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Joint Meetings of Tax and Environment Experts

LESSONS FROM 15 YEARS OF EXPERIENCE WITH THE DUTCH TAX ALLOWANCE FOR ENERGY INVESTMENTS FOR FIRMS

16 November 2012,
OECD Headquarters, Paris

This paper discusses 15 years of experience with the Dutch Tax Allowance for Energy Investments for firms. It was written by Arjan Ruijs (PBL Netherlands Environmental Assessment Agency) and Herman R.J. Vollebergh (PBL Netherlands Environmental Assessment Agency and CentER and Tilburg Sustainability Centre, Tilburg University), and was kindly offered as a voluntary contribution from Dutch authorities to two ongoing projects at the OECD:

- *The project on assessing environmentally motivated tax preferences under the auspices of the Joint Meetings of Tax and Environment Experts; and*
- *The project on lessons on environmental policy reform, under the auspices of the Working Party on Integrating Environment and Economic Policies.*

For further information, please contact:
James Greene, CTPA, tel: +33 (0) 1 45 24 88 86; email: James.Greene@oecd.org; or
Nils Axel Braathen, ENV, tel: +33 (0) 1 45 24 76 97; email: Nils-Axel.Braathen@oecd.org.

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NOTE FROM THE SECRETARIAT

This paper discusses 15 years of experience with the Dutch Tax Allowance for Energy Investments for firms. It was written by Arjan Ruijs (PBL Netherlands Environmental Assessment Agency) and Herman R.J. Vollebergh[1] (PBL Netherlands Environmental Assessment Agency and CentER and Tilburg Sustainability Centre, Tilburg University),[2] and was kindly offered as a voluntary contribution from Dutch authorities to two ongoing projects at the OECD:

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Delegates are invited to provide comments in writing by 10 December 2012. It is planned to release this study as an ENV Working Paper.

ACTION REQUIRED: For discussion.

1 . Corresponding author; Telephone: (+31)302742626; E-mail: herman.vollebergh@pbl.nl.

2 . The authors thank Nils Axel Braathen (OECD), Rob Aalbers (CPB), Jan Haverdings (Agentschap NL) and Bert Wilbrink (Ministry EL&I) for useful comments.

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LESSONS FROM 15 YEARS OF EXPERIENCE WITH THE DUTCH TAX ALLOWANCE FOR ENERGY INVESTMENTS FOR FIRMS

1. Introduction

1. Energy efficiency is quickly becoming a key ingredient of the energy and environmental policy mix (Convery, 2011). In many OECD countries, firms and households can collect government subsidies if they adopt certain energy efficient technologies or appliances. Such technologies and appliances not only provide benefits to the owner, but also to society at large. This certainly holds for energy efficient technologies such as double glazing, insulation, high-efficiency diesel engines, etc. These technologies have in common that they reduce the owner's energy bill, but they also mitigate the emissions of environmentally hazardous pollutants, such as greenhouse gases.

2. Already back in 1997, the Dutch government introduced a unique tax allowance scheme that aimed to promote investments in energy efficient appliances by firms. The tax deduction scheme was originally part of a broader energy tax policy package that was initiated in the Netherlands after the failure to implement a European-wide carbon tax in the early 1990s (Vermeend and Van der Vaart, 1997). This package included, first of all, the taxation of small-scale energy use in order to reduce CO_2 emissions (large-scale energy use was exempted for competitiveness concerns) (see Vollebergh, 2007). The second element of the package was the introduction of tax deduction for investments in energy savings and renewables, as a compensation mechanism for the additional tax burden. This so called 'Energy Investment Tax Allowance (EIA in Dutch) aims to stimulate investments in energy savings and sustainable energy production, with a special emphasis on small and medium-sized enterprises (SME) and enterprises having a covenant with the government to improve energy efficiency. The scheme reduces up-front investment costs of energy saving and sustainable energy technologies through a deduction from their taxable income.

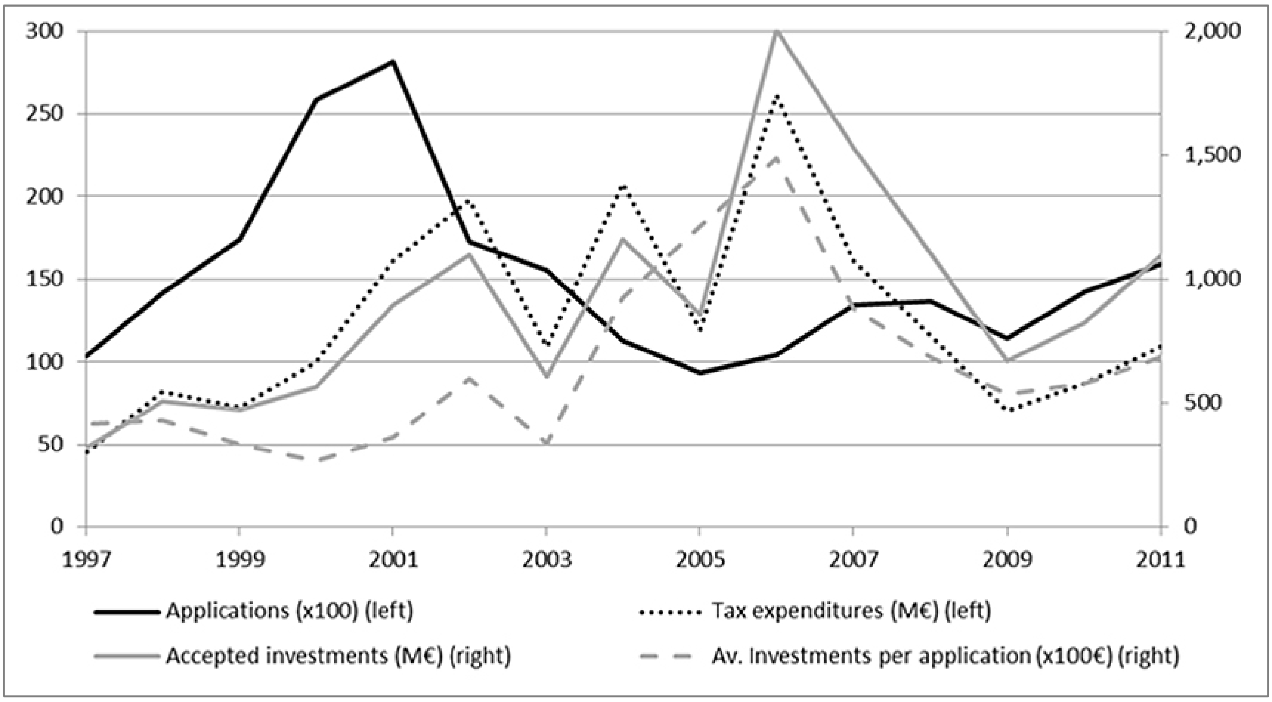
3. Already for 15 years, the EIA is one of the pivotal instruments within Dutch energy policy. The EIA generates an average of 15,000 applications each year, most of which are actually granted – see Figure 1. The amount of investments involved is around EUR 1 billion per year, which covers approximately 1% of overall Dutch industries' investments. The relative importance of the EIA varies enormously across sectors, however. Not surprisingly, the energy sector is on top of the list, with about 30% of their overall investment expenditures supported by the EIA on average, and with a peak of 93% in 2006.[3] Also the agricultural sector received a lot of support, though in their case, on average, only 7% of their investments received EIA support. The budgetary impact of this scheme is EUR 100 million of tax revenues foregone by the Dutch government in 2010, which is 0.07% of total tax revenues. Small and medium-sized enterprises make 80 to 95% of the applications each year, covering 50% to 80% of total accepted investments (in euro). Furthermore, 24% to 40% of the applications come from companies having a covenant with the government.[4] Finally, the regulating agency responsible for administering this scheme has calculated that the EUR 893 million of investment in 2010 have saved 21 PJ of energy. This amount

3. The energy sector contains the firms producing and transporting electricity, gas and heat. Most of the EIA-investments from the energy sector are done by electricity producers.

4. This share has declined over time, partly because the covenant system has changed.

corresponds to a reduction of greenhouse gas emissions of 1,200 kilo-tonnes of CO_2-equivalents and a reduction of overall energy use in the Netherlands of 0.75% (Agentschap NL, 2011).

Figure 1. Main indicators of the EIA tax expenditure scheme in the Netherlands



Source: Senter, Senter Novem, Agentschap NL, 1999-2012.

4. Subsidies often face scepticism among economists, in particular in the environmental field (Van Soest and Vollebergh, 2011). For instance, subsidies would have adverse effects on entry and exit decisions of firms, require distortionary taxes at the margin, and typically create ineffective incentives, and therefore inefficiency – due to asymmetric information. Though the subsidy instrument is not popular among economists, it is actually used quite often in practice. Subsidies appear in many forms, including explicit investment transfers and tax deductibility schemes. The latter include investment credits, accelerated depreciation, partial expensing, and exemptions (Jenkins and Lamech, 1992; Price *et al.*, 2005; OECD, 2006). This popularity can at least partly be explained by the fact that subsidies temper the increase in average cost by firms associated with environmental policies, and hence have a less detrimental effect on the domestic industry's international competitiveness, as compared to, for example, environmental taxes or quotas (Dietz and Vollebergh, 1999).

