CEI
CENTRAL EUROPEAN INITIATIVE

Regional Cooperation for European Integration

A Bridge between Macroregions

CEI - BLOOMBERG REPORT

NEXT GENERATION BIOFUELS AND OTHER BIOPRODUCTS:
OPPORTUNITIES FOR COUNTRIES OF THE CENTRAL EUROPEAN INITIATIVE

March 2012

PREFACE

Sustainable energy, environment, research, innovation, industrial competitiveness, agriculture and rural development are priorities of the Central European Initiative and the European Union. Next Generation Biofuels respond to these priorities. They represent, in general, a privileged option for a long-term strategy for renewable energy and stronger self-sufficiency. At the same time, they offer a unique opportunity for regional cooperation among CEI Member States which have large agriculture-forestry sectors. Therefore, they need to strengthen and disseminate their technology know-how in this field.

This is the background for the CEI activities in this strategic field. It is based on several years of fruitful experience with energy-related projects in the framework of our CEI Science and Technology Network, our CEI Trust Fund at the European Bank for Reconstruction and Development (EBRD) and our collaboration with the Regional Cooperation Council.

The CEI Secretariat has invested one year of preparations and discussions with the stakeholders in the CEI region. It has established an inventory of hundred research groups that are already active or have competences useful for the development of Next Generation Biofuels. They are ready to contribute to an ambitious regional project in this field.

In view of these encouraging results, the CEI Secretariat has commissioned to Bloomberg a comprehensive study on the prospects and long term impact of Next Generation Biofuels. A preliminary version of this study was presented to the CEI Ministers of Science and Technology, who met in Trieste on October 19, 2011. The "Trieste Declaration" contains the following paragraph on Next Generation Biofuels:

> *"Upon a proposal by the Chair, Ministers and other Heads of Delegation complimented the CEI Secretariat for the outstanding activities conducted so far concerning Next Generation Biofuels and for the preliminary concept for a CEI comprehensive and interdisciplinary regional R&D project in this field. They strongly recommended that the current and future presidencies should provide continuous support to this initiative in view of facilitating the accomplishment of all the outcomes envisaged. More specifically, they mandated the Secretariat to establish without delay a Network of Centres of Excellence as the basis on which the regional project should develop and, at the same time, to ensure that top experts from different Ministries in CEI Member States (Energy, Environment, Agriculture and others besides Research and Innovation) are involved in order to mobilise consensus and actual participation as large as possible. Furthermore, they mandated the Secretariat to identify with different Directorates of the European Commission the most appropriate ways to attract all possible means of financial support from the EC, from IFIs and from other public and/or private Donors."*

This version of the CEI-Bloomberg Report on the Prospects of Next Generation Biofuels represents the basis for further steps in the months to come. The Bloomberg-New Energy Finance team deserves our full appreciation for the excellent work done. We welcome further contributions from Member States enabling us to update this version of the report and making it even more comprehensive.

Ambassador Gerhard Pfanzelter
Secretary General
Central European Initiative

INTRODUCTION

The Member States of the Central European Initiative (CEI) have large agriculture and/or forestry sectors: for them Next Generation Biofuels are a concrete strategy option and a real challenge, also representing the best equation combining energy requirements for reducing dependence on fossil fuel imports, protecting the environment with less CO2 emissions, enhancing rural development and food security and creating far-reaching global market opportunities (to sell technology). **Transforming waste into energy is therefore the CEI's ultimate goal!**

Next Generation Biofuels are biofuels efficiently produced from different feedstock, without competing with food or cash crops for fertile land and water, while reducing global greenhouse gas emissions. The most important examples are crop residues, wherever there is an agricultural production; but residues both from sustainably harvested and undergrowth forests, algae or other spontaneous vegetation and municipal solid waste represent other promising sources of feedstock.

World players such as oil majors, top research centres, chemical industries and even Petrobras in Brazil, are ever more turning to Next Generation Biofuels. By taking this new trend into account, a priority project within the CEI framework would definitely be a strategic asset.

Technologies for Next Generation Biofuels are just around the corner: in five/ten years from now, according to the best educated estimate, they will be utilised worldwide. This is a very short time in view of a long-term sustainable strategy. Although several demonstration and pilot plants / bio-refineries are being built worldwide, and second generation plants are ready for production, dissemination of interdisciplinary scientific knowledge (in Biology, Chemistry, Physics) is crucial as well as the need to upgrade know-how in this field of technology in order to further improve the efficiency of the related industrial processes.

The following actions are required to reach this objective and they will significantly contribute to strengthening the scientific communities of the countries involved: human resources orientation through in-house applied research; further increase in process efficiency; capacity building through advanced training, workshops, seminars and networking. Furthermore, all available financial instruments (FP7, Horizon 2020, Structural Funds, IPA, etc.) should be channelled towards an integrated CEI regional project in order to provide support to centres/groups of excellence according to the status of their respective countries vs. the EU, resulting in a greater overall efficiency compared to aggregate efforts of individual applicants according to standard rules.

In other words, it is necessary to provide appropriate support for applied research projects and pilot activities, and a CEI sponsored regional project on next generation biofuels could be very useful in this regard. CEI Countries also need to invest their own resources in this strategy, and must start investing today: postponing an investment of this kind would likely bring about an external impact on their national priorities. Human resources are available, but immediate action and adequate organisation is needed to exploit this strategic precondition.

To this end, a network of centres / groups of excellence already committed or with the appropriate competences ought to be promoted and eventually it will involve all CEI countries in a major joint R&D project: given adequate resources a virtual critical mass of over one thousand scientists and researchers could easily be mobilized in a short time. In fact the CEI has already made an inventory of almost a hundred groups / centres of this kind which expressed their readiness to participate in such a regional project.

The development of Next Generation Biofuels is complemented by that of biorefinery, which implies the side production of added value biochemical materials: this will be the basis for a new chemical industry. The chemical industry today strongly depends on the by-products of oil refinery: the development by-products of Next Generation Biofuels would require significant R&D efforts and therefore also bring about new industrial opportunities.

Another element in favour of the utilisation of Next Generation Biofuels also refers to the prospects of additional income for farmers, which is likely to bring about a consistent **rural development** and a consequent long-term environment protection.

The Bloomberg Report uses two scenarios to illustrate the potential of a bioproducts industry in the CEI region. The **fuel demand scenario** shows what it will take to replace 10% of forecast gasoline demand by 2020 with next-generation ethanol supply: the intention is to illustrate a reasonable but achievable penetration that does not rely on significant changes to the existing vehicle fleet. The **residue potential scenario** shows how much gasoline could be replaced with next-generation ethanol if only 17. 5% of the available agricultural

residues were used, in other words without changing land use patterns (crop distribution) and current use of residues (for soil protection and animal husbandry).

Just a few numbers will provide the extraordinary dimension of the opportunities involved.

So which are the envisaged outcomes? According to the Report, should all available agricultural residue (i.e.17.5%) be converted into bioenergy, there would be an increase in job creation: (580.000 man-years of employment in the years 2012-2030 and up to 36.000 **permanent jobs**, would mainly be available in rural areas.

Moreover, it would bring about **innovation and economic growth** with an ethanol potential in 2030 of 30 billion litres per year, requiring a total investment of €40 billion in 2012-2030 for a total revenue of +/- €260 billion in the period 2012-2050. A fundamental result would be reached in terms of energy security, moving from high dependence on foreign oil towards a greater **self-sufficiency of transport fuel**.

The scenario outlined by Bloomberg, representing the maximum potential of agricultural residue converted to next generation ethanol – enough to replace 61% of fossil gasoline demand in 2030 - would imply, in terms of **environment protection**, a reduction of CO2 emissions from gasoline by around 40% by 2030.

These targets require important changes, for instance in legislation or in vehicle fleets, but they could be even more favourable as farming efficiency increases! Or by changing some elements in the scenario considered by the Bloomberg Report, based on very conservative assumptions.

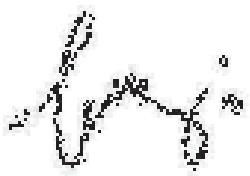
Even though Europe's potential for Next Generation Biofuels and the development other added-value by-products is very strong, there are indeed obstacles to be faced. Investing in this kind of activity today can still be risky, due, inter alia, to policies with unclear incentives. Indeed, all alternative / renewable / eco-friendly energy options need a substantive incentive policy: but the most economical incentive policy seems to be the one still required for Next Generation Biofuels.

On the basis of the afore-mentioned considerations, a first priority for CEI countries and EU policy-makers is the introduction of a wide mandate for Next Generation Biofuels along the lines of US policy covering 2009-2022. Moreover, policy-makers should introduce – even if temporarily in view of a future increase of process efficiency – selective incentives for the collection of biomass through an adequate assistance programme. The Common Agricultural Policy could provide an appropriate instrument, in this regard, considering the final result as a stronger rural development.

In conclusion, the CEI Project on Next Generation Biofuels would aim at creating a portfolio of bankable and more efficient projects for biorefineries using different feedstock, outlining the level of incentives and/or grant components in order to ensure sustainability at a given level of technology. What must be clearly borne in mind is that according to the EU legislation, fuel of non-fossil origin must reach 10% of the total fuel consumption for transportation in the EU by 2020. Moreover, most likely the largest share, if not the entire 10%, will necessarily come from certified Next Generation Biofuels.

CEI Member States are to ask themselves whether they are willing to abandon the market to oil majors or other global players, even though their countries have plenty of the necessary raw material (feedstock). Who would produce this quantity of Next Generation Biofuels? Where? How? Is the CEI region to import biofuels and/or the technology to produce them? Industries in the CEI Region could easily acquire the necessary know-how, but are they willing and ready to mobilise the necessary resources now? The Bloomberg Report also contains a number of country profiles for several CEI Members (Czech Republic, Italy, Hungary, Poland, Romania and Ukraine) to support with substantive data an option in favour of the development of a large domestic market for next generation biofuels and other added value bioproducts.

Waste to Energy: is it only a slogan, or are CEI member countries ready to meet the challenge and exploit the **extraordinary potential of Next Generation Biofuels**?



Giorgio Rosso Cicogna
Alternate Secretary General
Central European Initiative

The CEI Secretariat thanks Novozymes for its support which made this report possible.

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NEXT-GENERATION ETHANOL AND BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

2012

EXECUTIVE SUMMARY

Central and Eastern Europe has a unique opportunity to develop a next-generation ethanol and bioproduct industry in the next two decades. There could be major benefits in terms of job creation, the economy, reduction of greenhouse gases and energy security. Agricultural residue supply can underpin the development of this industry. It is a resource that can be sustainably harvested without altering current agricultural land use patterns. In supplementing food production, this resource can be turned into a variety of bioproducts from transport fuels to chemicals and plastics.

In this study Bloomberg New Energy Finance explores how establishing a next-generation bioproduct value chain in the next two decades could contribute towards building a bio-based economy. We use next-generation ethanol as a proxy for other bioproducts, as the technology is ready for commercial use.

OUTCOMES

Next-generation ethanol can be used as a proxy output for other bioproducts like biobutanol, bio-succinic acid or farnesene.

The study uses two scenarios to illustrate the potential of a bioproduct industry. In the "fuel demand" scenario, we project what it will take to replace 10% of forecast gasoline demand with next-generation ethanol. It is important to note, these volume projections represent an addition to existing first-generation ethanol supply: the intention is to illustrate a reasonable but achievable penetration that does not rely on significant changes to the existing vehicle fleet. In our "residue potential" scenario, we project how much gasoline could be replaced with next-generation ethanol if 17.5% of the available agricultural residues were used. Both scenarios could have various positive knock-on effects for Central and Eastern Europe.

- *Using a sustainable and renewable feedstock*: We project that 66m dry tonnes – 17.5% of overall agricultural residues – could be available in Central and Eastern Europe as bioenergy feedstock today without altering current land use patterns. This figure rises to 75m dry tonnes by 2030. Residues from wheat, barley, rye and maize crops make up the bulk of this resource. These agricultural residues can be harvested with existing techniques and grown again and again each year in perpetuity.
- *Diversifying farmers' income:* Harvesting a sustainable amount of agricultural residue will not interfere with the food chain and provides rural economies with an additional source of revenue that helps to diversify farmers' income.
- *Creating job opportunities:* In the "fuel demand" scenario, 100,000 man-years of employment are generated in the next two decades. If 17.5% of the agricultural residues available are converted into next-generation ethanol then 580,000 man-years of employment could be created from today until 2030. Jobs will come from constructing the necessary biorefining capacity, operating these biorefineries and delivering agricultural residues to these plants.
- *Lowering crude imports bill:* In the "fuel demand" scenario, Central and Eastern Europe could produce 4.7bn litres of next-generation ethanol annually by 2030 – using only 3% of its agricultural residues. Under the residue potential scenario conditions, the region could produce up to 29.8bn litres each year: enough to replace over 60% of its projected gasoline demand by 2030, which would provide an important step towards energy independence.
- *Generating new revenue:* Central and Eastern Europe has the potential to generate revenues of EUR 31bn between today and 2050 in the fuel demand scenario, which results from producing next-generation ethanol when assuming oil is at $100 per barrel. Revenues in the residue potential scenario could climb to approximately EUR 200bn in the same period.

Central and Eastern Europe could replace 10% of its gasoline demand in 2030 by converting 3% of its agricultural residues to next-generation ethanol.

- *Reducing greenhouse gas emissions:* Up to 44 million tonnes of greenhouse gases would be avoided between today and 2030 in the "fuel demand" scenario: equivalent to not using 240,000 railcars of coal. These savings rise to 45% of avoided greenhouse gas emissions in the residue potential scenario.
- *Towards a bio-based economy*: the development of a bioproduct industry in rural areas could constitute the first step away from a petroleum dependent economy. It will lead towards a more diversified future where renewable agricultural residues become a significant feedstock for both fuel and chemical production.

Figure 1: Key metrics for Central and Eastern Europe

	FUEL DEMAND	RESIDUE POTENTIAL
JOB OPPORTUNITIES, 2011-30 (man-years of employment)	100,000	580,000
NEXT-GENERATION ETHANOL POTENTIAL, 2030 (billion litres per annum)	4.7	29.8
REVENUE, 2011-2050 (EUR bn)	31.2	197.2
POTENTIAL GHG SAVING, 2011–2030 (mtCO2e)	44	278
MAJOR RESIDUE SOURCES	wheat, maize, barley	

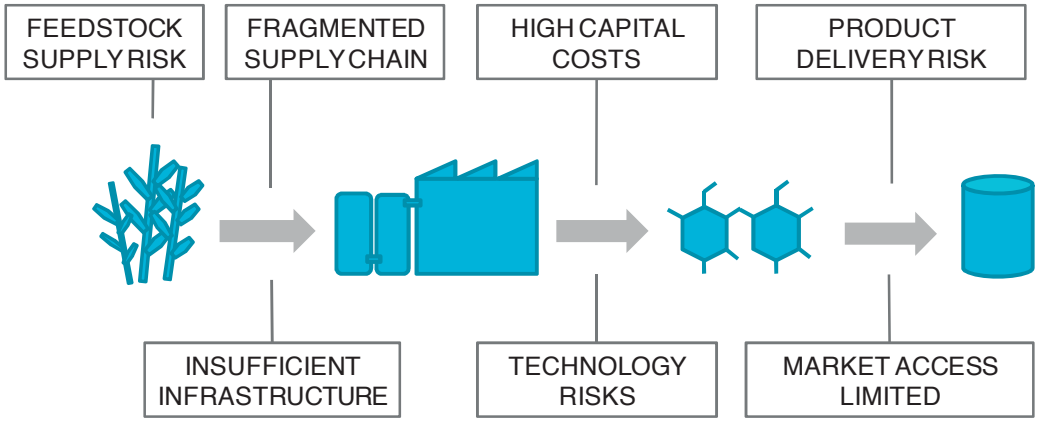
Source: Bloomberg New Energy Finance Note: The 'fuel demand' scenario assumes 10% of gasoline demand will be met with next-generation ethanol by 2030, essentially in addition to existing first-generation ethanol supply. The 'residue potential' scenario assumes all agricultural residues available for bioproducts are converted to next-generation ethanol for local consumption. We use next-generation ethanol – via an enzymatic hydrolysis technology – as a proxy for all other bioproducts. "Man-years of employment" represents one man-year of fulltime employment. We assume plant costs will be EUR 1.12 ($1.50) per litre of annual capacity and revenues will be generated from oil at $100 barrel. Following the EU-27 Renewable Energy Directive, the study assumes next-generation ethanol reduces GHG emissions by 80%.

BARRIERS AND POLICY SUGGESTIONS

There are however barriers preventing Central and Eastern Europe from unlocking the value of this agricultural residue resource. Bloomberg New Energy Finance has outlined some actions that could be taken by policymakers and other stakeholders to address risks and unlock this potential.

- *Feedstock supply risk*: Short-term incentives for farmers to collect agricultural residue could facilitate the development of a next-generation ethanol value chain.
- *Fragmented supply chain*: Helping to create a framework for large agricultural residue suppliers, that can aggregate different feedstock streams, will reduce some supply risk and instil greater confidence in the eyes of the capital providers.
- *Insufficient infrastructure:* Investment in rural roads to fields and orchards will facilitate efficient agricultural residue transport and reduce costs.
- *High capital costs*: Government support in the form of loan guaranties and R&D grants is vital to reduce the capital costs associated with constructing next-generation biorefineries.
- *Technology risks*: Incentives must be locked in for the lifetime of the plant, thus giving a premium to the first-movers. Investors will then become more comfortable with the project risks, which will mitigate any wait-and-see strategies.
- *Product delivery risk*: It is imperative to provide stable demand to attract capital to the farming and next-generation bioproduct sectors. It will also give the financial community a long-term market, which will considerably ease raising debt and equity capital.
- *Market access limitations*: Allow ethanol, both first and next-generation, to replace more than 10% of the fossil gasoline supply, which will help remove a "blend wall" that is impeding industry growth, promote flexible fuel vehicles and encourage long-term offtake agreements.

Figure 2: Risks along the next-generation bioproduct value chain



Source: Bloomberg New Energy Finance

STUDY CONDITIONS

Bloomberg New Energy Finance's study is designed to show how much agricultural residue will be available between now and 2030 and how this could be used for bioproducts, under certain conditions.

- It assumes that 75% of total agricultural residues will be returned to the field to protect soil quality; while 7.5% will go towards biopower production and animal husbandry; with the remaining 17.5% being made available for bioproduct conversion, under the appropriate economic circumstances.
- Agricultural land-use patterns have deliberately been held constant up to 2030 to negate any indirect land-use change concerns. Energy crops have likewise been excluded. One of the

primary intentions of the study is to show what resources are available with little or no ecological change.

- EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%. While overall transport fuel demand is rising, gasoline demand in Central and Eastern Europe is declining. We assume, however, that gasoline market share will not fall below 20% compared to diesel fuels.
- Bloomberg New Energy Finance was commissioned by Novozymes and the Central European Initiative Secretariat to research and write this report. The content and conclusions are those of Bloomberg New Energy Finance alone, based on its own independent analysis.
- The scenarios assume that the industry responds very rapidly in building up the necessary capacity in response to the opportunity of a next-generation bioproducts industry and any delay would defer revenues into future years. The study is a representation of how a next-generation bioproduct could evolve in the next two decades, but it is not an industry development forecast.

ABOUT US

Subscription details

Bioenergy,

sales@newenergyfinance.com

Contact details

Harry Boyle Manager, Bioenergy	hboyle3@bloomberg.net +44 20 3216 4365
David Hostert Analyst, Bioenergy	dhostert@bloomberg.net +44 20 3216 4352
Roberto Rodriguez Labastida Senior Analyst, Bioenergy	rrodriguezla@bloomberg.net +44 20 3216 4098

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NEXT-GENERATION ETHANOL AND BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

2012

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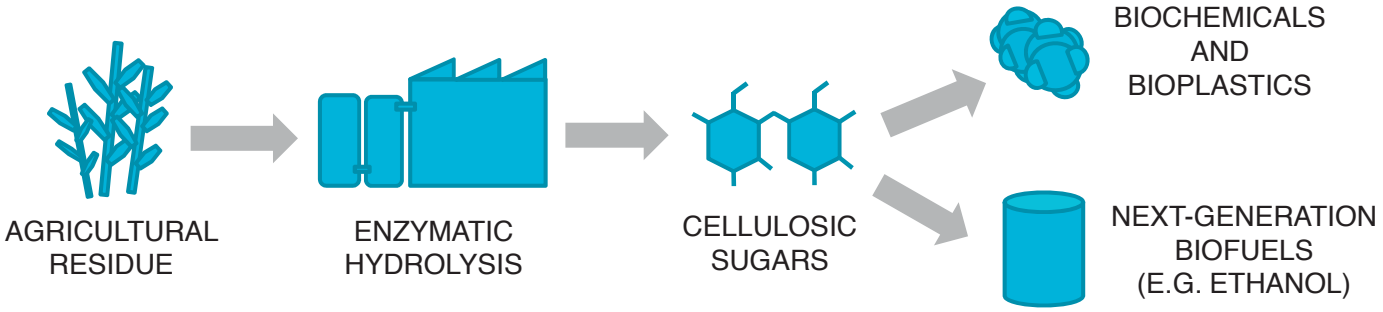
NEXT-GENERATION ETHANOL AND BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

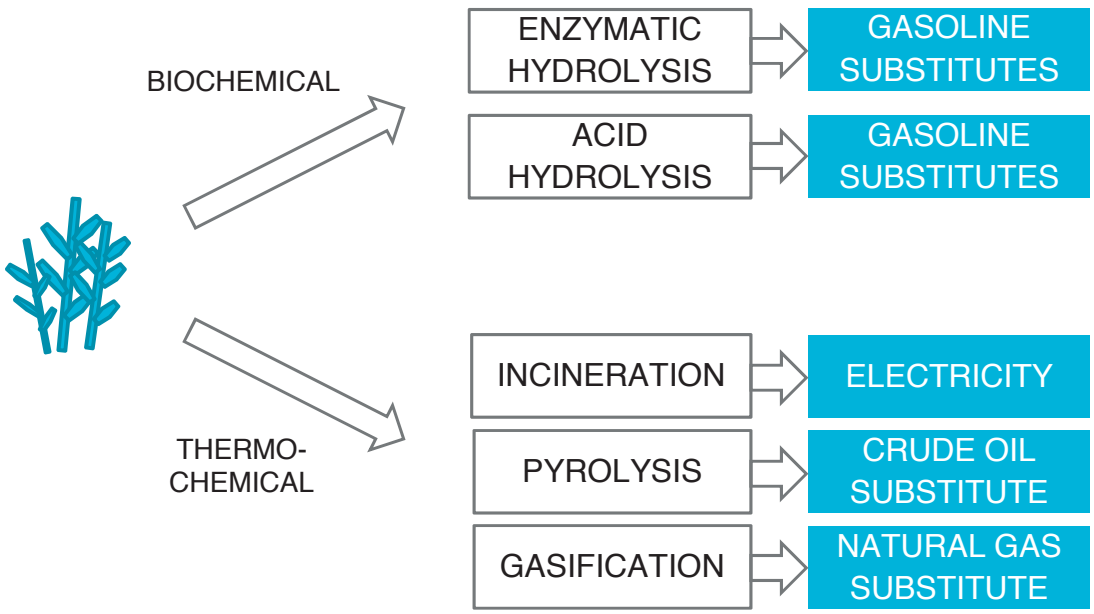
THE ROLE OF AGRICULTURAL RESIDUES IN A NEXT-GENERATION BIOPRODUCT INDUSTRY



Enzymatic hydrolysis is the most developed technology in producing cellulosic sugars. In the coming decades these sugars could be used to produce a variety of bioproducts. In this study, we assume next-generation ethanol will be the primary output; however, ethanol can be used as a proxy output for other bioproducts like biobutanol, bio-succinic acid or farnesene.

