



100% renewable energy- transition to clean energy

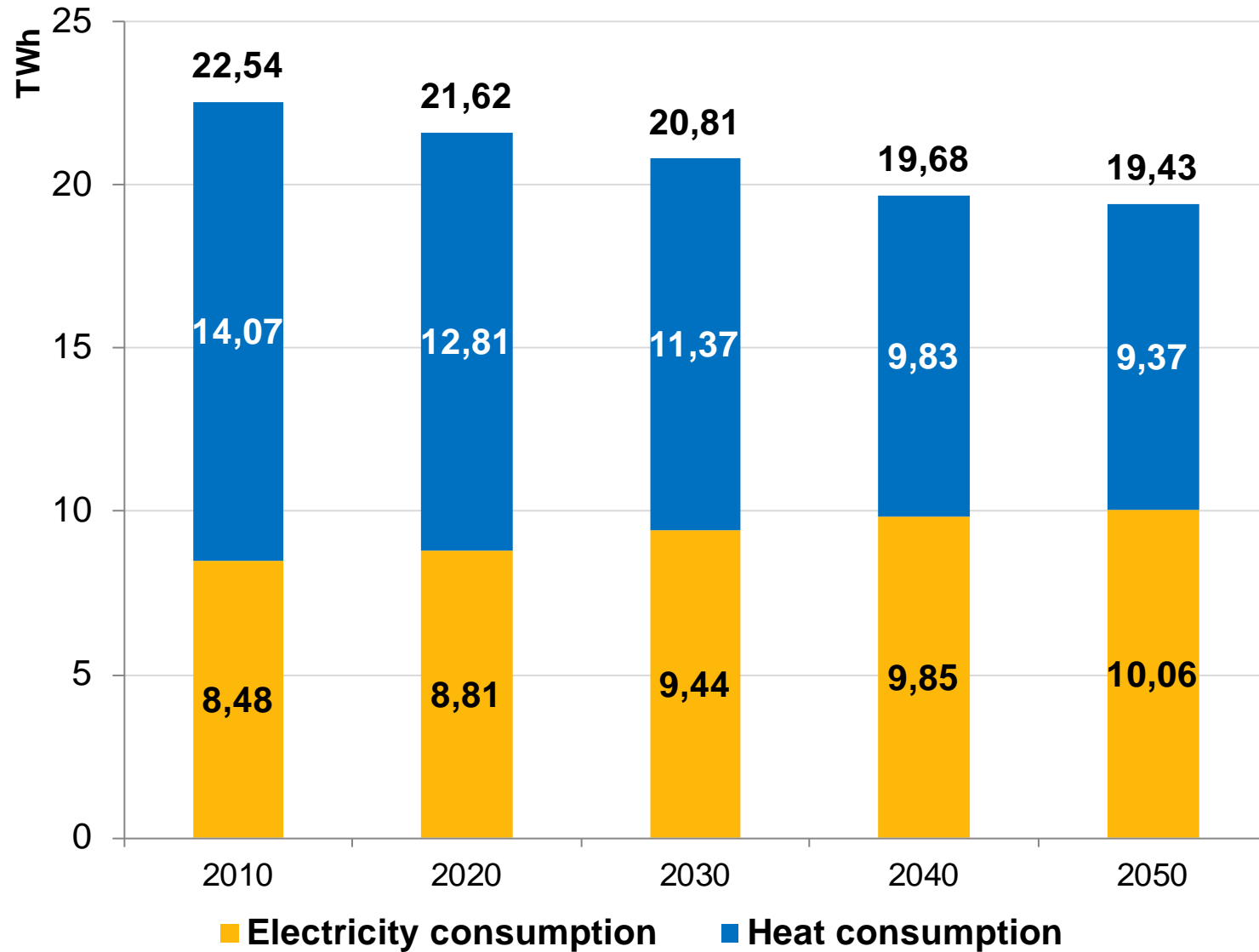
A project co-authored by the Estonian Renewable Energy Association and the Estonian Council of Environmental NGOs.