5. This paper reviews the experience with the EIA in the Netherlands with a special emphasis on these political-economy aspects. The review starts with a discussion of the motivation for its introduction in relation to some widely hold views on implementing subsidies and their budgetary impacts. It next discusses how policy effectiveness issues, in particular the debate on free riding, has influenced policy design over time. Finally, it evaluates a somewhat neglected issue of this scheme, which is the use of a dynamic technology list to define eligibility of the scheme. The paper ends with a brief discussion on the lessons learned.

Box 1. Investment incentives through the EIA

The objectives of the Dutch EIA are to improve energy efficiency and increase the share of sustainable energy by stimulating investments in energy saving or sustainable energy technologies. The basic principles of the EIA are the same already for 15 years.

The EIA stimulates adoption of energy saving technologies or renewables by lowering their investment cost up-front and is conditional on investments that are screened ex ante by the regulating agency. If (for profit) firms invest in technologies listed in the annually updated 'Energy List', they can deduct a part of the investment costs from their taxable profits or taxable income in the year when they invest. With investment level *I*, (corporate or income) tax rate t and EIA-rate s, firms can deduct an amount s**I* from their taxable profits or taxable income. In case profits or income are positive, the taxes paid decrease with t*s**I*. To the extent that the Dutch corporate and income taxes are progressive, the more profit you make, the more you benefit from the EIA. In 2011, the net tax reduction was on average 10% of investment costs.

Consider the following examples for 2012 when 41.5% of the amount of investment I can be deducted from the taxable profits or income.

- Firms with a taxable profit higher than EUR 200 000 face a corporate tax rate of 25%, which implies a reduction of corporate taxes paid of EUR 0.104.
- Firms with a taxable profit below EUR 200 000 pay a corporate tax rate of 20%, implying tax savings equal to EUR 0.083**I*.
- Entrepreneurs paying personal income taxes with a taxable income above EUR 55 695 face an income tax rate of 52% which implies EUR 0.216**I* less tax payments.

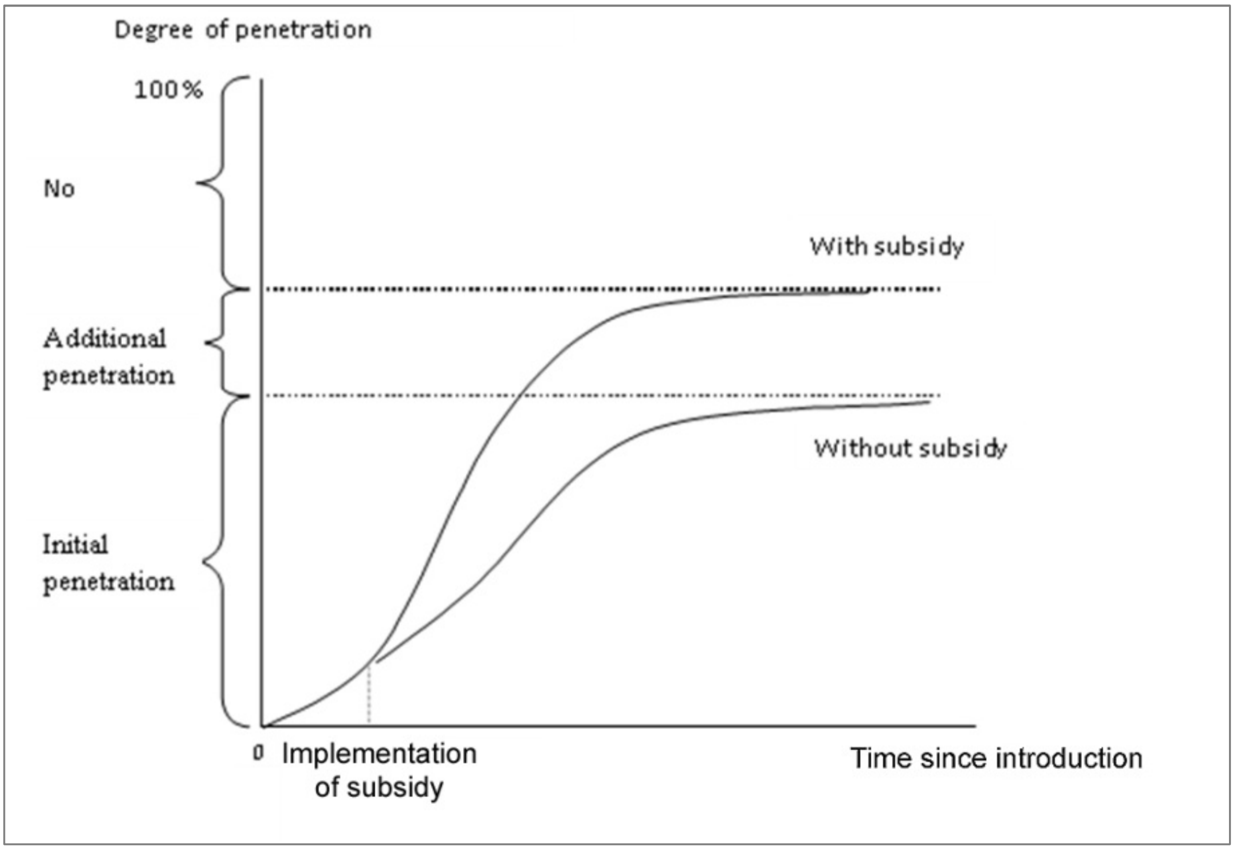
Next to the annual (additional) savings in energy use due to investments, the EIA decreases up-front investment costs of a specific set of technologies in particular. Compared to alternative investments in conventional reference technologies, the EIA increases the net present value (NPV) of these investments (decreases the payback period) and reduces financing needs for energy saving investments. So the EIA improves the odds for particular investment projects, in particular the adoption of energy-saving or sustainable technologies (see Van Soest and Vollebergh, 2011). Note that annual savings due to the use of more energy efficient technologies depend on the reduction in energy use compared to the conventional, reference technology and the energy price. With rising energy prices, annual savings increase and, as a result, the NPV of energy-saving technologies increases as well. So, less EIA support would be necessary to bridge the NPV gap when energy prices rise – via market price increases or increased energy taxes. Similarly, investments in sustainable energy sources, even though their up-front investments costs may be higher compared to conventional technologies, often lead to lower variable costs. If energy prices increase, the difference between variable costs of conventional and sustainable energy technologies may become substantial.

Defining the net adoption costs as the actual adoption costs minus the investment subsidy provided, technologies with lower net adoption costs are likely to obtain a higher ordering in the ranking of available alternative technologies. Therefore, energy-saving technologies, which usually have higher actual adoption costs than traditional technologies, will be adopted more readily with a subsidy than in absence of a subsidy. If firms are heterogeneous, for instance with respect to the technology currently in use or with respect to capital (or borrowing) constraints, the adoption of a particular technology is likely to follow a gradual pattern over time, or a so-called penetration curve (see Figure 2). A subsidy will shift this penetration curve to the left, whereas the overall penetration might be lifted somewhat due to lower net cost of this particular technology. Note that this line of reasoning holds even if firms belong to different risk classes, that is, if they differ with respect to the discount rate they apply to their investment decision.

The EIA may also reduce search costs for investors due to the annually updated Energy List which is used to consider eligibility for the subsidy. This Energy List contains generic technologies satisfying a certain (energy) savings standard or a selection of novel, but proven, technologies with a higher energy saving potential than conventional reference technologies. Therefore, the list itself may also have an important attention value which might contribute to alleviate information failures in the adoption market.

Apart from adoption decisions, the EIA is likely to also stimulate new inventions in the field of energy-saving or sustainable energy technologies (OECD, 2010; Vollebergh, 2012) The EIA offers innovators a stimulus to develop new technologies that have a better energy efficiency performance than reference technologies, because they can propose their new inventions to be added to the Energy List which is likely to increase sales and profitability of the new inventions. The Energy List is updated annually. Technologies with a sufficient level of market penetration, which have become conventional technologies themselves, are removed from the list. Accordingly, this dynamic element not only reduces the problem of free riding on the demand side (see also section 3), but also reduces the risk for innovators not to pass the market-introduction phase of new technologies. In this way, the EIA indirectly stimulates particular research avenues and therefore directs R&D-investments in specific directions.

Figure 2. Penetration curve of new innovations



Source: Van Soest and Vollebergh (2011).

2. The EIA in the public budget

6. In the second half of the 1990s, inspired by the left-liberal political wind throughout Europe, an increasing concern for climate change and the European discussions on liberalising energy markets, Dutch energy policies went through a period of change. In 1994, for the first time in Dutch history a left-liberal coalition government came to power in the Netherlands. One year later, they presented ambitious goals for energy saving, sustainable energy and greenhouse gas emission in the so called 'Third Energy Plan' (Tweede kamer, 1995). A diverse set of energy policies was agreed upon, characterised by a shift towards the use of more market-based instruments. Most instruments combined objectives of promoting energy savings, sustainable energy production and greenhouse gas emission reduction.[5]

5. For most instruments, however, it was not clearly described which of the three objectives was leading and to what extent the instrument had to contribute to the overall objective of improving energy efficiency with 2% per year (which was reduced later), reaching a share of sustainable energy of 14% in total energy production in 2020 and reducing greenhouse gas emissions in 2020 by 20% compared to the level in 1990.