Source: Bloomberg New Energy Finance

NEXT-GENERATION BIOPRODUCT PATHWAYS FROM AGRICULTURAL RESIDUES



Source: Bloomberg New Energy Finance

CENTRAL AND EASTERN EUROPEAN COUNTRIES COVERED

Source: Bloomberg New Energy Finance

SCENARIO ASSUMPTIONS FOR NEXT-GENERATION ETHANOL, 2011–2030

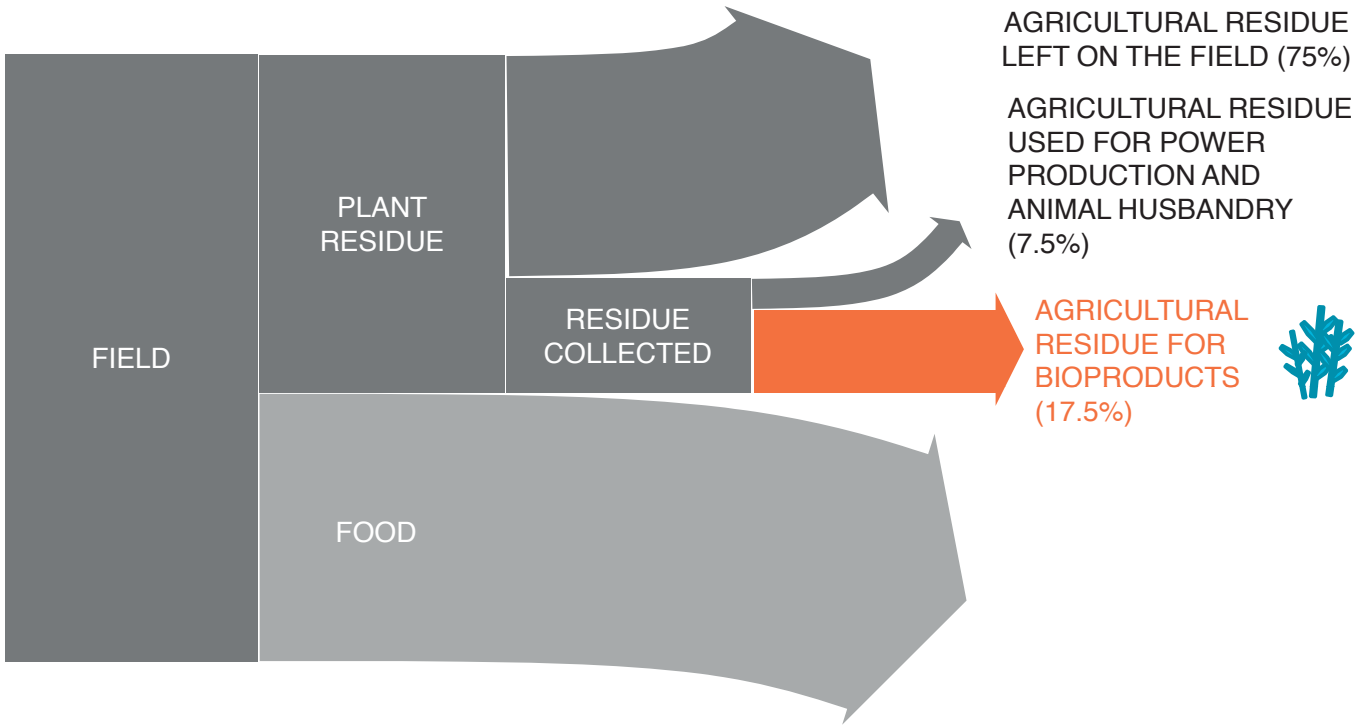
The study uses two scenarios to illustrate the potential of next-generation ethanol to replace gasoline demand in Central and Eastern Europe.

In the "Fuel demand" scenario we have calculated what it will take to replace 10% of gasoline demand with next-generation ethanol. These volume projections represent an addition to existing first-generation ethanol supply. The scenario is designed to illustrate a reasonable but achievable ethanol penetration that would not rely on significant changes to the vehicle fleet.

In the "Residue potential" scenario, we have projected how much gasoline could be replaced with next-generation ethanol if all the available agricultural residues were converted into next-generation ethanol.

NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

FROM THE AGRICULTURAL FIELD TO THE BIOREFINERY



Note: Using historical national yield data and crop-specific food-to-residue ratios ("harvest indexes") we have calculated agricultural residue availability for bioenergy from today until 2030 for the following crops: maize, wheat, sugarcane, rice, soybeans, sugar beet, cotton, sorghum, barley, beans, rapeseed, cassava, oats, tomatoes, sunflower, potatoes, apples, grapes, safflower, nuts, peas, palm, rye, olives, and flaxseed.

Source: Bloomberg New Energy Finance

AGRICULTURAL RESIDUE SUSTAINABILITY ASSUMPTIONS

LAND USE CHANGE

In this study we assume land use patterns will not change before 2030; existing activities are not altered nor is new agricultural land added.

HUMUS BALANCE

We assume a maximum of 17.5% is potentially available for bioenergy production; it is a conservative estimate which deliberately steers clear of removing a high level of nutrients.

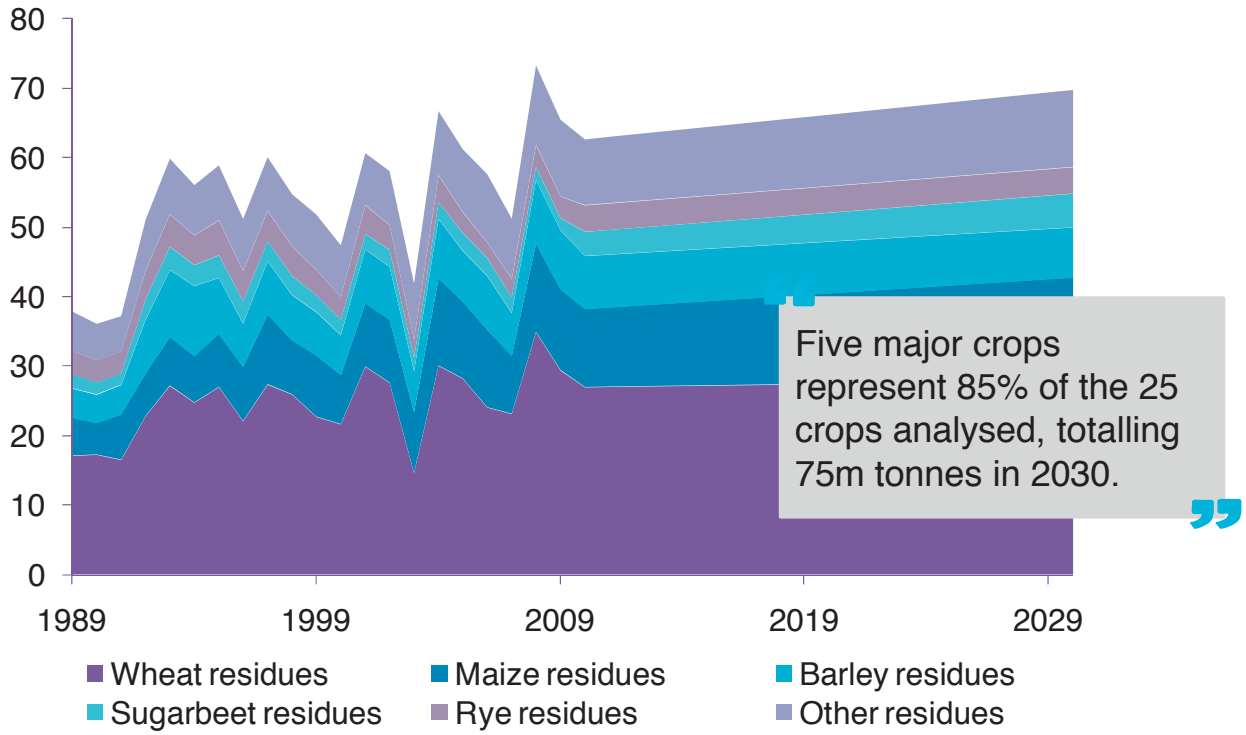
YIELD GROWTH

Our methodology assumes stable yield growth rates, based on historic data between 1989 and 2010.

ENERGY CROPS

We have excluded energy crops and project there will be no change in existing soil productivity. Growing energy crops on marginal land will however increase total biomass availability.

CENTRAL AND EASTERN EUROPE AGRICULTURAL RESIDUE AVAILABILITY, 1989–2030 (MILLION DRY TONNES)

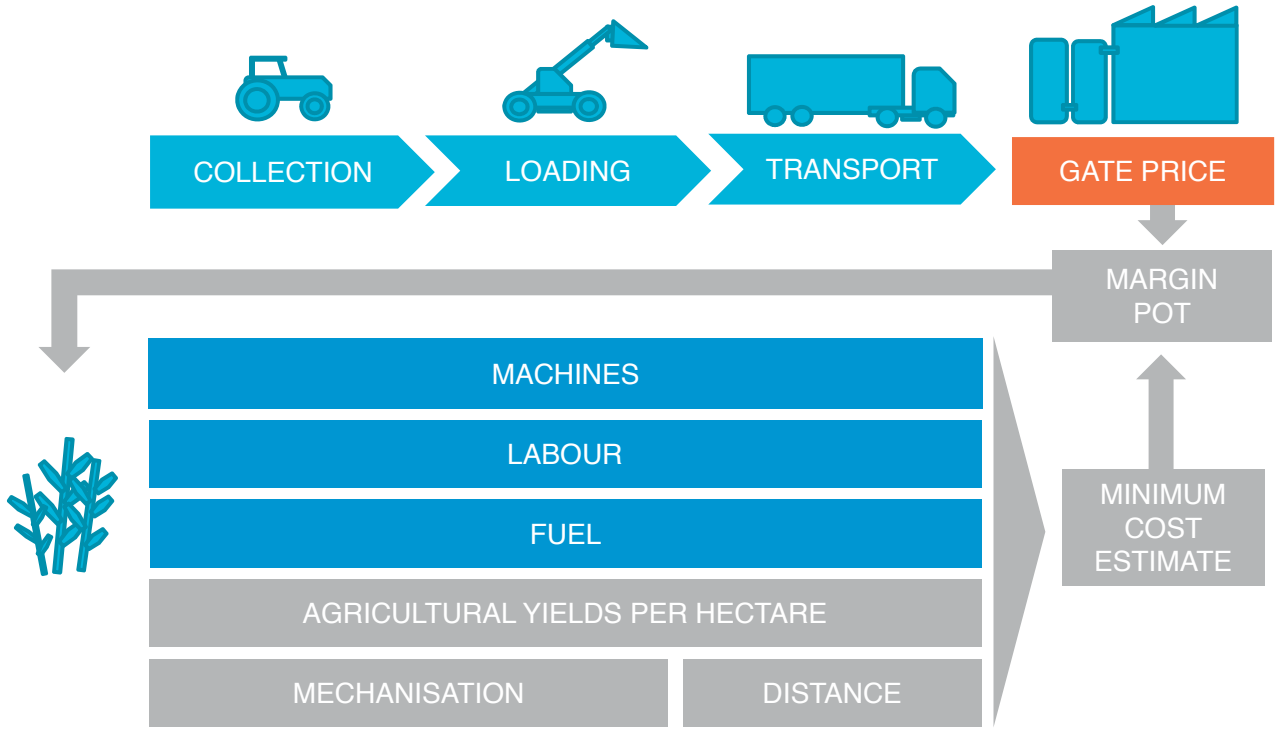


Note: Residue projections are based on food yield projections. "Other residues" represents residues from the following crops: sorghum, beans, rapeseed, cassava, oats, tomatoes, sunflower, potatoes, apples, grapes, safflower, nuts, peas, palm, olives, and flaxseed.

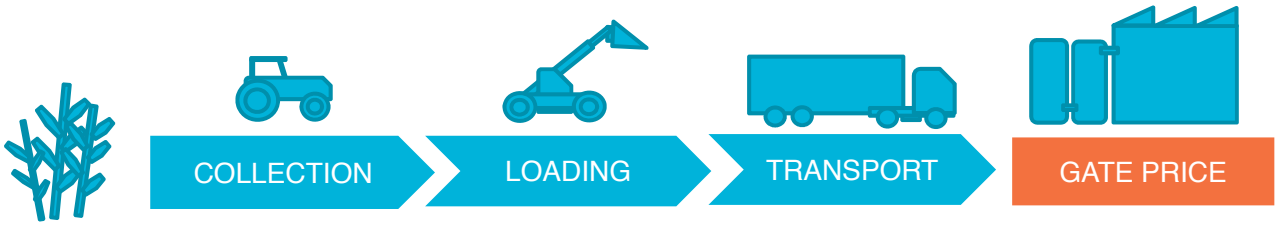
Source: Bloomberg New Energy Finance, FAO

NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

THE DECISION TO DELIVER AGRICULTURAL RESIDUE IS TAKEN AT A FARM LEVEL: GATE PRICES MATTER

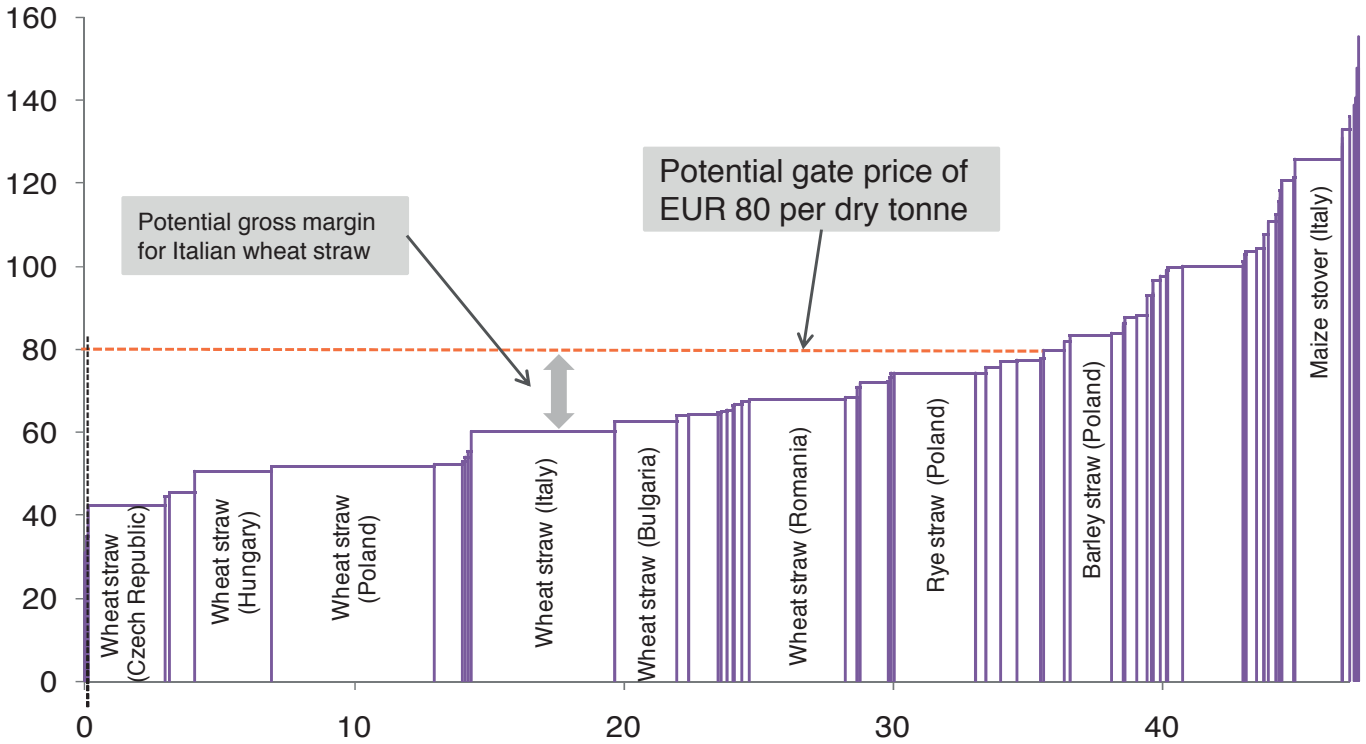


SUPPLY CHAINS, GATE PRICES AND MARGINS



> Different national costs and efficiencies in the supply chain affect delivered costs of agricultural residue. This determines both feedstock gate prices and gross margins across the supply chain.

SELECT COUNTRY AGRICULTURAL RESIDUE SUPPLY CURVE, 2011 (EUR/TONNE; MILLION DRY TONNES)



Note: Supply costs represent the sum of all the collecting, transporting and loading agricultural residue costs; although, the select country agricultural residues potential amounts to approximately 52m dry tonnes we had to limit our x-axis supply cost curve to 47m dry tonnes. Countries covered are Austria, Bulgaria, Czech Republic, Hungary, Italy, Poland, Romania, and Slovakia.

Source: Bloomberg New Energy Finance

NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

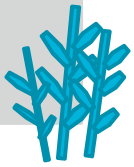
NEXT-GENERATION ETHANOL SCENARIO ASSUMPTIONS, 2011–2030

"FUEL DEMAND" SCENARIO

Using our estimates for transport fuel demand, we have calculated what it will take to replace 10% of gasoline demand with next-generation ethanol. These volume projections represent an addition to existing first-generation ethanol supply. The scenario is designed to illustrate a reasonable but achievable ethanol penetration that would not rely on significant changes to the vehicle fleet.

"RESIDUE POTENTIAL" SCENARIO

Using our fuel demand estimates again, we have projected how much domestic gasoline demand could be replaced with next-generation ethanol if all the available agricultural residues were converted into next-generation ethanol.



Note: Non-flex-fuel vehicles in Brazil already use gasoline with 20%+ ethanol blends.

Source: Bloomberg New Energy Finance

ECONOMIC ASSUMPTIONS

We assume plant costs for a next-generation ethanol biorefinery will be approximately $1.50 (EUR 1.12) per litre of annual capacity, derived from capital cost information from a proprietary database.

We have used an energy equivalent ethanol price of $0.44 (EUR 0.33) per litre, which represents oil at $100 (EUR 75) per barrel.

Following the EU-27 Renewable Energy Directive, the study assumes next-generation ethanol – using an enzymatic hydrolysis technology – reduces GHG emissions by minimum 80%.

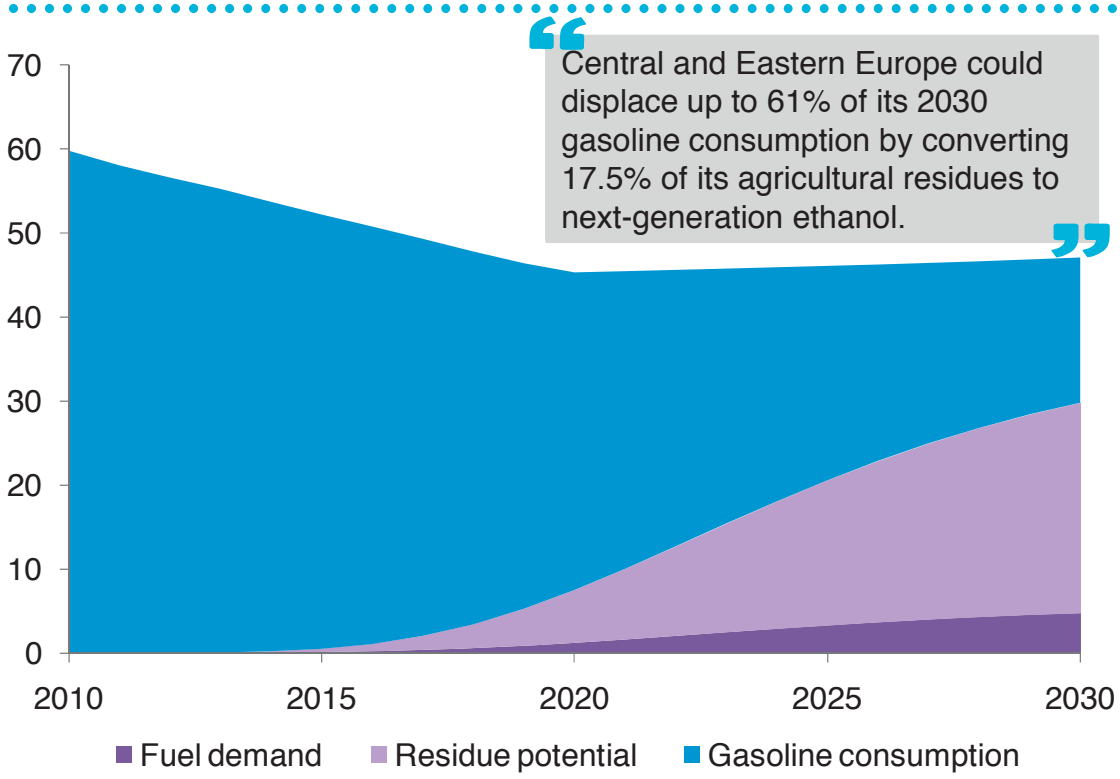
NEXT-GENERATION ETHANOL METHODOLOGY

We project that 75m dry tonnes – 17.5% of overall agricultural residues – could be available for next-generation ethanol production in 2030. We estimate ethanol yields, per dry tonne of agricultural residue, will increase from 250 litres today to 400 litres by 2030.

In the "fuel demand" scenario, Central and Eastern Europe could produce 4.7bn litres of next-generation ethanol annually in 2030 if 3% of the agricultural residues were to be converted.

In the "residue potential" scenario, Central and Eastern Europe region could produce up to 29.8bn litres of next-generation ethanol annually in 2030 if 17.5% of the agricultural residues were converted.

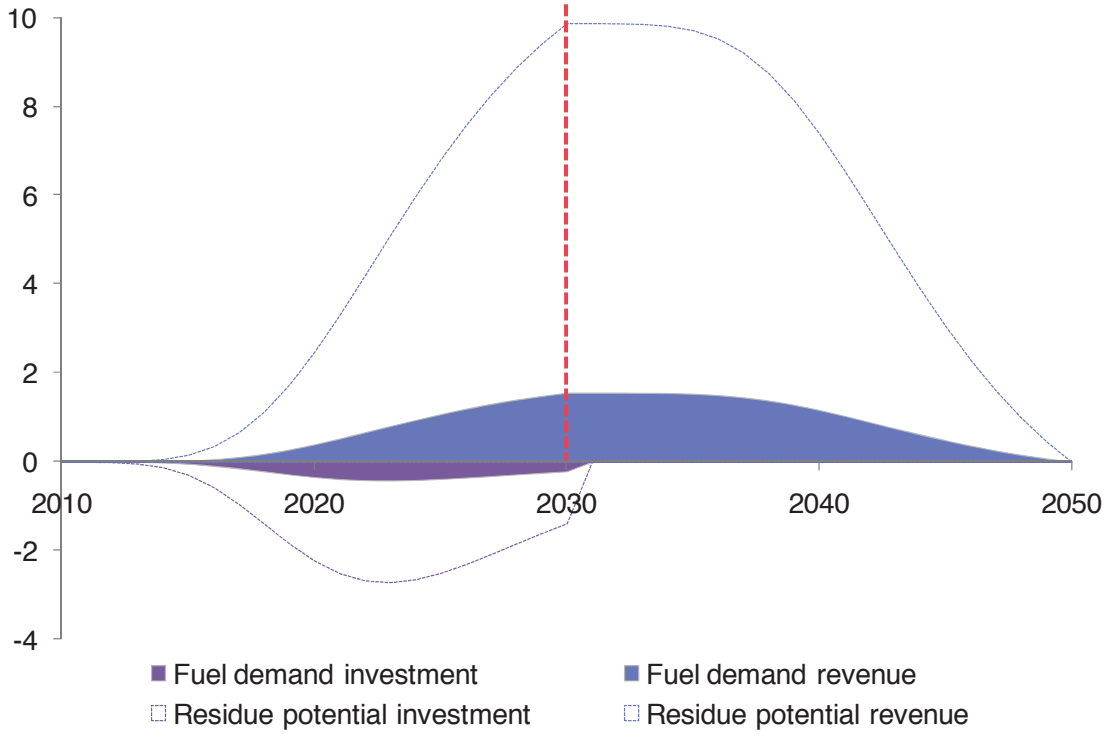
CENTRAL AND EASTERN EUROPE NEXT-GENERATION ETHANOL POTENTIAL, 2010-30 (BN LITRES)



Note: Gasoline expressed in ethanol equivalent terms. While overall transport fuel demand is rising, gasoline demand in Central and Eastern Europe is declining. We assume, however, that the gasoline market share will not fall below 20%.

