Berenschot

Impact of rising interest rates on sustainable projects

Business case analyses

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Reading guide

After an introduction explaining the reasons for this report, we give some extra background on the increased interest rates over the past 1 to 2 years on the basis of state bonds. The impact on the weighted average cost of capital is also shown and explained.

Secondly, the model used to compare the business cases for different technologies is explained, as well as the two chosen indicators used to present results. This section concludes with an introduction to the scenarios used to illustrate the impact of different interest rates.

Thirdly, results are presented with observations explained starting with the micro-economic level and ending with a national calculation on macro level on the basis of two energy scenarios for 2030 and 2050 respectively. Ending with the conclusions of the report.

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Management summary

Interest rate rises will result in additional costs of EUR 163 billion up to and including 2050 and possibly delay the energy transition.

Due to the recently increased interest rates, the costs of the energy transition for the technologies studied in this study will increase by 163 billion euros compared to the situation 2021 and before. The attractiveness of investments in renewable energy is decreasing and demand for subsidy is increasing, possibly also for technologies that are now profitable and expected to be installed the most, such as solar and wind energy. Therefore, the sector runs the risk of being able to attract less capital and of realising less projects with the same subsidy budget. Which may eventually result in less investment and delays in the transition.

Introduction

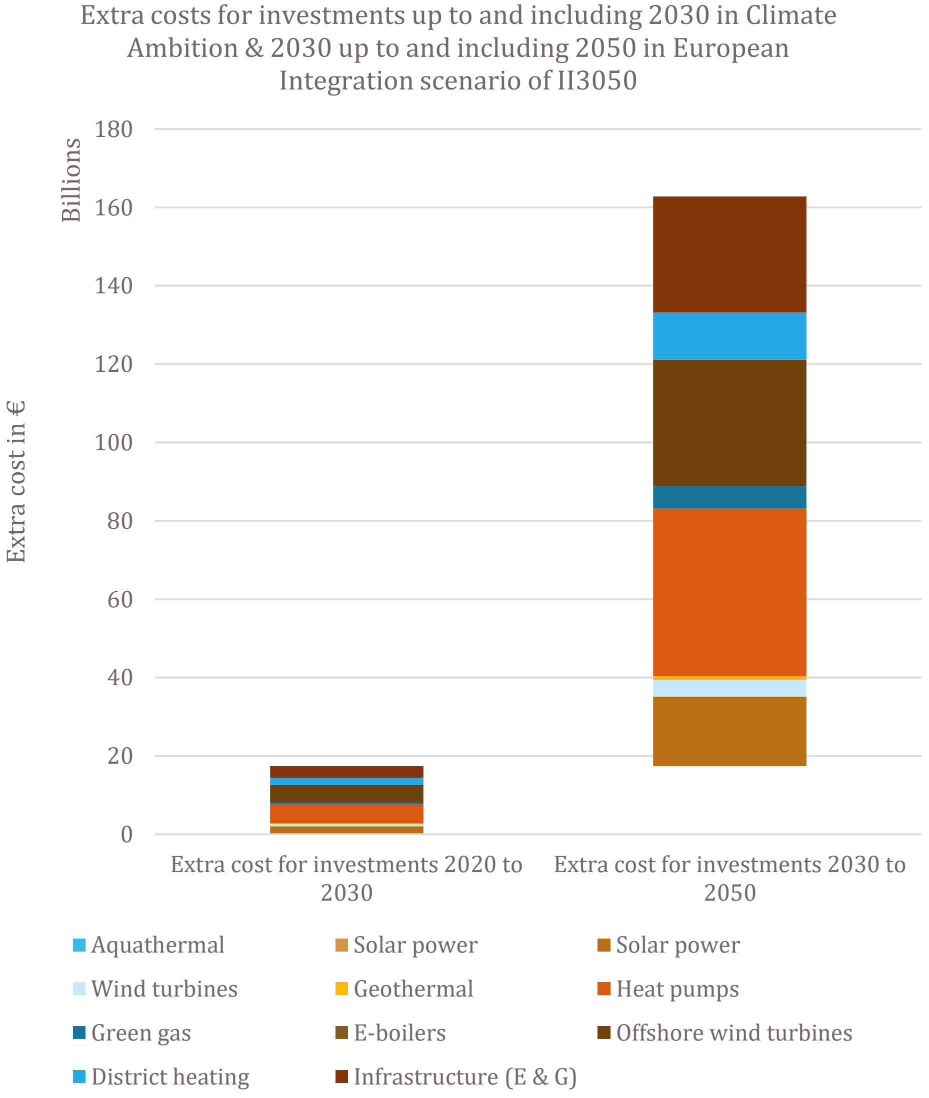
In order to make the intended energy transition possible, billions in investments will be needed in the coming years. These investments are necessary for the development of new technologies, but especially for the realisation of large-scale projects within the energy sector. These investments are stimulated and partly subsidised by government. Interest rates affect the cost and thus the profitability of (new) projects. As a consequence, more subsidies are needed and investors might be less eager to invest. As most of these projects are relatively capital intensive (with low operational costs) compared to fossil routes, interest rates affect the costs relatively strongly.

Now that interest rates are rising worldwide, the Netherlands Renewable Energy Association (NVDE) has asked Berenschot to analyse the impact of the interest rate rises on the business cases of renewable energy technologies and on the energy transition.

The figure on the right shows the extra costs based on the current estimated increase in interest rates, the subsequent change in levelised cost compared to 2021, capacity to be added, lifespan and operating hours compared for investments. Capacity to be added is based on two energy scenarios developed by Netbeheer Nederland (Dutch industry association for system operators):

- Cost up to and including 2030 in **Climate Ambition scenario,**
- and cost from 2030 up to and including 2050 in **European Integration scenario**.

Costs increase with ~17 billion euros until 2030 and up to 163 billion euros in 2050.



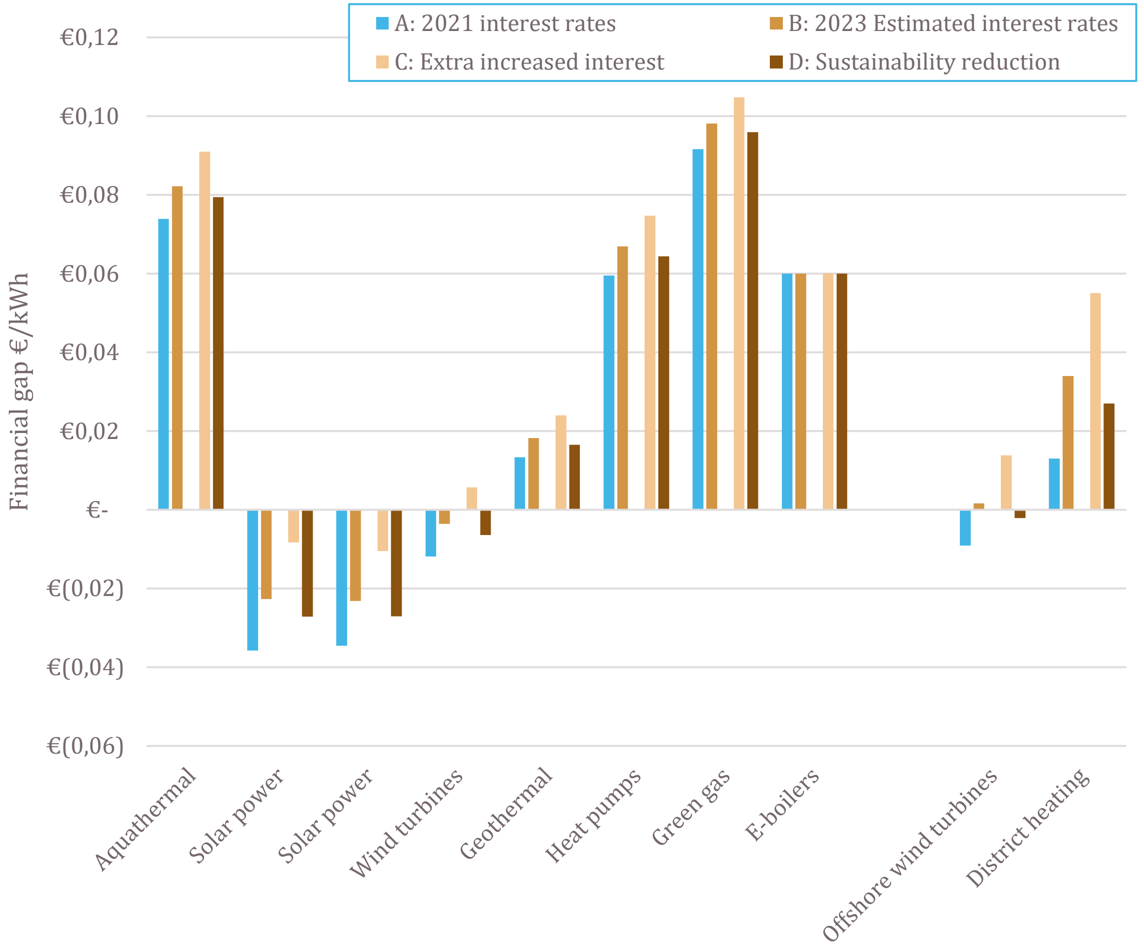
Rising interest rates negatively impact renewable energy business cases this is reflected in the energy transition.