7. Furthermore, the Dutch government also started to experiment with covenants in environmental and energy policy. In this period, several energy covenants were agreed upon in which a number of economic sectors voluntarily promised to reduce energy use in exchange for a government contribution to facilitate investments in new technologies. Moreover, the government introduced a Regulatory Energy Tax (REB) for small-scale energy users (in particular electricity and gas) to be implemented in the beginning of 1996 due to the failure to introduce a CO_2-tax at the European level. To compensate small firms for the additional tax burden of the REB, first of all, the corporate tax rate was reduced. In addition, to stimulate investments in energy savings and sustainable energy, the Dutch government also decided to partly refund these tax revenues in the form of a tax allowance, the EIA.[6]

8. This subsidy scheme was explicitly designed as a tax allowance. The design as a fiscal instrument had the advantage that the subsidy was a so called off-budget expenditure which at that time was not subject to the usual government budget rules. The reason for this choice was the agreement in the coalition to reduce overall government expenditures. Indeed, the combined use of a tax on small-scale energy use and a fiscal allowance scheme to compensate for the reduced after-tax income of small firms enabled the government to implement their plans without further budgetary consequences.[7] The EIA was targeted in the first years on SMEs and sectors having energy-saving covenants in order to compensate them for the REB.

9. Apparently this Dutch policy mix, combining a tax on (small-scale) fossil fuel related energy use (electricity and gas) and an abatement subsidy (adoption of energy-saving technologies or renewables) is a two-part instrument ‘avant-la-lettre’. The subsidy stimulates adoption of cleaner production technology, and therefore makes dirty inputs relatively more expensive, causing substitution away from the dirty input. However, the abatement or investment subsidy is also responsible for (excessive) entry into the industry (Baumol and Oates, 1988). This classic objection against using environmentally related subsidies can be solved by using an additional policy instrument, such as dirty input or output taxes (Eskeland and Devarajan, 1996). As demonstrated by Fullerton and Wolverton (1999), a properly designed two-part instrument could even exactly match the incentive effects of a direct tax on pollution or waste. Note that these taxes also raise revenues that finance the subsidies and therefore reduce the negative effect of the marginal cost of public funds.

10. From the start, the EIA attracted a large number of applications. Despite only a modest promotion campaign, this number was over 10,000 per year from the very beginning, while only 3,000 were expected (Van der Lande and De Vries, 2001). Until 2001, the number of applications grew rapidly and total EIA-investments almost tripled (see Figure 1). Not surprisingly, budget implications were considerable. Between 1997 and 2002, the overall amount of taxes foregone rose from EUR 45 million to EUR 198 million. Despite its success, compensation for the introduction of the energy tax through the EIA was initially rather weak. The share of EIA expenditures as a percentage of tax revenues from the REB from firms (mainly SMEs) was only 10-15% in the 1990s. This percentage increased after 2000, with a peak at 35% in 2002; it then gradually declined. Indeed, compensation through the EIA was only implicit and part of a package of compensation measures (including changes in corporate and income taxes). It was never explicitly laid down in budgetary rules or other types of agreement.

11. The initial strong growth in the amount of tax expenditure induced considerable budget concerns. At that time, tax expenditures, such as the EIA and other related fiscal measures, like the MIA (tax

6. In the same period, several small-scale and sometimes short-lived subsidy schemes were introduced, focusing on particular sectors, energy sources or technologies, like R&D subsidies, subsidies for pilot projects in renewable or energy-saving technologies and subsidies to invest in wind, solar or biomass-technologies.

7. Households were compensated through other (income tax) measures.

allowance for investments in environmentally friendly technologies), VAMIL (accelerated depreciation for investments in environmentally friendly technologies) and the income tax allowance for investments in shares of environmentally friendly firms, created a large, uncontrolled burden on the overall budget of the Dutch government. Between 1997 and 2002, overall tax expenditures for these instruments rose from EUR 150 Million to EUR 429 Million (CBS, 2012). Not surprisingly, the EIA also ran an increasing risk of overrunning the (*ex ante*) budget.

12. Clearly, the set of tax expenditures for investments in energy saving, environmental equipment and renewables created an off-budget risk to the general budget because of their open-ended structure: any application considered eligible for subsidy should also be accepted. Accordingly, if applications grew and/or the amount of investment involved increased, the tax authority had to grant every single application. This characteristic of the tax expenditure schemes in the Netherlands induced a fundamental debate on how to get better control over tax expenditures in general. A first step to prevent uncontrolled growth was to make the expenditures transparent for the parliament and thus, ultimately, for the tax payer. Since 2001, tax expenditures have to be accounted for in the Annual Tax Plan, which should be sent to the parliament together with the yearly budget (Ros, 2003). Moreover, the new budget system '*From Policy Budget to Policy Accountability*' (VBTB), required Ministries to provide more insight about policy objectives, instruments implemented and their effects. Also, tax expenditures had to be evaluated each 5-year interval.

13. Despite these measures, tax expenditures like the EIA still provided a considerable risk for the overall public budget. This is illustrated in Figure 3. The initial popularity of this subsidy scheme was clearly accommodated in the beginning. Its budget grew steadily until 2002. But even though the number of applications started to decline rapidly due to changes made to the EIA Energy list after its first evaluation, total investments for which EIA was applied still showed a remarkable increase in that year (see Figure 1), especially because of the rise in applications for relatively expensive renewable energy installations. This sharp rise was much higher than in all previous years and was likely to exceed by far the *ex ante* budget of the scheme. This induced the Minister of Finance to close the EIA earlier than planned within this year. The same happened in 2006 and 2007, when the EIA was also closed temporarily to avoid a too large burden on the public budget.[8]

14. Apparently, the budgetary tensions did not lead to the decision to stop providing this tax allowance altogether or switch to a different type of subsidy. The EIA is an element of a whole set of subsidy schemes provided by the Dutch government that – together – aim to induce firms to invest in energy saving, environmentally friendly and renewable technologies. This overall scheme has been gradually built up and shows a clear pattern of trial and error (Roosdorp, 2012). Also, the premature closures of the EIA make the government look unreliable and created a lot of additional uncertainty to the entrepreneurs. Therefore, it was decided in 2009 to change the budget system for the EIA such that a longer-term budget equilibrium was allowed. Under-spending in one year can be used to compensate for overspending in another year.

15. Finally, the EIA has been used to stimulate investment in the construction sector after the start of the economic crisis in 2008. The impact on the budget has been quite limited, however. The sharp decline in tax expenditures visible after 2006 clearly reflects underutilisation of the EIA budget since 2008.

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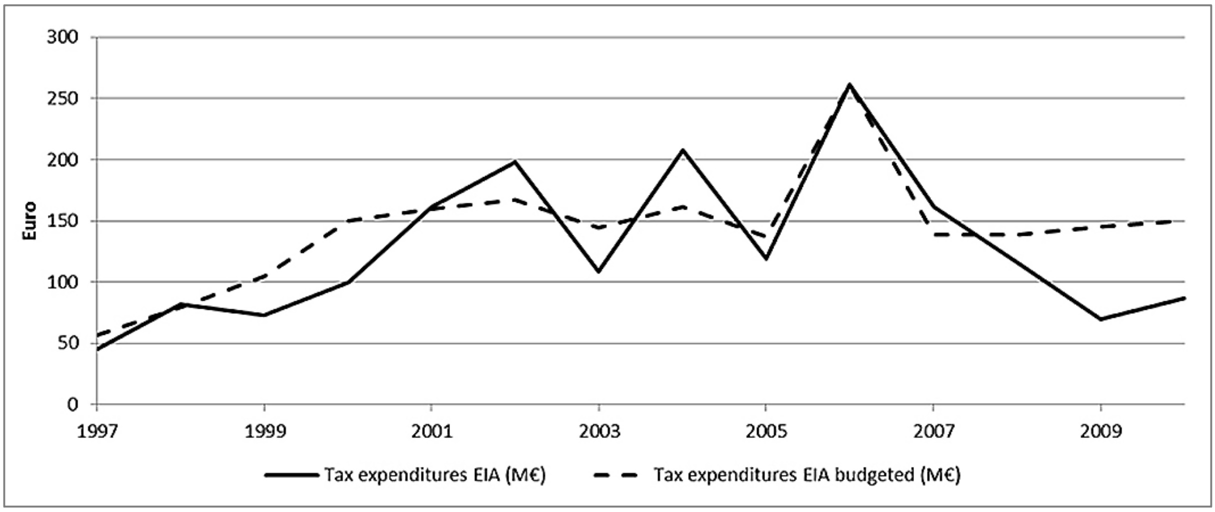
8. The temporary expansion of the budget in 2006 was due to the closure of another subsidy scheme for renewable energy investments. The EIA was used to bridge the gap between this closure and the take off by its successor (Roosdorp, 2012).

