JIQ Magazine on Climate and Sustainability
Special

Solar PV in the Netherlands: for the people or by the people?

Assessing the impacts of different routes for rapid solar PV expansion

17 November 2016 Addendum to JIQ Magazine vol. 22, no. 4 (December 2016)

TRANSrisk project

The objective of TRANSrisk (www.transrisk-project.eu) is to explore low emission transition pathways and analyse the possible associated risks. A key feature of TRANSrisk is that it brings together quantitative techniques (such as models) and qualitative approaches (such as participatory consultations with stakeholders). This combined approach enables identification of possible low emission transition pathways which are technically and economically feasible, and acceptable from a social and environmental viewpoint.

Are you a stakeholder involved or interested in the solar energy market sector? Feel free to join the discussion and share your thoughts and insights with the TRANSrisk project. For more information, please contact Krisztina Szendrei of JIN Climate and Sustainability (krisztina@jin.ngo).

Electricity transition pathways

The Netherlands is lagging behind on the implementation of renewable energy technologies and therefore is likely to miss its 14% renewable energy target (relative to the total gross final energy consumption) in 2020,[1] as in 2015 only 5.8% renewable energy was achieved. Specifically for electricity, only about 12% of the gross production was generated from renewable sources,[2] to which solar energy contributed only 1%-point. Therefore, increasing the generation of renewable electricity has become urgent. One option to accelerate the implementation of renewables in the Netherlands is to intensify the implementation of solar PV panels.

Renewable electricity objectives

The installed solar power capacity in the Netherlands is currently 1.5 GW_p. About 70% of the solar power is generated by households and 30% by businesses. The National Solar Power Action Plan for 2016, developed by DNV GL, sets a goal of 4 GW_p in 2020.[3] In addition, based on historical growth rates, expert assessments, and various benchmarks, two growth scenarios have been developed (for corresponding potential targets see Table 1). The first is a low-growth scenario based on the current roof potential of 70 GW_p in the built environment (households and utility buildings). The second scenario is a more ambitious one, based on a 150 GW_p potential that also includes the impact of technology development, and other potentials outside the built environment (i.e. large-scale projects). It has been estimated that the full growth potentials can be achieved by 2075.

Table 1. Overview of targets and growth scenarios (in GW_p) for solar power in the Netherlands. Source: National Solar Power Action Plan 2016[4]

	2015	2020	2023	2030	2050
Low-growth scenario	1.5	4	6	15	50
High-growth scenario	1.5	6	10	30	105

Against this backdrop, the TRANSrisk project carries out a case study to explore two pathways for rapid solar PV expansion in the Dutch electricity sector:

1. Up-scaling of small-scale solar panel use in the built environment with a focus on households, small businesses, schools, etc.
2. Large-scale applications of solar panels on state owned or controlled land/infrastructure (e.g. solar parks). Currently, large-scale solar establishments are scarce in the Netherlands,[5] but this is expected to change since the national feed-in subsidy scheme has been reorganised and support is more fairly distributed among the eligible categories.[6]

In a densely populated country like the Netherlands, the available land surface area is already intensively used for different purposes (e.g. housing, nature, agriculture, industry), which can be a barrier to a rapid expansion of large-scale solar PV. Recently however, it has been shown that there is a sizeable amount of (non-agricultural) public and private land and water surface available that could be used to install a large amount of solar panels.[7]

Do tax exemptions lead to fiscal losses or gains?

In relation to small-scale solar panels on building rooftops, it has been frequently pointed out that due to net metering the Netherlands government (i.e. the Ministry of Finance) misses potential tax revenues (net metering is the possibility for households to feed a surplus of solar-produced electricity to the grid and be exempted from energy tax). This is because households and businesses with solar PV panels on their rooftops do not pay energy tax, VAT, and sustainable energy contribution over the self-generated and used electricity. This tax income loss is expected to grow as more and more PV panels are installed on rooftops.

For this reason, the government raised the question whether net-metering with corresponding tax exemptions is the best and most cost-effective option to stimulate the installation of solar PVs. Recently, the government announced its intention to evaluate the policy of net metering in 2016.[8] However, what is often neglected in this discussion is that, next to missing out tax revenues, the fiscal support to solar PV may also have positive fiscal implications.

In fact, increased decentralised electricity production typically implies the involvement of small and medium-sized companies (installation and maintenance of solar panels). These companies pay taxes over their revenues and incomes. Therefore, considering the current debate on continuation of the net metering support, it is interesting to look at the *net* financial effect (balance in public budget spending; shown in Figure 1) for the Dutch State of fiscally stimulating small-scale solar PV investments.