Source: Bloomberg New Energy Finance

REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)

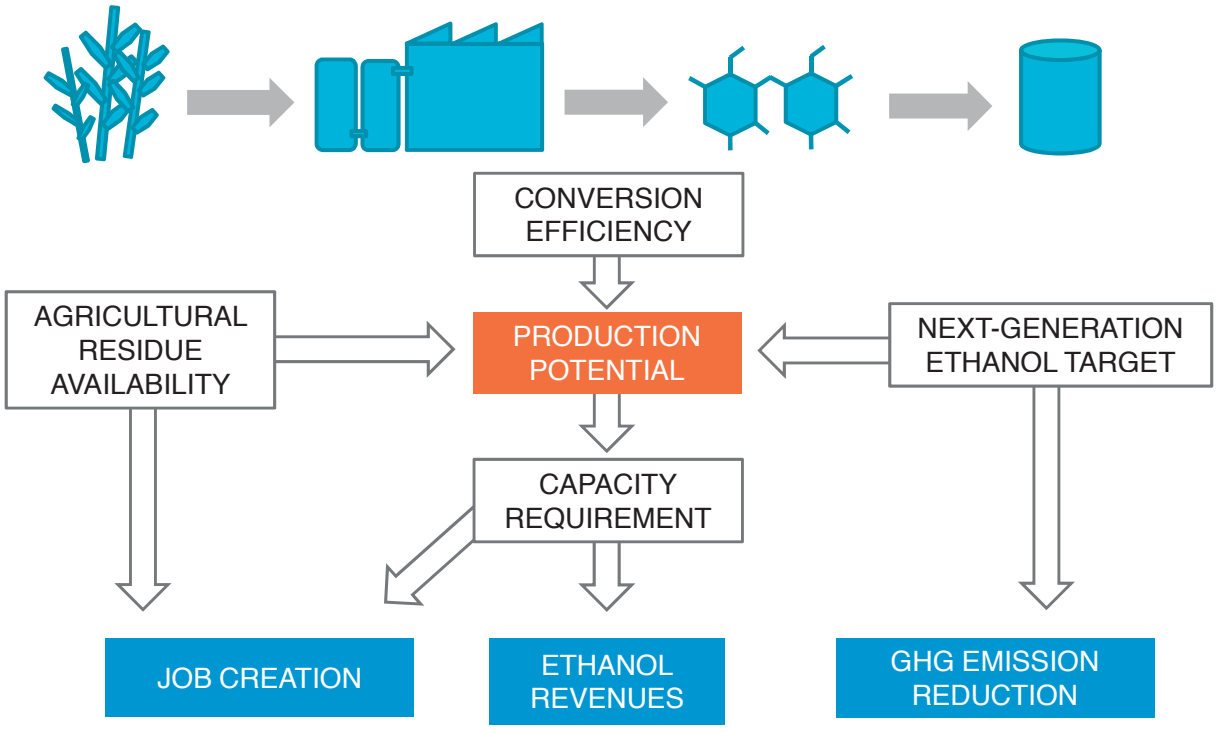


Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

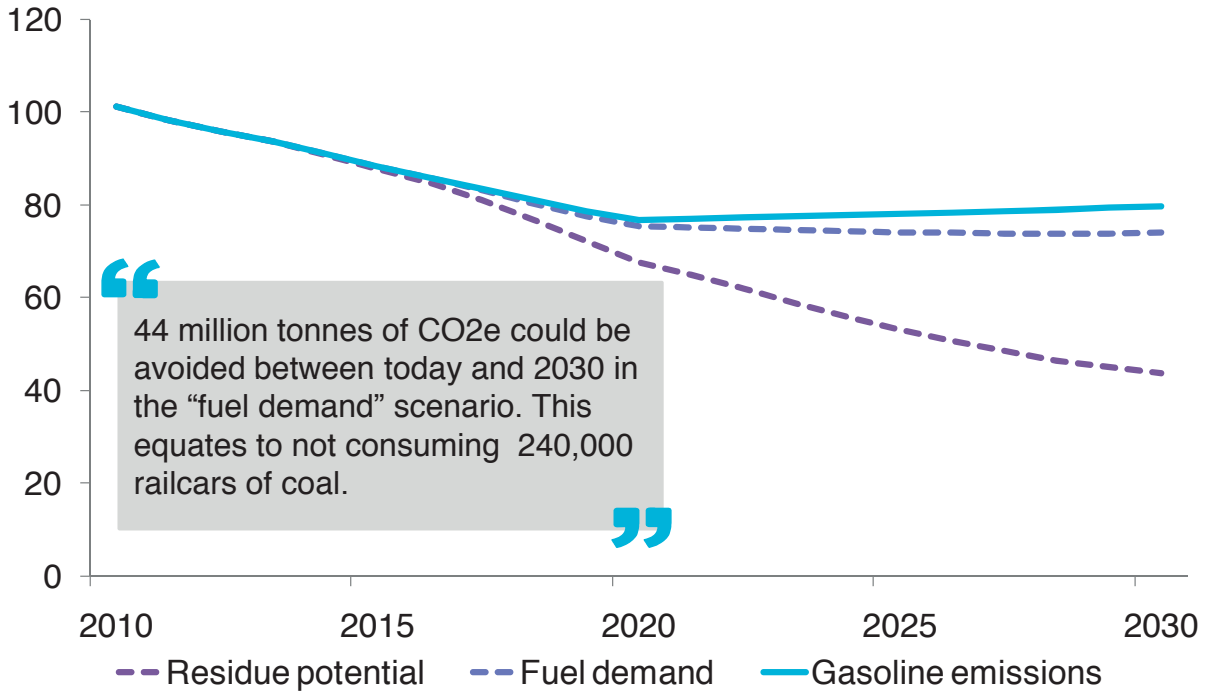
BENEFITS ACROSS THE NEXT-GENERATION ETHANOL VALUE CHAIN



Note: This study uses next-generation ethanol – produced via enzymatic hydrolysis – as an example bioproduct.

Source: Bloomberg New Energy Finance

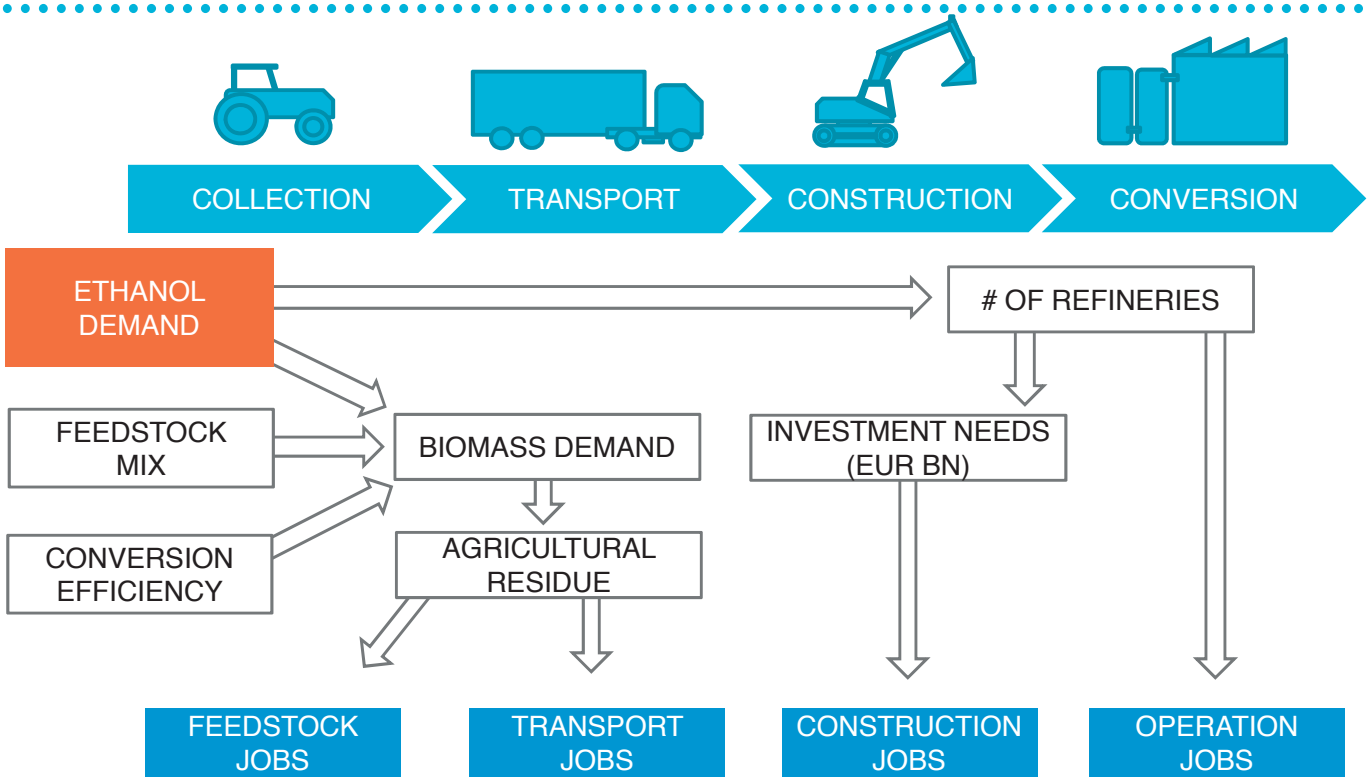
NEXT-GENERATION ETHANOL GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%. While overall transport fuel demand is rising, gasoline demand in Central and Eastern Europe is declining. We assume, however, that gasoline market share will not fall below 20%.

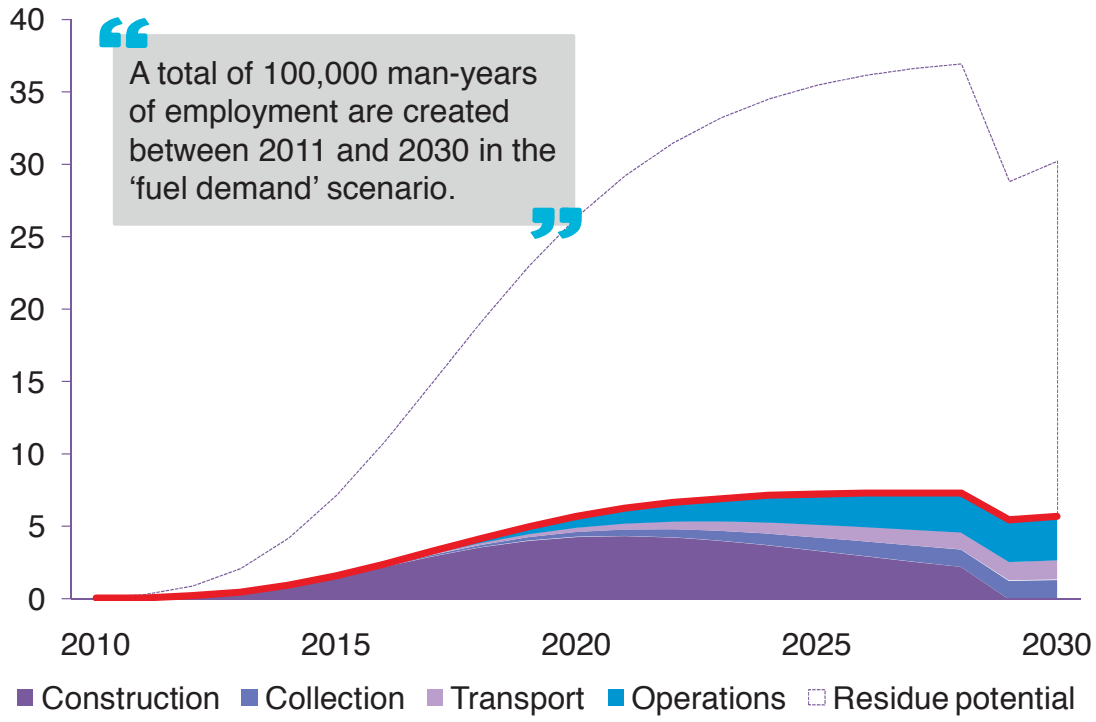
Source: Bloomberg New Energy Finance

JOB CREATION ACROSS THE NEXT-GENERATION ETHANOL SUPPLY CHAIN



Source: Bloomberg New Energy Finance

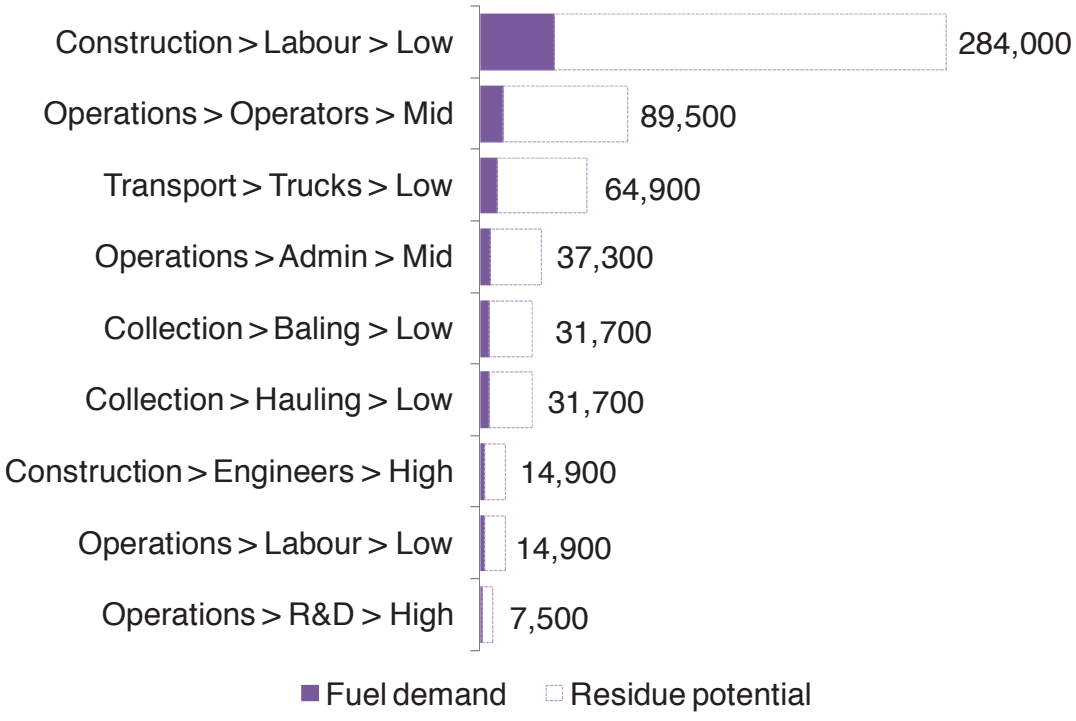
JOB CREATION IN CENTRAL AND EASTERN EUROPE, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance
Danish Construction Association

JOB CREATION BY SKILLS IN CENTRAL AND EASTERN EUROPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)

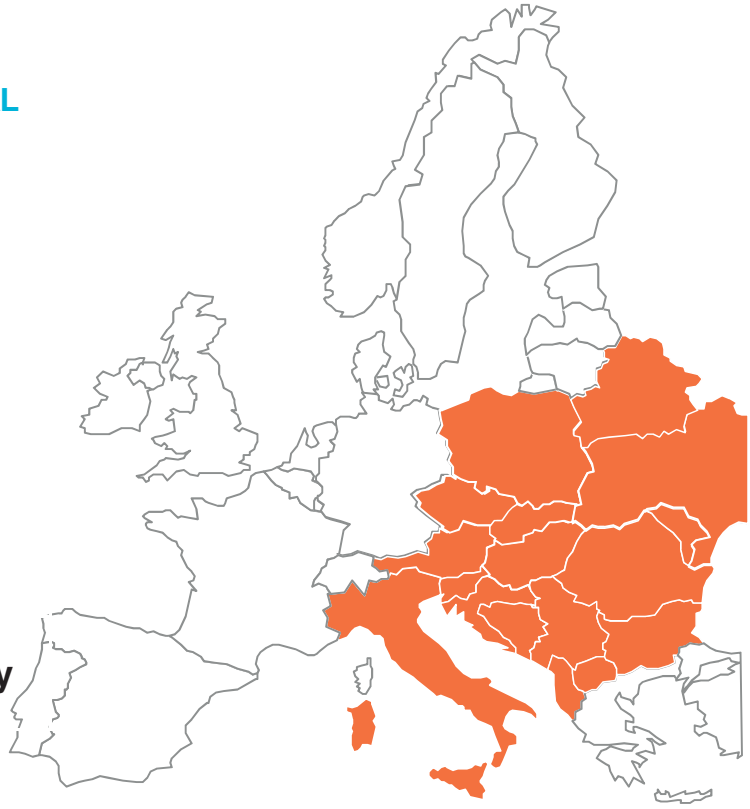


Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance
Danish Construction Association

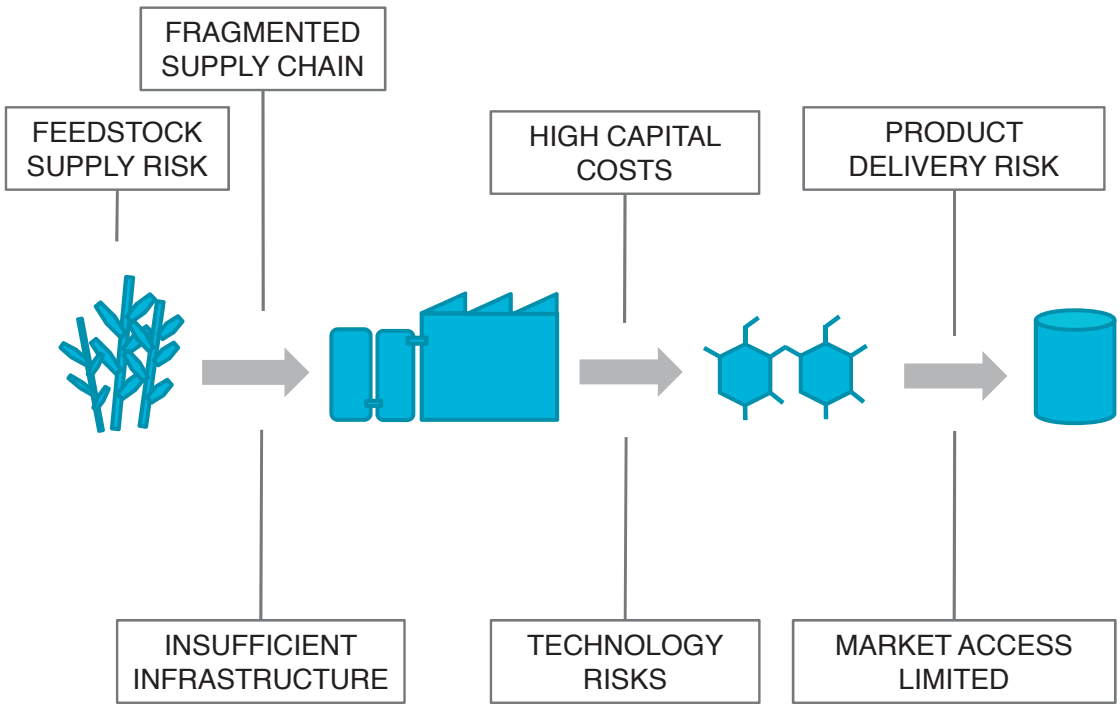
CENTRAL AND EASTERN EUROPE KEY METRICS

	FUEL DEMAND	RESIDUE POTENTIAL
JOB OPPORTUNITIES, 2011-30 (man-years of employment)	100,000	580,000
NEXT-GENERATION ETHANOL POTENTIAL, 2030 (billion litres per annum)	4.7	29.8
REVENUE, 2011-2050 (EUR bn)	31.2	197.2
POTENTIAL GHG SAVING, 2011–2030 ($mtCO_2e$)	44	278
MAJOR RESIDUE SOURCES	Wheat, maize, barley	



NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

RISKS ALONG THE NEXT-GENERATION ETHANOL VALUE CHAIN



Source: Bloomberg New Energy Finance

NEXT-GENERATION ETHANOL INDUSTRY CHALLENGES

	Collection	Transport	Biorefinery	Distribution
Socio-economic	Food versus fuel and sustainability debates confuse public image and understanding of next-generation fuels			
Infrastructure	No financial incentives for famers to collect agricultural residues		Uncertain markets for next generation fuels	
Capital	Absence of machinery investment	Insufficient infrastructure	Capital availability problems	
Regulatory	Farmer and developer interests not aligned			Limits on blending
Market access	Currently no next-generation biofuels value chain			

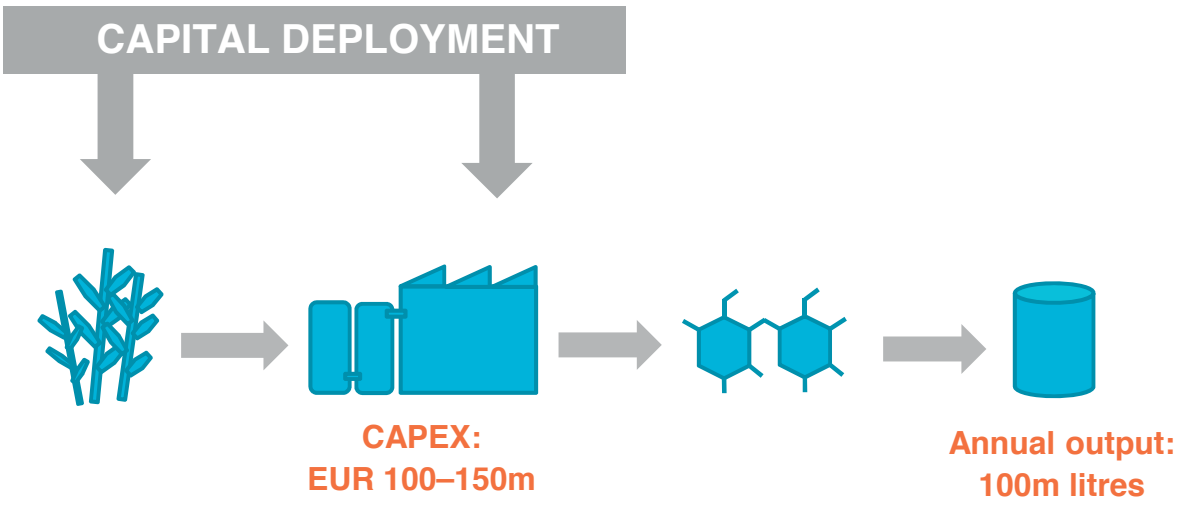
Source: Bloomberg New Energy Finance

NEXT-GENERATION BIOPRODUCTS: OPPORTUNITIES IN CENTRAL AND EASTERN EUROPE

NEXT-GENERATION ETHANOL INDUSTRY REGULATORY TOOLS

Feedstock	Conversion	Blending & distribution
Agricultural residue collection incentives	Investment incentives	Next-generation ethanol blending and non-compliance penalties
Facilitating access to public and private capital in infrastructure		Ethanol price control and consumption incentives
R&D feedstock grants	Biorefinery construction grants and loan guaranties	Market access and incentives to remove infrastructure bottlenecks

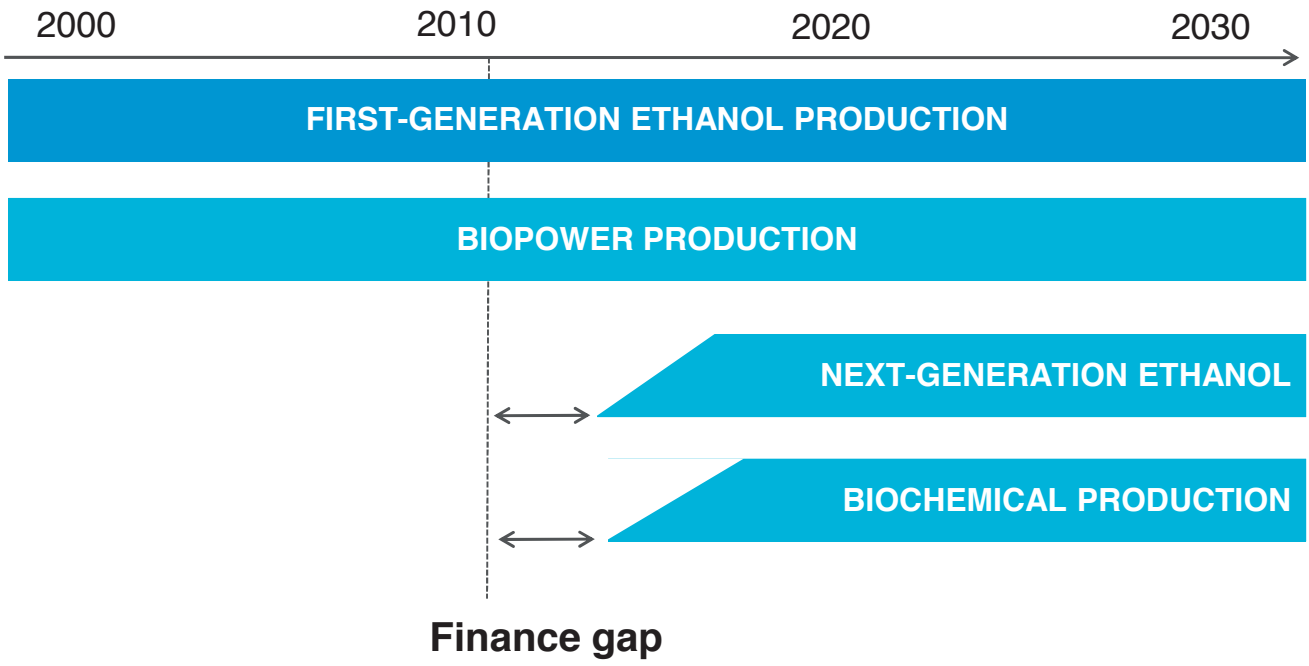
BUILDING THE NEXT-GENERATION ETHANOL VALUE CHAIN



Note: Next-generation biorefinery construction costs – or CAPEX – are based on current estimates for a commercial scale next-generation ethanol facility using enzymatic hydrolysis.