Rising interest rates negatively impact renewable energy business cases. The two investigated indicators (financial gap and value investment ratio) deteriorate as interest rates rise. The financial gap rises, as shown in the figure to the right, for all technologies, which implies that the subsidy pressure increases significantly. We see a linear stronger increase if interest rates continue to rise, and that the increase is dampened in the event of a sustainability discount.

The value investment ratio (VIR) deteriorates. This is seen mainly for CAPEX-intensive technologies (high investment compared to operational expenditures), since the VIR is less useful to assess OPEX-intensive technologies (operational expenditures). This implies that the attractiveness of investing in these technologies is declining. Here too, we see a stronger deterioration of the VIR if interest rates continue to rise, thereby reducing attractiveness for investors. We also see that this deterioration can then be dampened with a sustainability discount.

On the macro level, annual system cost related to investments (interest), increases at the current interest rate by 5-9% in respectively 2030 and 2050. This is mostly expressed in cost related to solar and wind energy, heat pumps and infrastructures, as most installed capacity is to be expected within those technologies.

As for the long term, due to the current high interest rates, the system costs of the energy transition for the technologies examined in this study will increase by 163 billion euros. If interest rates continue to rise at the same rate, these costs could rise to as much as 336 billion euros. But the reverse also applies: a sustainability discount on interest rates can save ~55 billion euros and may therefore be a solution to keep the energy transition more affordable.



The above figure illustrates the financial gap in order to create a profitable business case for the different variants researched. As shown, the financial gap for solar and wind energy is currently negative, suggesting a positive business case and requiring no subsidies to be viable.

Two-step approach to indicate the impact of interest rate rises

To investigate the impact of the interest rate increases on the finance possibilities of the energy transition, a two-step approach has been chosen. First, the impact of the interest rate rise on the business cases of renewable technologies was examined at the micro level based on the financial gap and value investment ratio (VIR). This impact was then translated at macro level to see what this means for the national costs for the energy system up to 2030 and 2050.

To determine the impact on the energy transition, 8 different renewable energy technologies and heat and other infrastructure within the energy sector were researched, all of which are deemed essential for the energy transition. For each technology a comparison was made between the situation before the interest rate rises and three different situations:

A: 2021 interest rates – Business as usual (before increased interest rates)
The business cases in the reference scenario.

B: 2023 Estimated interest rates
3% increase in interest rates compared to 2021.

C: Extra increased interest
6% increase of interest rates compared to 2021.

D: Sustainability reduction
2% increase in interest rates compared to 2021, thus a 1% reduction compared to the assumed interest rates for 2023.

The financial gap and value investment ratio for each variant was calculated based on a discounted cash flow model (the model used is the “OT-model” from PBL, see report).

To conclude:

- Interest rate rises are causing a significant deterioration of the business case for renewable technologies.
- As a result, the subsidy pressure is increasing for many technologies, which increases the risk of exhaustion of the SDE++ (Dutch subsidy scheme) budgets. This could possibly slow down the energy transition, since fewer projects can be realised with the same budget, if budgets are not raised.
- The attractiveness of investments in renewable energy is decreasing, including those that are now profitable and that are expected to be installed the most, such as solar and wind energy. Therefore, the sector runs the risk of being able to attract less capital, which may eventually result in less projects and delays in the transition.
- Further interest rate rises may cause technologies that are expected to be installed the most (such as wind and solar) to once again require subsidies.
- When these techniques again become dependent on subsidies, this means that they must also meet the subsidy requirements. In addition, the subsidy is aimed at the cheapest projects. This then leaves less room for other additional costs, such as meeting for local demands regarding the multiple use of space (unless the subsidy instrument is designed for this purpose), a discussion that is now in full swing in the Netherlands.
- A reduction of interest rates for renewables might help to dampen these effects.
- Making sure investments in renewables are not delayed might help reduce further interest rate increases in the future. Since the current increase in interest rates is partially due to rising fossil energy prices, causing inflation. Therefore, interest rates are increased to slow down the economy and reduce inflation. Making sure to keep investing in energy transition technologies reduces dependability on fossil fuels and thus its influence on inflation.

Introduction

Extensive investments in renewable technologies coming years, a study into the impact of increased interest rates.

Large investments in renewable energy sources are required

In order to combat climate change, a collective decision was made in 2015 to drastically reduce global CO2 emissions, known as the Paris Agreement. As a consequence, the heads of government of the European Union (EU) agreed in 2020 to strive for a CO2 reduction target of 55% in 2030 compared to 1990. To achieve this reduction, a transition from fossil to sustainable energy sources is necessary. Partially as a result of this, the demand for sustainable energy is increasing. Large investments in renewable energy sources are required to meet this increased demand within the energy transition.

As a result of the energy transtion the Netherlands will shift from a fuel-based energy system relying for a large part on imports of energy towards a more asset-based energy system. It will use, among other things, solar and wind energy on the one hand, and on the other hand it will change installations and infrastructure to be able to use and transport more electricity and other energy carriers such as hydrogen and hot water.

Interest rates increased rapidly between 2021 and 2023.

Over the past year and a half, interest rates have risen sharply as a result of several factors including the climate conditions and disappointing harvests, and especially the war in Ukraine and resulting energy crisis. As a consequence, it is becoming more difficult for parties to raise capital: interest costs are rising and the business cases of projects are taking a more negative turn. Resulting in a higher need for subsidies. At the same time, we have a subsidy instrument in the Netherlands in the form of the SDE++, whereby subsidy amounts are determined and awarded annually. Given that there is a time gap between the moment of investment and when the subsidy is granted, the result can be that the increased interest costs ensure that the previously determined subsidy is not sufficient to cover the cost.

A study after the impact of interest rates on the business case of renewable technologies

The Netherlands Sustainable Energy Association (Nederlandse Vereniging duurzame Energie, NVDE), here after referred to as the NVDE, is worried about the impact of the increased interest rates on the energy transition, since a lot of investments are required over the coming years and decades.

Therefore, the NVDE has asked Berenschot to investigate the impact of increased interest rates on the business case and costs of renewable energy projects.

To this end, this study shows an expected interest rate for 2023 and the impact of expected interest rates on financial gaps of specific energy transition technologies (the micro dimension) and on overall system costs (the macro dimension), in order to assess implications of current circumstances and possible policy interventions for the energy transition.

The NVDE consists of companies and trade associations in the sustainable energy sector. On behalf of these companies, the NVDE is committed to an energy supply that is entirely based on renewable energy by joining forces from the entire industry. As a result, the NVDE is also entering into discussions with government and institutions to help formulate policy aimed at an energy supply based on renewable energy.

Disclaimer

This report was created within a short time frame and on the basis of publicly available information. The results will provide a good indication on the impact of investigated scenarios and can be seen as an upper bound effect. Since no capital cost reductions for investments were assumed and no refinancing. More in-depth research would help to make a more reliable calculations in that sense.

