Macro-economic impact of Renewable Energy Production in Belgium

21 October 2014

Building a better working world

Context and objectives of the study

- **Renewable energy deployment among key solutions for meeting energy challenges to be addressed by policymakers, industrialists and society**
  - Need to replace Europe's ageing energy infrastructure
  - Compensate for nuclear energy phase-out
  - Reduce fossil fuel import dependency → energy trade deficit in Belgium > 5% of GDP, and set to increase under current conditions
- **In a context of budget-constrained governments, it is necessary to provide a comprehensive overview of benefits of renewable energy.**
- **Objectives of this study**
  - Assess socio-economic impact and contribution (trade balance, GDP, employment, tax revenues) of renewable energy deployment in Belgium
  - Inscribe this assessment within national renewable energy deployment prospects

Scope of the study: direct and indirect impacts of RES production in Belgium

RES value chain

E.g.Offshore wind

Construction → O&M*

- Development
- Finance and insurance
- Components (including turbine)
- Foundation
- Installation
- Connection and commissioning

E.g. Photovoltaic

Construction → O&M*

- Module
- Balance of system inverter
- Other balance of system components
- Engineering, studies, administration
- Installation

** Operations & Maintenance*

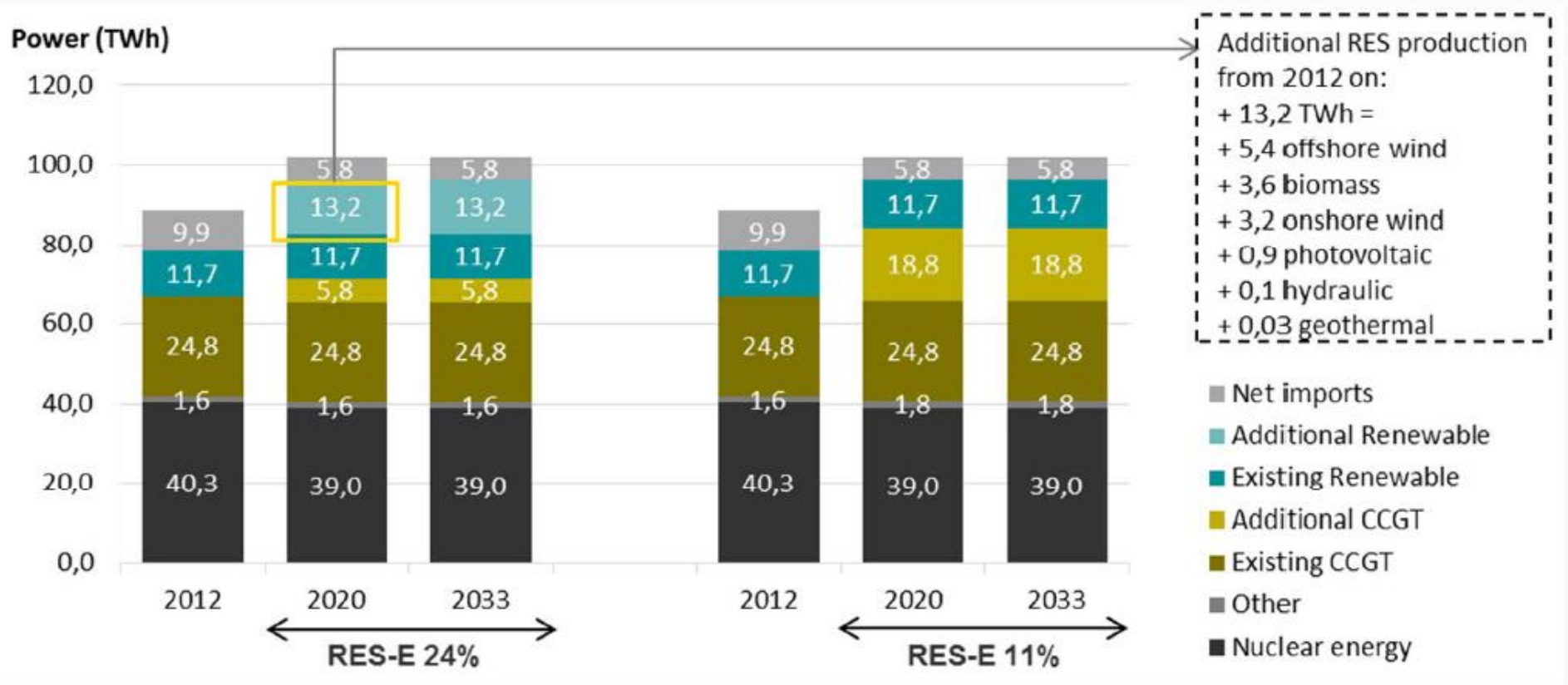
Direct impacts studied in this report include value added (GDP contribution), employment, and taxes paid by domestic RES companies working on these segments of the value chain.