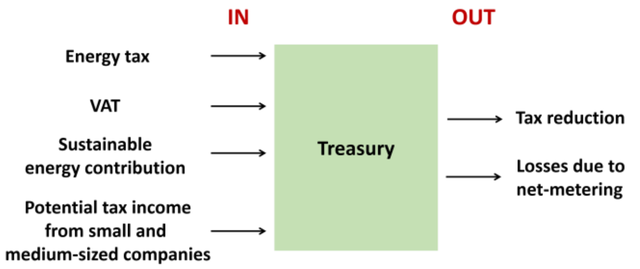

Figure 1. The overview of the net financial balance of the Dutch Treasury.

With respect to large-scale solar PV stimulation the story is different. Solar parks are generally not eligible for net metering, which only applies for households or small businesses that produce solar power, use part of it, and feed the rest back to the grid (net metering is then the difference between what is taken from and given to the grid). In the case of large-scale solar projects, consumers do not generate electricity at home, and thus need to pay taxes over the use of the electricity consumed from the solar parks (via the operating energy companies).

Fiscally, this implies that large-scale solar parks are stimulated through the Dutch feed-in programme,[9] but since tax exemptions due to net metering do not apply for large-scale solar, tax revenues of the treasury are not negatively influenced. On top of that, the establishment of large solar parks on state owned/controlled land and infrastructure could lead to economies of scale: as the projects are larger they are likely to attract larger companies to be involved in the construction and maintenance of such parks. This in turn results in a different fiscal feedback in terms of revenue/corporate taxes and income taxes.

Other potential benefits/trade-offs

Aside from the fiscal implications for the Netherlands government, both solar PV pathways also differ on various other aspects. There are for example differences in the impacts on spatial planning, public acceptance, as well as electricity grid balancing and investments. To illustrate, in the large-scale PV pathway, where a more centralised production plan is pursued, an electricity grid operator should be better able to predict (coordinate) its implications on grid expansion/reinforcements, thereby being better able to manage incremental costs, while grid integrity is ensured. Also with regard to public acceptance, the spatial (and aesthetical) implications of both pathway are likely to differ.

The goal of the case study analysis is to assess and compare the advantages and shortcomings of the two solar PV transition pathways. This will be done by considering costs and benefits of the transition within the current context or system. To quantify and qualify these (and other effects), economic models as well as stakeholder consultation and policy analyses will be used.

Scoring of pathways

Part of the case study analysis is to assess how both low-carbon transition pathways 'score' in terms of their contribution to meeting the Dutch renewable energy targets and realising other socio-economic benefits. Both pathways positively contribute to reaching the Dutch renewable energy target of 14% in 2020 (and beyond). However, large-scale solar PV projects appear to be in a better position to reach this target faster than small-scale decentralised solar PV initiatives, due to economies of scale in planning, financing, and construction. Considering overall cost efficiency of public spending and fiscal effects, it is still unclear which pathway is most cost-effective.

Spatial planning is, and will remain, a challenge for both transition pathways, but there could be important differences between the two options that could affect both the costs and speed of implementation. For the small-scale solar pathway, rooftops are often not suitable for the installation of solar panels due to shading or positioning, while for large-scale projects it might be challenging to find the most suitable location due to public resistance. On this note, it is also important to look at the public perception of solar development projects. The public perception for installing solar panels of rooftops is overall positive and only occasionally hindered by aesthetic concerns. Also for large-scale projects, as long as solar panels are installed on state owned and industrial lands, public perception is expected to be positive. However, this might quickly change if agricultural lands or lands located close by communities are converted for such purposes ('Not In My Back Yard' effect; NIMBY).

In terms of employment, both pathways are expected to generate more jobs per unit of output energy, compared to large fossil fuel power plants. Nevertheless, there are also indications that there is a relative difference in labour intensity between large-scale and small-scale solar PV, where we currently expect that small-scale solar PV generates more labour per unit of installed capacity. Grid balancing (and the costs associated with it) is expected to be less of a challenge for larger PV installations as their location and daily output is more predictable compared to the small-scale pathway.

Table 2 summarises this preliminary assessment.

Next steps

The next step within the TRANSrisk project is to quantify the effects shown in Table 2 with the help of stakeholders and (macro-)economic models to further explore the relative importance of these effects when it comes to implementing a certain low-carbon transition pathway. With a better understanding of the key effects of alternative pathways it will be easier to develop a more robust and integrated policy framework to foster a low-carbon transitions in the solar PV sector.