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Background and methodology

Central banks decide to raise interest rates

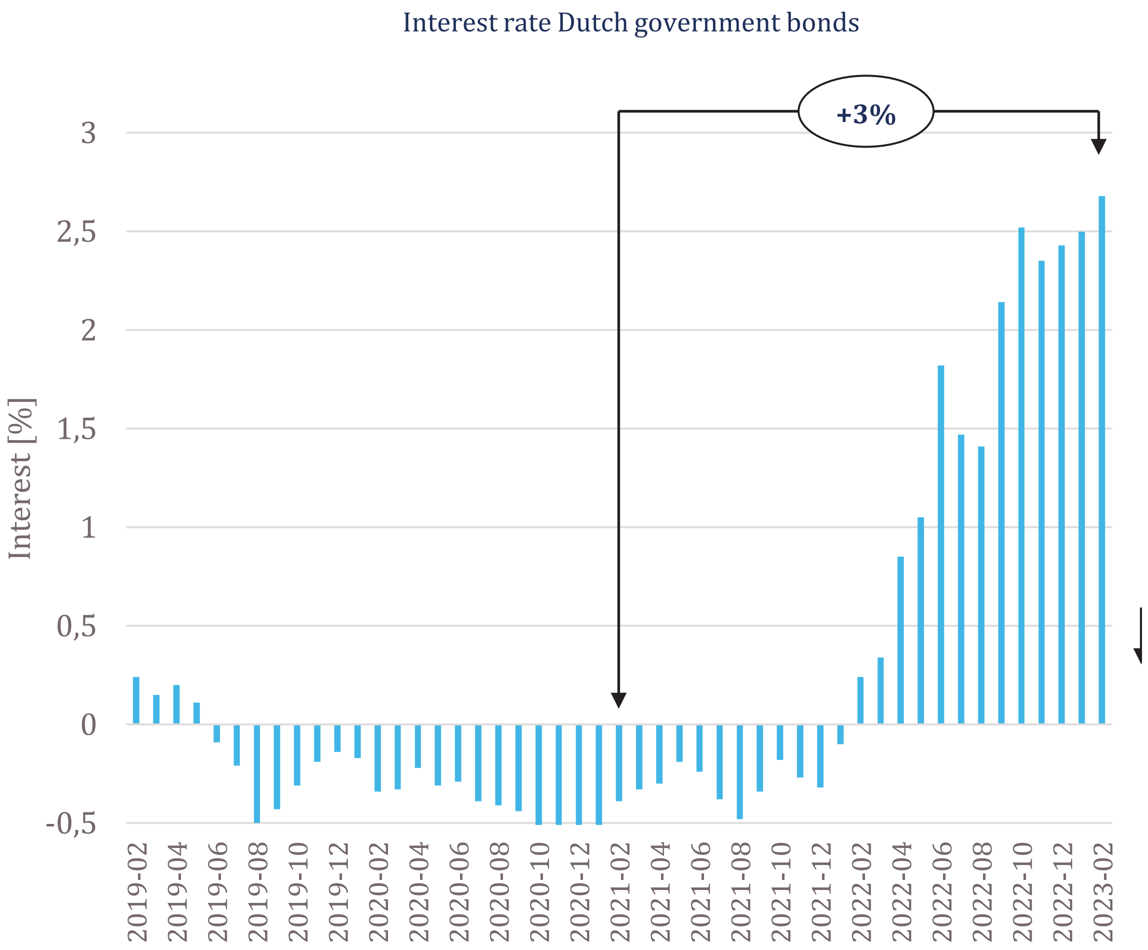
Rising interest rates have a negative effect on business cases in the energy market

Interest rates have risen sharply in the past eighteen months. Due to climate conditions resulting in disappointing harvests, but especially due to the war in Ukraine and the ensuing energy crisis, prices have risen sharply around the world. In order to curb this inflation, the central banks have long decided to raise interest rates in stages. In this way the price for money becomes higher, which has a depressing effect on demand. This in turn has a depressing effect on inflation.

Because a government bond is issued by the government, it is generally considered a risk-free investment and reflects a certain risk-free interest rate. Other financial instruments in the market build their risk and associated interest on this interest rate.

In this way, this interest rate becomes a benchmark for interest rates on the financial market. For this reason, the Dutch government bond is assumed as indicator of rising interest rates in the financial market for the purpose of this study. As can be seen in the figure to the right, interest rate increases are clearly reflected in interest rates for Dutch government bonds.

Between February 2021 and February 2023, interest rates rose by ~3%. This will also be the basis for the different calculations. The business-as-usual variant will assume 2021 interest rates. For 2023 we increase the interest rates used in 2021 for each type of investment and increase this by 3%. For the sake of this short study both equity and debt increase with the same percentage and the ratio between debt and equity is kept constant, although this will not be the case in practice.



Source: De Nederlandse Bank

Rising interest rates have an effect on financing costs

Eight production and conversion technologies and infrastructure deemed critical for the energy transition

The figure to the right illustrates the historic development of the Weighted Average Cost of Capital (WACC) for 8 technologies and district heating and infrastructure for electricity and gas (E&G).

For the purpose of this study the following 8 technologies have been identified combined with infrastructure investments as key investements for the energy transition:

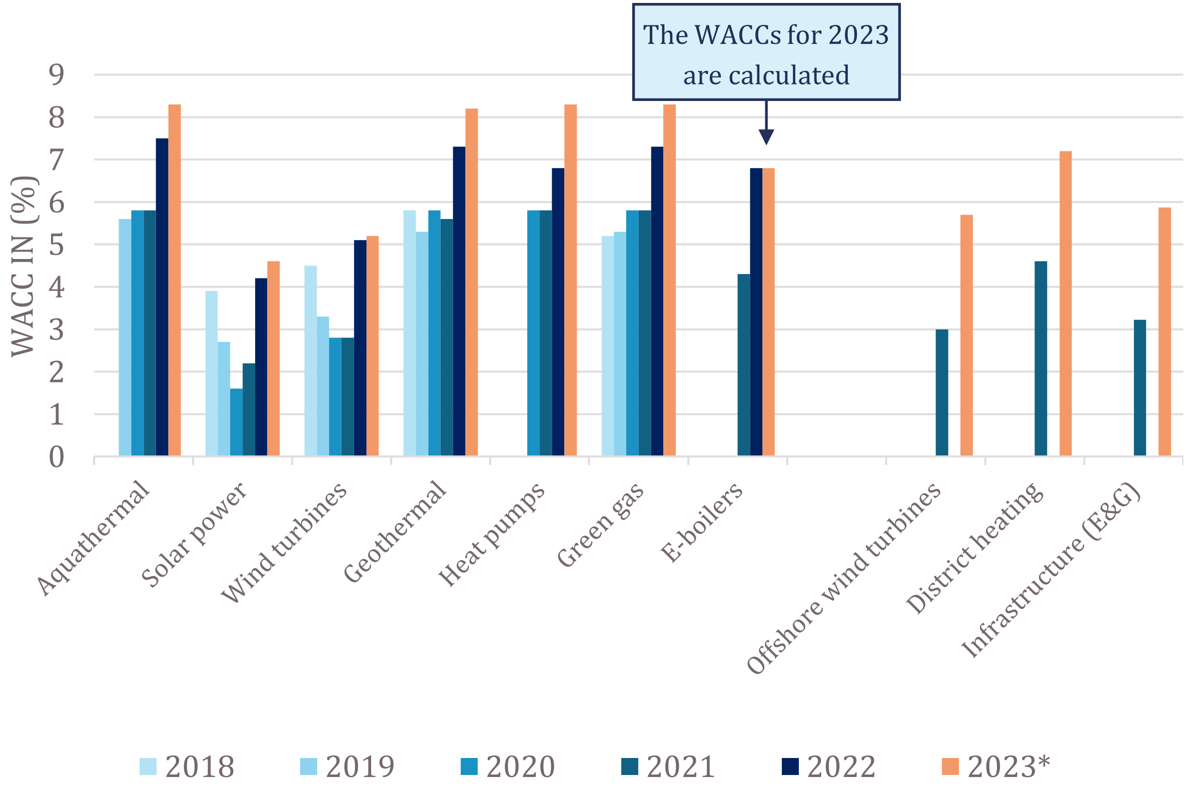
1. Aquathermal energy
2. Solar power
3. Wind energy (offshore calculated seperately)
4. Geothermal energy
5. Heat pumps
6. Green gas production (on the basis of fermentation)
7. Electric boilers (E-boilers, on industrial scale)
8. District heating
9. Infrastructure (electricity and gas)

These techniques account for the vast majority of techniques expected to be installed in order to transition towards a renewable energy system in the Netherlands in 2050[1].