RES companies will be purchasing goods and services, partly from domestic suppliers. This is known as indirect socio-economic impact (value added, employment, taxes) generated through the supply chain (e.g. cement suppliers for building biomass plants).

Approach: comparative analysis of two scenarios of Belgium's electricity mix

- **2012 baseline mix taken from Federal Planning Bureau study** "*Etude sur les perspectives d'approvisionnement en électricité à l'horizon 2030*"… corrected to take into account capacity installations in late 2012
- **Simulate 2 scenarios** with the same electricity demand profile (101.9 TWh in 2020), same dismantlement of nuclear capacity (900 MW in 2015), but differing in deployment of Renewable Energy capacity
  - **RES-E 24%:** development of renewable electricity capacity to cover about 24% of total electricity consumption in 2020; capacity deployed for individual renewable energy technologies (biomass, offshore wind, onshore wind, PV, hydropower, geothermal) coherent with FPB study
  - **RES-E 11%:** fictitious scenario with no new renewable capacity, assuming the existing renewable electricity portfolio (2012) remains constant; it would cover 11% of total electricity consumption in 2020
  - **CCGT (Combined Cycle Gas Turbine) as adjustment variable** to meet total electricity demand
- **Simulation of installation of capacity until 2020, and operation until 2033**, so as to level CAPEX, OPEX and fuel costs

Evolution of electricity mix under the two scenarios



Main Assumptions

- **Fuel prices + evolution:** this study takes nominal natural gas and crude oil import prices for Europe as per the International Energy Agency's 2013 World Energy Outlook, in its "Current Policies Scenario".
- **Discount rate:** take into account the time value of money (embodied by the "risk-free rate"), and aversion to risk (embodied by a risk premium). This study uses a discount rate of 2.8%, with no risk premium, equivalent to Belgium's current yield for 20-year government bonds. Future financial flows resulting from the scenarios are considered risk-free, with the assumption that public authorities would provide the necessary conditions to make the scenarios materialize. Sensitivity analyses have been conducted to measure the robustness of the conclusions.
- **Biomass fuel import dependency:** biomass is a heterogeneous sector, with difficulties in assessing the exact technology mix to be deployed by 2020. This study takes a conservative assumption of 50% biomass fuel import dependency. Under an assumption of 20% dependency, the cumulated import bill under "RES-E 24%" would be € 1.2 billion lower than under the chosen assumption.

Approach to simulate socio-economic impacts under each scenario

- **Step 1:** establishment of both scenarios starting from FPB forecasts, ensuring in both cases that intermittency is covered with enough peak capacity, in line with Belgian energy security requirements;
- **Step 2:** collection of costs and domestic shares of CAPEX, OPEX and fuel for each technology. Their input into the national economy generates added value, employment, and tax revenues. The import shares of CAPEX, OPEX, and fuel costs impact the trade balance. Future financial flows are discounted;
- **Step 3:** calculation of direct and indirect effects by taking into account the interdependencies between different sectors (services or industries), using a multiplier model based on Eurostat input-output tables;
- **Step 4:** estimation of effects on national tax revenues (corporate, income, social taxes) through the economic activity generated by both scenarios.