Introduction

- Full transition to renewable energy (RE100) in the electricity and heating sector in Estonia is economically viable and technically feasible by 2030
- According to RE100, the average production cost of electricity from renewable sources is 19% lower in 2030 and 31% lower in 2050 than from sources based on oil shale and nuclear power plants.
- RE100 production portfolio is competitive
- RE100 requires investments in the amount of 5891 million Euros, necessary investments can be financed through revenues from private capital and alternative sources of funding
- The potential of renewable energy in Estonia is largely untapped

Consumption forecast

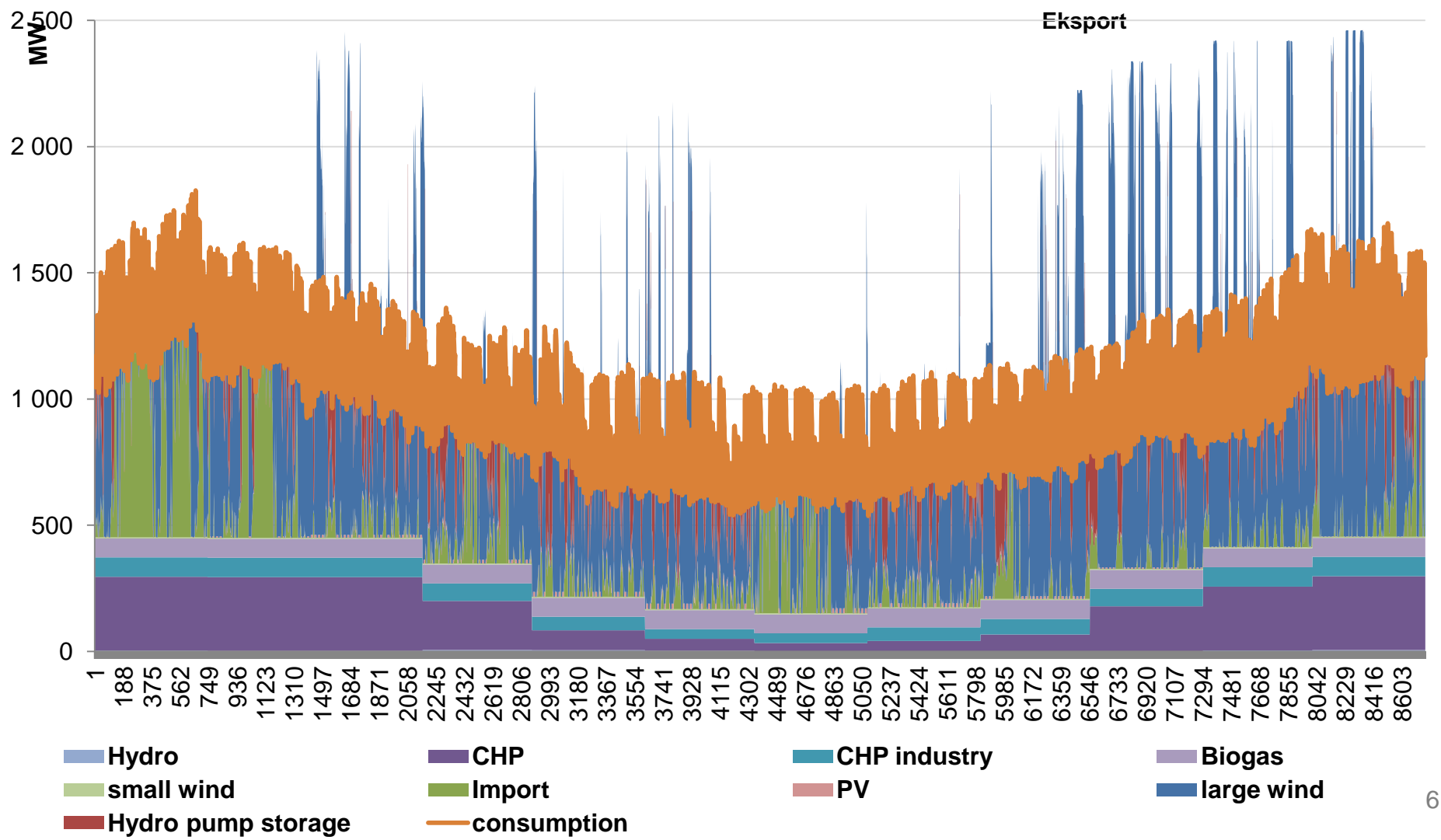
Electricity and heat consumption forecast