Figure 3. ***Ex ante*** **budget estimates and actual tax expenditures of the EIA**



16. Despite of all changes in Dutch energy policies in general and its earlier-than-planned closure in 2002, 2006 and 2007, the EIA has never been abrogated, whereas several other instruments to stimulate energy savings or production of sustainable energy did not survive in the same time span (Noailly, 2010).[9] First of all, the policy objective remained high on the agenda throughout its life span. Second, the budgetary turbulence was at least partly due to well-explicable problems or flaws in the different subsidy schemes used in the Netherlands (see also section 3). Third, it was widely believed that several options were available to prevent budget overruns and to increase its effectiveness (amounts of PJ saved) and efficiency (amount of PJ per euro saved). We discuss this belief in the next section in further detail. Whatever the exact reasons, a number of measures have been undertaken to improve the performance of the EIA since 2002 and to restrain its budgetary impact, such as a reduction of overlap between subsidies (with MIA, VAMIL and MEP), lower deduction percentages, higher energy-saving norms and regular updates of the energy list. In that respect, also the EIA is an example of an instrument that is improved through learning by doing.

3. Subsidy effectiveness and efficiency: free-riding and beyond

17. In this section we concentrate on how the Dutch regulator responded to well-known incentive compatibility issues of subsidy schemes and which has played a large role in the subsidy reform of the EIA since its start. At the time that the budgetary impact of the EIA, as well as some of the other prevailing subsidy schemes, started to grow very fast – shortly after 2000 – the Dutch government evaluated the effectiveness and efficiency of those schemes through a commission chaired by independent experts (De Beer *et al.*, 2000).[10] The available empirical evidence on the effectiveness and efficiency of similar subsidies at the time seemed to support the economists' belief that subsidies are inefficient. Some studies report that the numbers of agents whose behaviour is not affected by the subsidy, tends to be very high (for

9. For instance, a similar measure like the EIA for non-profit firms was terminated in 2002. The Energy Investment Subsidy for Non-profit firms used a similar Energy List, but provided direct support instead of tax deduction because non-profit firms do not pay corporate or income taxes.

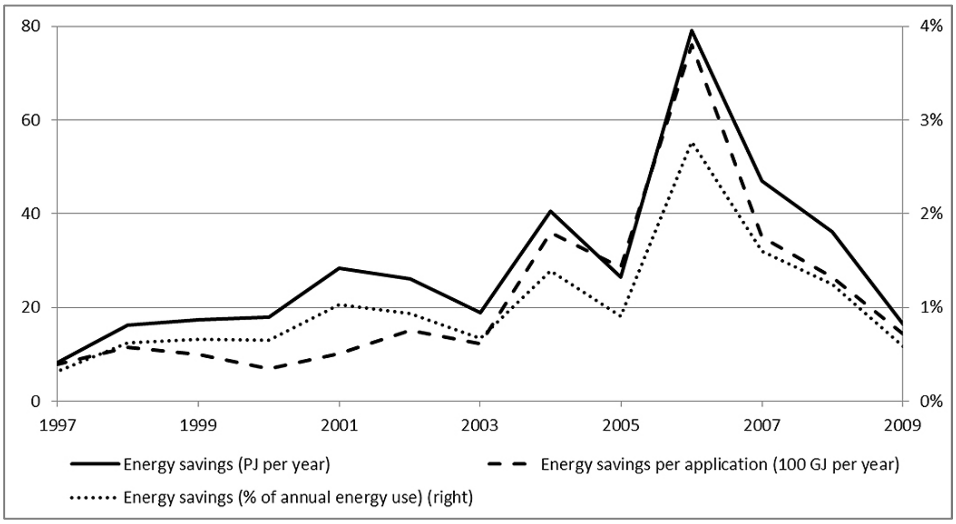
10. These so-called interdepartmental commissions were used to critically assess government expenditures in different fields by independent experts. Although the government had no obligation to follow-up the conclusions of these commissions, their evaluations were quite influential.

example, Malm, 1996; Wirl and Orasch, 1998; Wirl 2000).[11] Following this influential discussion about 'free riding' of similar support schemes, such as the Demand-Side Management scheme in the USA in the 1990s, this Dutch commission raised similar concerns.

18. The point is that subsidies are usually not just claimed by agents, for whom the investment opportunity is not profitable without the subsidy, but also by agents who would have adopted the technology anyway, even with zero subsidies (Wirl and Orasch, 1998; Wirl 2000). Indeed, for some firms, the costs of purchasing an energy-saving technology may be smaller than the benefits it provides in terms of, for example, a reduced energy bill, and hence for these firms the subsidy would just be a windfall profit. For other firms, the subsidy is not high enough to offset their net investment costs. For those firms, the subsidy is not sufficient to induce them to adopt, and hence their behaviour is also unaffected by the scheme. Only those firms will be induced to change their decision and adopt the new technology for which the costs exceed their private benefits by an amount that is less than the subsidy. However, depending on the cost structure of firms in the industry, this third type of firm may actually be a small fraction of all firms in the industry, whereas the first type may be dominant. Accordingly, a large amount of money would be spent without inducing much additional investment. In combination with the observation that raising funds for subsidies is costly to society, the welfare effects associated with subsidies may even be negative.

19. The IBO commission supported independent research to evaluate the effectiveness and efficiency of the EIA scheme and this study reported also a substantial amount of free riders (see De Beer *et al.*, 2000, IBO, 2000). Using a survey among a sample of the EIA applicants between 1998 and 2001, De Beer *et al.* (2000) estimated that, on average, 64% of those using the EIA scheme could be considered as 'free-riders', although this number varies strongly across the subsidised technologies (see also Aalbers *et al.*, 2011). Nevertheless, bottom-up estimates which account for investment in specific reference technologies – *i.e.* technologies that would have been used in the absence of the scheme, still revealed substantial energy savings, even if one controls for the technology-specific number of free riders.

Figure 4. Estimated energy-savings due to EIA-investments



Source: Senter, Senter Novem, Agentschap NL, 1999-2012. Statline CBS.

11. The evidence, however, was mainly confined to this Demand Side Management (DSM) programme by electric utilities in the United States. Although Hassett and Metcalf (1995) provided some counterevidence, showing that energy-conservation credits given to households were effective in stimulating the penetration of modern energy-saving technologies, the overall impression of such schemes was very negative (*e.g.* IEA, 2002).

20. Figure 4 illustrates bottom-up estimates of energy-savings each year (in PJ), as well as per application by the scheme, according to the regulating agency.[12] According to these estimates, 29 PJ of energy was saved in 2001 due to the EIA, which was around 1% of overall energy use in the Netherlands around that time. Although the estimated *effective* energy savings for 2001 is much lower if one accounts for the 'free-rider' effect, of course (see De Beer *et al*., 200, p.60, p.61), these numbers still appear substantial. These reported effects are likely to have contributed to the continuation of the scheme. Moreover, this study also concluded that several measures could be implemented to improve the effectiveness and efficiency of the scheme and the IBO (2001) commission subscribed to these conclusions. We discuss several of these measures subsequently.

21. A first set of relatively simple administrative measures related to the introduction of specific condition that should apply for applications to be eligible for subsidy, such as having already accepted construction licenses (in 2003) or environmental permits (in 2007). These measures reduced the inflow of applications for expensive investments for which construction and environmental licenses were not yet certain. In This way the budget would be spent on projects having the best prospects for fast realisation. Large projects for which licenses were not yet certain, especially wind projects, claimed large parts of the EIA-budget which caused oversubscriptions and premature closure of the regulation. As a consequence several promising applications could not apply for tax deduction whereas a number of the projects accepted (and accounted for in the EIA-accounts) did not proceed a few years after their acceptance. The additional requirements created more certainty about the acceptance of a particular application and therefore about the realization of the energy saving in a given budget year.[13]

22. A second measure was to reduce the considerable overlap between subsidy schemes. At the time the same investment by firms was quite often eligible for subsidy under various subsidy schemes, such as the VAMIL. The VAMIL provides entrepreneurs a liquidity and interest advantage by allowing them the flexibility to decide when to depreciate the costs of the energy saving or environmental investments. In 2003, energy technologies were removed from the Technology List of the VAMIL and applying with the same investment for both EIA and VAMIL was no longer possible. Interestingly, the pressure on the EIA budget of 2002 can be explained for a large part by anticipation to these upcoming restrictions to prevent application for multiple subsidies for one investment. Over 55% of the investments in sustainable energy applications were in wind turbines in that year (Senter, 2002).