Main takeaways of the study

The following outcomes of the study are the key findings adding to the existing literature on costs and benefits of renewable energy in Belgium:

1) **Higher employment created** under an ambitious renewable electricity path

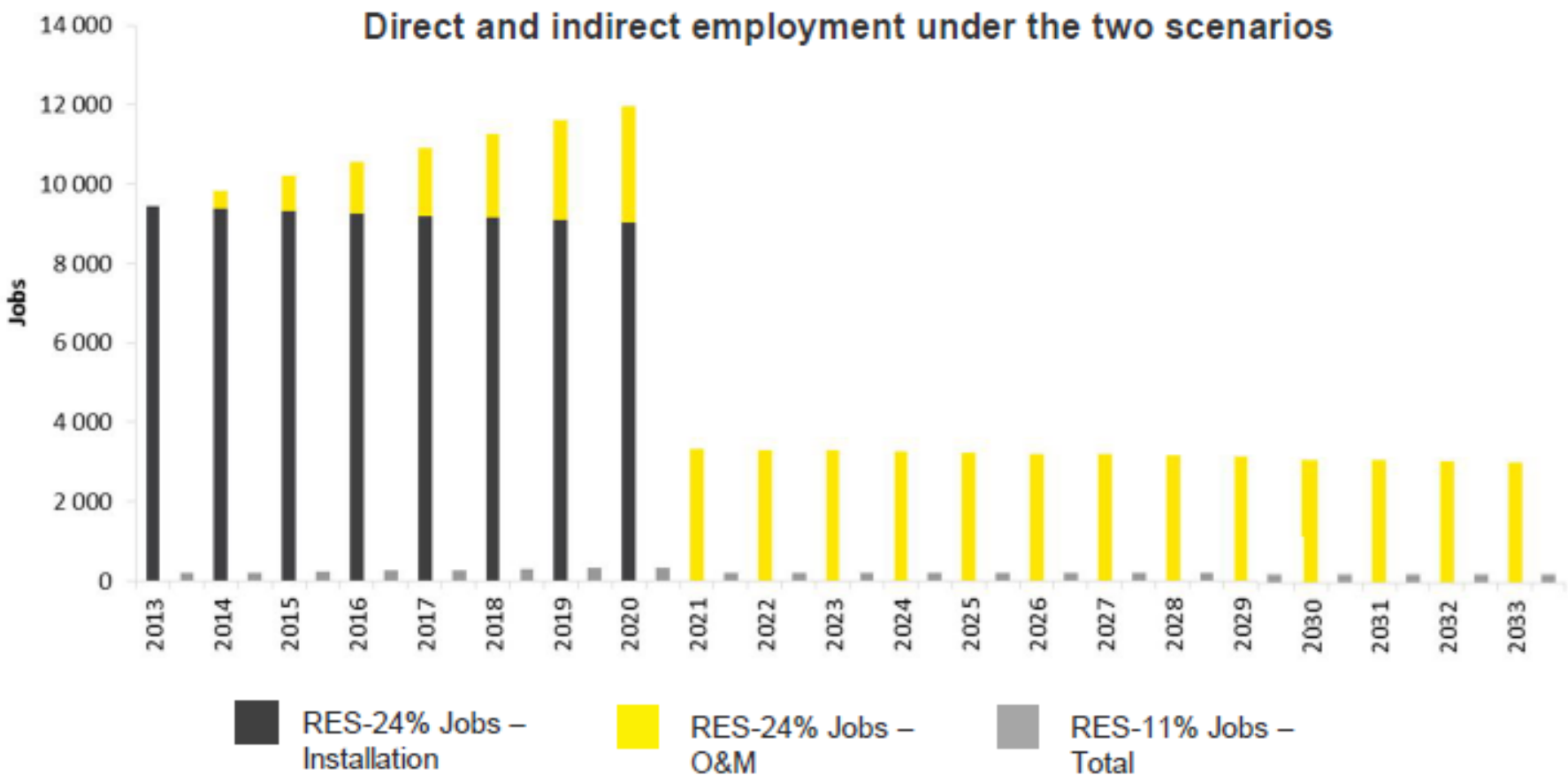
2) **Lower import bill**