Production forecast

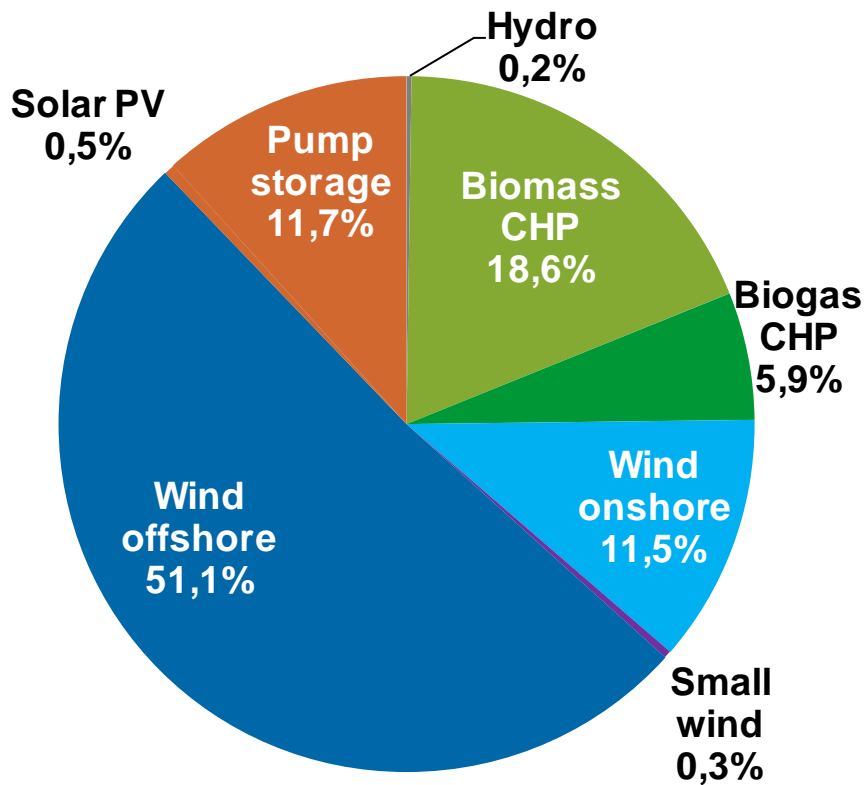
Renewable energy covers the Estonian electricity consumption