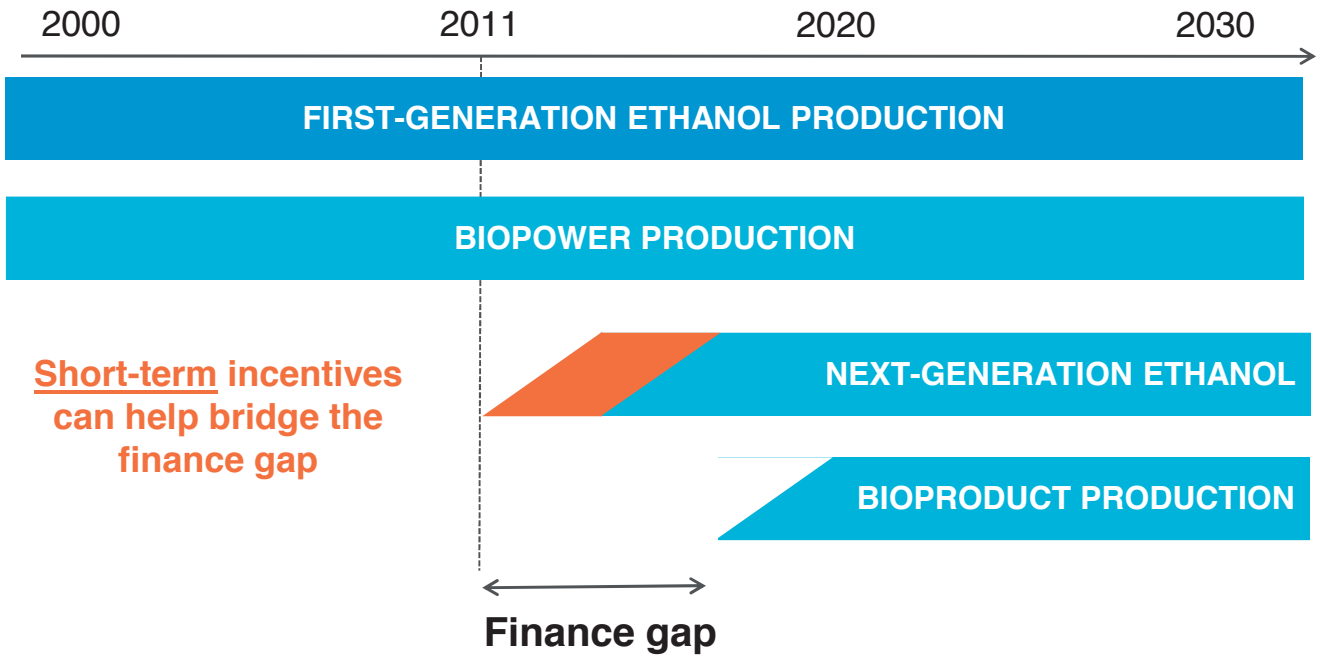
Source: Bloomberg New Energy Finance

BIOPRODUCT INDUSTRY DEVELOPMENT, 2010-2030



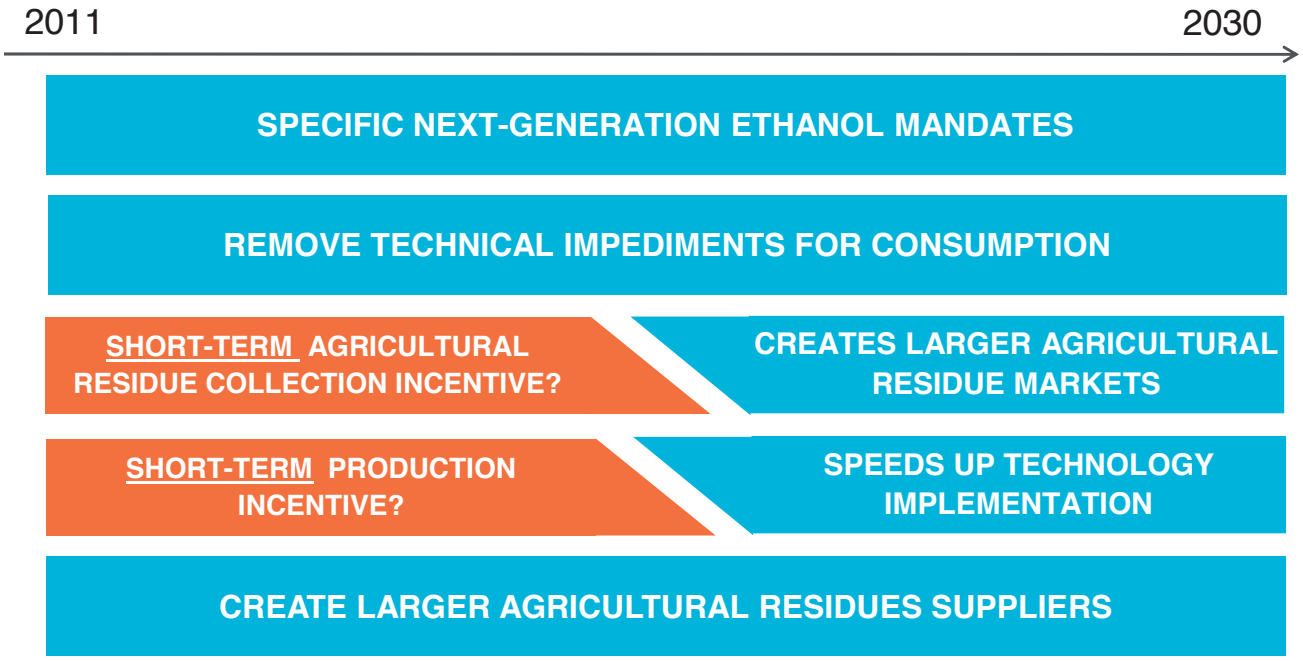
Source: Bloomberg New Energy Finance

"BIG THEME" BIOPRODUCT INDUSTRY DEVELOPMENT, 2010-2030



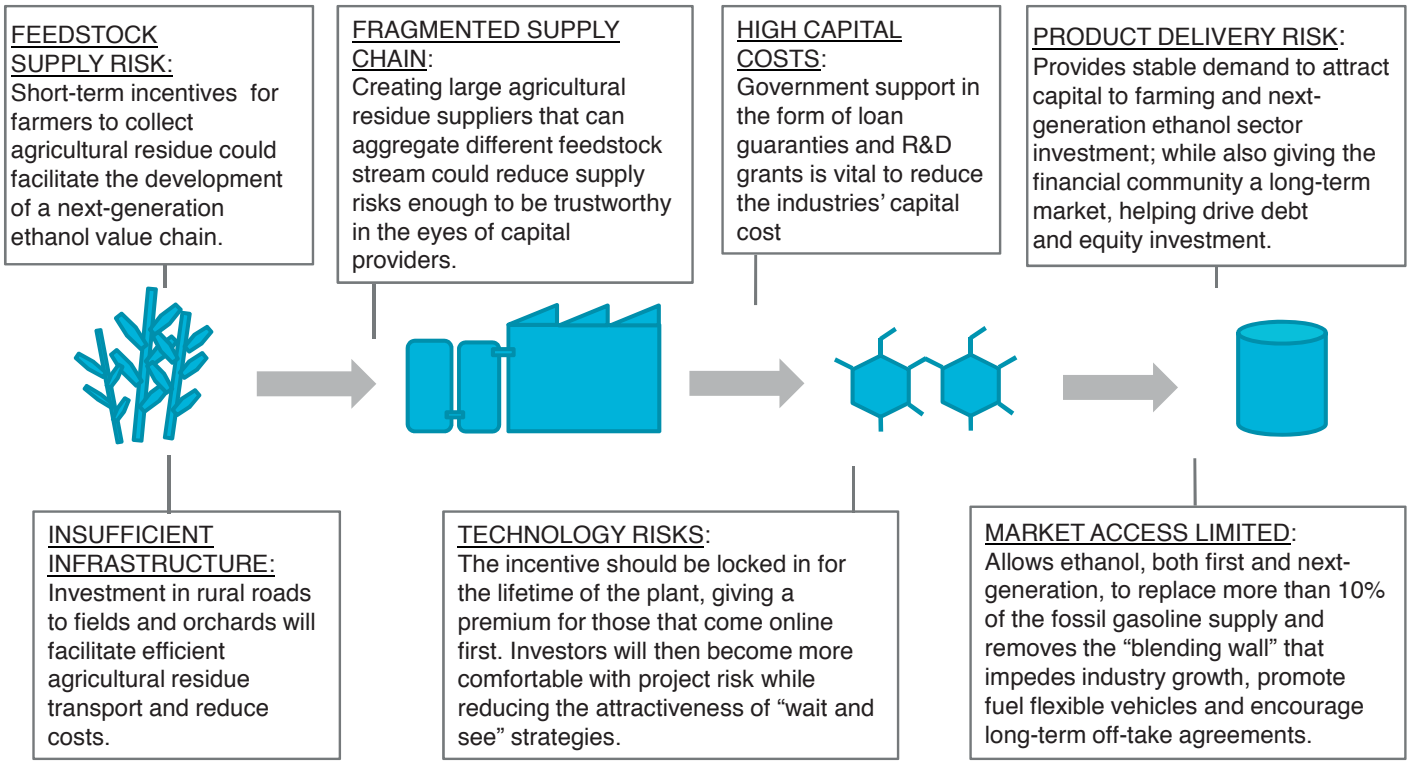
Source: Bloomberg New Energy Finance

"BIG THEME" BIOPRODUCT INDUSTRY DEVELOPMENT, 2011–2030



Source: Bloomberg New Energy Finance

POLICY SUGGESTIONS FOR THE NEXT-GENERATION ETHANOL VALUE CHAIN



Source: Bloomberg New Energy Finance

COUNTRY PROFILES

1. Czech Republic
2. Italy
3. Hungary
4. Poland
5. Romania
6. Ukraine

CZECH REPUBLIC KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Wheat, barley, sugar beet

JOB OPPORTUNITIES, 2011-30

9,700 man-years

ETHANOL POTENTIAL, 2030

500 MLPA

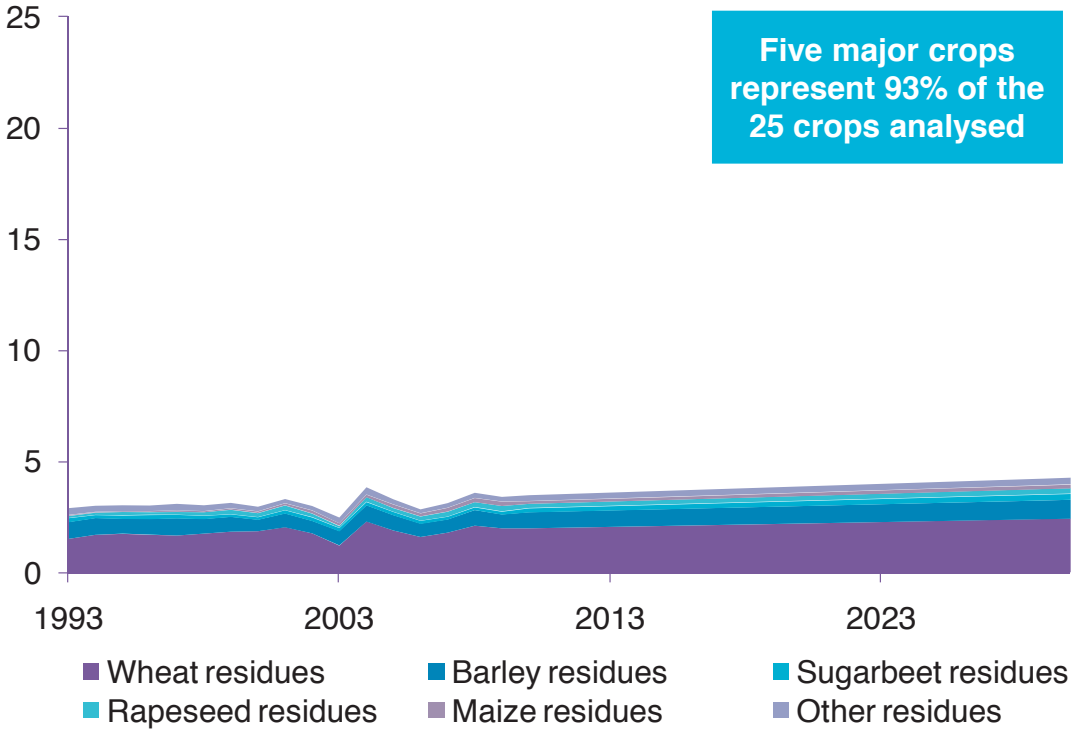
REVENUE, 2011–2050

EUR 3.3bn

POTENTIAL GHG SAVING, 2011-30

4.6 mtCO2

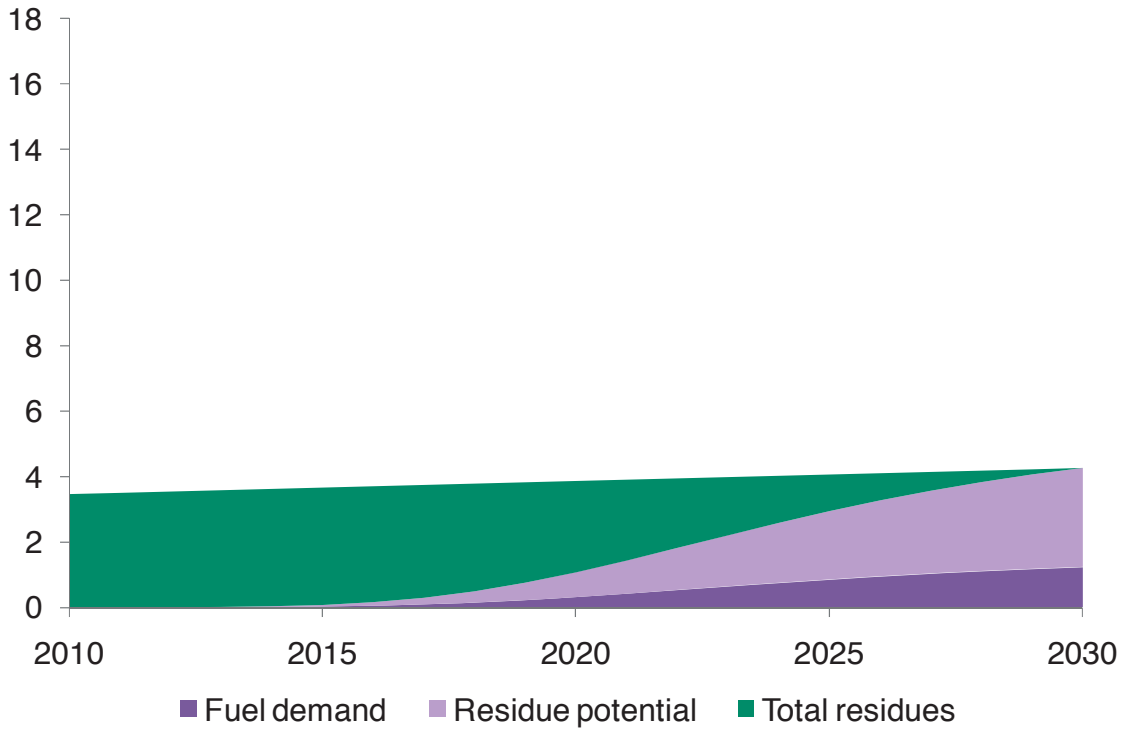
CZECH REPUBLIC AGRICULTURAL RESIDUE AVAILABILITY, 1989—2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

Source: Bloomberg New Energy Finance, FAO

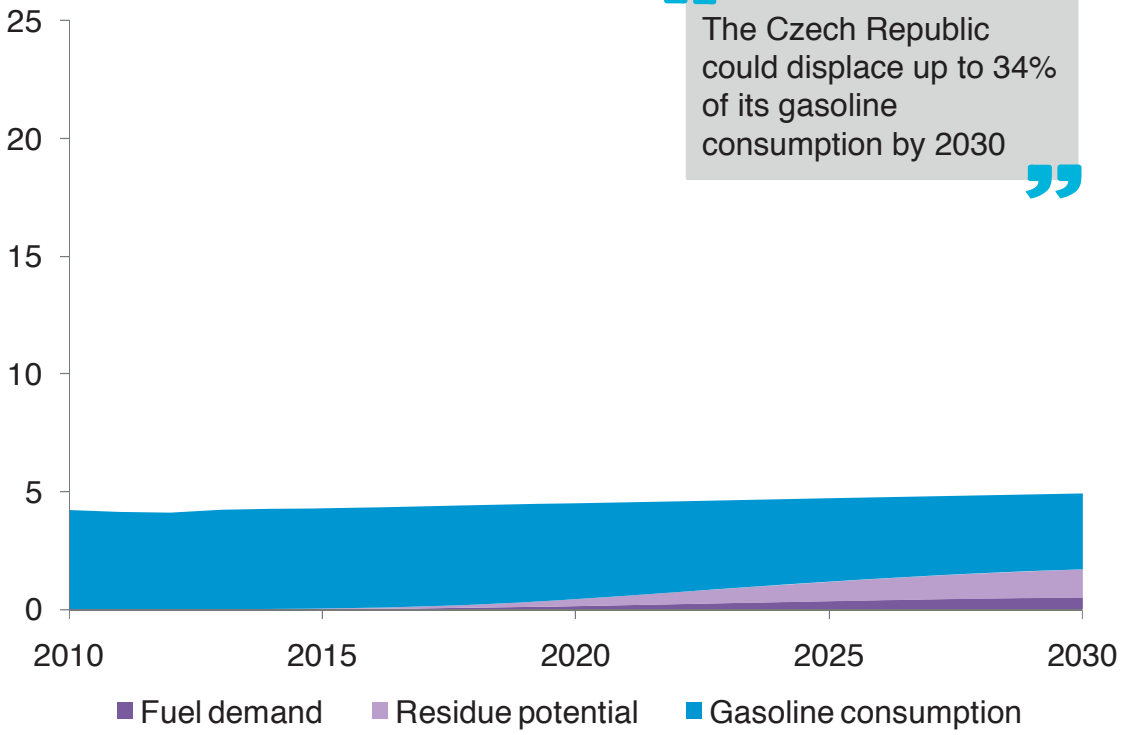
CZECH REPUBLIC AGRICULTURAL RESIDUES, 2010-30 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

CZECH REPUBLIC NEXT-GENERATION ETHANOL POTENTIAL, 2010-2030 (BN LITRES)

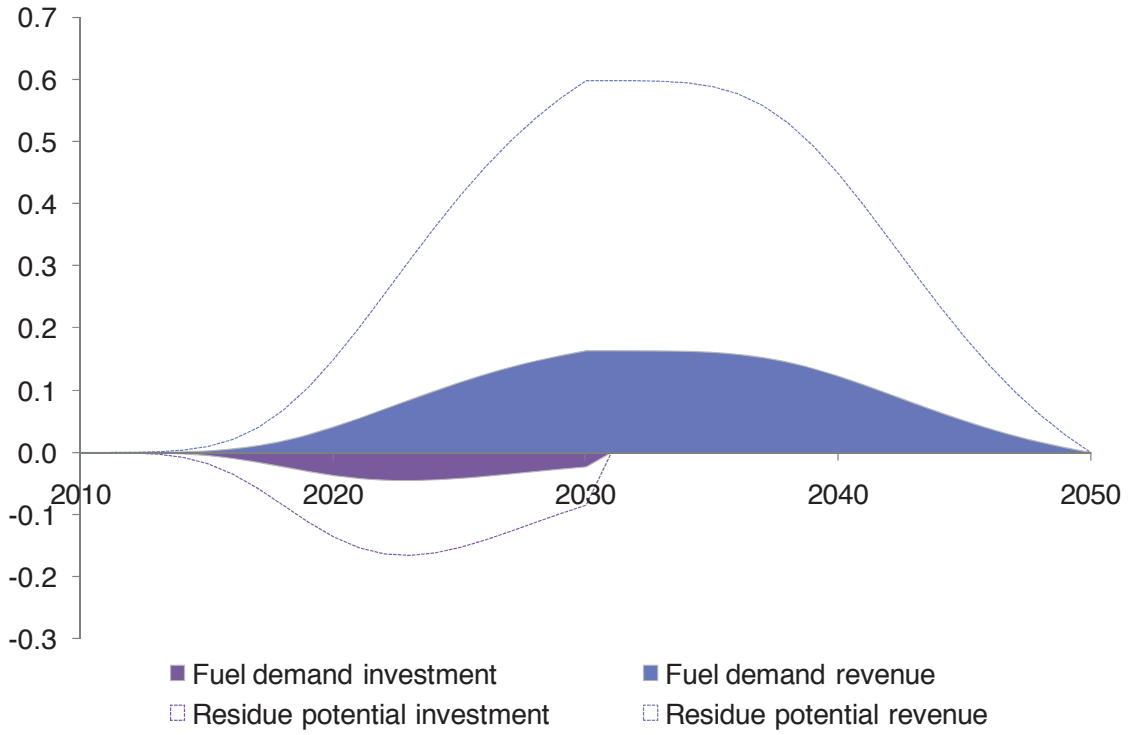
> The Czech Republic could displace up to 34% of its gasoline consumption by 2030



Note: Ethanol supply expressed in gasoline energy equivalent terms.

Source: Bloomberg New Energy Finance

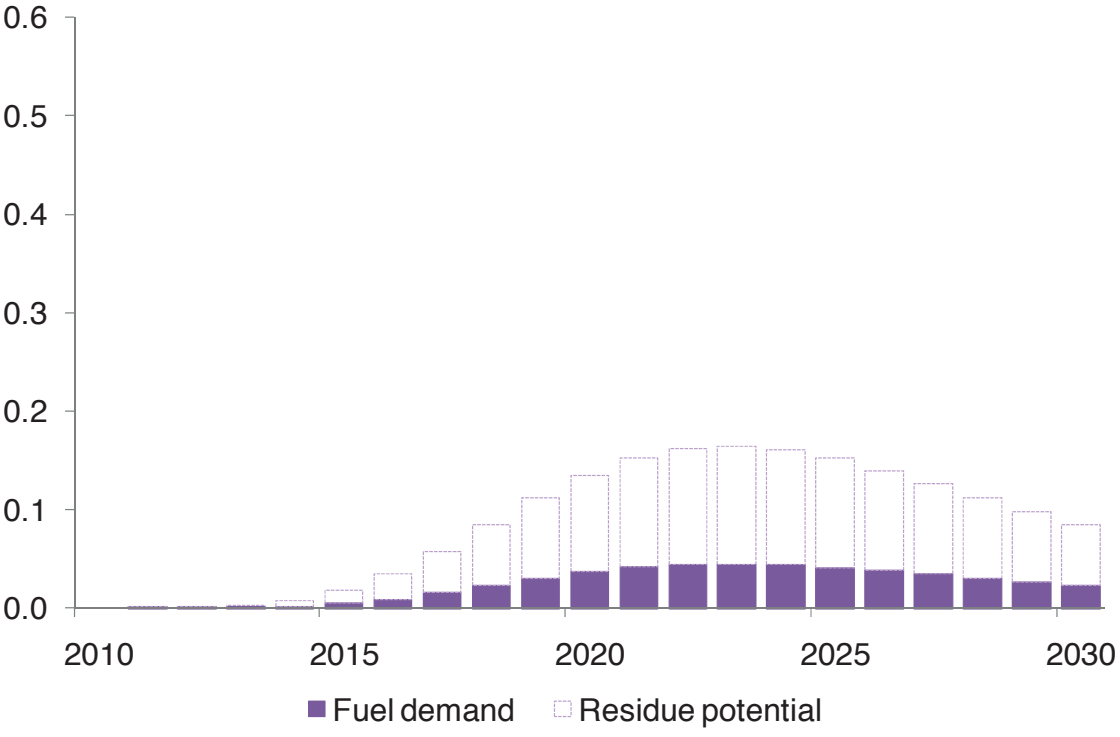
CZECH REPUBLIC REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)



Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030.

Source: Bloomberg New Energy Finance

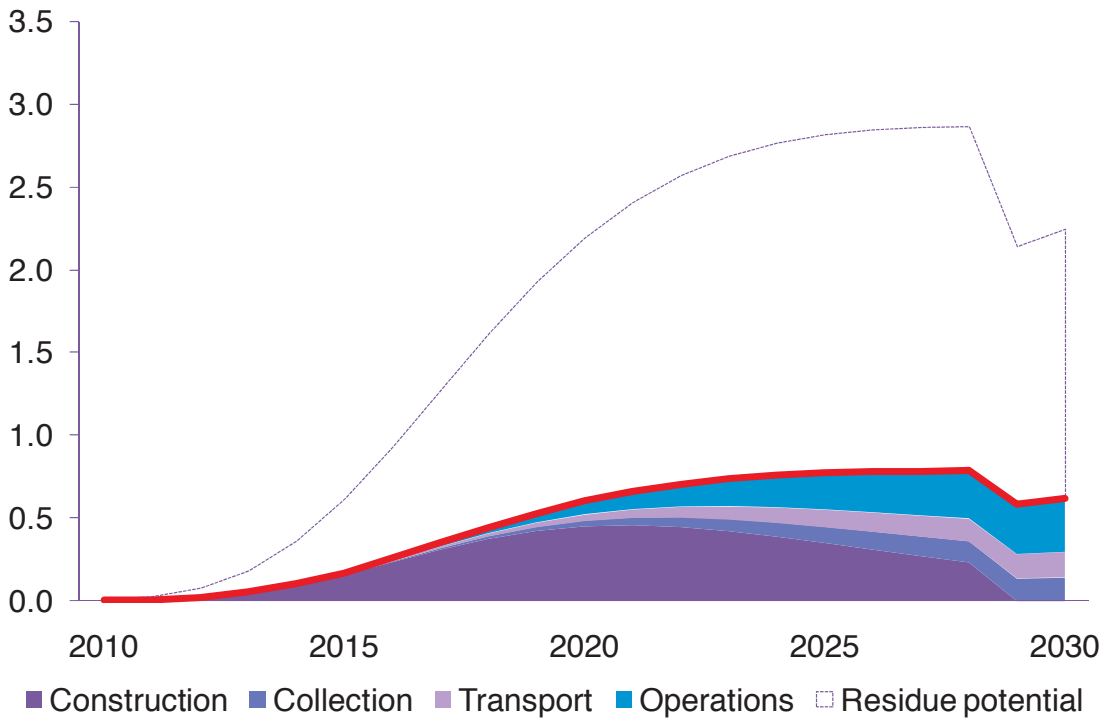
CZECH REPUBLIC TOTAL INVESTMENT, 2010–2030 (EUR BN)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately $1.50 per litre of annual installed capacity.