Rising interest rates have an increasing effect on the costs of financing projects, these costs are expressed in the Weighted Average Cost of Capital (WACC).

The resources for financing projects are generally divided into two components: equity and debt. The WACC is a ratio that expresses the costs that are incurred for the capital with which a company or a project is financed. The WACC is calculated by 'weighing' the costs of each of these two asset types by the share of each asset type in the total financing mix. The WACC is one of the possible return requirements that can be introduced in a discounted cash flow model used to calculate business cases. Therefore, the WACC is a good ratio that expresses the costs that incur for the capital with which a project is financed.

We made a forecast of the WACC for the year 2023. As can be seen in the chart below, a significant increase in the WACC for all technologies can be expected as a result of the interest rat erises. Whereas the WACC in the years before 2021 was relatively stable. The shown increase in WACC leads to a higher required stream of revenues (from markets sales and subsidies) for a project to be sufficiently profitable to be realised.



Source: PBL Eindadviezen basisbedragen SDE++ (2019-2023), except Offshore wind energy and district heating and infrastructure (Appendix).

* The WACC for 2023 is calculated by adding 3% interest rate on the debt and equity in the mix.

1) NetbeheerNederland (2023), Het energiesysteem van de toekomst: de II3050-scenario's

Financial gap as indicator for the profitability of different technologies

Financial gap as a way to compare profitability and subsidy intensity for diferent energy-related technologies.

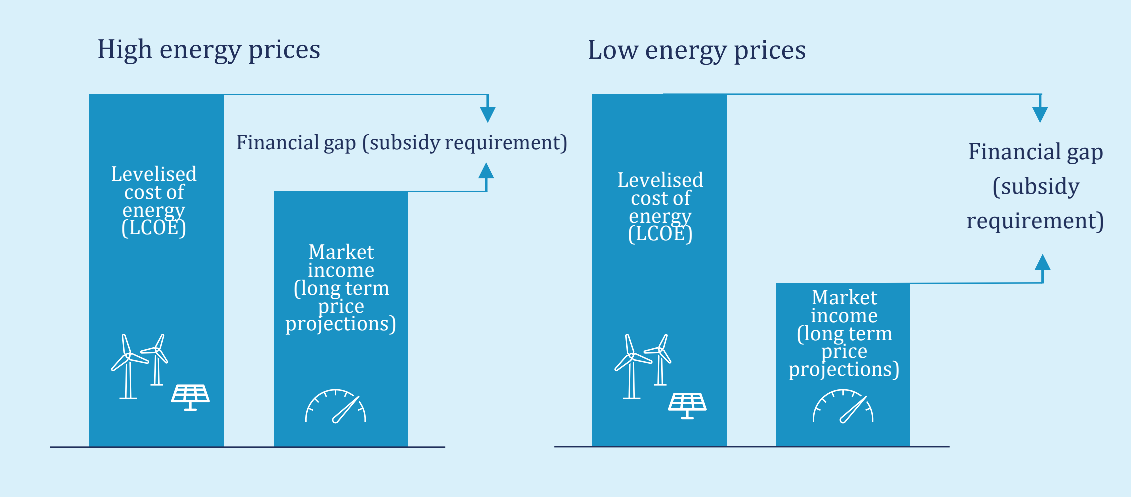
In order to compare the business case or profitability of different technologies we determined the financial gap in €/kWh. This method is used to compare different investments and methods of energy generation (but in this case also conversion and transport) on a consistent basis, illustrating the amount of subsidy needed to realise a project.

The financial gap is expressed in €/kWh: this is done by calculating the net present value[1] of a project divided by the discounted lifetime energy production (or in some cases transport or conversion). In this study we use the "OT model" developed by the Dutch planning agency for the living environment (PBL). This is a model that changes yearly depending on new insights and input from market consultations.

The OT model has several input variables from which crucial components and ultimately the subsidy per unit is calculated. This is done using a discounted cash-flow model[2]. One of the parameters for this is the interest rates for the equity (own) and debt capital. When these change, the cash flows and other variables in the model also change. They affect interest and debt repayments. Changes in the interest rates for equity and debt have an effect on the financial gap that is calculated. Moreover, these interest rates have a direct effect on the WACC. This is therefore a good variable for looking at the effect of interest rate increases on project returns. Important to note, for those that know the OT model, that we used the lifetime of a technology in order to calculate the financial gap. This means we also use the lifetime yields (in kWh) as opposed to only the period that subsidy is normally provided. This way the true financial gap is shown over the economical lifetime of the project.

To determine the financial gap, market income is assumed based on long-term market price forecasts adopted in PBL's OT model. The figure illustrates how the financial gap is calculated

Simplified representation of the financial gap.



1) Net present value (NPV), is how much an investment is worth throughout its lifetime, discounted (using the WACC as illustrated before) to today's value. The formula for NPV is often used in investment banking and accounting to determine if an investment, project, or business will be profitable in the long run.
2) In a discounted cash flow model, all future cash flows are estimated and discounted by using cost of capital to give their present values. The sum of all future cash flows, both incoming and outgoing, is the net present value

Value investment ratio as indicator for potential investors' appetite to invest

Value investment ratio to illustrate attractiveness for investors

The Value Investment Ratio (VIR) is a financial measure used to determine whether and to what extent an investment is profitable. It calculates the ratio between the present value of future cash flows and the initial investment.

Value Investment Ratio (VIR) = ${}^{NPV_{\tau=0}}/_{Inv_{\tau=o}}$,

NPV (Net Present Value) = $\sum_{\tau=1}^{T} {}^{Cash\ Flows_{\tau}}/_{(1+r)^{\tau}}$ - $Investments_{\tau=0}$, $\tau = [0; 20]$

If the VIR ratio is greater than 1, an investment is profitable. If the ratio is less than 1, it indicates a loss-making investment. Given that many technologies are in principle loss-making and therefore eligible for subsidy, the ratios are expected to be negative in many cases. However, some technologies within (solar and wind) have a positive business case. With a further increase in the WACC, a deterioration in profitability is expected for those technologies.

The profitability index is helpful in ranking various projects because it lets investors quantify the value created per each investment unit. A profitability index of 1.0 is logically the lowest acceptable measure on the index, as any value lower than that number would indicate that the project's present value is less than the initial investment. As the value of the profitability index increases, so does the financial attractiveness of the proposed project.

Three variants compared to 2021 in order to illustrate the impact of increasing interest rates

Three scenarios

For this study three scenarios have been distinguished as compared to 2021. The reference used in this study is 2021 as a Business as usual situation from before the increased interest rates shown. Followed by:
Firstly, the forecast for 2023 (current situation) based on the increased interest rates on government bonds between 2021 and 2023. In addition, a scenario to illustrate the effect if interest rates continue to rise at the same rate, and a scenario in which a sustainability discount is assumed for renewable technologies.
In this last scenario, a discount of 1% on the interest is assumed. This scenario is to illustrate an order of magnitude effect and is not a direct proposal for a specific percentage. Discounts in this context already exist at some banks for example for more sustainable homes, often as a result of different risk assessments for such investment.

A: 2021 interest rates – Business as usual (before increased interest rates)
The interest rates and WACC from 2021 were used as a basis for calculating the business cases in the reference scneario.

B: 2023 Estimated interest rates
For the forecast for 2023, the interest rate increase of Dutch government bonds of 3% compared to 2021 has been used. All interest rate increases have been passed on in the 2023 OT model. In this way, the effect of the rise is directly shown in the loan in the discounted cash flow model.

C: Extra increased interest
This scenario assumes a further sharp rise in interest rates. An interest rate increase of 6% compared to 2021 has been used for this.