Projected consumption and simulated output in 2030

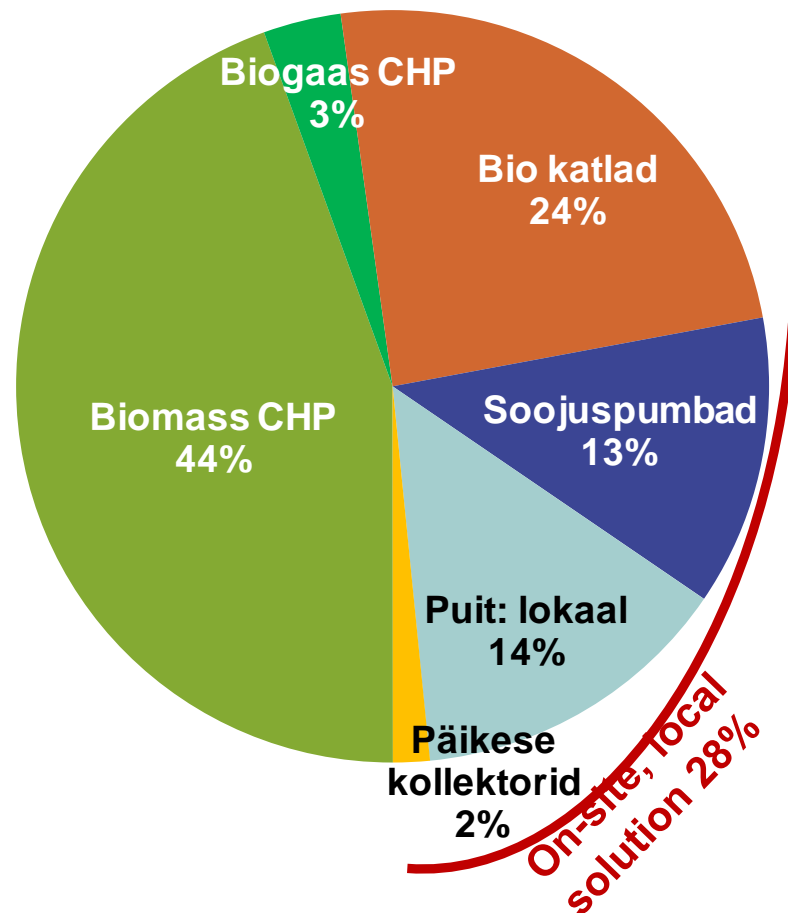


Electricity and heating & cooling scenarios in 2030

RE100 electricity scenario in 2030

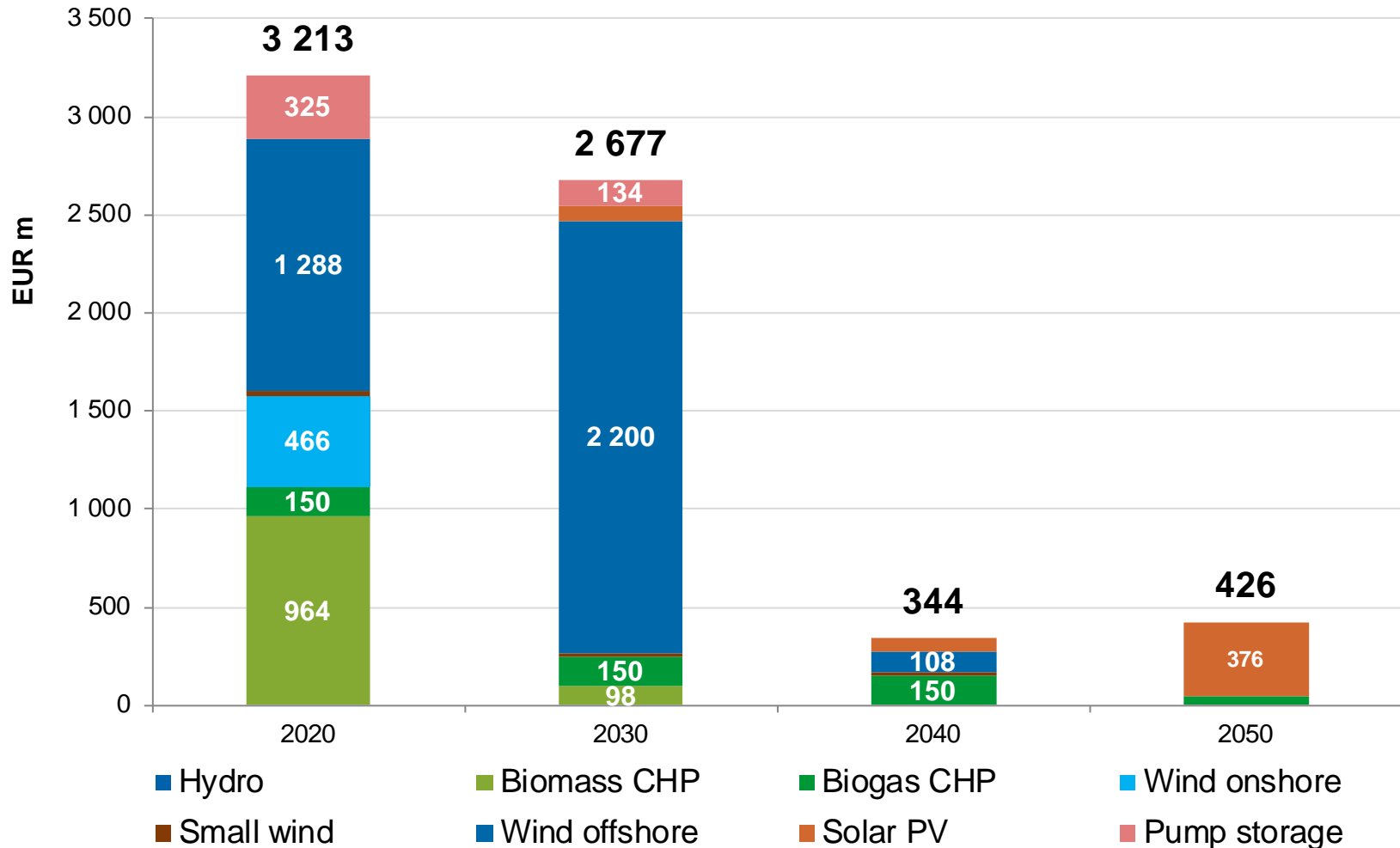


RE100 heating and cooling scenario in 2030