23. A third measure was to better screen the acceptance of the technologies to be subsidised. This list is an important design element of the EIA and was copied from the VAMIL. Initially, firms could only select technologies eligible for subsidy from a publicly available list, the so called Energy List. Acceptance of technologies was based on a (bottom-up) estimated payback period for industrial investments (including the tax deduction) of 5 years, while a somewhat longer payback period was allowed for investments in construction (see also section 4 for more details). Accordingly, the Energy List reflected technologies that were especially interesting for SMEs. Anticipating criticism from the European Commission that the EIA would be discriminatory (holding eligible only specific market participants) and therefore be considered as state aid, as of 1999, a generic category was opened up allowing any investment in energy saving

12. These numbers do not control for the loss associated with free-riding nor with the rebound effects. According to these estimates, energy-savings are the reduction in energy use compared to a less energy-efficient alternative prevailing in the market. Investments in renewable energy equipment are assumed to 'save' energy through its saving on fossil fuel electricity generation (measured against the Dutch energy mix) or consumption of an equivalent amount of gas (*e.g.* with biogas). Nor does this computation account for additional number of sales because of their relative reduction in investment cost.

13. The even stricter requirement that the licenses should be irrevocable turned out to be too strict.

satisfying certain (minimum) savings norm, measured in energy-savings per Euro invested (Nm^3 gas equivalents [g.e.] per Euro).[14]

Table 1. Share of free-riders per technology in 2001

Technology	Share of free-riders (%)	Technology	Share of free-riders (%)
Energy Blinds	66	Heat pump	59
Light weight semi trailer	36	Wind Turbines	17
Condenser	49	Cominbed Heat Power	48
High Efficiency Boiler	58	Energy Efficient Lightning	30

Source: De Beer *et al*. (2000).

24. Interestingly, the evaluation of 'free-riders' in 2001 illuminated that some technologies should not be on the list at all. The financial payback period of some technologies was already very short because of its (market-based) energy saving performance (and relative to the critical payback period used in the sector investing in the technology). Further support was likely to increase the overall number of 'free-riders' (see Aalbers *et al*., 2011).[15]

Table 2. Saving norms for different investments categories
In Nm^3 gas equivalents per Euro invested

		1997-2001	2002-2006	2007-2008	2009-2012
Buildings	Min	0.55	0.4	0.3	0.2
	Max		4	2	1
Processes	Min	1.1	0.8	0.7	0.6
	Max		4	2	1.5
Transport	Min		0.4	0.3	0.2
	Max		4	2	0.8
Sustainable energy*		large share of w, s, b	>30% w, s, b	>70% w, s, b	>70% w, s

* The standard for sustainable energy refers to a minimum share for hydropower (w), solar power (s) and biomass (b) in total.
Source: Senter, Senter Novem, Agentschap NL, 1999-2012.

25. As a response, the regulating agency decided to update the list and also started to apply *maximum* savings norms *per euro invested* to all technologies on the Energy List, as well as for generic investments to be eligible for subsidy since 2002. With maximum norms, very energy-efficient technologies (compared to their alternative) that are likely to be already beneficial on their own energy saving potential are no longer eligible for subsidy. These maximum savings norms were originally set at 4 Nm^3 g.e. per Euro (see Table 2). This table also shows that these norms were subsequently sharpened and made category-dependent. The norm for investments in processes was reduced to 2 Nm^3 g.e. per Euro in 2007 and even further to 1.5 Nm^3 g.e. per Euro, 1 Nm^3 g.e. per Euro for investments in construction and 0.8 Nm^3 g.e. per Euro for investments in transport in 2009. Also the Energy List itself was updated more rigorously and technologies are removed faster from the list.

26. Furthermore, specific provisions had to be implemented for the category of sustainable energy technologies several times (see also last row in Table 3). As noted before, EIA-investments gradually increased since the start of the regulation. The focus of the applications, however, suddenly shifted in 2001 and 2002, to a much larger share of total investments in sustainable energy projects. Where in the year 2000 only 12% of the investments was related to sustainable energy, this number rose to 60% only two years later (note that the number of applications in sustainable energy only increased from 1.7% in 2000 to 4.3% in 2002, implying that investments per application were substantially higher than for the other

14. Normal m^3 gas equivalents; 1 Nm^3 g.e. = 31.65 MJ.

15. For instance, lightweight trailers even had a negative payback period (when taking energy-savings into account), but still accounted for 21% of the total EIA credits in 1997.

investment categories). In 2002 even, over 55% of total accepted investments were related to only one technology; wind turbines (see Table 3). Similar problems occurred in 2006. As an answer to this unbalanced focus on a few expensive technologies, the regulating agency responded by explicitly sharpened the norms for sustainable energy and only allowed technologies that used a minimum share of hydropower, solar power or biomass. Moreover, applications for biomass are no longer allowed since 2009. Finally, maximum investment caps on wind turbines were introduced in 2005 and sharpened in 2008.

Table 3. Top-10 of most important subsidised technologies in 2002 and 2006

2002		2006	
Technology	**% of total investments**	**Technology**	**% of total investments**
Wind turbine	55	Wind turbine	22
Generic existing processes	3	Generic existing processes	13
Heat pump or heat pump boiler	3	Generic sustainable energy	12
Cogeneration plant >60kW and <2MW	3	Cogeneration plant >2 MW	8
Energy shields in greenhouses	4	Cogeneration plant >60 kW and <2 MW	5
Biomass pre-treatment plant	2	Biomass burning plant	5
Insulation	2	Generic existing buildings	3
Heat/cold buffer system	1	Anaerobic fermentation plant	4
Generic existing buildings	1	Generic new processes	3
High-efficiency gas-fired fryer	1	Energy-saving freezer and cooler	1

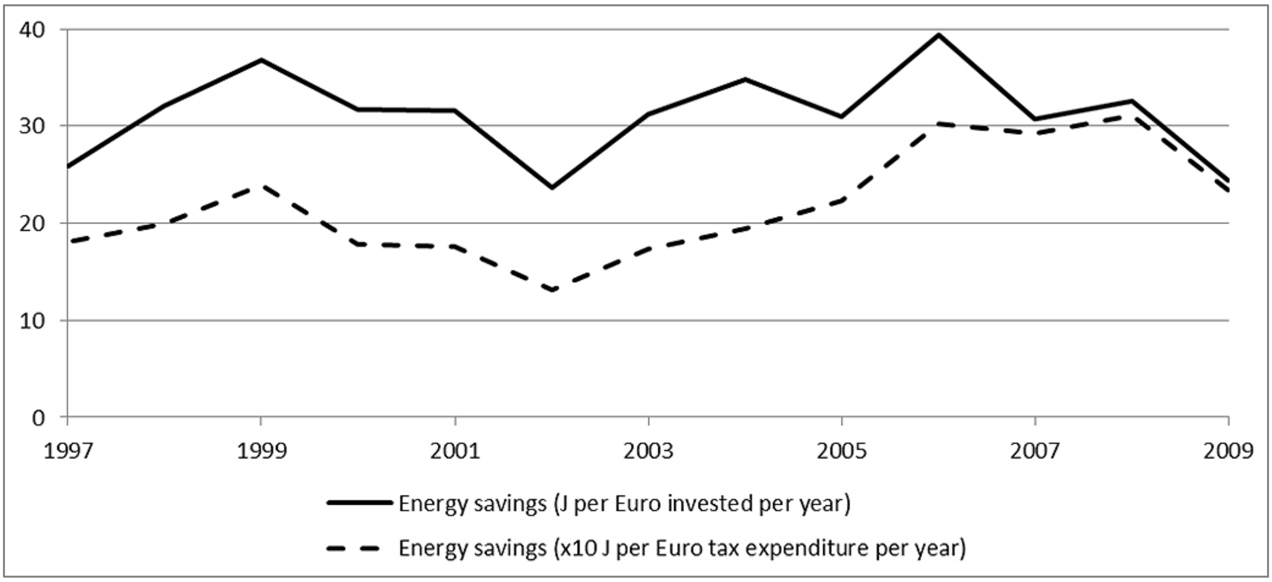
Source: Senter, 2002; Senter Novem, 2006.

27. A final instrument used to increase the effectiveness of the EIA was the reduction of the rate at which investments were subsidised. The EIA started with a regressive tax deduction system, ranging from 40% to 52%, depending on the firm's profit level, but the deduction percentage became a flat rate of 55% in 2001. New (experimental) research initiated by the Ministries of Economic Affairs and Environment had shown in the meantime that adoption of new technologies was not very sensitive to the rate of subsidisation (Aalbers *et al*., 2005). A large number of the participants in the experiments still invested in technologies for which adoption was inefficient from their own private perspective, i.e. had a PBP below 0. These findings were reported both for students and managers of firms that used the EIA investment subsidy before (Aalbers *et al*., 2009). Therefore, the regulator decided to lower the deduction rate to 44% in 2005 and later on again to 41.5% in 2011. These changes, together with the changes in the corporate and income tax rates, resulted in a reduction of the average tax benefit from 18% in 2001 to 10.5% in 2007.[16]

28. This set of measures has been exploited by the regulating agency to improve the incentive-compatibility of the subsidy scheme and therefore its overall effectiveness and efficiency (Arguedas and Van Soest, 2009; Aalbers *et al*., 2011). Several indicators suggest that the performance of the allowance scheme indeed strongly improved after these measures became effective, *i.e.* since 2002. In particular, Figure 5 shows that energy-saving per Euro investment clearly started to rise after a gradual decline since 1999, and, even more important, since 2002, per Euro of tax expenditure, *i.e.* per Euro or tax deducted by the investing firms. Also average energy-savings per application grew faster than total energy-savings, despite the fact that technologies with high savings potentials (per Euro) were excluded from the list because of tightened maximum savings norms.