3) **More wealth kept within domestic borders**

4) **More taxes collected**

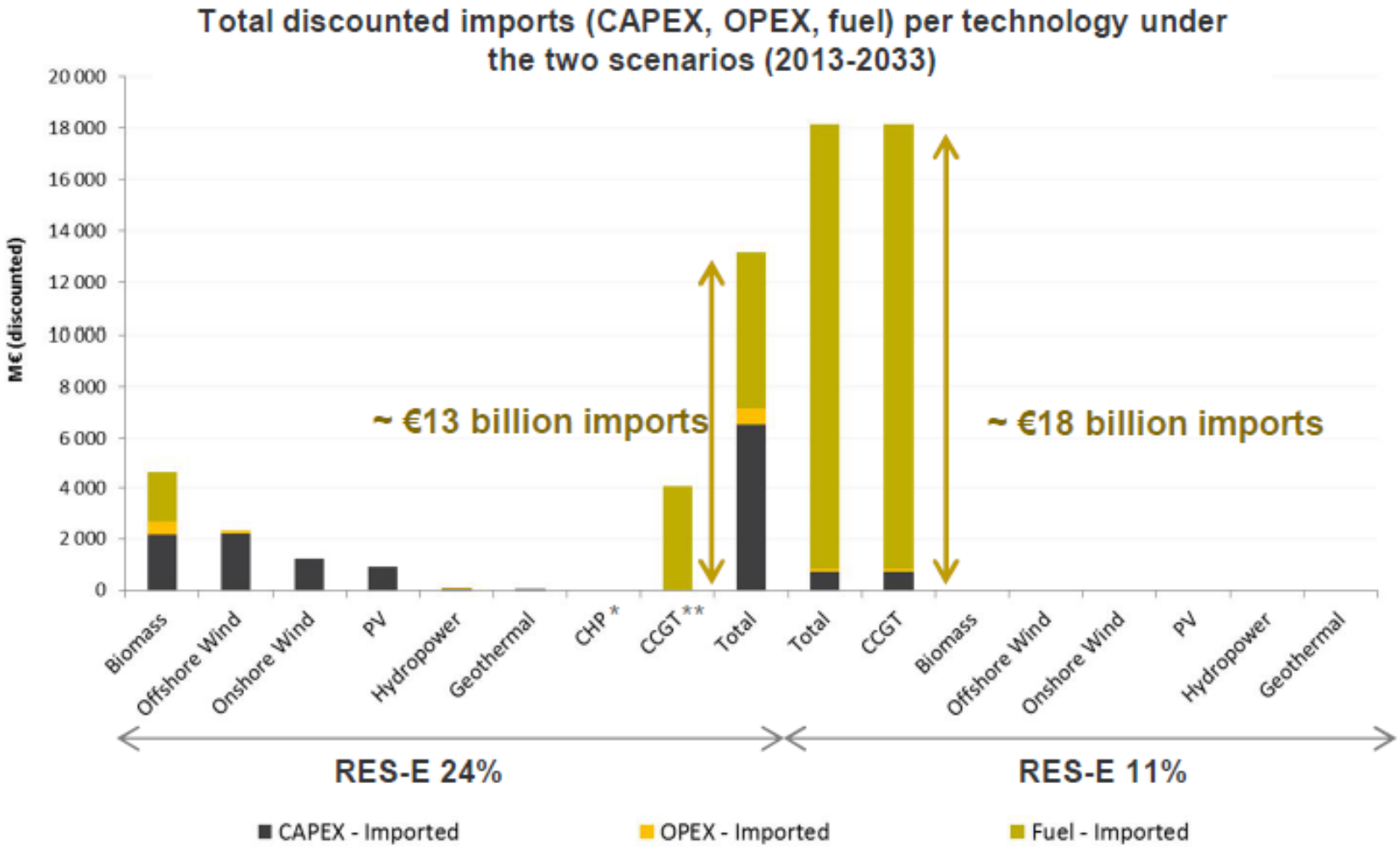
1) Higher employment under RES-24% compared to RES-11%

- About 9 000 extra installation jobs a year during the installation period
- About 2 500 extra O&M jobs a year during the operation period