Cost

Necessary investments into electricity capacities



Investments until 2030 are 5 891 million Euros*

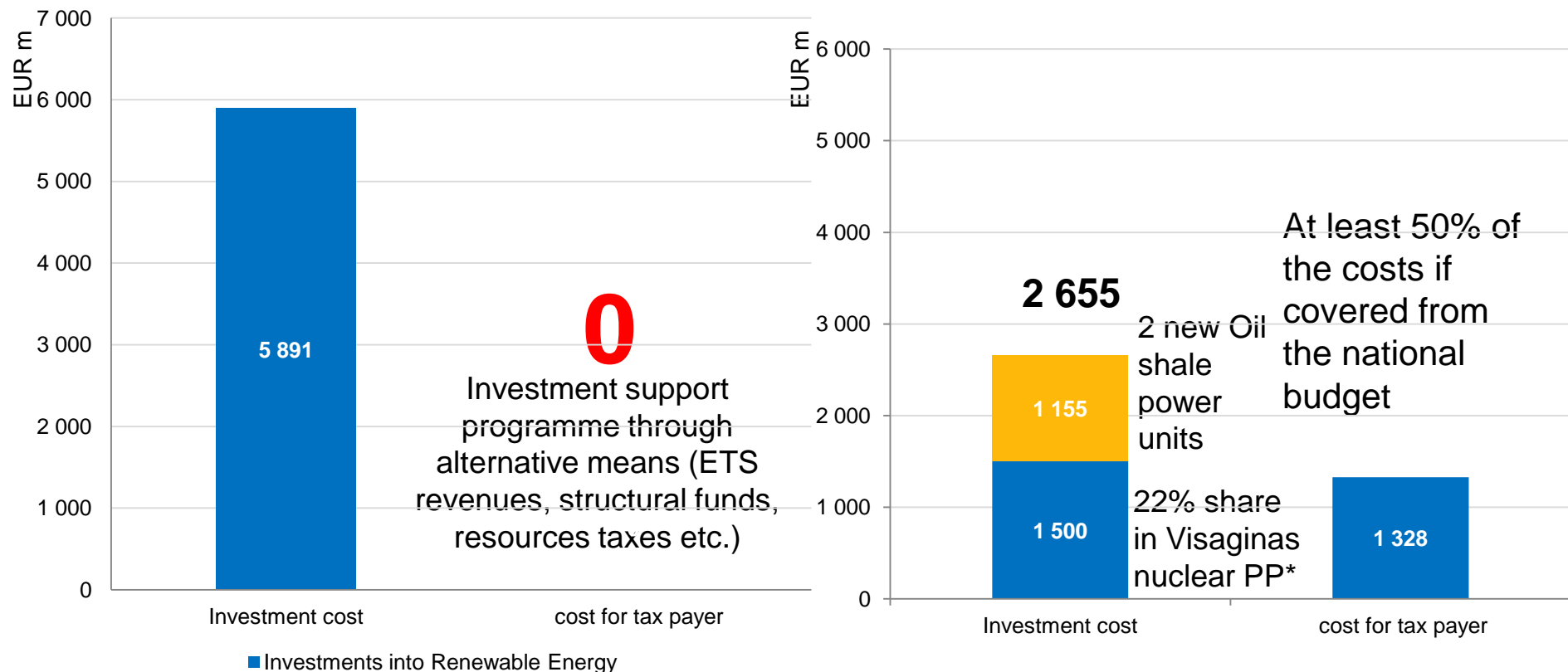
* Investmensts are caltulated in 2012 values and do not take into account inflation