D: Sustainability reduction
This scenario assumes a hypothetical sustainability discount of 1% on the interest on renewable energy projects in 2023, to illustrate the effect of possible policy measures affecting the interest rate directly. As a result, an interest rate increase of 2% compared to 2021 has been used.

Results

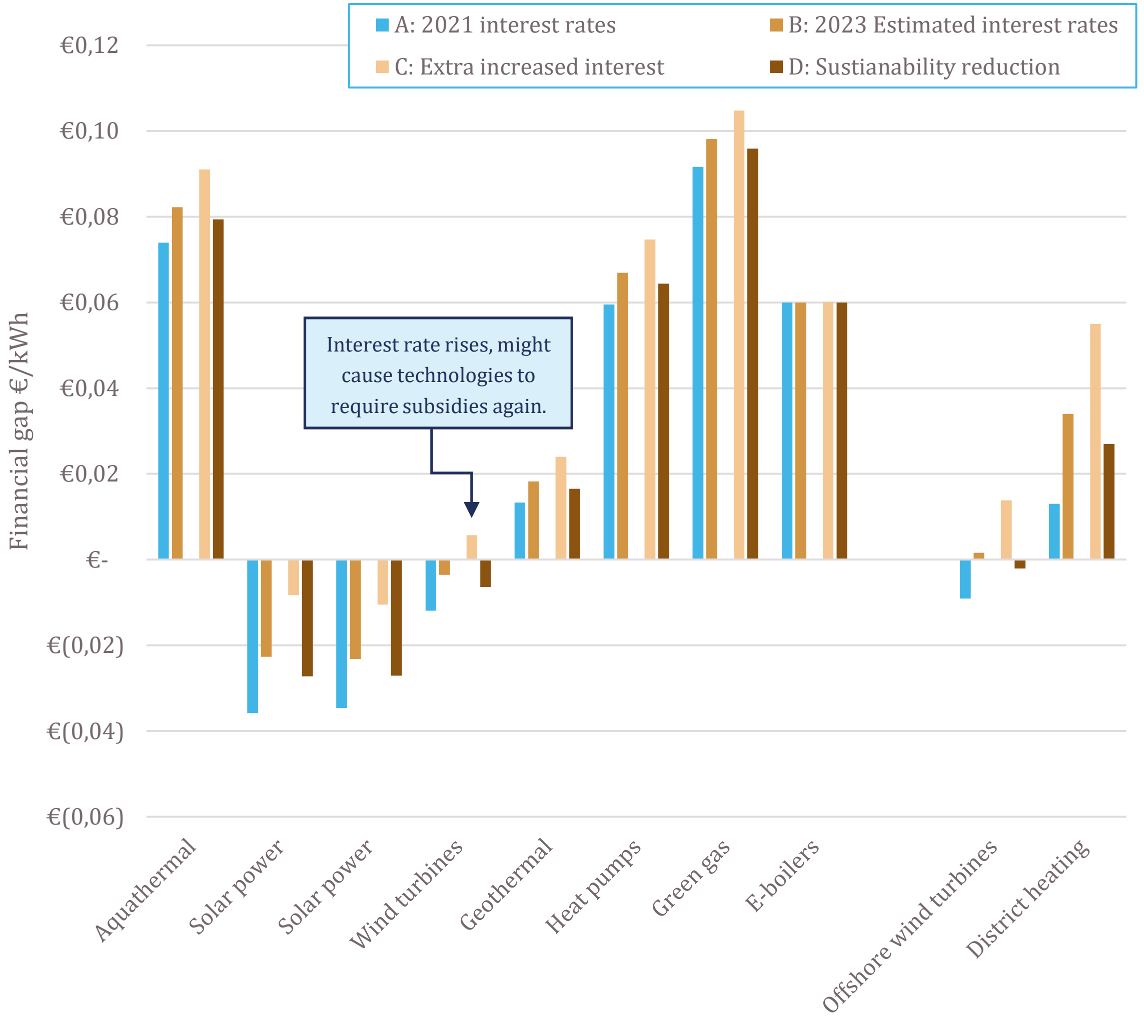
Increased interest rates cause profitable renewable technologies to need subsidies once again

Increased interest rates negatively impact the business case of renewables.

As shown in the figure to the right, the levelised cost of energy per technology minus the market prices, expressing the financial gap, increases significantly with the current estimated interest rates compared to before the increase (figure: A vs B).
The figure to the right shows the financial gap: this is the amount the market price for energy for the respective technology needs to increase in order to become profitable. A positive value means that there is a financial gap and that subsidies are needed in order to realise the project. A negative financial gap illustrates that there is a positive business case.

The increase in cost, due to a rise in financial gap, is shown more strongly in technologies that have a relatively high capital expenditure (CAPEX) such as solar, wind and infrastructure compared to operational cost (OPEX). Logically this is can be explaind due to the fact that the increased interest is visible in the loan required for the initial investment relating directly to the CAPEX.
At the moment solar and wind but also infrastructure are expected to be the most installed assets in the future. Thus the most impact is also seen in the most used technologies.
As for the further extra increased interest scenario (figure: C) an almost linear effect is visible of the increase in levelised cost, meaning that if interest rates keep increasing, the negative impact on the business case of renewables will in parallel. On the other hand, a reduction of interest rates by 1% could already make the difference for whether technologies would require subsidies or not (Figure: C vs D, Wind turbines).

Some technologies might need subsidies again where as, in recent years, they became feasible without subsidies. This is mainly the case for wind energy. Because of this the government will be able to stimulate fewer investments in renewables with the same subsidy budget. For E-boilers, the financial gap remains virtually unchanged. Due to a limited investment compared to operational costs (annually 2.5 x the investment), interest has less influence on this.



Appetite for investing in renewables might decrease, making it harder to realise projects

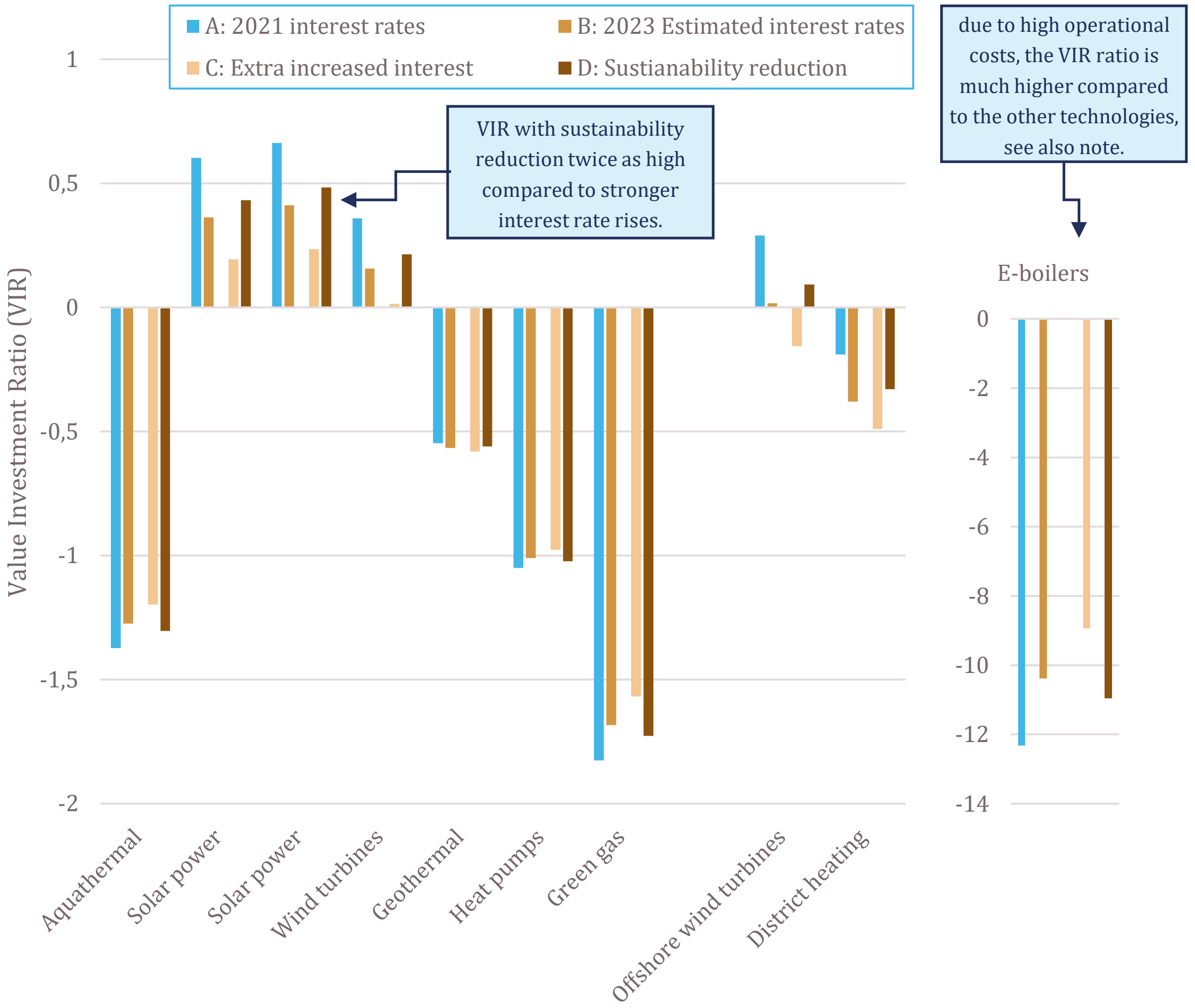
Increased interest rates negatively impact the value investment ratio.