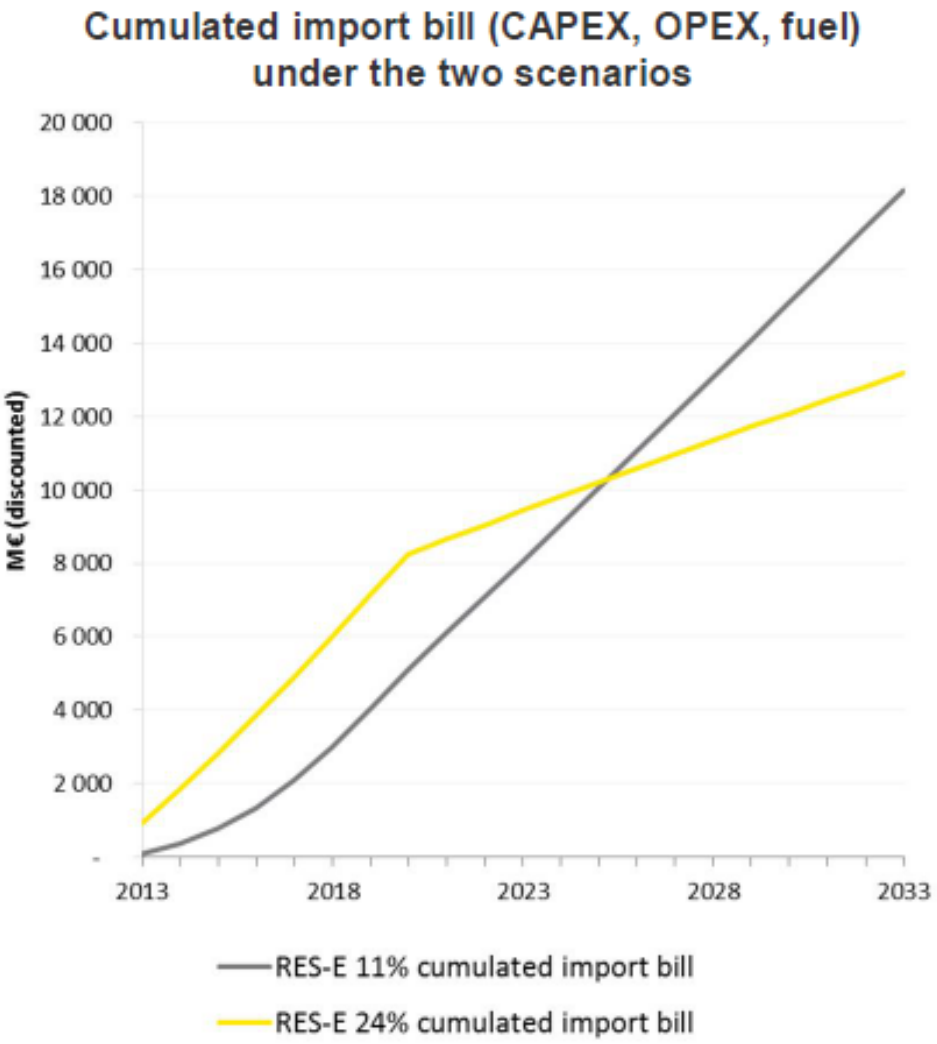
2) Lower import bill

- € 5 billion avoided imports under RES-24% compared to RES-11%, cumulated over 2013-2033