Source: Bloomberg New Energy Finance

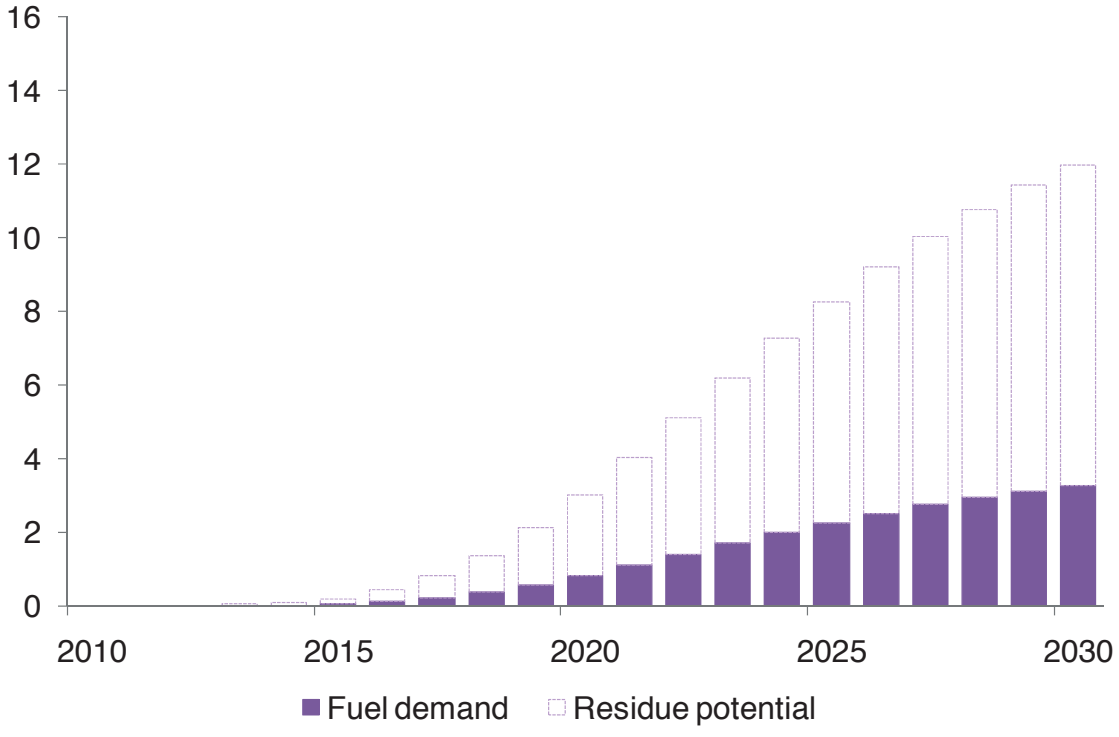
CZECH REPUBLIC JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Bloomberg New Energy Finance

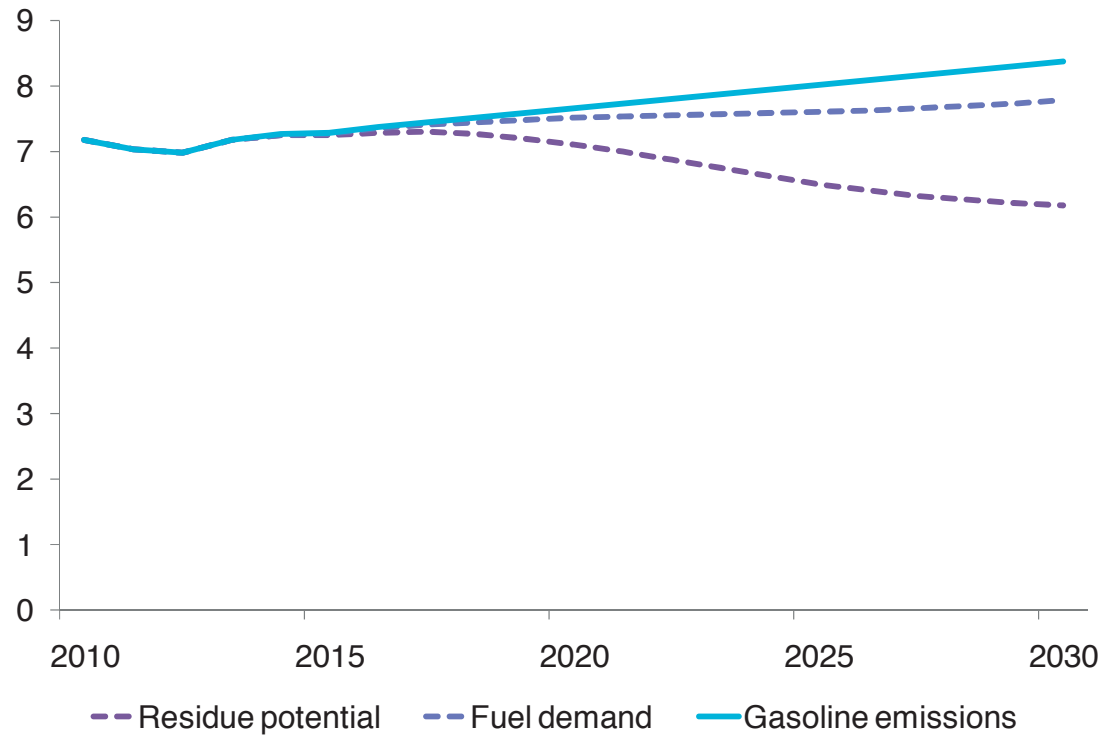
CZECH REPUBLIC REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

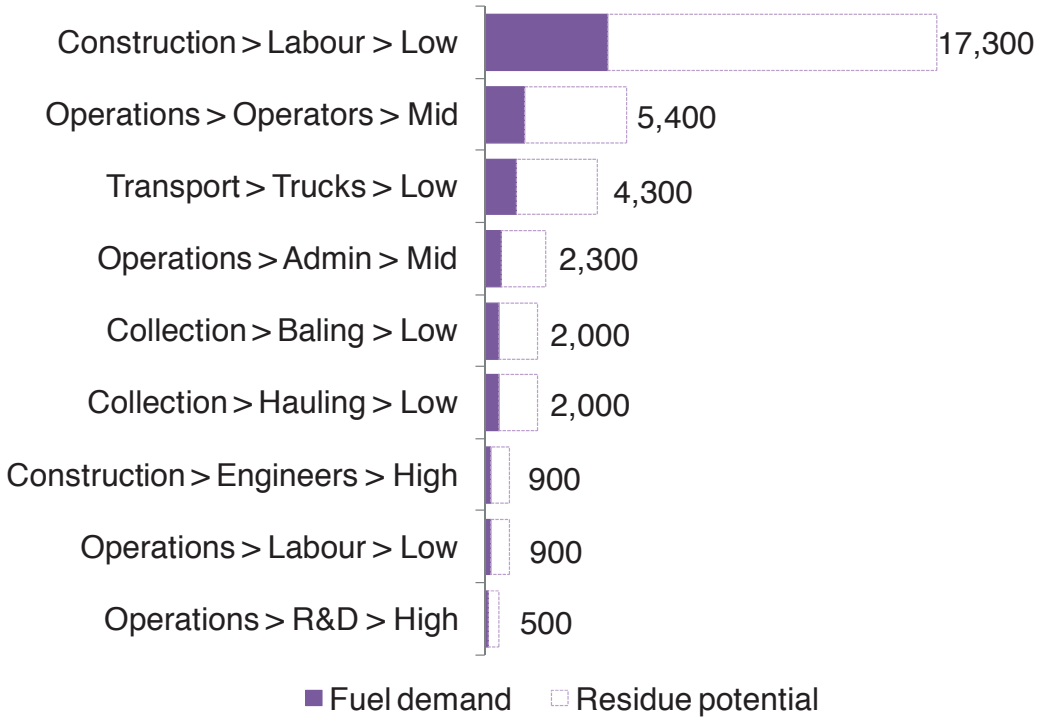
CZECH REPUBLIC GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%.

Source: Bloomberg New Energy Finance

CZECH REPUBLIC JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source:
Bloomberg New Energy Finance
Danish Construction Association

HUNGARY KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Maize, wheat, sunflower

JOB OPPORTUNITIES, 2011–2030

8,000 man-years

ETHANOL POTENTIAL, 2030

400 MLPA

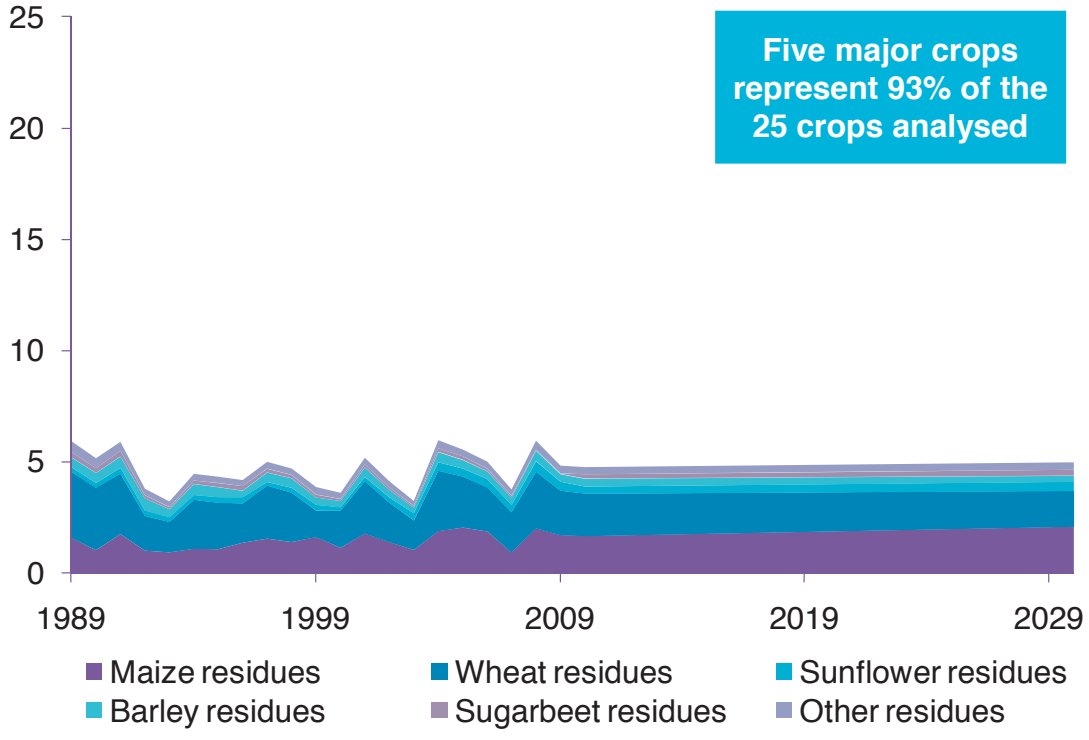
REVENUE, 2011–2050

EUR 2.8bn

POTENTIAL GHG SAVING, 2011–2030

3.9 mtCO2

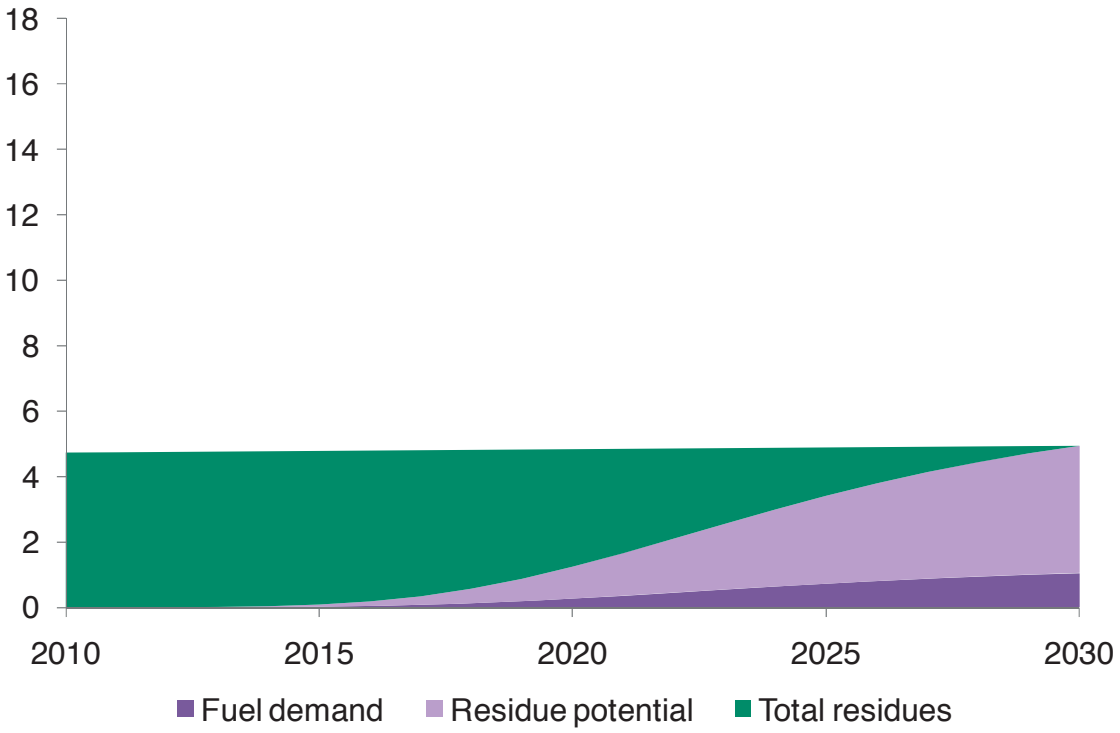
HUNGARY AGRICULTURAL RESIDUE AVAILABILITY, 1989–2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

Source: Bloomberg New Energy Finance, FAO

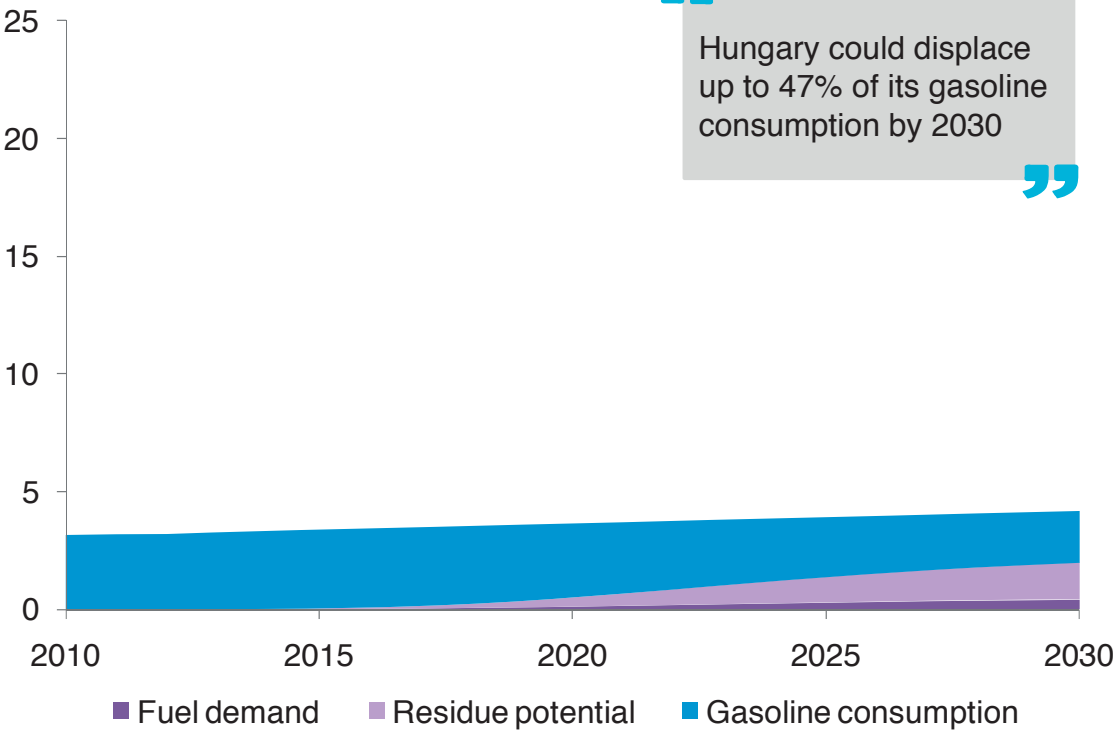
HUNGARY AGRICULTURAL RESIDUES, 2010-30 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

HUNGARY NEXT-GENERATION ETHANOL POTENTIAL, 2010-2030 (BN LITRES)

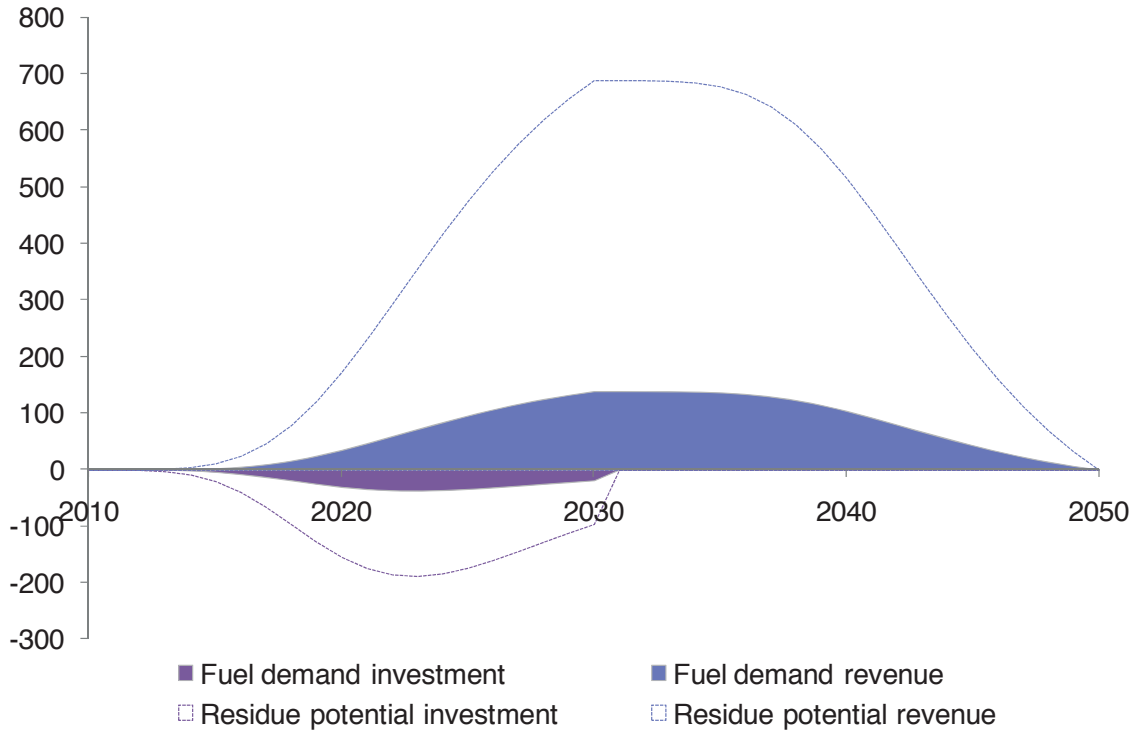
> Hungary could displace up to 47% of its gasoline consumption by 2030



Note: Ethanol supply expressed in gasoline energy equivalent terms.

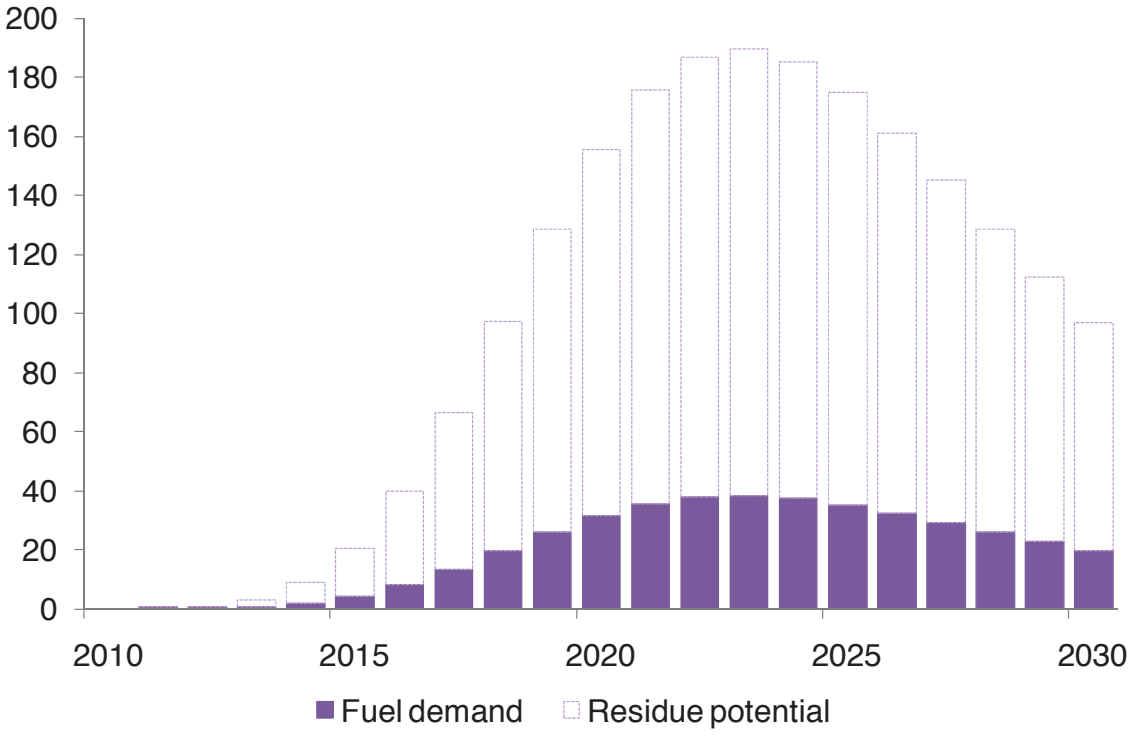
Source: Bloomberg New Energy Finance

HUNGARY REVENUE VERSUS INVESTMENT, 2011–2050 (EUR MILLION)



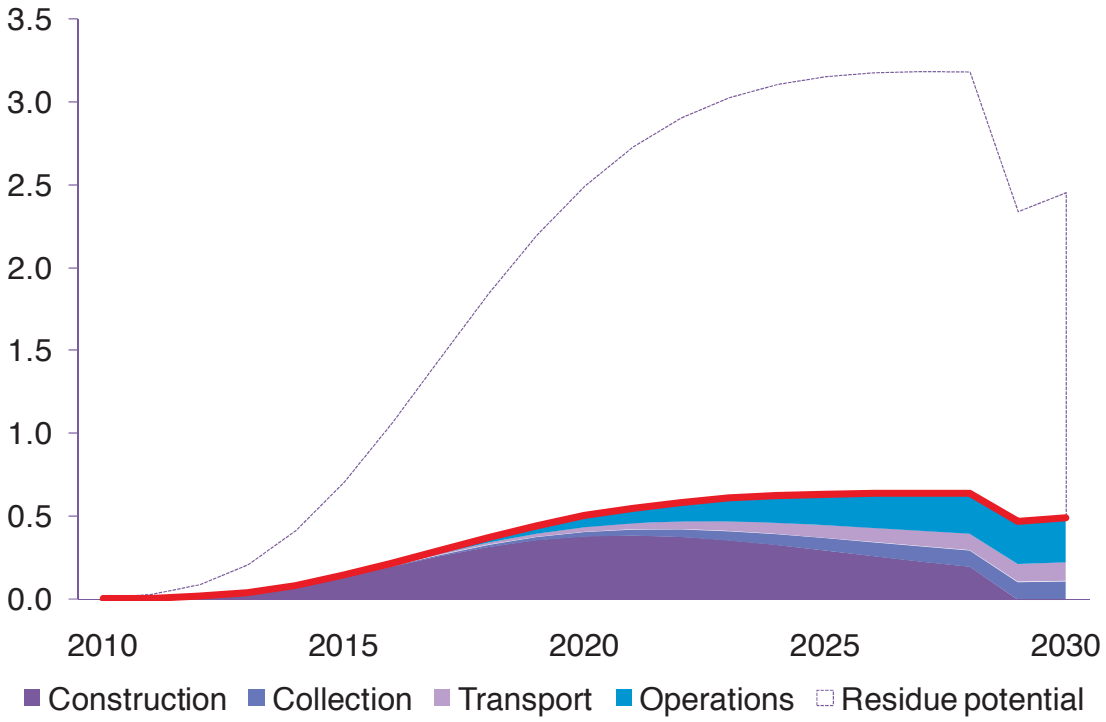
Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030. Source: Bloomberg New Energy Finance