Investments until 2030 and costs to the taxpayer

Comparison of alternatives

RE100 scenario

Oil shale and nuclear scenario



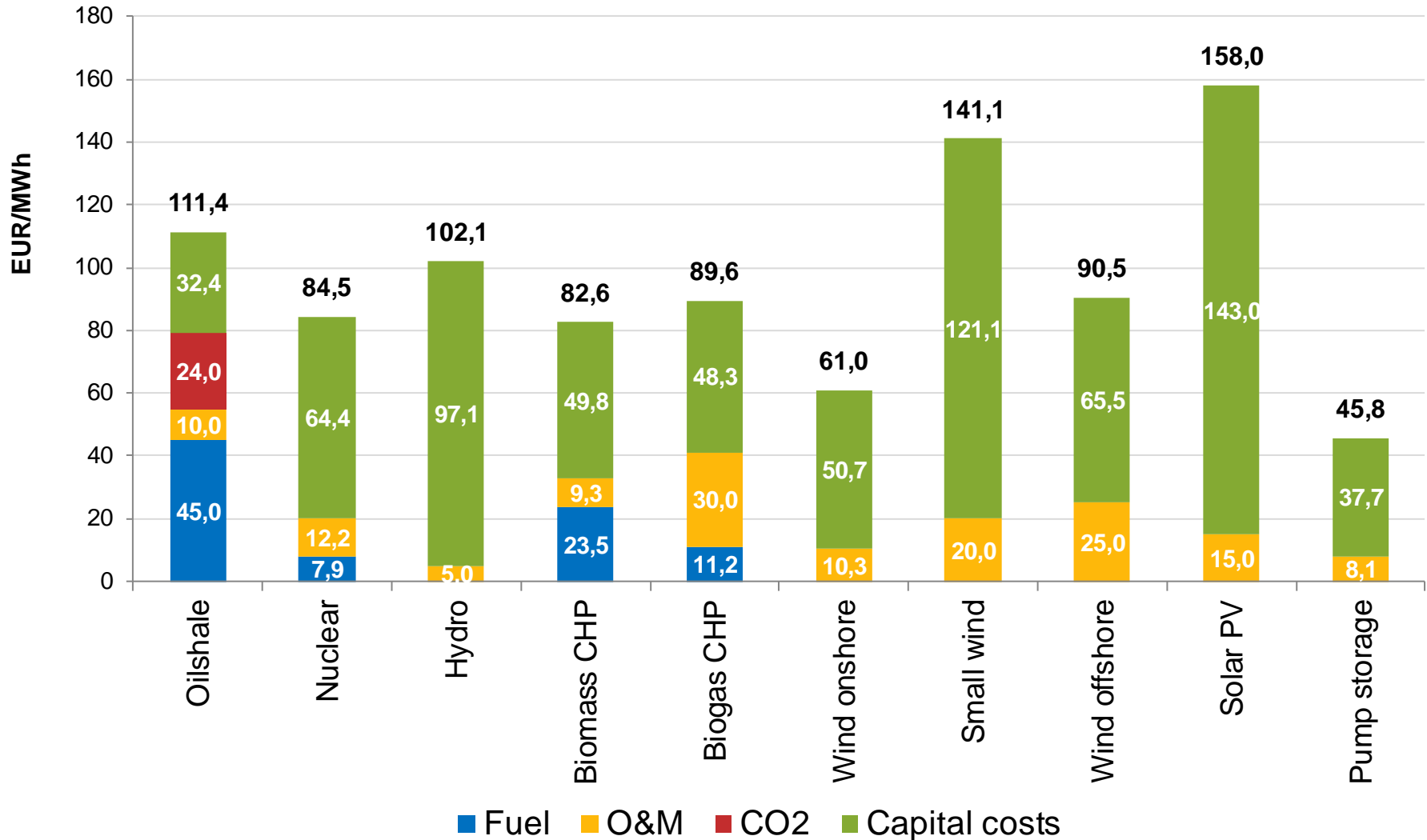
► Investments towards renewable energy projects can be financed through revenues from the European Union emissions trading scheme, European Union structural funds, oil shale resource fees and trading revenues from flexibility mechanisms