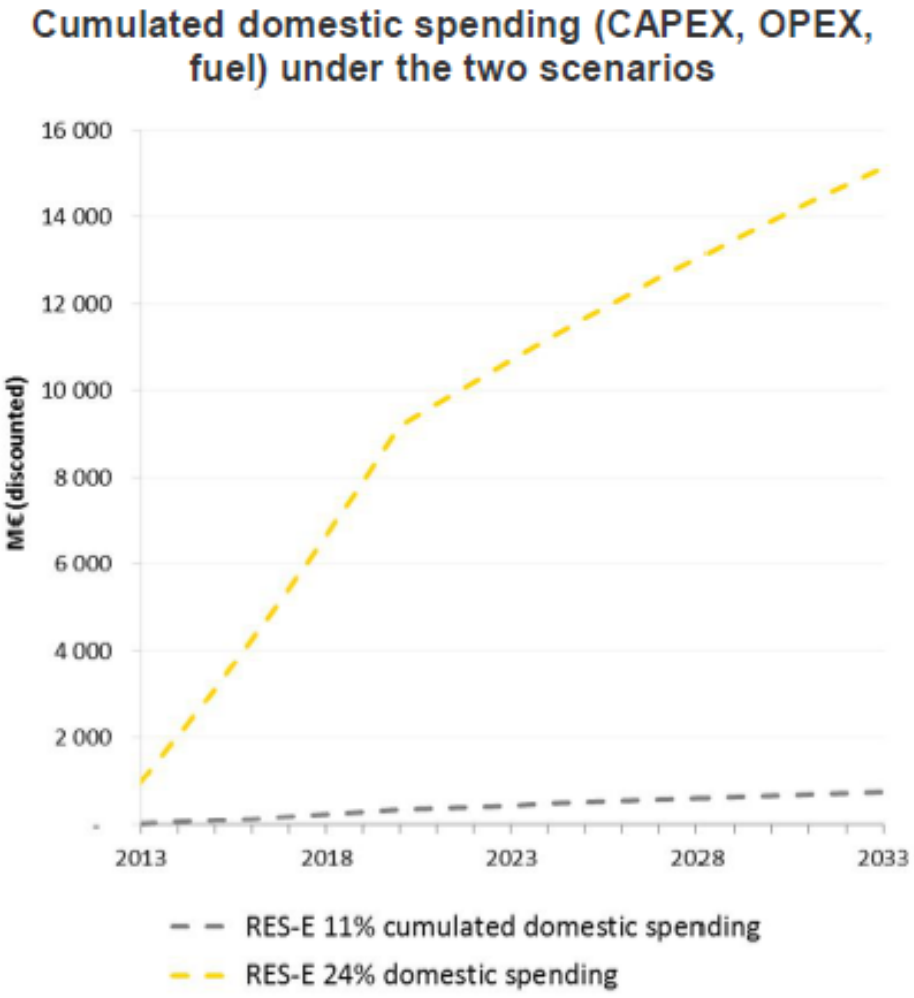
2) Lower import bill

- Higher import bill initially because of higher CAPEX needs
- Gap decreases from 2020 because of end of installation period under RES-24% and higher OPEX under RES-11%
- Import advantage of RES-24% would materialize starting in 2024-2025
- This varies by +/- 1 year when discount rate varies between 1-4%



