we see that individual car types will not become more efficient. On this more detailed level, the effect of the subsidy is a structure effect and not a savings effect. Disentangling the saving effect ask for specific volume and structure information that is not always available.

3.4 Advantages of the different methods

Section 3.3 showed the large differences in outcome between the different methods that are used in the Netherlands. What method is most suitable is dependent on the aim of the analysis; every method has its own (dis)advantages, which are summarized in table 5.

Table 5. (Dis)advantages of methods

Method	Advantages	Disadvantages
PME	Historical and future trends	Some policy effects are shown as volume or structure effect
ODEX	Comparison of countries	Structure effect are shown as savings
EED	Gap to European target	Only part of policy is relevant
EA	Gap to national target	Only part of policy is relevant
Bottom up	Most detailed information on projects	Focuses only on positive savings. No distinction between autonomous and additional savings

This finding is not new. In an assessment of the NEEAPs of the EU27, the most common problem in comparing EED and national savings concerns incorrect calculation of the savings target (Coalition 2014). This problem originates from:

- A vague baseline, because of the many possible exemptions
- Double counting (e.g. EIA/vamil vs MJA)
- Not all policy measures are eligible
- Diminishing impact of pricing policies
- Only part of fuel switches are eligible

Therefore, one should not translate results of one method to that of another and always bear in mind the aim and background of the particular method before interpreting the result.

4- Conclusions and policy implications

The current Dutch Energy policy to reduce energy use, is a mix of (adaptations on) instruments, existing and new, targeting generic versus specific groups, and steering to convince target groups to change their behavior by enforcement, seduction and/or informing. To follow this mix of policy measures the Netherlands use several methods to calculate energy savings. Besides three national top-down methods, several policy instruments have their own bottom-up method. The three top-down methods differ in aim, scope, the data used and the factors in which effects are decomposed in the calculations. Whether an effect is shown as a volume, structure or a saving effect, depends among others on the level of detail of volume and structure information available and used in the particular method. Therefore, it is not possible to compare the outcome of these methods. This conclusion is also applicable when comparing the top down models to the bottom up approaches. Up to a certain extent, it is possible to translate the outcome from one method to that of another. However, this is only possible with good understanding of the underlying method, definitions and data used.

It is not possible to nominate one of these methods as the ‘best’ method. What method is most suitable depends on the aim of the analysis; every method has its own (dis)advantages. When looking at energy savings indicators one needs to keep in mind that indicators in some cases do not purely represent energy savings. It is important to have good insight in the method to know whether other effects, like volume or structure, are included as well.

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Appendix

Overview and typology of current policy instruments on energy efficiency in the Netherlands

Instrument	Typology	Year	Description
Environmental Management Act (EMA)	Prescriptive	1993-	This act sets out an integrated approach to environmental management in the Netherlands and provides the legal framework by defining the roles of national, provincial or regional, and municipal government
LEE	Prescriptive	2009-2020	A voluntary agreement , in particular for companies that fall under the EU-ETS scheme. In total, 114 companies in 7 sectors joined the LEE-covenant, with a combined energy use of 602 PJ (2011)
LTA3	Prescriptive	2008-2020	The LTA3, is joined by over 900 companies in 32 sectors, mostly industrial, but also some services and rail transport. The majority of LTA3 companies fall under the definition of SME's
Energy Agreement for sustainable growth (EA)	Prescriptive	2013-	Signed by more than forty organizations, the overarching goal of the Energy Agreement is to achieve a completely sustainable energy supply system by 2050. In total, more than 100 actions have been identified in the Energy Agreement, of which 5 (mentioned in this table) are relevant to industry. Part of the actions are prescriptive, part is economic or supportive
EA: Enforcement LTA3	Prescriptive	2014-	An agreement with municipalities and regional government agencies to prioritize enforcement of the energy-saving obligation in the EMA
EA: Selection recognized measures	Prescriptive	2014-	A list of specific approved measured that have proven to be profitable in other companies. Municipalities and regional government agencies could use this list in the enforcement of the EMA
EA: Company specific agreements	Prescriptive	2014-	Agreements with individual companies to implement certain projects, in exchange of specific support
Regulating Energy Tax (REB)	Economic	1996-	A yearly set levy on the use of electricity, coal and natural gas. The height of the levy decreases with increasing energy use
EU-ETS	Economic	2005-	The largest industrial companies can trade emission certificates.
Compensation ETS-costs	Economic	2014-	A subsidy scheme for ETS companies to compensate for rising electricity prices. Budget 2015 is €50 million
SDE+	Economic	2008-	A € 3.5 billion subsidy scheme for production of renewable energy and combined heat and power (CHP).
EIA	Economic	1997-	Companies investing in energy-efficient technologies can deduct part of the investment costs from their profits. Total 2013 budget for EIA was 151 Million euro (RVO.nl, 2014).
MIA/VAMIL[i]	Economic	1991-	Tax deduction schemes for investments in environmental friendly products or business resources. Total 2013 budget of €125 Million (website RVO.nl 2014).
Green Deals	Supportive	2011-	In a Green Deal, central government signs a deal with market parties to overcome one or more problems that hamper progress towards a sustainable society.
Action Plan industrial heat	Supportive	2014-	A plan to utilize industrial waste heat
Expertise centre energy efficiency	Supportive	2014-	An independent centre of expertise to assist businesses and funding bodies in identifying the most effective measures
Gasunie environmental plan for industry	Supportive	1991-	Free advice on energy saving possibilities

Source: adapted from Cagno et al. 2015, Gerdes 2012 and SER 2013.

[i] MIA (Environmental investment rebate) and VAMIL (Arbitrary depreciation of environmental investments)