16. The average deduction percentage depends on the number of applicants paying corporate and personal income taxes in a certain year and their profit and income levels. As corporate and income taxes are progressive, higher-profit entrepreneurs benefit more from the EIA than low-profit entrepreneurs. Moreover, those paying personal income taxes usually benefit more than those paying corporate taxes as personal income tax rates are higher than corporate tax rates.

Figure 5. Energy savings due to EIA-investments



Source: Senter, Senter Novem, Agentschap NL, 1999-2012. Statline CBS.

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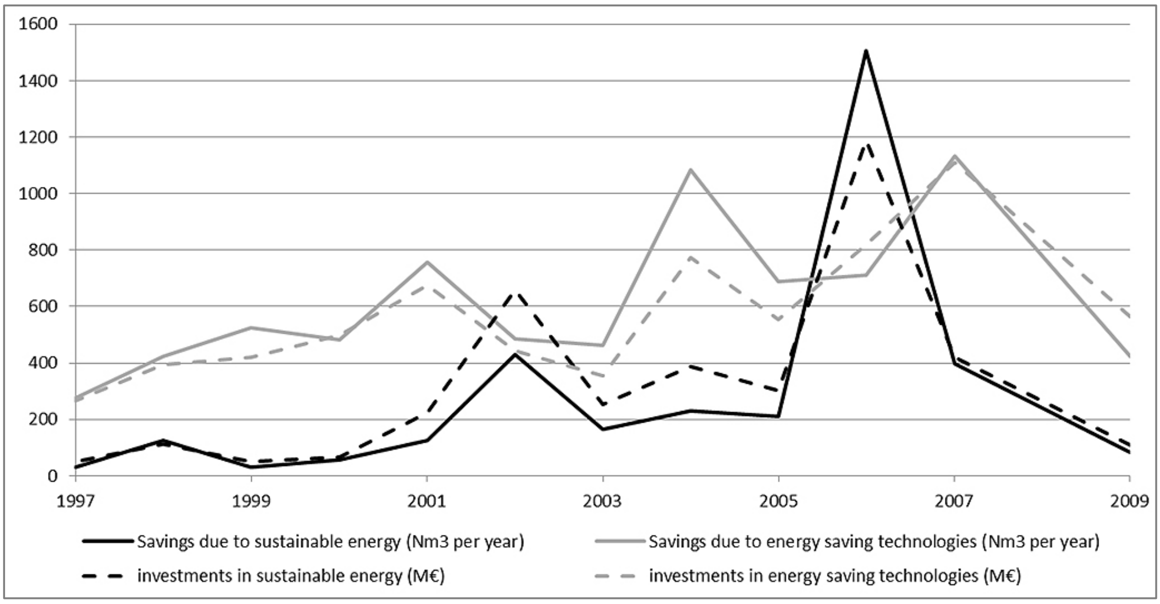
30. These measures helped to improve the efficiency of the subsidy scheme, *i.e.* energy savings per unit tax foregone. One would also expect fewer free-riders for the remaining subsidised technologies because they should have lower payback periods. Interestingly, the five year period evaluations of the EIA provide some rough evidence to test this hypothesis. Aalbers *et al.* (2007), using the same survey as De Beer *et al.* (2000), indeed reports a free-rider share of 47% on average for the year 2005, which is exactly the same as in another study at that time (2007). Given the changes implemented in the regulation and the Energy list, it is expected that the share of free riders has decreased ever since. The slow decrease of the percentage of free riders basically illustrates the difficulty in practice to create incentive compatible contracts because, for instance, a subsidy scheme should be non-discriminatory on legal grounds.. It also remains unclear to what extent the (exogenous) rise in energy prices between 2001 and 2007 has had an influence on the number of free-riders.[17] One question is whether the more stringent standards being applied to make technologies eligible for subsidy were sufficiently reformed to compensate for this factor.

17. The Dutch gas price is closely linked to the oil price in the Netherlands. This, in turn, also contributes to an upward shift in the electricity price. Rising energy prices also decrease the pay-back periods of the subsidised technologies, which, in turn, may amplify the number of free-riders. This potential impact requires a more careful elaboration. The rise in energy prices is exogenous, and will impact different technologies differently. Consider, for example, technology with high versus low pay-back period and high versus low investments. The exogenous change in energy prices will impact both technologies differently depending on the pay-back period and investment levels before the change.

31. Despite these improvements in subsidy effectiveness since 2002, the allowance scheme remained vulnerable to both dynamic changes in the type of technologies subsidised over time (which is closely related to the interaction with other policy instruments) as well as exogenous developments (*e.g.* change in the net-of-tax energy price, which affects the payback period of investments). For instance, the budget problems around 2002 were mainly due to a sudden strong rise of applications for wind turbines and biomass installations from the electricity producers which was closely linked to the reform of the VAMIL subsidy. By contrast, the inflow in 2006, causing the enormous spike in both accepted investments (Figure 1) and savings (Figure 4), was on purpose (see also the spike in budget allocation in Figure 3). In that particular year, the EIA was opened up for technologies which no longer could receive subsidy from another renewable energy investments subsidy regime in the Netherlands, called 'Environmental quality Energy Production' (MEP), introduced in 2003. The popularity of that scheme also induced a sudden closure in early 2006, but its successor did not start before 2007 (Roosdorp, 2012). The EIA was also used for different purposes after the start of the economic crisis in 2008, as explained before.

32. Apparently, the renewable energy technologies create a lot more turbulence than the energy saving technologies. Figure 5 presents the main performance indicators, when controlling for the difference between the two main categories that the EIA aims to support. Interestingly, sustainable energy investments were indeed responsible for the spikes in the EIA budget in 2002 and, in particular, 2006, but not so for the spike in 2004. Also, investments in sustainable energy contributed relatively less to the energy savings goal (per euro subsidy) compared to the energy savings technologies with 2006 as being the main exception. Despite the fact that wind turbines covered a large part of the investments in those years, the spikes are mainly caused by investments in biomass installations and generic sustainable energy technologies.[18]

Figure 6. Realised savings for investments in sustainable energy and energy-saving technologies
Million Euro



Source: Own calculations using Senter, Senter Novem, Agentschap NL, 1999-2012a, b.

18 . Energy savings per Euro invested are relatively low for wind turbines (about 0.55 Nm^3 of gas equivalents per Euro invested) whereas the biomass and generic technologies have much higher saving potentials (exceeding 3 Nm^3 of gas equivalents per Euro).

33. A final issue is the overlap of the EIA with the EU Emission Trading System (EU ETS) (Aalbers *et al*., 2007). Even though the EIA has no explicit objective to reduce CO2-emissions, the overlap of the EIA with ETS reduces its potential contribution to the overall reduction of the amount of CO_2-emissions. This is particularly the case if EIA subsidy is used for investments that reduce CO2-emission by firms also participating in ETS, e.g. by investing in a wind turbine. Such an investment reduces demand for permits which – given the overall cap – enables other installations within this firm or of other firms to be covered by ETS-permits. This problem applies in particular to renewable energy investments of large (ETS) firms, but also to firms investing in CHP, in particular in horticulture in the Netherlands, because they also fall under the ETS. Subsidising CHP has even perverse effects because this induces an *increase* of CO_2 emissions through its savings on electricity and whose delivery is subject to ETS (Aalbers *et al*., 2007). Finally, also the subsidisation of energy-saving equipment by the EIA contributes indirectly to a reduction of the ETS-permit price. If less electricity is generated due to energy savings, the firms participating in the ETS can sell more ETS-permits and accordingly decrease its price. If full cost pass through exist, this price reduction might also reduce the electricity price, raising energy demand, which in turn might cancel out the initial energy savings.[19]

4. Energy list, technology adoption and lobbying

34. A crucial element of any subsidy scheme is the decision to make some specific type of investment eligible for subsidy. Interestingly, the Dutch tax allowance scheme is not only characterised by its upfront payment of subsidy lowering initial investment (and therefore financing) cost, but even more so by its use of an explicit Energy List.[20] Once a year, this list is updated at the request of firms supplying energy-saving or sustainable energy production technologies. To be eligible for inclusion, a technology should result in a substantial reduction in the consumption of energy, and the technology should also not be common. This characteristic causes this tax allowance scheme to be quite different from subsidy schemes that preselect technologies or provide feed-in tariffs (*e.g.* per unit electricity produced). For this reason, the EIA subsidy could also be perceived as a technology-adoption programme aimed at the penetration of new, hardly adopted energy-saving or sustainable energy production technologies. Even though this is not the direct objective of the EIA, this characteristic also partly explains its success and its survival. Moreover, one might also expect a dynamic impact, *i.e.* on the supply of new technologies ('inventions').