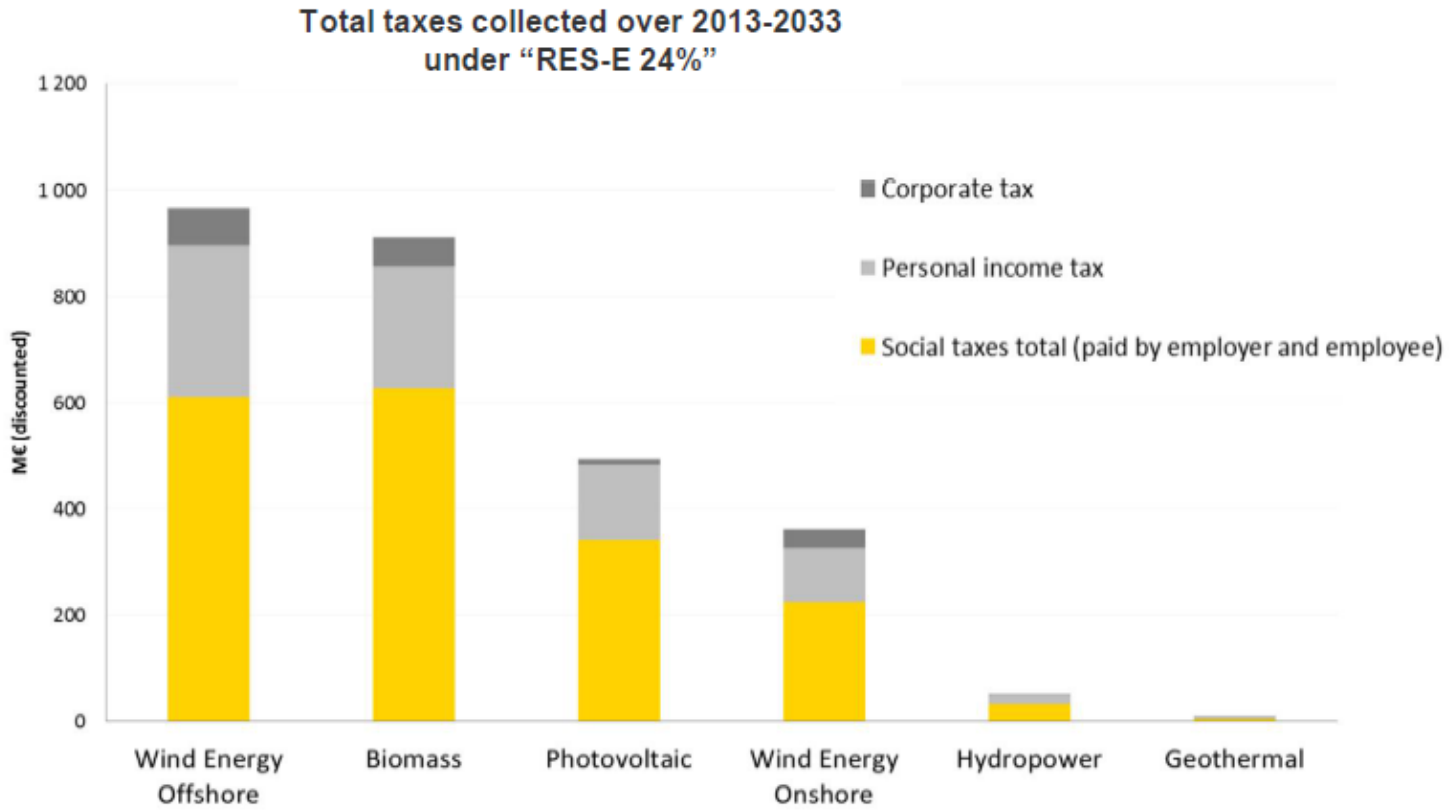
3) More wealth kept within domestic borders

- € 15 billion cumulated domestic spending over 2013-2033 under RES-24%
- € 1 billion under RES-11%