As shown in the figure to the right, value investment ratio (VIR) per technology decreases significantly with the current estimated interest rates compared to before the increase (figure: A vs B). This decrease is also most prominent in solar and wind energy.

The VIR can be used as an indicator for the value of an investment for potential investors. A ratio of 1 is typically good. As shown in the figure, before the increased interest rate (figure: A) mainly solar but also to some extent wind energy were becoming naturally interesting investments. Now, with the increased interest rate, it will become much harder to attract debt. As a result the percentage of equity (own capital) in the investment will increase. On the one hand this reduces leverage and profitability for developers, on the other hand developers will be able to develop fewer projects with the same amount of equity. Subsidies will compensate for this, however subsidies also have specific requirements and granting takes time. This potentially reduces the development speed and margin to innovate.

A deterioration of the VIR means a decrease in the profitability of new projects with these technologies, which therefore reduces their attractiveness as an investment.
If interest rates continue to increase, the VIR will decrease further by as much as ~150% (absolute decrease) for offshore wind. A sustainability discount of 1% could make a significant difference.

Note
This ratio can give a misleading picture when we are dealing with a technology with relatively high operational costs. It then suggests that an increased WACC has a positive effect on the VIR, which is not the case (aquathermal, heat pumps, green gas, E-boilers). For this reason, it has been decided to disregard the results for these indicators for OPEX-intensive technologies.



Method for calculating the effect of increased interest rates on expected investments towards 2050

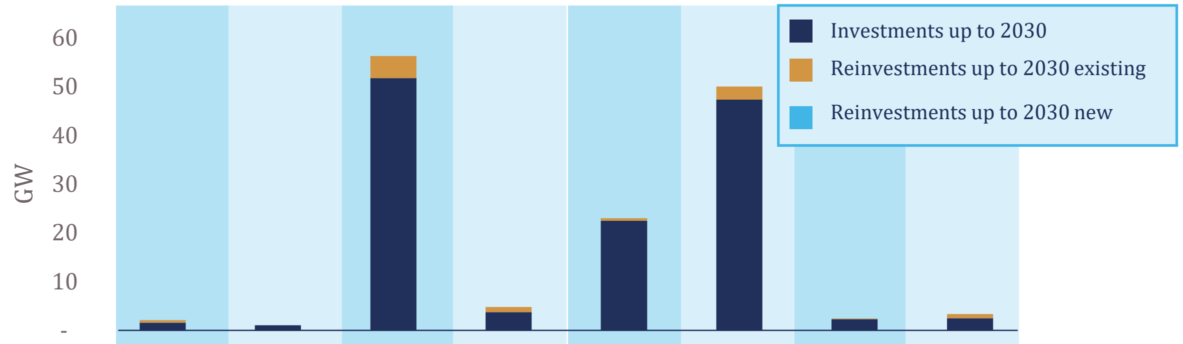
We have determined how much is expected to be invested in terms of capacity (in MW) for the technologies studied. We performed this analysis on the basis of two scenarios:

1. the **Climate Ambition scenario** for 2030 and
2. the **European Integration scenario** for 2050

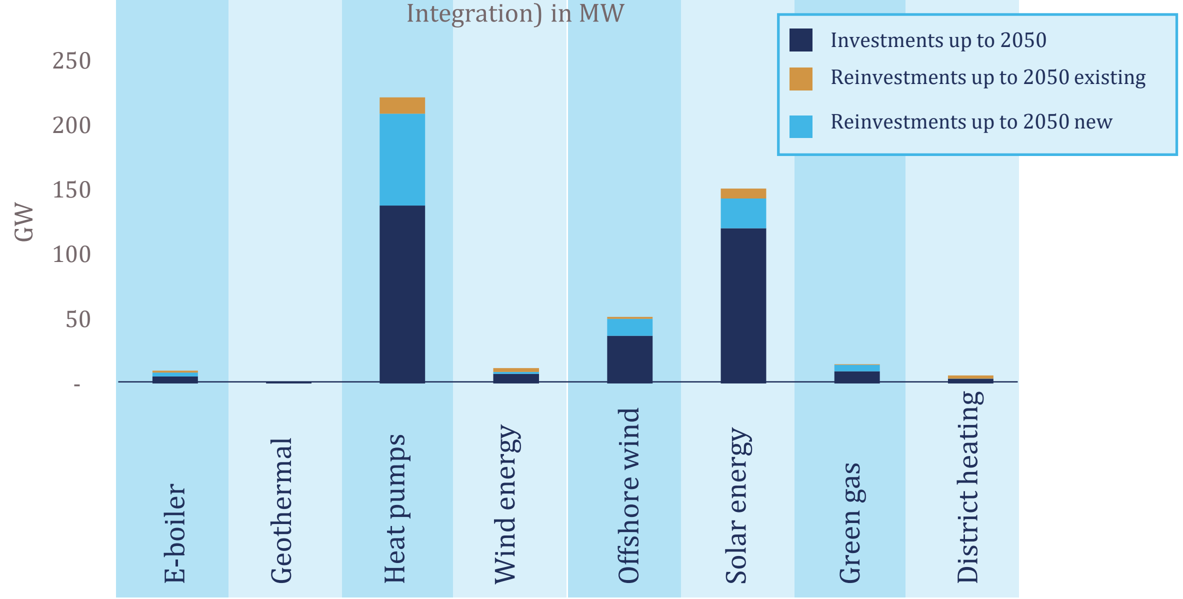
as stated in II 3050, the study by Netbeheer Nederland[1].

We have taken into account that some investments will be made well before 2050 and that the useful life of these investments will already have expired in 2050, which means that new investments will have to be made (we call this reinvestment 'new'). We also take into account the fact that these technologies have already been implemented in some places (such as wind and solar energy, which we already have) and may have to be replaced before 2030 or 2050. The investments in capacity are shown in the figure on the right.

Required investments in capacity from 2020 to 2030 (Climate Ambition) in MW



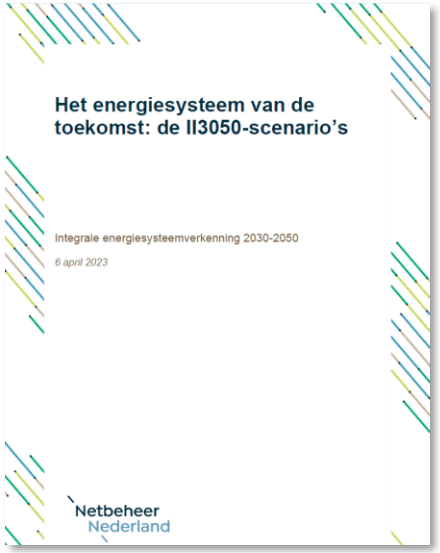
Required investments in capacity from 2020 to 2050 (European Integration) in MW



Note: Investments related to electricity and gas infrastructure are not included in the figures to the right. For the method used, we refer to the Appendix.