► Fossil and nuclear energy projects have to be financed by the state (taxpayer) through an investment grant program

* The Visaginas nuclear energy plant will cost 6,8 million Euros, according to the Lithuanian Ministry of Finance.

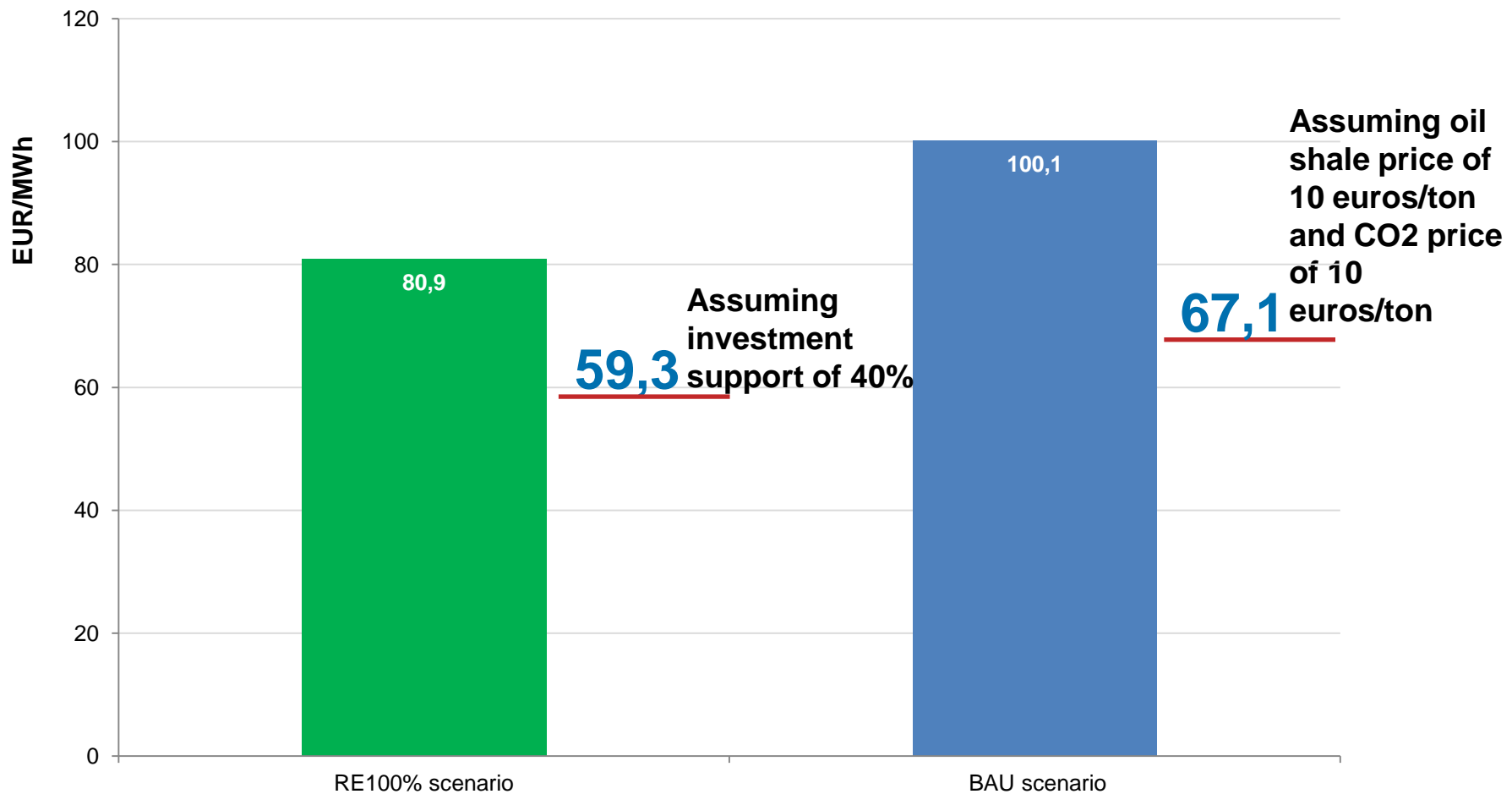
Cost of electricity production in 2030

Comparison of technologies



Average cost of production for electricity in 2030

Comparison of alternatives



Policy recommendations

Sources of funding for RE100

- The total cost of RE100 for 2030 is 5 891 million Euros
- Sources for investments:
 - ▶ **Revenues from emissions trading**– 188 million EUA units during 2013-2030. Revenues would reach **2,82 million Euros**, which is 47.8% of the necessary investments by 2030.
 - ▶ **EU structural funds** - 2014-2030 magnitude of 420 million Euros
 - ▶ **Oil shale resource fee**– 27 Euros per ton of oil shale with a mining capacity of 15 million tons per year, the yearly resource fee would be 405 million Euros. That is 6.88 billion in 2013-2030.
 - ▶ **Flexibility mechanisms of Renewable energy Directive**– magnitude of 3.4 billion Euros to finance Estonia's offshore wind projects

Policy recommendations

- Need for long-term binding national goals
- Creation of an investment grant program
- Introduction of smart grids and better facilitation of renewables into the grid
- Developing of energy storage capacities

Socio-economic effect

Lower production costs for electricity	<ul style="list-style-type: none">■ According to RE100, the average production cost of electricity from renewable sources is 19% lower in 2030 and 31% lower in 2050 than from sources based on oil shale and nuclear power plants
Diverse production portfolio	<ul style="list-style-type: none">■ RE100 scenario provides a diverse and dispersed energy production portfolio that is based on local resources and provides security of supply
Cleaner environment	<ul style="list-style-type: none">■ Widespread usage of renewable energy will lead to a cleaner environment, promoting sustainable development and public health
Efficient use of resources	<ul style="list-style-type: none">■ Oil shale can be used for the production of more value added products■ Biomass and biogas cogeneration uses primary energy more efficiently
Income from reduction of CO₂ emissions	<ul style="list-style-type: none">■ From 2030 onwards, a yearly release of 17 million tons of CO₂ emissions (electricity and heat) will be avoided with a projected price of 30 Euros per ton, a total of 510 million Euros every year
Creation of new jobs	<ul style="list-style-type: none">■ At least 10 000 new jobs with a tax revenue of approximately 100 million Euros
Improving the trade balance	<ul style="list-style-type: none">■ Elimination of the need to import gas
Improving the quality of roads through granite usage	<ul style="list-style-type: none">■ Construction of the hydro-accumulation power station will produce local granite, which would increase the service life of the roads by 10 years
Economic development	<ul style="list-style-type: none">■ Development of renewable energy sector will act as a growth engine to the national economy