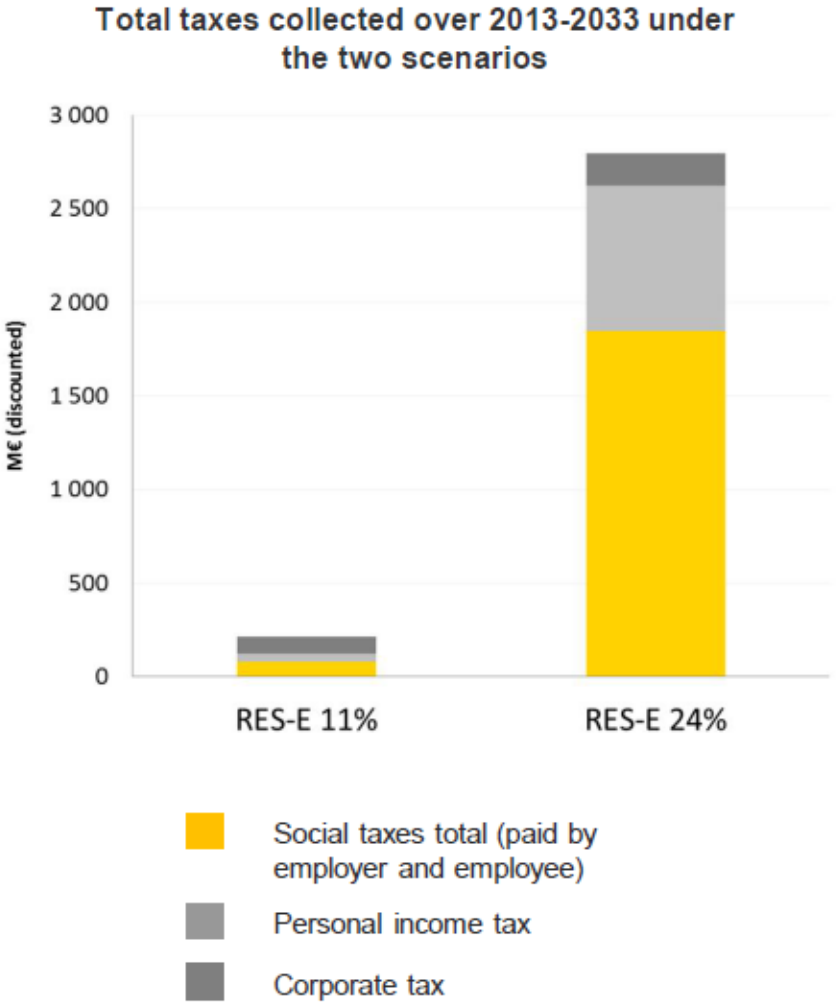
4) More tax revenues collected

- Offshore wind and biomass energy return the highest result, due to the high amount of total installed capacity, as well as labor-intensity
- Wage-related taxes like Social taxes and Personal income taxes are relatively high in Biomass, Hydropower and Geothermal because of relatively high salaries and labor-intensity;



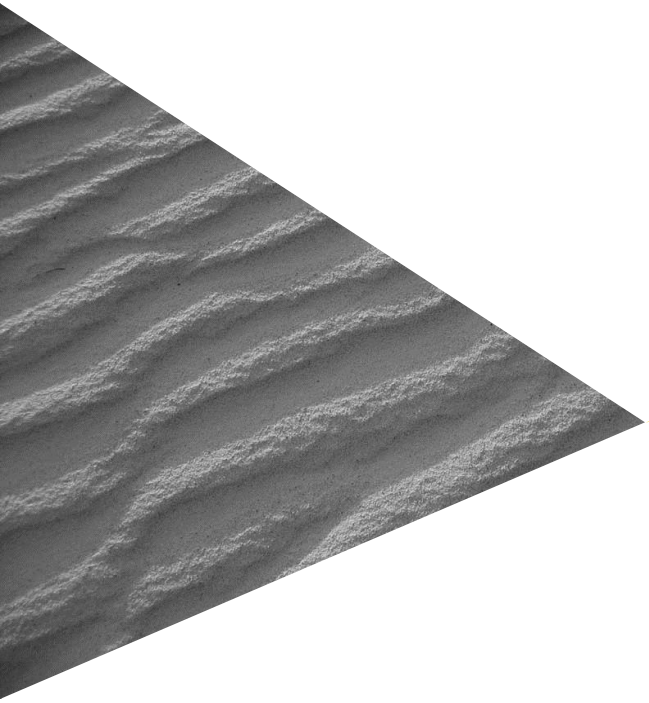
4) More tax revenues collected

- RES-E 24% would generate, over 2013-2033, about € 2.6 billion more taxes than RES-E 11%...
- …meaning a yearly average of over 130 M€ extra tax revenues
- Difference in natural gas taxes collected is negligible
- VAT and electricity taxes are scenario-neutral



Other impacts, measured qualitatively and not subject to detailed modelling by EY

- **Electricity prices**: EY's report provides a brief literature review on the merit-order effect
- **Induced employment** (employment supported by household spending from direct + indirect employees): induced employment under RES-E 24% higher in proportions similar to direct + indirect employment
- **Environmental externalities**: RES-E 24% compared to RES-E 11% translates into reduction of 3% of Belgium's GHG emissions in 1990
- **Loss of jobs in other sectors:** lack of factual data to confirm and then quantify the loss of employment due to "carbon leakage" and industrial delocalization; need for further research.
- **Socio-economic impacts of RES-Heat**: deployment of solar thermal + solid biomass + heat pump as per Belgium's NREAP would support
  - ~9,000 jobs a year during installation phase (2013-2020)
  - ~10,000 O&M jobs a year from 2020 onwards



Thank you

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