Currently Transmission and distribution operators are calculating these investments and estimate to have results by the end of the summer of 2023 (interview NetbeheerNederland).

Also in the macro analysis aquathermal energy is not present since this technology is not explicated in the II3050 scenarios in the ETM[2].



1) NetbeheerNederland (2023), Het energiesysteem van de toekomst: de II3050-scenario's
2) Energy Transition Model: https://energytransitionmodel.com/, this model was used for the performance of the calculations regarding the II3050 scenarios

Effect at the macro level of the technologies studied: 5% increase of system cost in 2030 and 9% in 2050

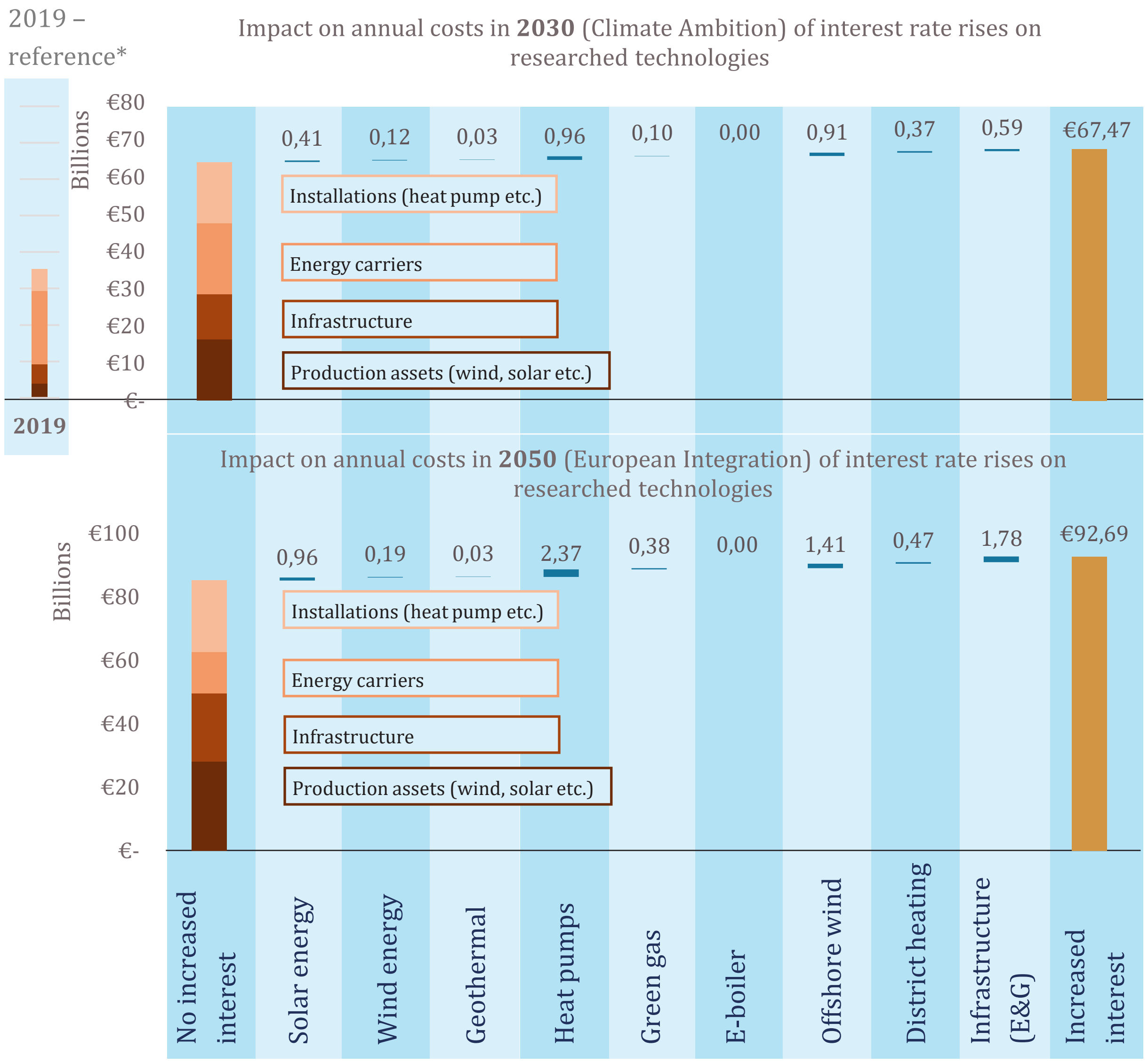
We have determined how much capacity of the technologies mentioned will be set up in the future (in MW) for the technologies studied. We performed this analysis on the basis of the Climate Ambition scenario for 2030 and the European Integration scenario for 2050 as stated in II 3050, the study by Netbeheer Nederland.

We have determined the extra annual costs of the interest rate increase on the examined technologies. We did this by multiplying the change in the unprofitable top in €/kWh by the capacity and the expected number of operating hours. This results in the additional costs resulting from the interest rate increase of 3% on the system costs in 2030 and 2050, respectively, of the technologies studied. We see that system costs will increase by about €3.5 billion (±5,4%) in 2030 and even by €7.6 billion (±9%) in 2050.

A sustainability discount of 1% interest compared to the 2023 forecast would save 1,2 billion euros in annual costs for 2030 and 2,6 billion euros in 2050.

Moreover, the graphs to the right show the division of annual cost categorised for installations, energy carriers, infrastructure and production assets. They show that, comparatively, the annual cost for energy carriers will decrease whereas the cost for the other categories will increase in 2050 compared to 2030 . This shows that the Dutch energy system is expected to become a more asset-based system. On the long run this will reduce sensitivity to external markets, but in the short-term it will demand high investments. The energy carrier cost left in 2050 are mainly expected imports of hydrogen.

Note: we assume the system costs according to the (energy transition model) ETM of the scenarios created by the network operators. It is possible that the network operators themselves present other costs if they have determined the effects on the infrastructure in detail. However, it does give a good indication of the order of magnitude.



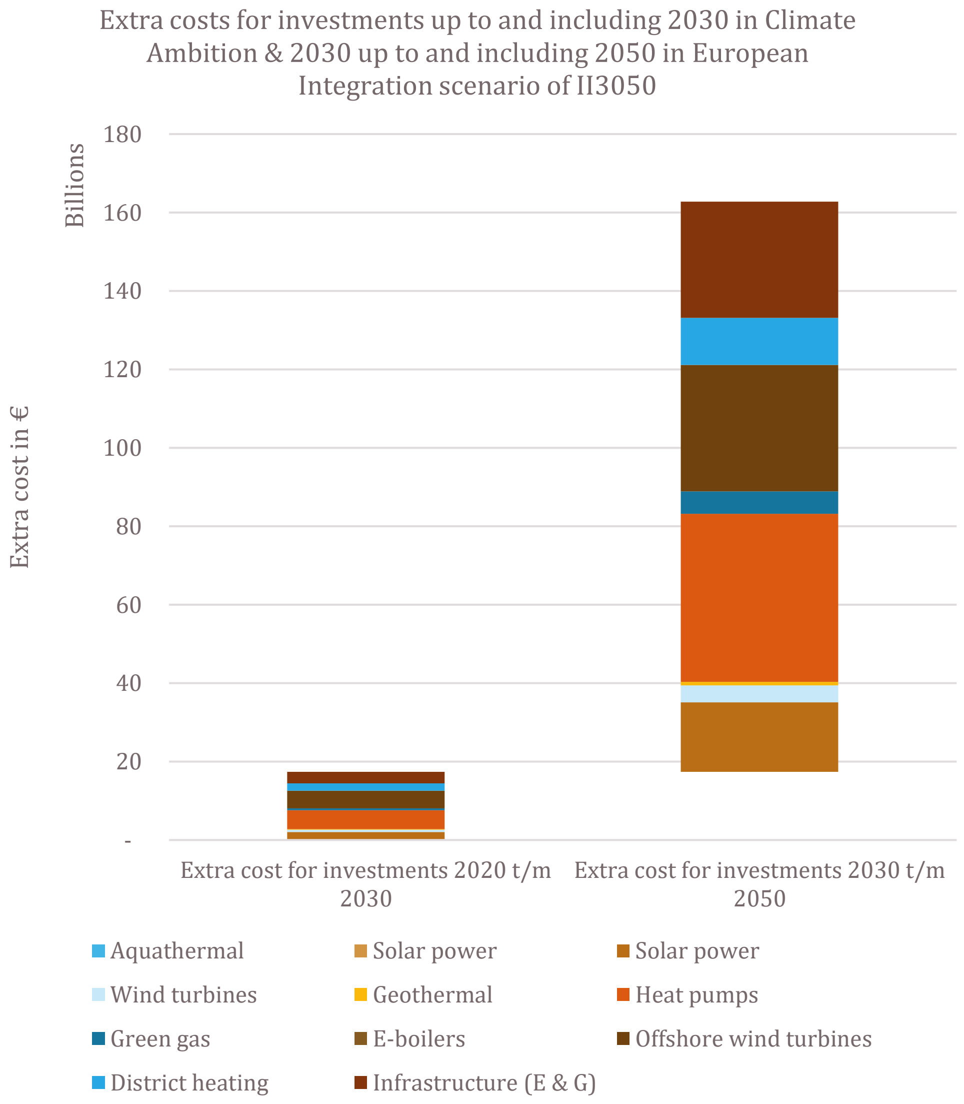
*Annual sociatal energysystem cost based on the EnergyTransitionModel