HUNGARY TOTAL INVESTMENT, 2010–2030 (EUR MILLION)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately $1.50 per litre of annual installed capacity. Source: Bloomberg New Energy Finance

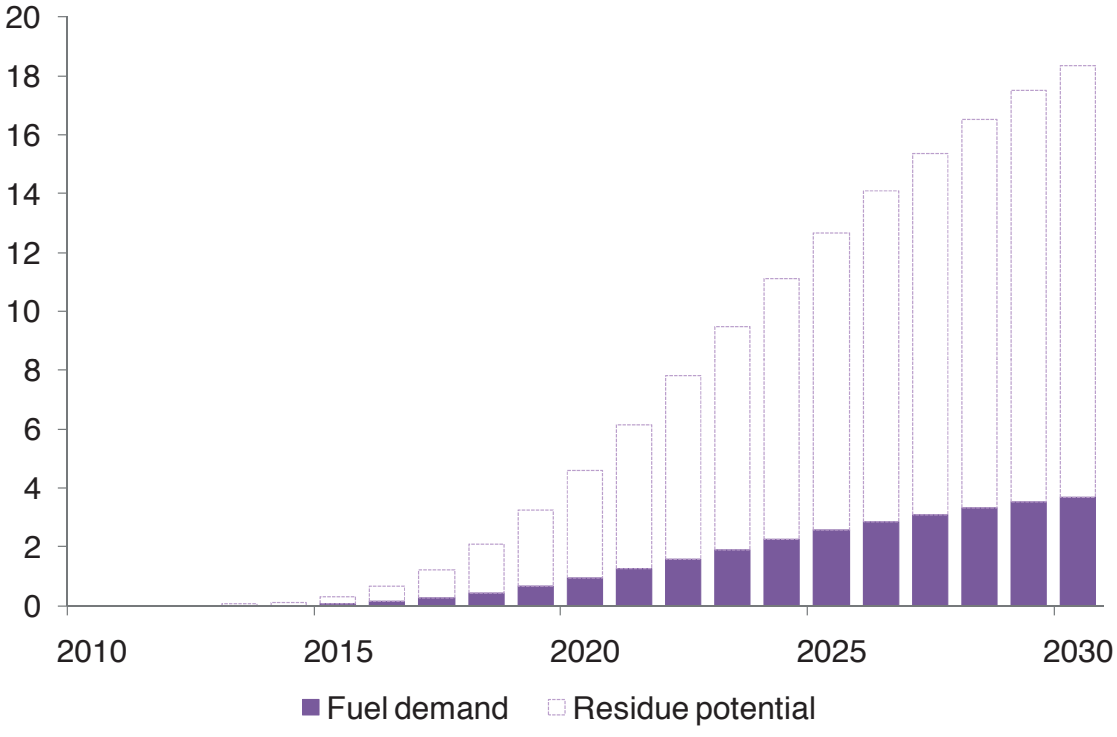
HUNGARY JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Bloomberg New Energy Finance

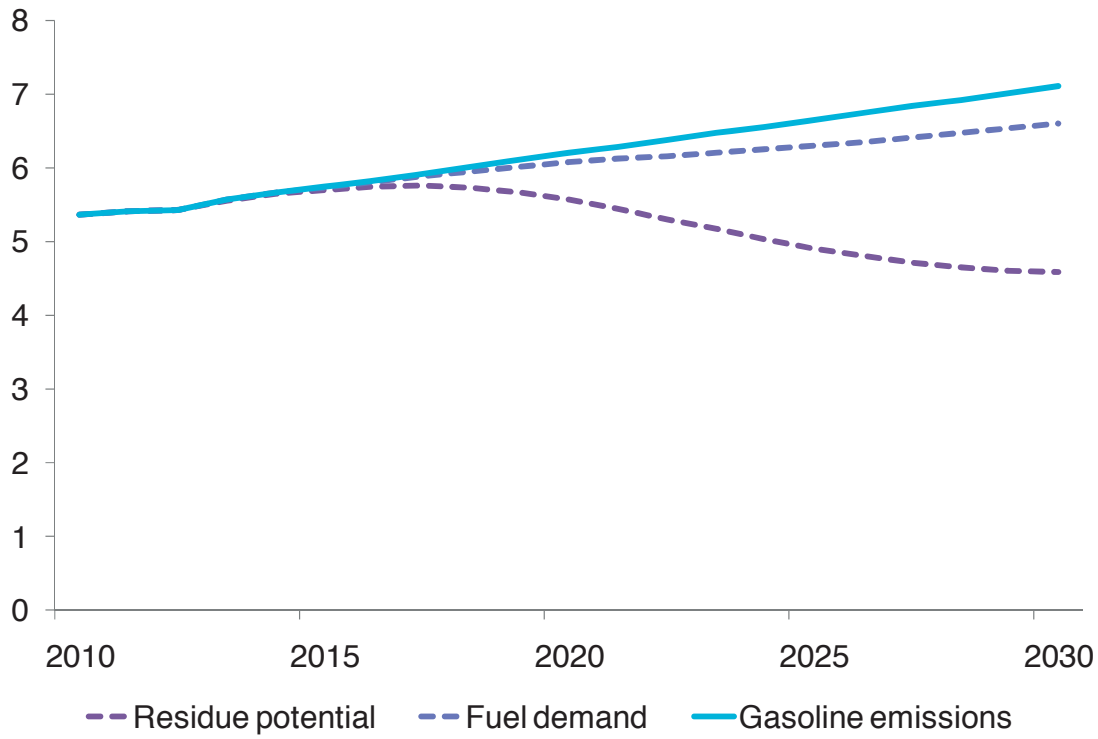
HUNGARY REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

HUNGARY GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



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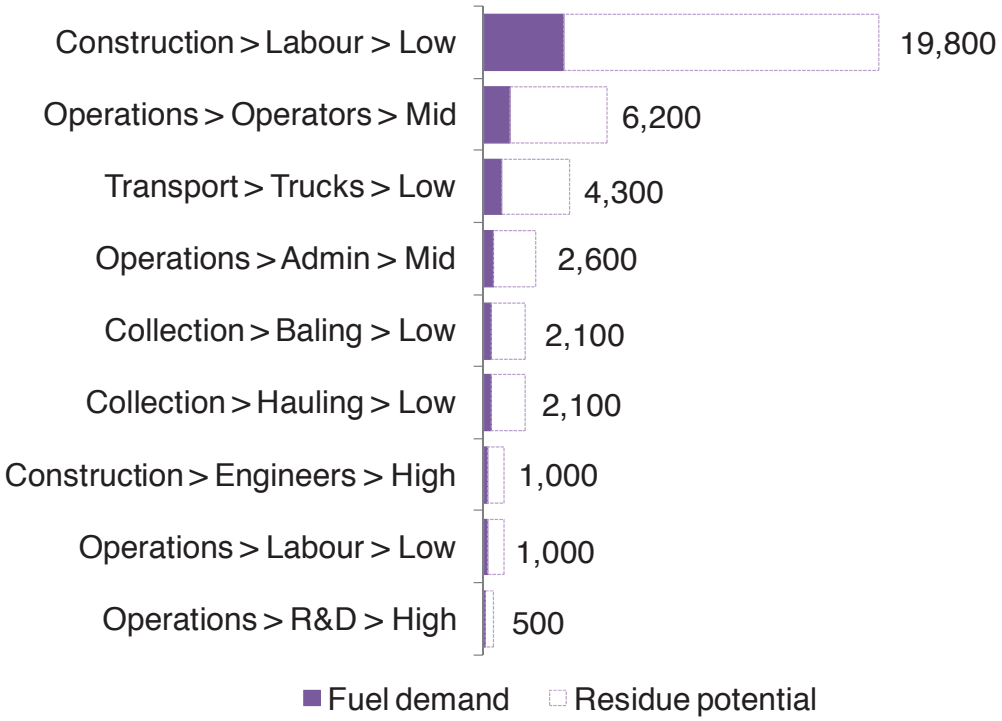
HUNGARY JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



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Source: Bloomberg New Energy Finance
Danish Construction Association

ITALY KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Wheat, maize, sugar beet

JOB OPPORTUNITIES, 2011–2030

9,200 man-years

ETHANOL POTENTIAL, 2030

500 MLPA

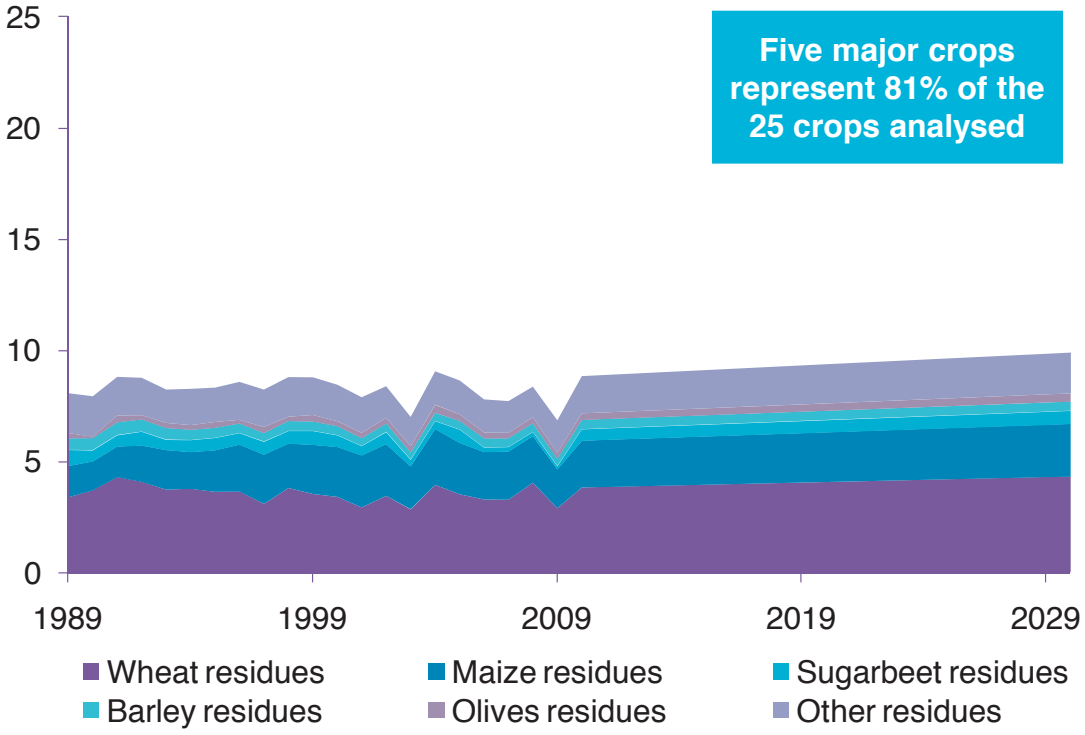
REVENUE, 2011–2050

EUR 3.2bn

POTENTIAL GHG SAVING, 2011–2030

4.4 mtCO2

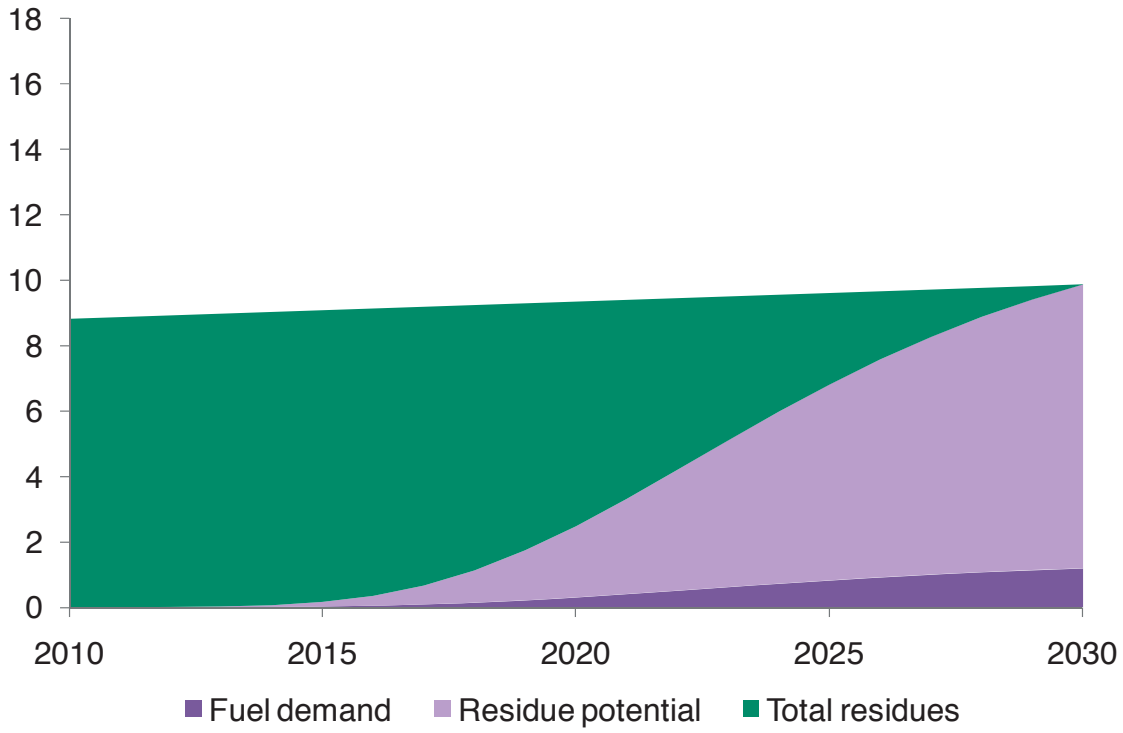
ITALY AGRICULTURAL RESIDUE AVAILABILITY, 1989–2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

Source: Bloomberg New Energy Finance, FAO

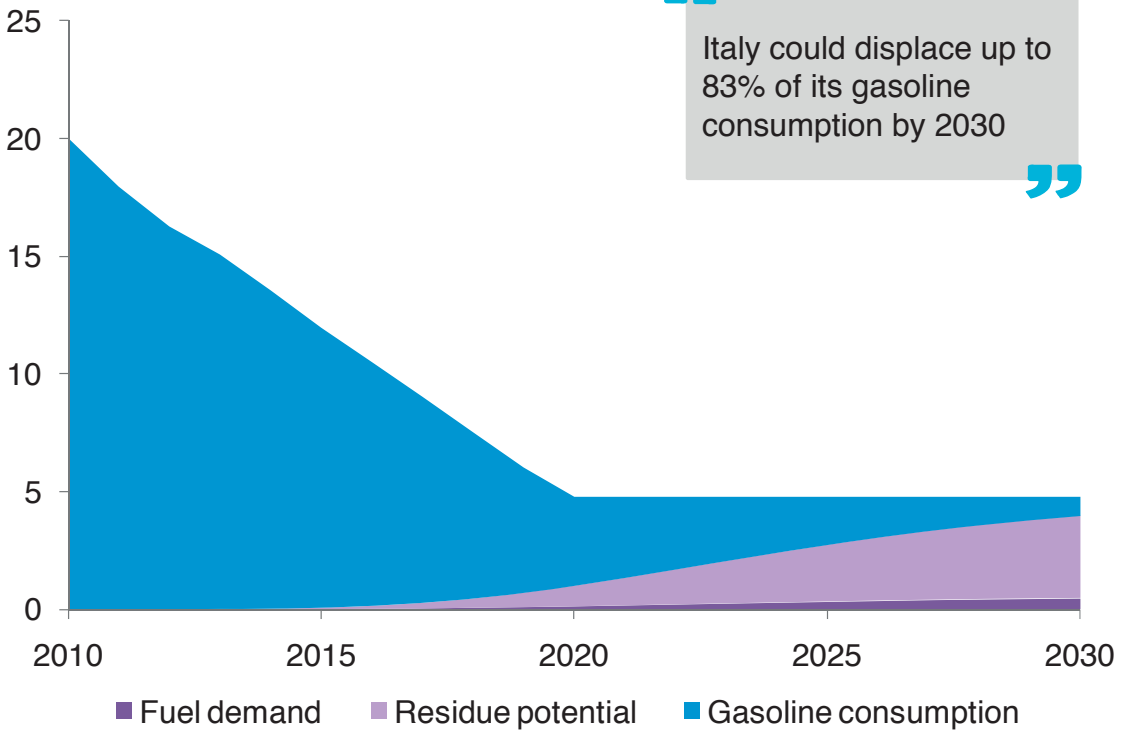
ITALY AGRICULTURAL RESIDUES, 2010–30 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

ITALY NEXT-GENERATION ETHANOL POTENTIAL, 2010–2030 (BN LITRES)

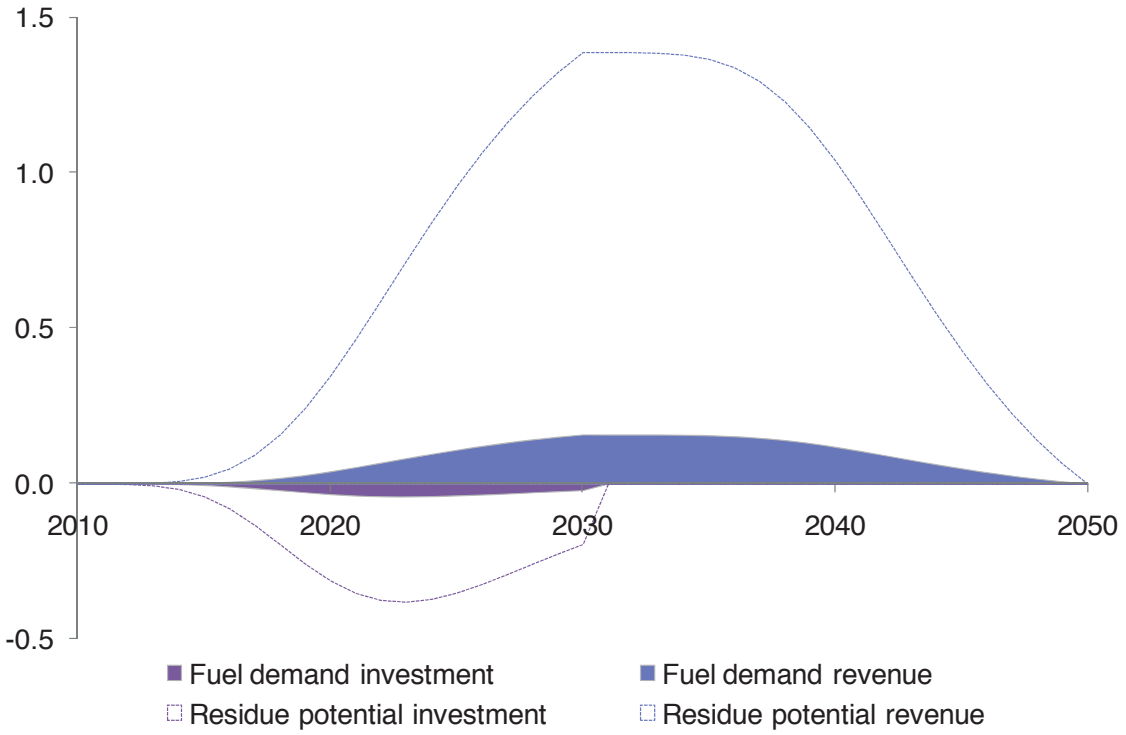
> Italy could displace up to 83% of its gasoline consumption by 2030



Note: Ethanol supply expressed in gasoline energy equivalent terms.

Source: Bloomberg New Energy Finance

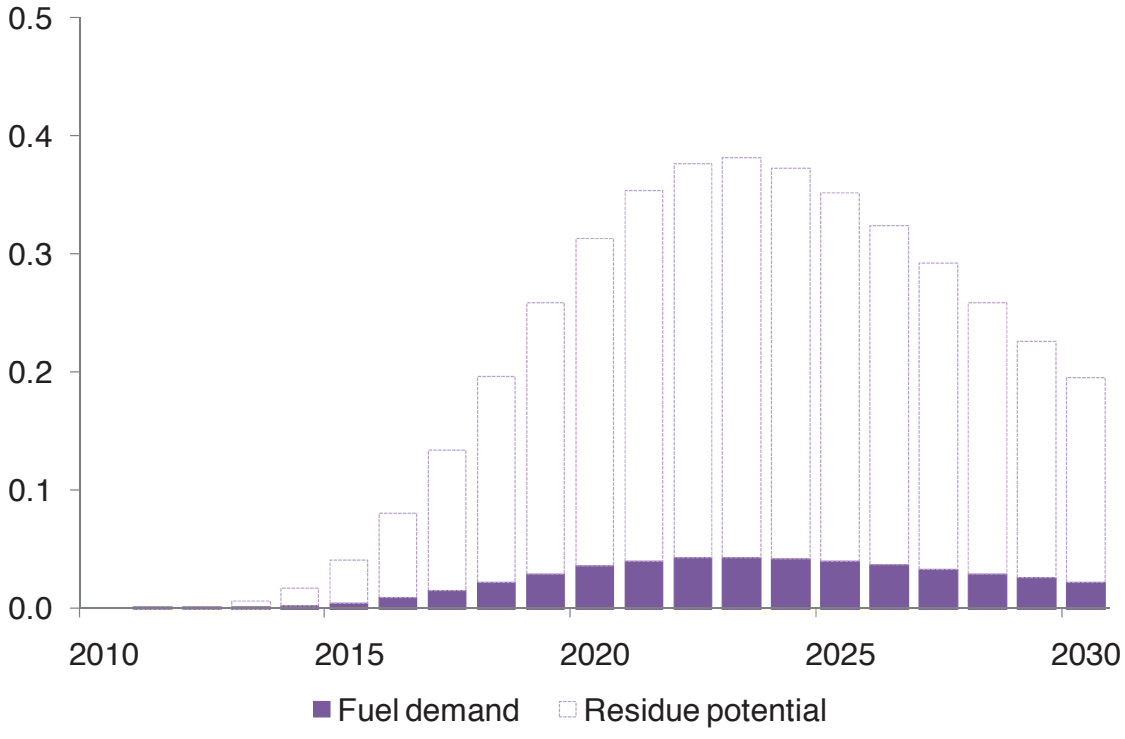
ITALY REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)



Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030.

Source: Bloomberg New Energy Finance

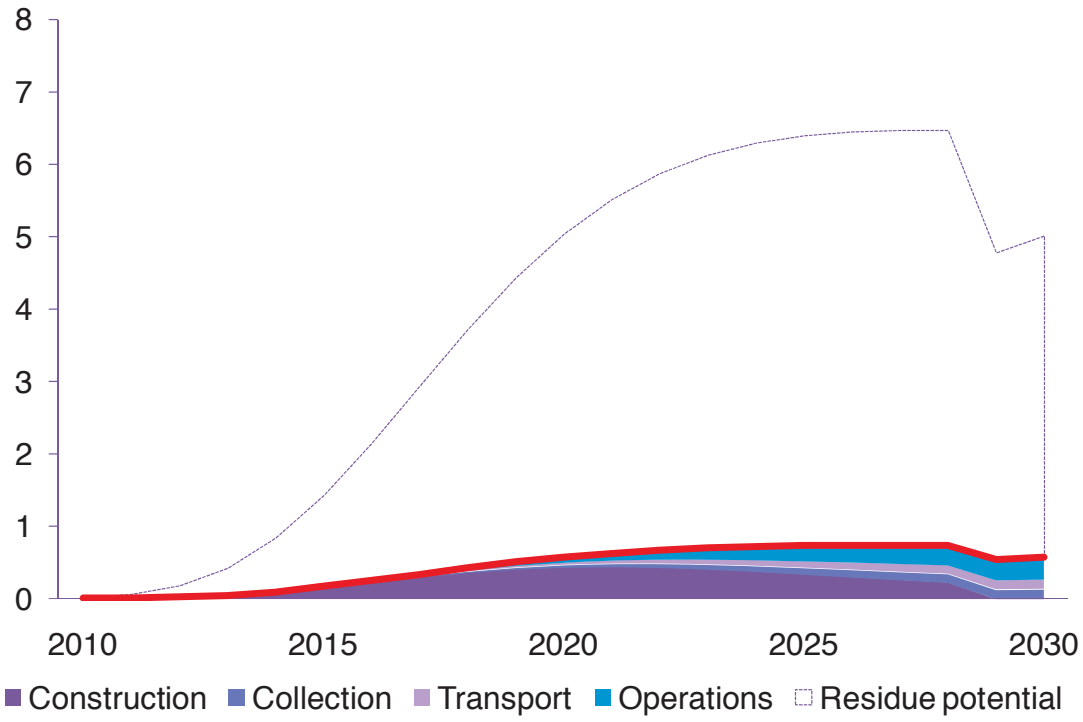
ITALY TOTAL INVESTMENT, 2010–2030 (EUR BN)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately $1.50 per litre of annual installed capacity.