Table 2. Overview of the potential impacts of solar PV transition pathways in the Netherlands.

Possible impacts	Small-scale	Large-scale	Remark
Required speed of implementation			
Development speed to reach the target	+/-	+	Due to the uncertainty of the future of net-metering, investments in small-scale solar panels on building rooftops might decline or at least become more moderate. Also the installation of solar panels cannot be enforced therefore the development speed for this pathway is rather unknown.* Large-scale projects however could contribute much faster to reaching renewable targets if they are developed on large state owned or industrial areas. Acquiring permits for these projects is also expected to be less difficult compared to projects intended to develop on privately owned lands.
Overall cost-efficiency			
Energy tax, VAT, sustainable energy contribution	-	+	Losses due to net-metering are evident and expected to increase in the future. Large-scale projects on the other hand would not generate income losses for the Treasury since consumers purchasing the generated renewable electricity would pay the same taxes as they would for the use of grey electricity.
Corporate tax	+	+	Both pathways are expected to generate more corporate tax than large energy companies since small and medium-sized businesses pay higher corporate tax.
Income tax	+	+	Both pathways are expected to generate more income tax than large energy companies, since small and medium-sized companies are expected to have more employees and hence pay more income tax.
Spatial planning			
Installation challenges	+/-	+/-	Panels often do not fit within the surrounding due to the positioning of the rooftop or the presence of large shading throughout the day (e.g. hindered by large trees or other buildings). For new buildings, possibilities for solar PV integration in spatial planning constructions and renovations should be therefore carefully considered. Large-scale projects developed on state owned and industrial lands are expected to have only minor issues with spatial planning since the infrastructure already exists and network operators have the knowledge how and where is the most sensible to develop such a project. On the other hand, spatial planning in densely populated/occupied areas could become very challenging.
Social acceptance			
Public perception	+	+/-	The public perception for installing solar panels of rooftops is overall positive and only occasionally hindered by aesthetic concerns (panels might not fit within the surrounding or does not look attractive on the roof which might discourage the consumer to install them). As long as solar panels are installed on state owned and industrial lands, public perception is expected to be positive. However, this could quickly change if agricultural lands are converted for such development projects or if people backyards are intended to be used for this purpose (NIMBY-effect).
Employment effect			
Labour intensity per unit of energy	++	+	Both pathways are expected to generate more jobs than large energy companies (large power plants require fewer employees per generated kWh). However, we currently presume that small-scale solar PV generates more labour per unit of installed capacity than solar parks due to the economies of scale.
Impact on grid balancing/reinforcement			
Difficulty of balancing	-	+/-	The daily output of large-scale solar parks is more predictable compared to small-scale solar panels on rooftops which would make balancing for the network operator less of a challenge.
Impact on dispatch regime	?	?	Does large-scale (centralised) solar PV have a different effect on the merit order of power plants relative to small-scale (decentralised) solar PV?
Impact on GHG emissions	?	?	If there is a different impact on the wholesale market (dispatch regime) then there is also a difference in terms of GHG emissions (and other air emissions).

Symbols indicate (+) positive, (-) negative, (+/-) uncertain/unknown or both positive and negative effect of the low carbon transition scenario.

*The most common reason for consumers not installing solar panels is the lack of investment (this is particularly true for low-income households).

Source: TRANSrisk project / JIN Climate and Sustainability, 2016

Notes

[1] https://www.government.nl/topics/climate-change/contents/eu-policy

[2] http://statline.cbs.nl/Statweb/publication/?DM=SLEN&PA=80030ENG&D1=1-3&D2=0&D3=a&D4=l&LA=EN&HDR=T&STB=G1,G2,G3&VW=T

[3] https://www.dnvgl.com/energy/details/naz.html

[4] https://brandcentral.dnvgl.com/fileroot6/gallery/DNVGL/files/original/bb3498c479ca48959d63a3c83936eacd.pdf

[5] The largest solar park in the Netherlands is situated on the island of Ameland with an installed capacity of 6 MW_p.

[6] The Dutch feed-in subsidy, called SDE+, intends to stimulate the production of energy in the Netherlands by compensating the difference between the cost prices of renewable and fossil energy.

[7] http://www.hollandsolar.nl/publicaties-pagina1-a302-rapport-ruimte-voor-zonne-energie-in-nederland-2020-2050.html%20-%20.V3orRPl96Uk#.WA9n5fl96Uk

[8] http://www.hieropgewekt.nl/actueel/kamp-evaluatie-salderingsregelin-gestart-en-nog-2016-afgerond

[9] This has also been done for offshore wind power in the Netherlands.