Additional costs associated with investigated investments up to and including 2050 total more than 210 billion euros

Due to the rise in interest rates, the costs of the energy transition for the technologies studied in this study will increase by ~163 billion until 2050. If interest rates continue to rise, these costs could rise to as much as 336 billion (Scenario C). But the reverse also applies: a sustainability discount (scenario D) on the interest rate could save ~55 billion and may therefore be the solution to keep the energy transition more affordable.

Based on the investments, we determined the extra costs as a result of the increased interest rates. We do this by multiplying the change in the levelised cost in €/kWh by the capacity to be added or replaced, the expected number of operating hours and the lifespan of the investment. This results in the additional costs resulting from the interest rate increase of 3% on all investments that are required up to and including 2030 and 2050 respectively for the technologies studied.

It is important to note here that this also concerns additional costs after 2030 and 2050 respectively, which are the result of the higher interest rate that was set at the time of an investment in the period up to and including 2030 and 2050 respectively (implicitly with the assumption that interest and the required return are fixed for the entire term of the investment). The figure on the right shows that as a result of the current rise in interest rates, the costs up to and including 2030 will increase by ~17 billion euros as a result of investments up to and including 2030. If we analyse the effect on all investments up to and including 2050, we even see an effect of ~163 billion euros.



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Conclusion

Rising interest rates negatively impact renewable energy business cases this is reflected in the energy transition.

Both indicators (financial gap and value investment ratio) deteriorate as interest rates rise. The financial gap rises for all technologies, which implies that the subsidy pressure increases significantly. We see a linear stronger increase if interest rates continue to rise, and that the increase is dampened in the event of a sustainability discount.

The value investment ratio (VIR) deteriorates. This is seen mainly for CAPEX-intensive technologies (high investment compared to operational expenditures), since the VIR is less useful to assess OPEX-intensive technologies (operational expenditures). This implies that the attractiveness of investing in these technologies is declining. Here too, we see a stronger deterioration of the VIR if interest rates continue to rise, thereby reducing attractiveness for investors. We also see that this deterioration can then be dampened with a sustainability discount.

On the macro level, annual system cost related to investments (interest), increases at the current interest rate by 5-9% in respectively 2030 and 2050. This is mostly expressed in cost related to solar and wind energy, heat pumps and infrastructures, as most installed capacity is to be expected within those technologies.

As for the long term, due to the current high interest rates, the system costs of the energy transition for the technologies examined in this study will increase by 163 billion euros. If interest rates continue to rise at the same rate, these costs could rise to as much as 336 billion euros. But the reverse also applies: a sustainability discount on interest rates can save ~55 billion euros and may therefore be a solution to keep the energy transition more affordable.

To conclude:

- Interest rate rises are causing a significant deterioration of the business case for renewable technologies.
- As a result, the subsidy pressure is increasing for many technologies, which increases the risk of exhaustion of the SDE++ (Dutch subsidy scheme) budgets. This could possibly slow down the energy transition, since fewer projects can be realised with the same budget, if budgets are not raised.
- The attractiveness of investments in renewable energy is decreasing, including those that are now profitable and that are expected to be installed the most, such as solar and wind energy. Therefore, the sector runs the risk of being able to attract less capital, which may eventually result in less projects and delays in the transition.
- Further interest rate rises may cause technologies that are expected to be installed the most (such as wind and solar) to once again require subsidies.
- When these techniques again become dependent on subsidies, this means that they must also meet the subsidy requirements. In addition, the subsidy is aimed at the cheapest projects. This then leaves less room for other additional costs, such as meeting for local demands regarding the multiple use of space (unless the subsidy instrument is designed for this purpose), a discussion that is now in full swing in the Netherlands.
- A reduction of interest rates for renewables might help to dampen these effects.
- Making sure investments in renewables are not delayed might help reduce further interest rate increases in the future. Since the current increase in interest rates is partially due to rising fossil energy prices, causing inflation. Therefore, interest rates are increased to slow down the economy and reduce inflation. Making sure to keep investing in energy transition technologies reduces dependability on fossil fuels and thus its influence on inflation.

Appendix

Appendix: assumptions for analysis of offshore wind and heat networks

Offshore wind analysis

For the offshore wind analysis, the methodology of the PBL OT model was used for onshore wind. Subsequently, the assumptions for Wind op Zee are based on the public valuation report IJmuiden ver Alpha. The following important principles have been adjusted in the OT model 2023 with regard to onshore wind:

- Reference size and output power: 4 GW
- Investment: 2,150 euros/kW
- Annual Degradation: 0.25%
- Full load hours: 4675
- Fixed operational costs: 22.5 euros/kW/year
- Variable operating costs: 0.0146 euros/kWhVV/
- EV ratio: 50%Interest on equity: 12% (2021)
- Interest on loan capital: 2% (2021)
- Economic life 30 years
- One-off remediation costs after 30 years of operation: 120,000 euros/MW (0.5% bank guarantee)
- Interest rate increase 2021 compared to 2023 in line with the described approach 3%

District heating analysis

The “startmotor template” of the “expertise centrum warmte” was used as a basis for the heat network analysis. Subsequently, a business case was made based on the starting points Berenschot 2022, Ontwikkeling instrumentarium warmte op basis van casussen and Berenschot, InvestNL (2022) Collectieve warmtenetten – meerwaarde van een publiek private samenwerking (PPS). The assumptions used correspond to the example cases from these studies.

Regarding the assumption for interest on equity and loan capital for heating networks, the default values from the “startmotor template” in 2021 are used.

- Interest on equity: 12% (2021)
- Interest on loan capital: 2% (2021)
- Share of loan capital: 70%
- This brings the WACC to 4.64% for 2021 and 7.16% for 2023
- Interest rate increase 2021 compared to 2023 in line with the described approach 3%

Appendix: assumptions for analysis of infrastructure electricity and gas

Infrastructure analysis

For the infrastructure analyses information was used from the report: PWC (2021), De energietransitie en de financiele impact voor de netbeheerders.

In this report the expected capital expenditures are shown toward 2050 and also the components used to determine the WACC. These two elements were used to calculate the impact of a rise in interest rates (for both debt and equity) on the WACC. Subsequently, we calculated the effect of an increased WACC on yearly cost using the WACC and capital expenditures.

Note: the method used gives an estimate of the impact of the formulated interest scenarios. However the PWC study does use II3050: the annual cost shown in the graphs in this report correspond to ETM (EnergietransitionModel) calculations. In this report we combined the two.

For a better estimate of infrastructure-related cost we refer to a study expected to be published during the second half of 2023 by the system operators (interview NetbeheerNederland, may 2023).

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