Source: Bloomberg New Energy Finance

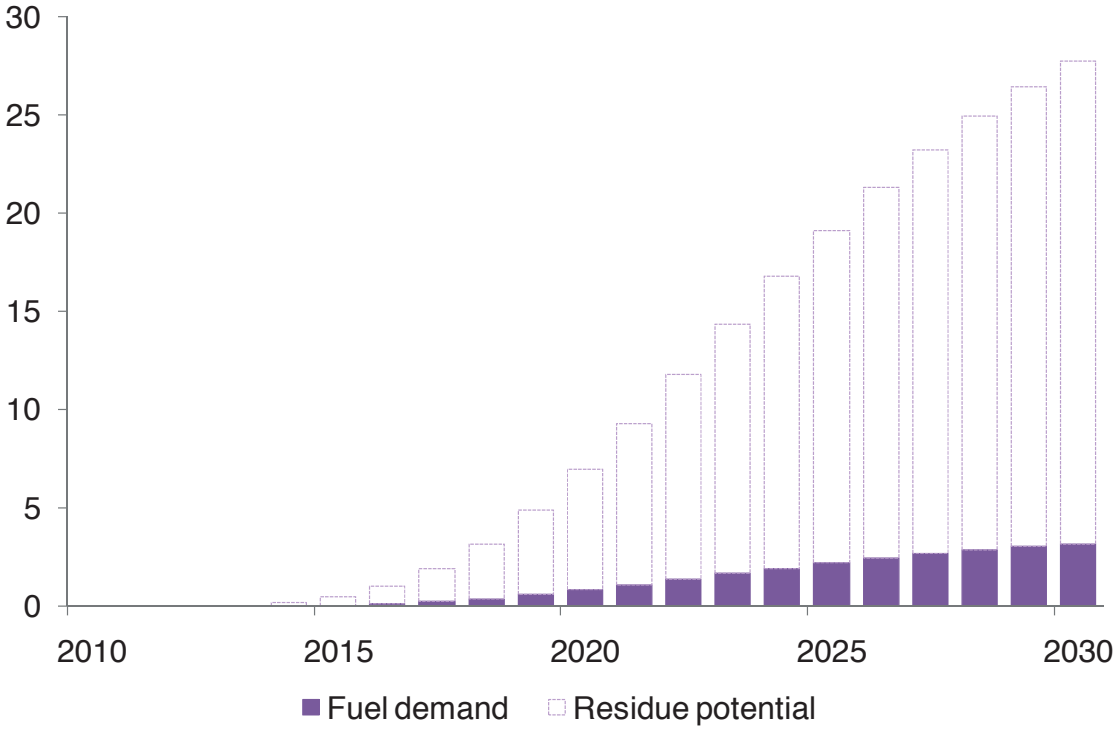
ITALY JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance, Danish Construction Association

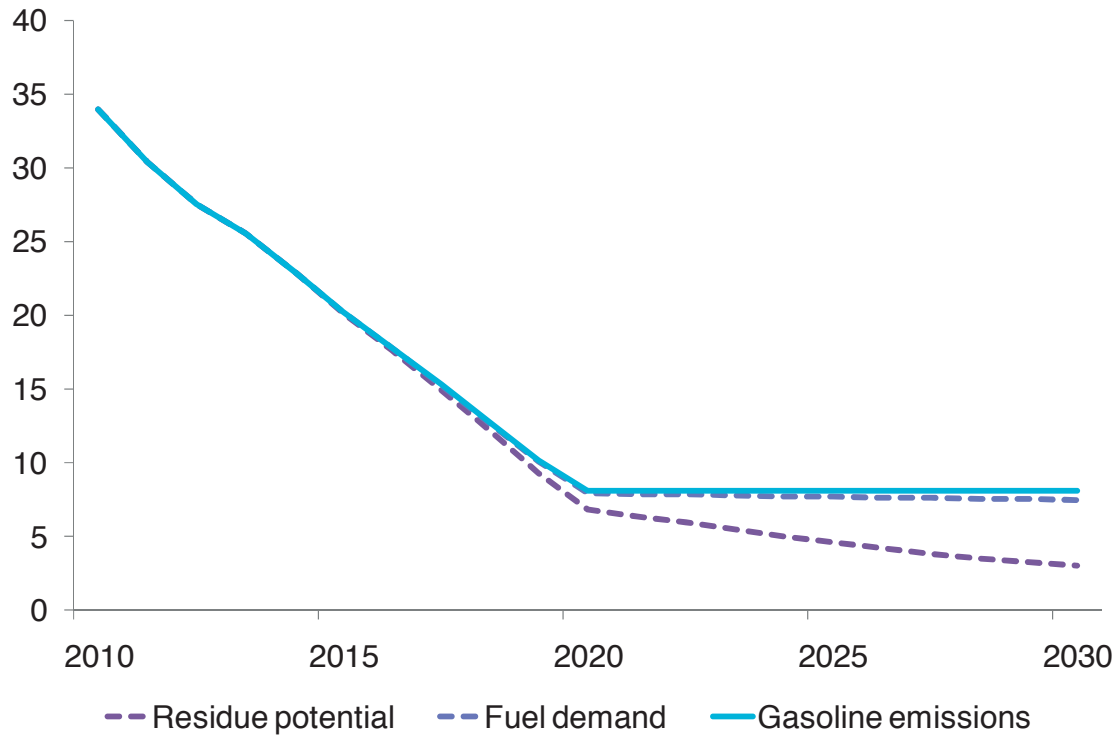
ITALY REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

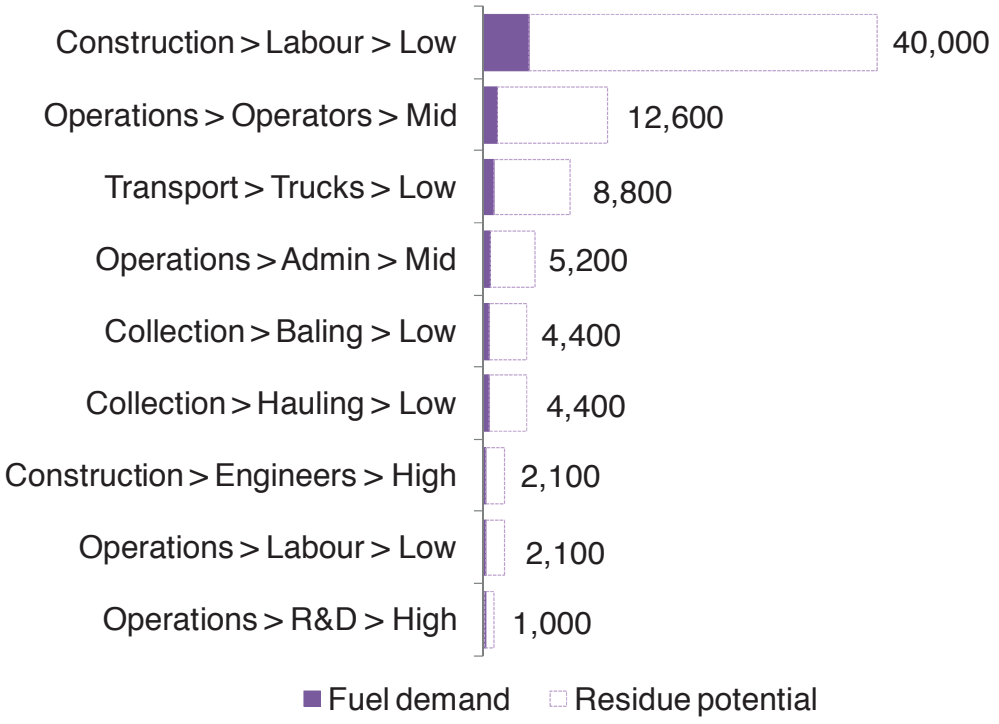
ITALY GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%.

Source: Bloomberg New Energy Finance

ITALY JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance Danish Construction Association

POLAND KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Wheat, rye, barley

JOB OPPORTUNITIES, 2011-30

8,700 man-years

ETHANOL POTENTIAL, 2030

400 MLPA

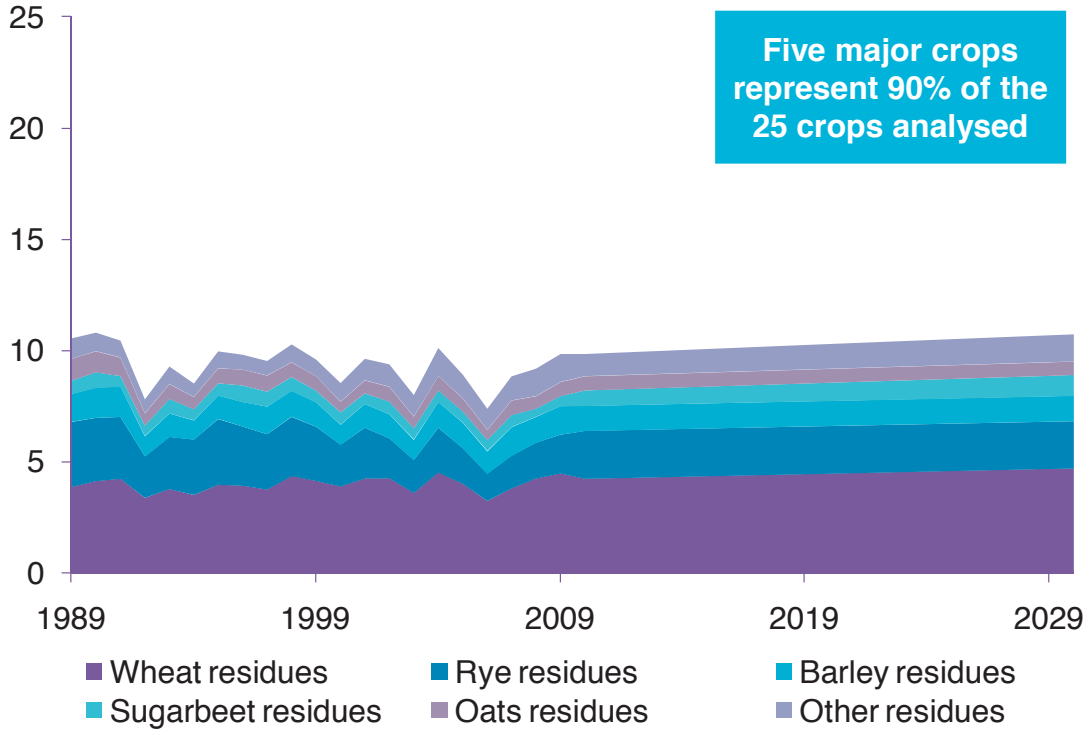
REVENUE, 2011–2050

EUR 3.0bn

POTENTIAL GHG SAVING, 2011-30

4.2 mtCO2

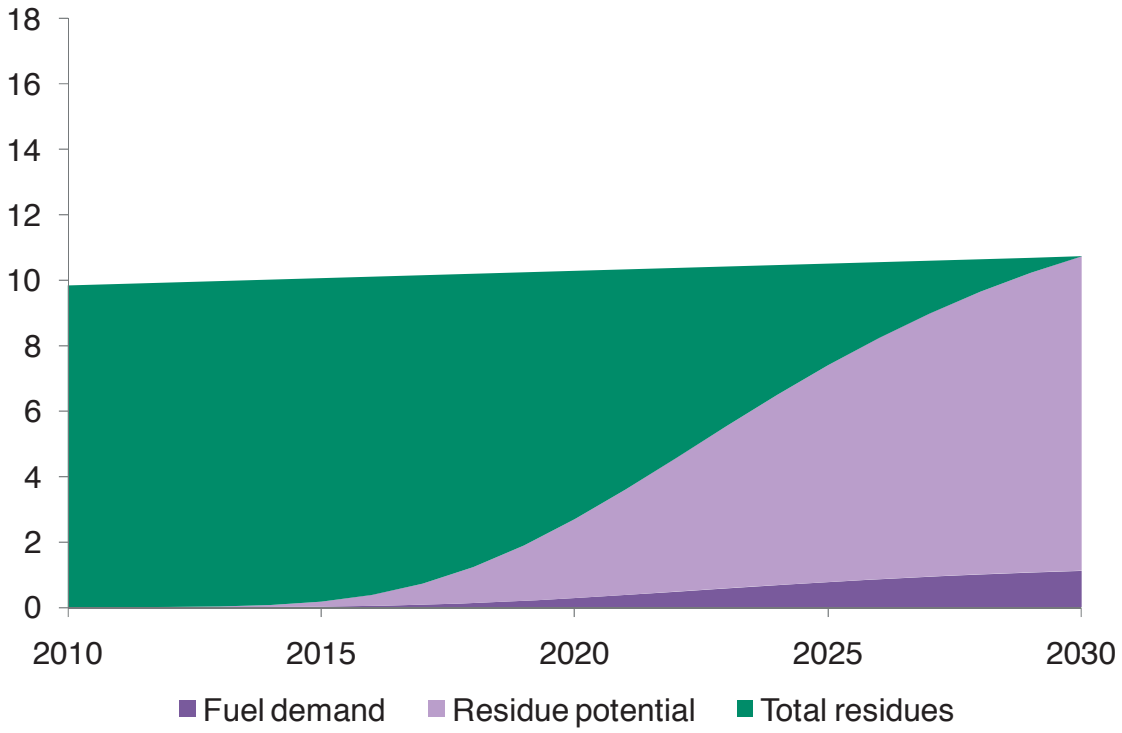
POLAND AGRICULTURAL RESIDUE AVAILABILITY, 1989—2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

Source: Bloomberg New Energy Finance, FAO

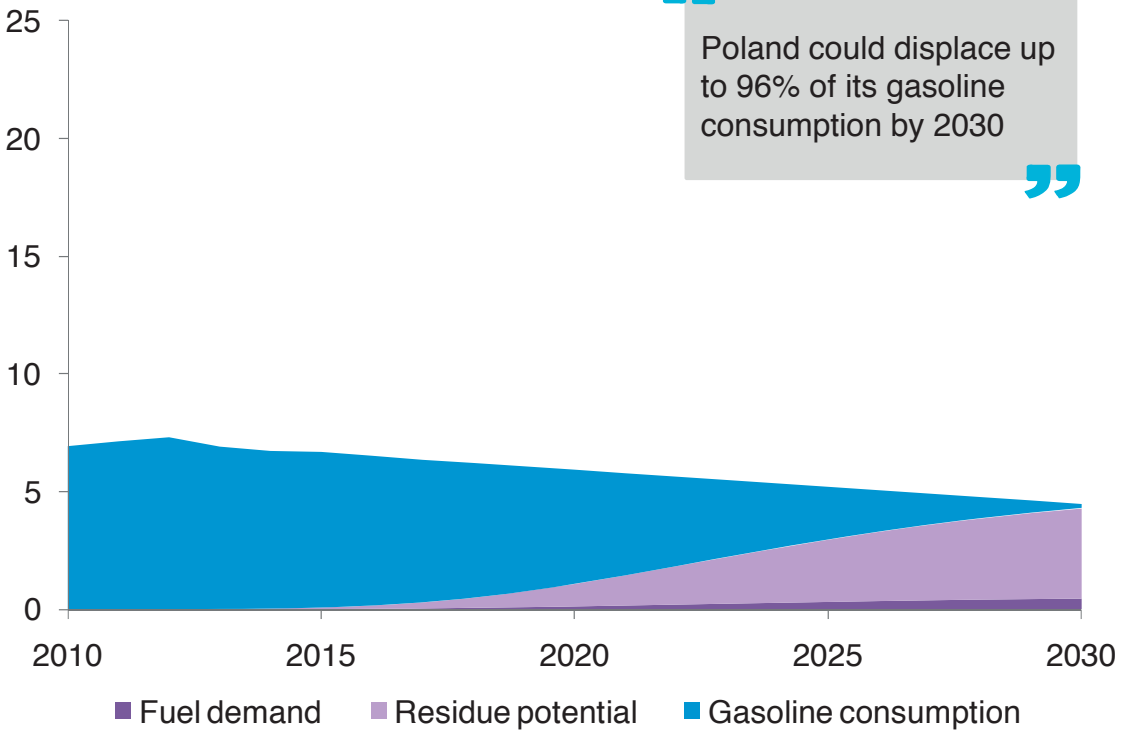
POLAND AGRICULTURAL RESIDUES, 2010–2030 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

POLAND NEXT-GENERATION ETHANOL POTENTIAL, 2010–2030 (BN LITRES)

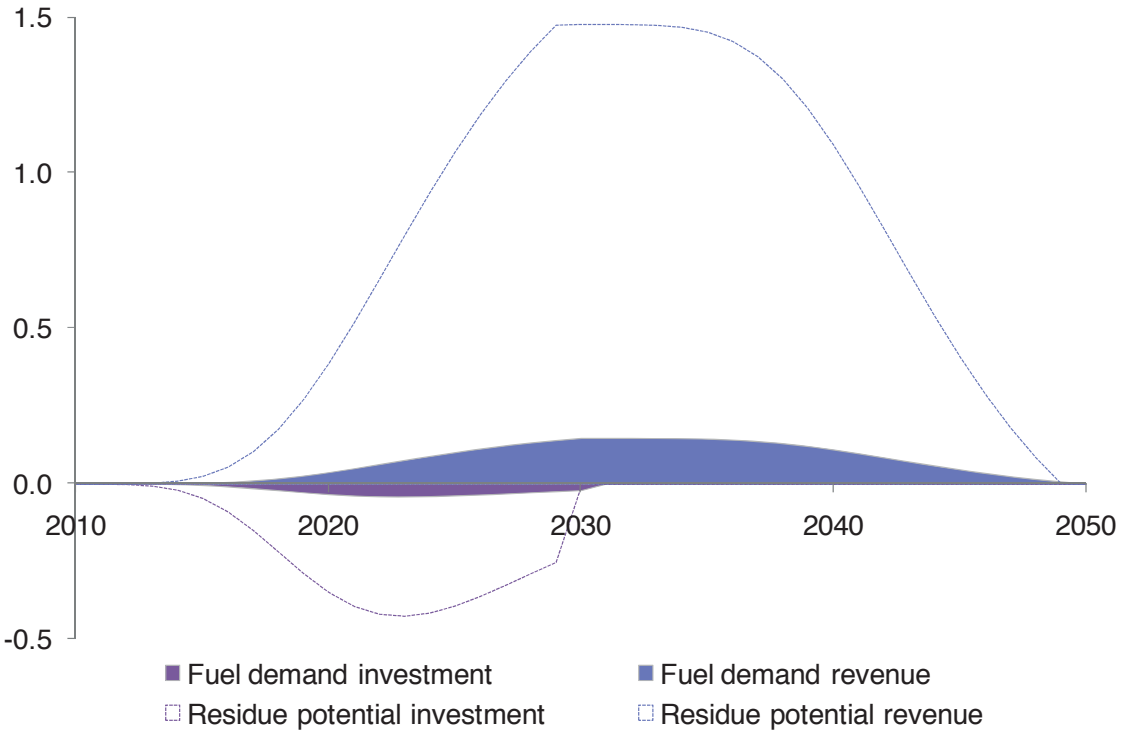
> Poland could displace up to 96% of its gasoline consumption by 2030



Note: Ethanol supply expressed in gasoline energy equivalent terms.

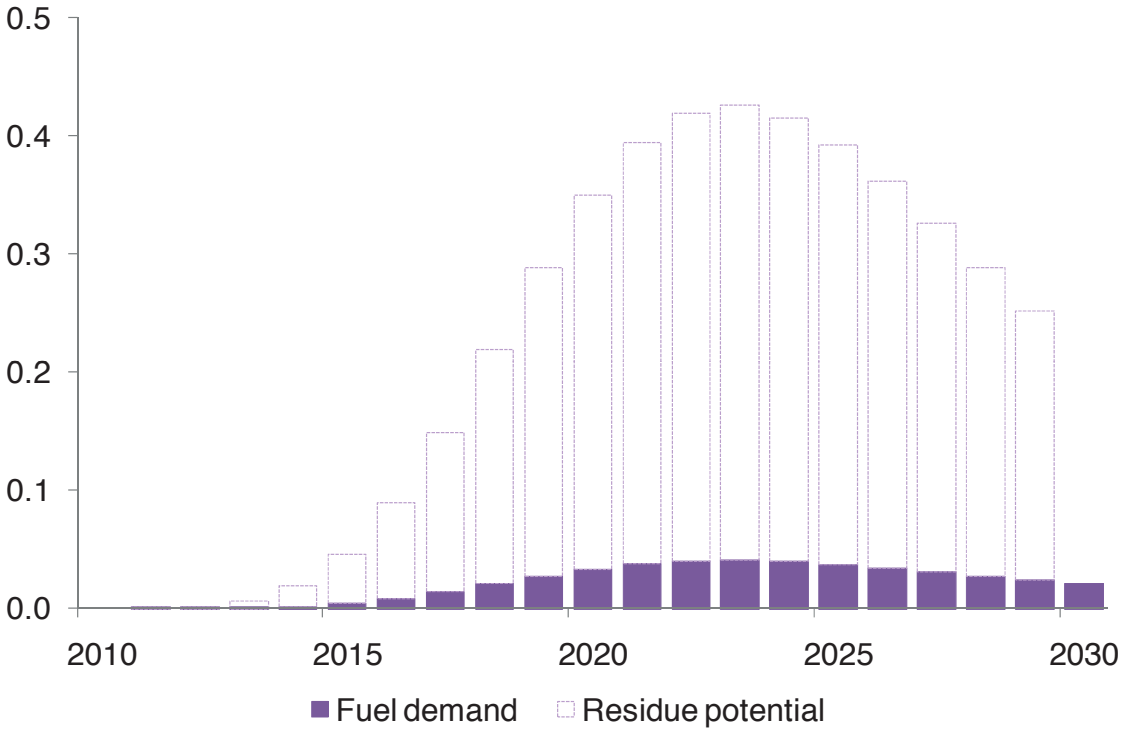
Source: Bloomberg New Energy Finance

POLAND REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)



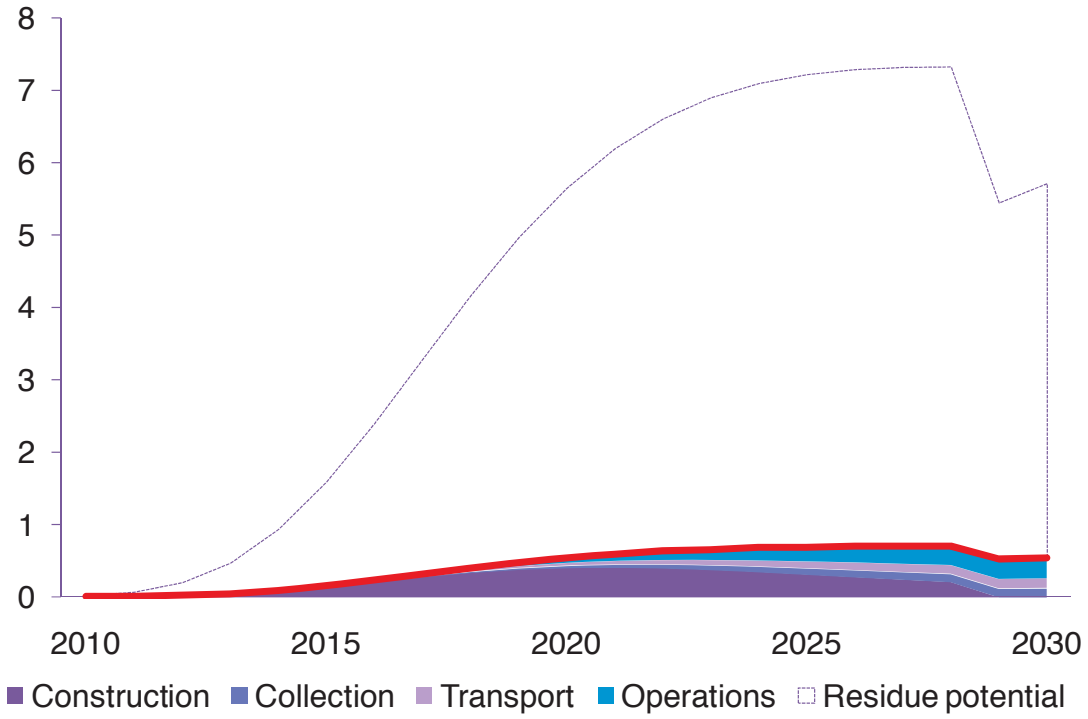
Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030. Source: Bloomberg New Energy Finance