35. The idea behind a technology adoption programme is to (re)establishes a social optimum in the context of technology adoption spillovers. Instead of paying some 'fine' for generating pollution, the tax expenditure provides a bonus to do more of a 'good' activity, because this activity has positive 'spillovers.' Indeed, diffusion of new technologies is less likely to be instantaneous across a heterogeneous population because of all sorts of information failures (see also Popp *et al*., 2009; Vollebergh, 2012). From this perspective, a tax allowance for specific technologies is likely to lower the net adoption costs – *i.e.* the actual adoption costs minus the investment subsidy provided – of the subsidised technologies causing a higher ordering in the ranking of available alternative (reference) technologies (Van Soest, 2006). Therefore, the subsidised technology will be adopted more readily than it would be in the tax expenditure's

19. According to CPB (2001), the rebound effect of the EIA due to the demand effect would range between 0% and 20%. This implies that 0% to 20% less energy-savings will be realised than calculated on the basis of the investments related to the EIA investments.

20. Such a technology list is used by three of the most enduring subsidy programmes in the Netherlands; the VAMIL, the MIA and the EIA. The MIA is similar to the EIA, but focuses on investments in environmentally friendly technologies. The VAMIL has been discussed above.

absence, whereas the overall penetration will be lifted somewhat due to the lower net cost of this particular technology (see also Box 1).[21]

36. Clearly, the Energy List in the EIA is the focal point for both demand and supply of new energy-saving and sustainable energy technologies. Therefore, we start the discussion of its role on the demand side. Next we discuss its role in inducing new inventions. Finally, we explain again how this list provides interesting opportunities for the regulating agency to reduce rent-seeking behaviour, even though inventing firms are likely to lobby for their technologies to become eligible.

37. The role of the list on the demand side, *i.e.* on firms investing in new equipment, is the so-called attention value (De Beer *et al*., 2000). The list contains state-of-the-art proven and existing technologies that can readily be implemented in industrial processes, buildings or transport. Accordingly, the list informs entrepreneurs about feasible technologies which they might not yet know about. The firms save search costs about technologies that reduce their energy costs or increase their production of sustainable energy. So the list acts as an information device that reduces search costs for entrepreneurs and corrects for information failures.

38. De Beer *et al.* (2000) conclude that it is difficult to determine the attention value of the Energy List. Only 4% of the respondents in their survey indicated that the list affected their investment decision. The attention value did not play a role for 40% of the respondents and the other 56% remained undetermined. One of the reasons might be that this list also had considerable overlap with the VAMIL at that time. Also especially SMEs use intermediaries who not only help in issues such as book-keeping, but also with tax payment and subsidies. In such cases, the attention value would run through a different channel and this channel was not included in that survey.

39. On the supply side, the list may also contribute to new inventions by providing innovators with a platform that eases introduction of their technologies. Even though the tax expenditure only aims to fasten market penetration of existing and proven innovations that have not yet penetrated the market, inventions are likely to be stimulated as well (Popp *et al*., 2009; Acemoglu *et al*., 2012; Vollebergh, 2012). The list makes particular innovations more widely known and the market introduction phase shorter, which is likely to increase incentives for inventors to invest in these types of technologies ('directed technological change'). The most popular technologies also give direction to the types of inventions and innovations for which entrepreneurs are looking. Moreover, the annual update of the technology list could, in principle, also contribute to increased competition among inventors and innovators. As long as the list is updated on a regular basis and the number of suppliers is large enough, inventors and innovators are stimulated to continuously improve their technologies and lobby to get or remain on the list, preferably before their competitors. This also reduces asymmetric information between the suppliers of innovations and the regulating agency, thus increasing the odds against regulatory capture.

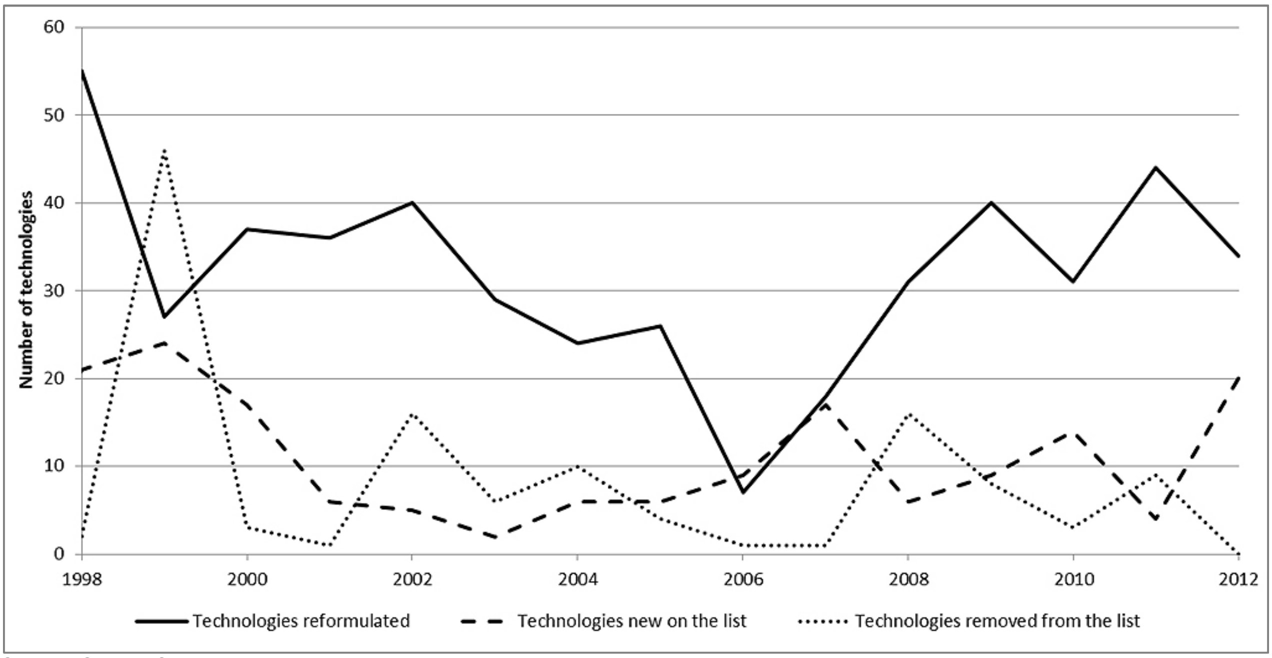
40. To what extent these dynamic incentives actually work in practice is not very well-established so far, however. A survey by EIM (2007) reports that marketing and growth policies of many suppliers indeed depend on the types of technologies on the list. They argue that their sales are positively affected by changes in the EIA. Also Figure 7 provides some evidence that there is quite some dynamics on the list. No information is available about the speed at which savings of individual technologies improve over time.[22]

21. Note that this line of reasoning holds even if firms belong to different risk classes; that is, if they differ with respect to the discount rate they apply to their investment decision (DeCanio and Watkins, 1998).

22. This assessment would require detailed information on actual savings for the listed and reference technologies, which is left for future research.

Nevertheless, the large number of modified technologies suggests quite some dynamics even though the numbers for entirely new and expired technologies are relatively small.

Figure 7. Changes of the technologies appearing on the Energy list



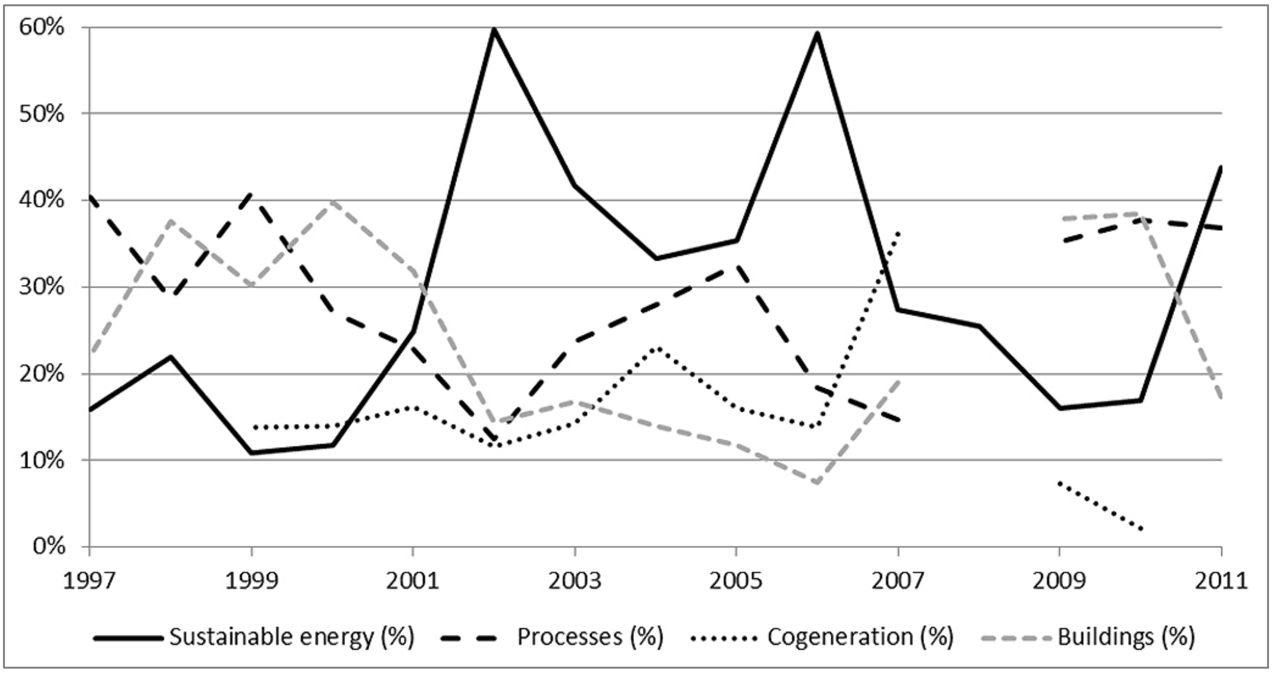
Source: Senter, Senter Novem, Agentschap NL, 1998-2012.

41. Finally, the use of the technology list facilitates regulatory responses from the regulating agency. The annual update allows the agency to quickly adapt norms, remove free-rider technologies or reformulate the focus of the technologies eligible for subsidy. The previous section has already illustrated the importance of the screening property of the Energy list in improving the effectiveness and efficiency of the subsidy scheme, and in reacting to unforeseen changes in regulatory or other circumstances. The best example is the radical shift in applications for sustainable energy within the EIA in the period 2002-2006 (see Figure 7). This major shift in applications, reaching peaks of 60% of all investments in 2002 and 2006, is mainly due to the incoherence and trial and error process of finding proper subsidy schemes for sustainable energy in the Netherlands (Roosdorp, 2012). In this turbulent period, old instruments were reformed to reduce overlap (*e.g.* VAMIL), but also new instruments were introduced and abolished, such as the MEP between 2002 and 2006.

42. One potential risk of the Energy list is the precision required to judge whether a particular technology is eligible on the list. This requires a large degree of technocratic precision because payback periods and savings per invested Euro had to be calculated. Not only technology-specific (bottom-up) payback periods differ per sector and even per firm, but also critical payback periods used by firms to evaluate their investments.[23] As a result, a technology which seems to be satisfying the norms for one sector may still be a free-rider technology for another sector. The difficulties related to this selection process were especially clear in the first years of the EIA.

23. According to Aalbers *et al.* (2011), half of the firms applying for subsidies do not even apply any traditional financing evaluation scheme, such as a critical payback period.

Figure 8. Share of investments for different types of technology



Source: Senter, Senter Novem, Agentschap NL, 1999-2012.

43. Selecting technologies also makes the regulating agency susceptible to lobbying from both firms that would like to adopt certain technologies with subsidy as well as the energy-technology supplying firms. In the first years of the EIA, the technologies listed were especially focused on SMEs and the sectors with which the government had covenants. These firms had an important vote in the setup of the first list. They were explicitly consulted about the technologies they planned to invest in. In later years, the influence of these firms was reduced and the norms for being accepted at the Energy list were applied more strictly. Each year a number of technologies is removed, accepted and reformulated. Moreover, the introduction of the generic technologies even further reduced this influence. All energy-saving technologies are eligible and new inventions can receive EIA-support immediately, and not only after the new list is published. Due to these generic technologies, the Energy list is no longer a necessary element of the subsidy scheme. In principle, all technologies satisfying the savings norms are eligible for EIA. So, even without the Energy list, subsidising investments in energy-saving or sustainable energy technologies would also be feasible. To what extent this might put a burden on its likely attention value remains to be determined.

44. A final risk of regulations like the EIA is that high administrative costs may reduce its efficiency. For the EIA, we can distinguish between administrative costs by the government and compliance costs by the firms. Administrative costs are the costs made by the government and its regulating agency to implement the regulation, *i.e.* to handle requests, control firms' tax payments, update the Energy list and maintain contacts between the different ministries and agencies involved. Compliance costs by the firms refer to the internal costs or outsourcing necessary to apply for EIA, *i.e.* the time spent by own employees or external support hired for the application.

45. The time spent on an application differs substantially between generic and specified technologies on the Energy list. For a generic technology, firms have to specify several details and the regulating agency has to monitor potential savings. These details have been pre-specified for the specified technologies on the Energy list. Data from the regulating agency show that in the last couple of years they spent on average

about 1.5 hour for an application of a specified technology and 6 hours for an application of a generic technology.

46. For the EIA, total handling costs for the government generally range between EUR 3.5 and EUR 4.4 million. This implies that the handling costs range between 3% and 4% of the overall tax expenditures. Data from the regulating agency show that in the last couple of years the costs per application and the time spent per application have been reduced. In the early years of the EIA, execution costs per application were lower, however, because generic technologies were less popular and the Energy list still contained several cheap and popular technologies which were easy to administer.[24] In 2007, compliance costs for firms were estimated to be EUR 3.87 million (Capgemini *et al.*, 2008). Compared with the total accepted investment expenditures of EUR 1 530 million this represents 0.25% of investment costs. For small applications, however, administrative costs are relatively higher compared to large applications. Due to a simplification of the administrative procedure, it is expected that administrative costs have decreased since 2007.

5. Conclusions

47. Even though the basic principles and objectives of the EIA have remained the same for the last 15 years, the use of the EIA went through a number of changes, mainly due to exogenous factors, such as interaction with other policy instruments, rising oil and gas price, and the economic crisis since 2007. In particular the use of tax instruments to stimulate sustainable energy production varied considerably in the Netherlands throughout the last 15 years. Despite this turbulence and changes in government focus, the EIA apparently remained attractive enough for politicians and survived. Its flexibility allowed for adaptations if necessary and its role as a technology adoption subsidy likely contributed to its legitimacy as well.

48. The evolution of the EIA over the past 15 years also contains interesting lessons First, the use of fiscal expenditures to subsidise investment in energy-efficient equipment and renewable energy is not very different from using on-budget subsidies if budgetary rules require sufficient accountability of such tax expenditures. This is nicely illustrated by the struggle at the beginning of the scheme when this lack of accountability seems to have contributed to the budgetary turbulence. A number of the budget overruns in later periods were mainly caused by changes outside the EIA, such as policy reforms to prevent using multiple subsidies and the choice to prematurely close related instruments.

49. Second, well-known concerns about incentive compatibility issues of subsidy schemes for consumers also clearly apply to firm specific subsidies like the EIA. Indeed, periodic evaluations of the EIA reveal that the main weakness of the tax allowance is the difficulty to prevent free-riders from receiving subsidies. At the same time, however, tighter eligibility rules and norms, more stringent evaluation processes to update the Energy List and reductions of the tax deduction percentage, have improved the subsidy effectiveness considerably. Still a substantial welfare loss due to free-riding remains, however, which can be partly explained by the difficulties to create fully separable incentive contracts in practice. Another related concern is the interaction of the scheme with ETS. Even though savings on CO_2-emissions is not its direct concern and the scheme mainly aims to support SMEs, its indirect impacts may not be negligible here, and in some case may even be counterproductive. These problems are mainly related to renewable energy and CHP technologies on the list, however. Finally, administrative costs seem to be reasonable small in particular for pre-specified technologies.

50. Third, one of the most innovative design elements of the Dutch EIA is the use of a dynamic technology list. This list pre-eminently makes the regulation flexible, allowing policy to refocus and apply

[24] Aalbers *et al*. (2007) evaluated that handling costs for the EIA were marginally higher than for comparable regulations like MIA and VAMIL.

tighter norms if necessary. More important, however, the list enables the regulating agency to reduce the information asymmetry between supply and demand of new technologies. Due to the unfamiliarity of new energy-saving or sustainable energy technologies, suppliers may have difficulties to overcome the well-known "valley of death". The technology list may contribute considerably to reducing this type of information failure. Using the technology list only, *i.e.* without an additional favour through the subsidy, may not be sufficient for companies to switch to these new energy saving technologies. These subsidies need not be large as some laboratory experiments have shown, but the subsidy contributes mainly by signalling that the technology is attractive. The experience with the EIA indeed seems to confirm that reductions of corporate taxes or tax deduction percentages have not had a negative impact on the amount of energy saving established by the EIA, but the optimal rate of subsidy remains unclear so far.

51. This evaluation has shown the EIA regulation was dominated by investments in sustainable energy in the period 2001-2007. Moreover, many of the budget overruns were related to sustainable energy investments. The same is true for issues related to the overlap with ETS. Promoting sustainable energy has been an important government objective in the last 15 years, for good reasons. However, creating a balanced package of (subsidy) instruments has proven to be quite difficult in the Netherlands. It is not entirely clear whether the sustainable energy goal within the EIA has been sufficiently supportive to the overall energy policy objectives, while it is responsible for the main (budgetary) shocks in the use of the EIA. It is a legitimate question whether the dual objective of promoting energy-savings and sustainable energy production is efficient, because also other instruments are already implemented to help new renewable technologies. To what extent this lesson has already been taken sufficiently serious, however, is not entirely clear. The more stringent requirements for sustainable energy technologies to be eligible for subsidy through the EIA since 2007 clearly reduced the number of these applications, although they started to grow recently again (see Figure 8).

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