POLAND TOTAL INVESTMENT, 2010–2030 (EUR BN)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately EUR 0.975 per litre of annual capacity. Source: Bloomberg New Energy Finance

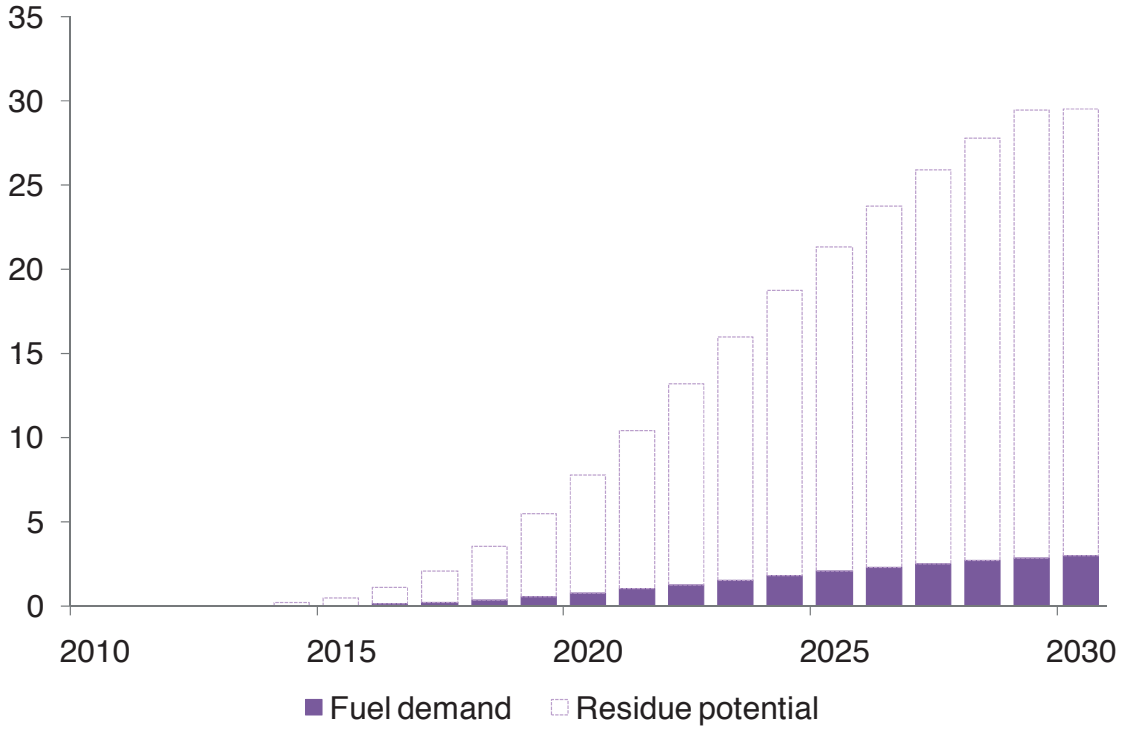
POLAND JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance, Danish Construction Association

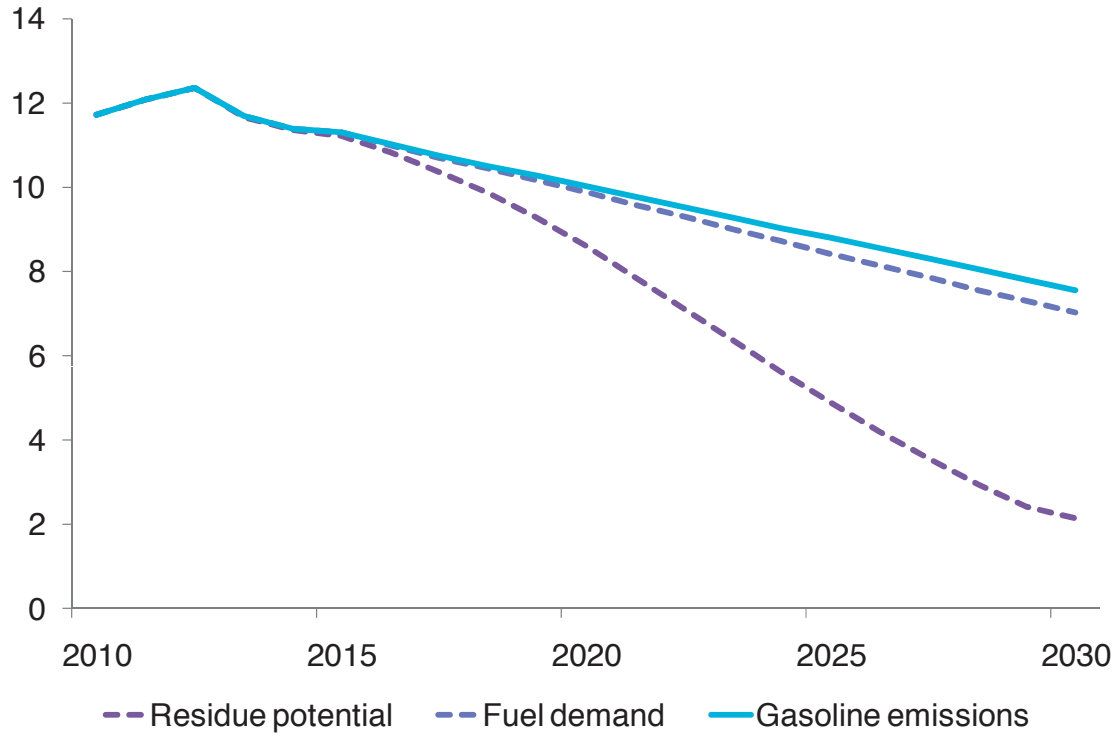
POLAND REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

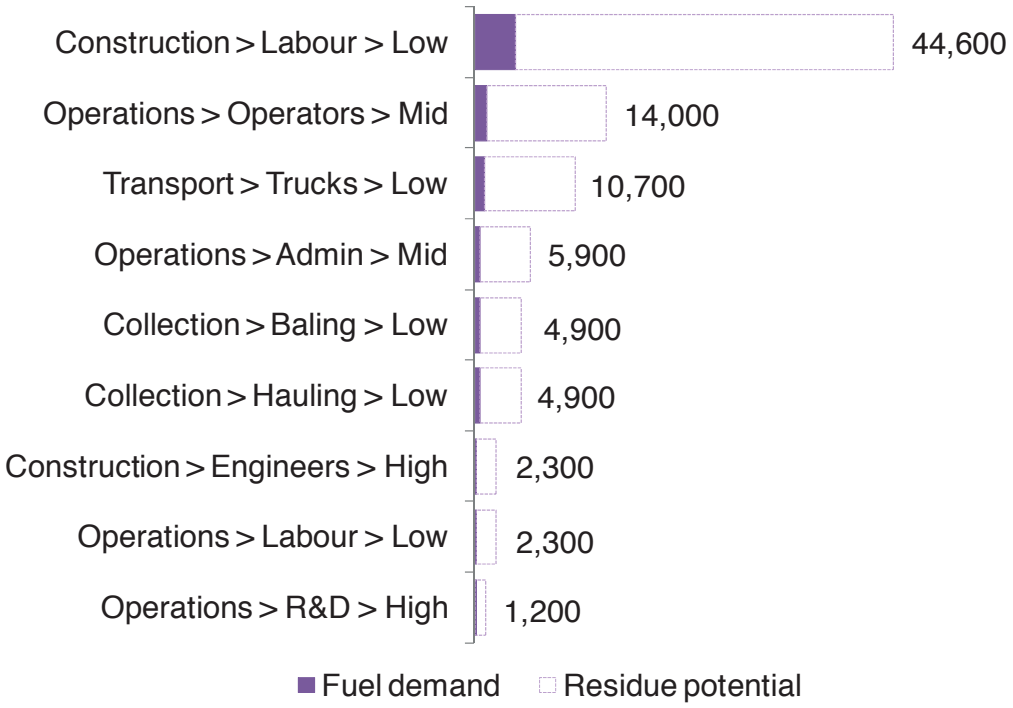
POLAND GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%.

Source: Bloomberg New Energy Finance

POLAND JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance
Danish Construction Association

ROMANIA KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Maize, wheat, sugar beet

JOB OPPORTUNITIES, 2011-30

3,200 man-years

ETHANOL POTENTIAL, 2030

0.2 BLPA

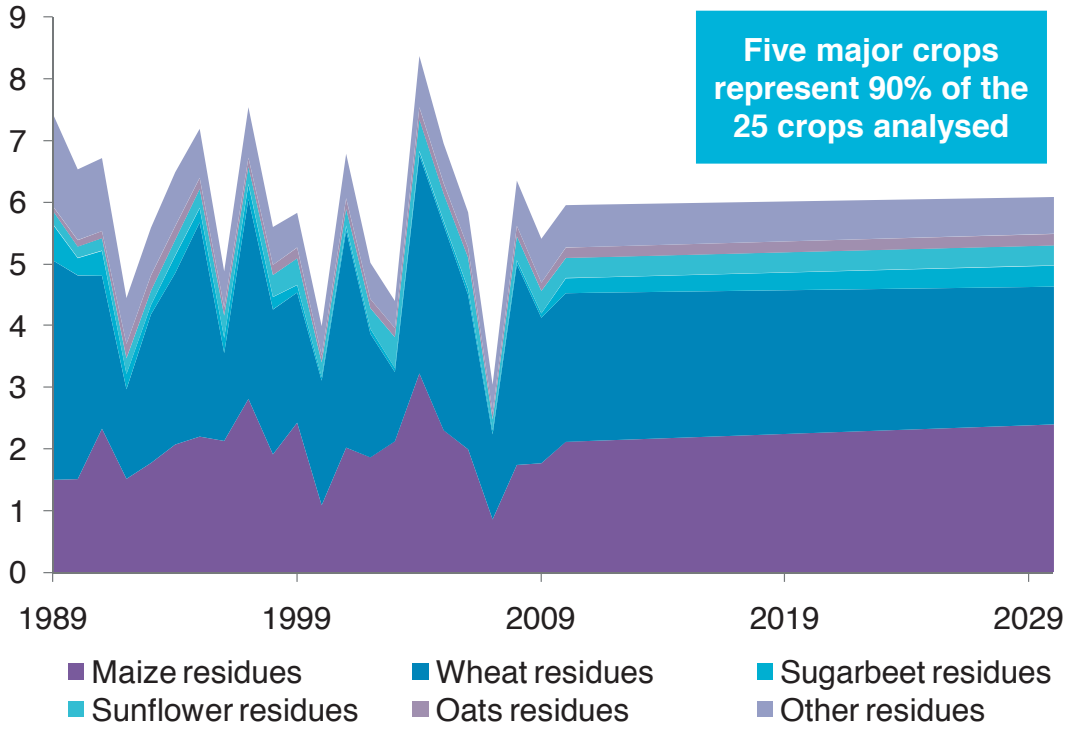
REVENUE, 2011–2050

EUR 1.1bn

POTENTIAL GHG SAVING, 2011-30

1.6 mtCO2

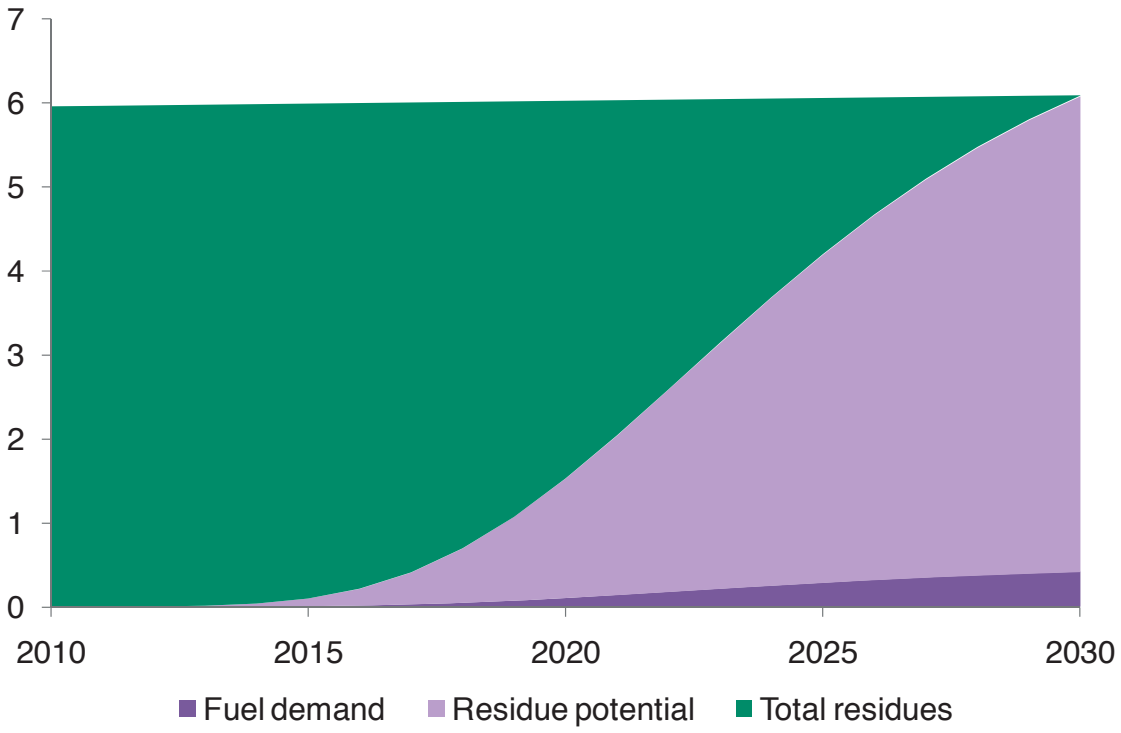
ROMANIA AGRICULTURAL RESIDUE AVAILABILITY, 1989–2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

Source: Bloomberg New Energy Finance, FAO

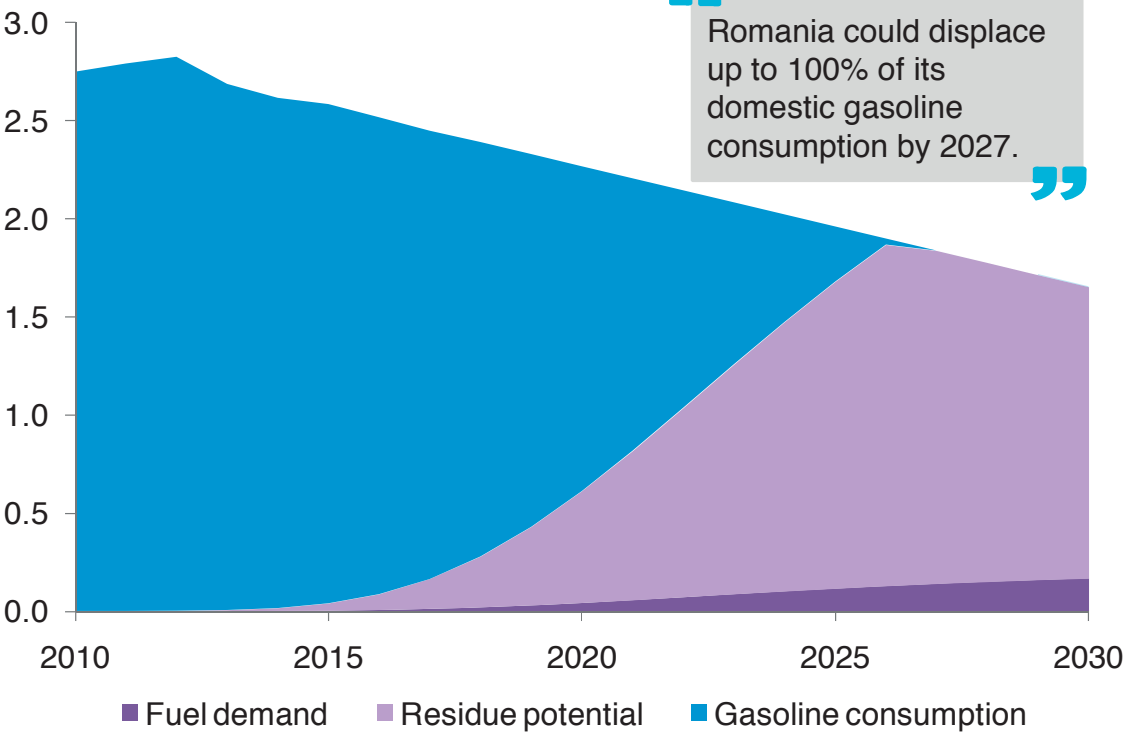
ROMANIA AGRICULTURAL RESIDUES, 2010-30 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

ROMANIA NEXT-GENERATION ETHANOL POTENTIAL, 2010–2030 (BN LITRES)

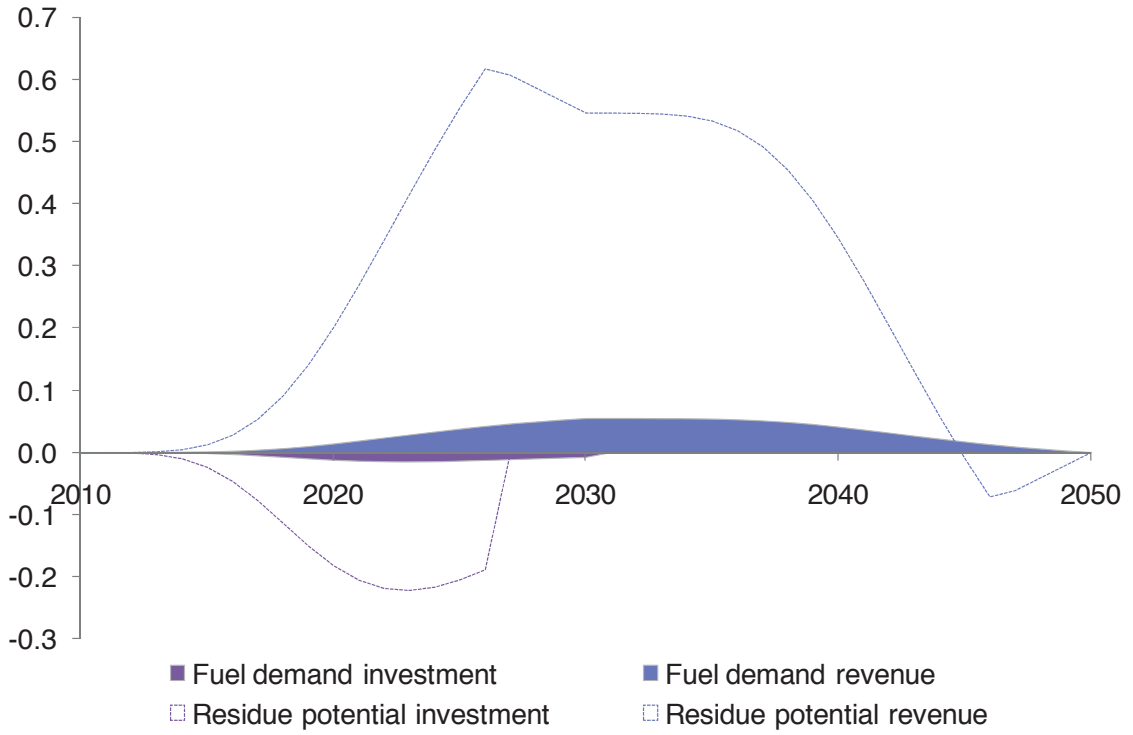
> Romania could displace up to 100% of its domestic gasoline consumption by 2027.



Note: Ethanol supply expressed in gasoline energy equivalent terms.

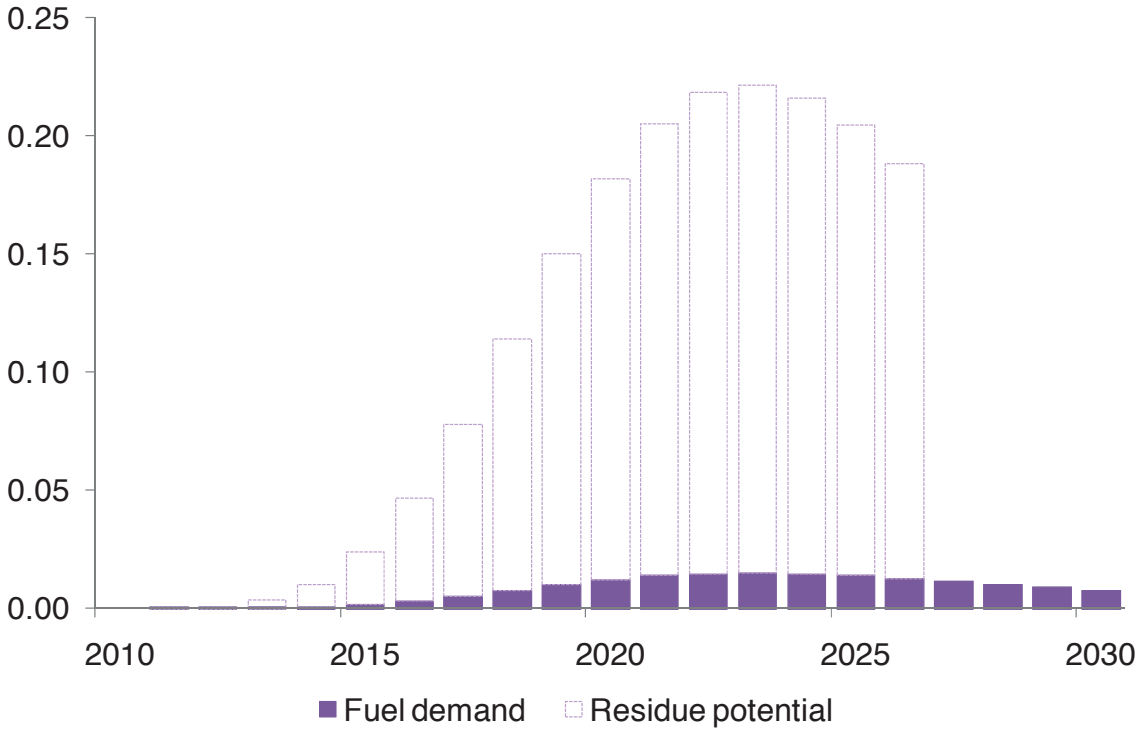
Source: Bloomberg New Energy Finance

ROMANIA REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)



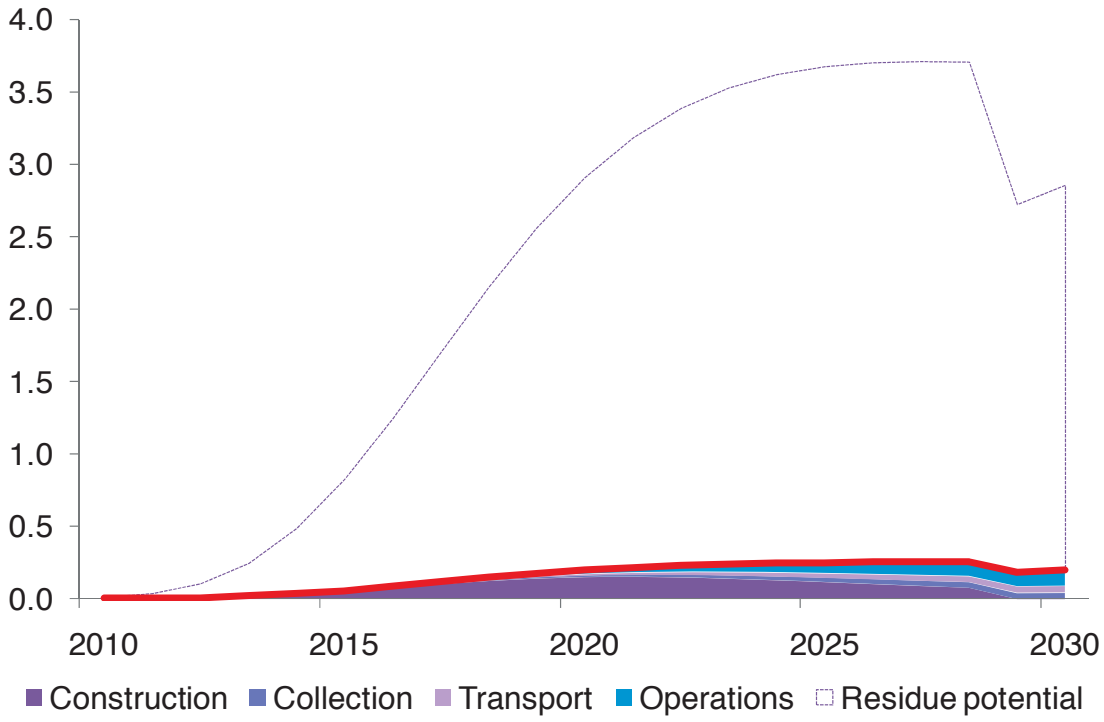
Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030. Source: Bloomberg New Energy Finance

ROMANIA TOTAL INVESTMENT, 2010–2030 (EUR BN)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately $1.50 per litre of annual installed capacity. In the 'fuel demand' scenario, Romania replaces all of its gasoline demand with next-generation ethanol in 2027. Source: Bloomberg New Energy Finance

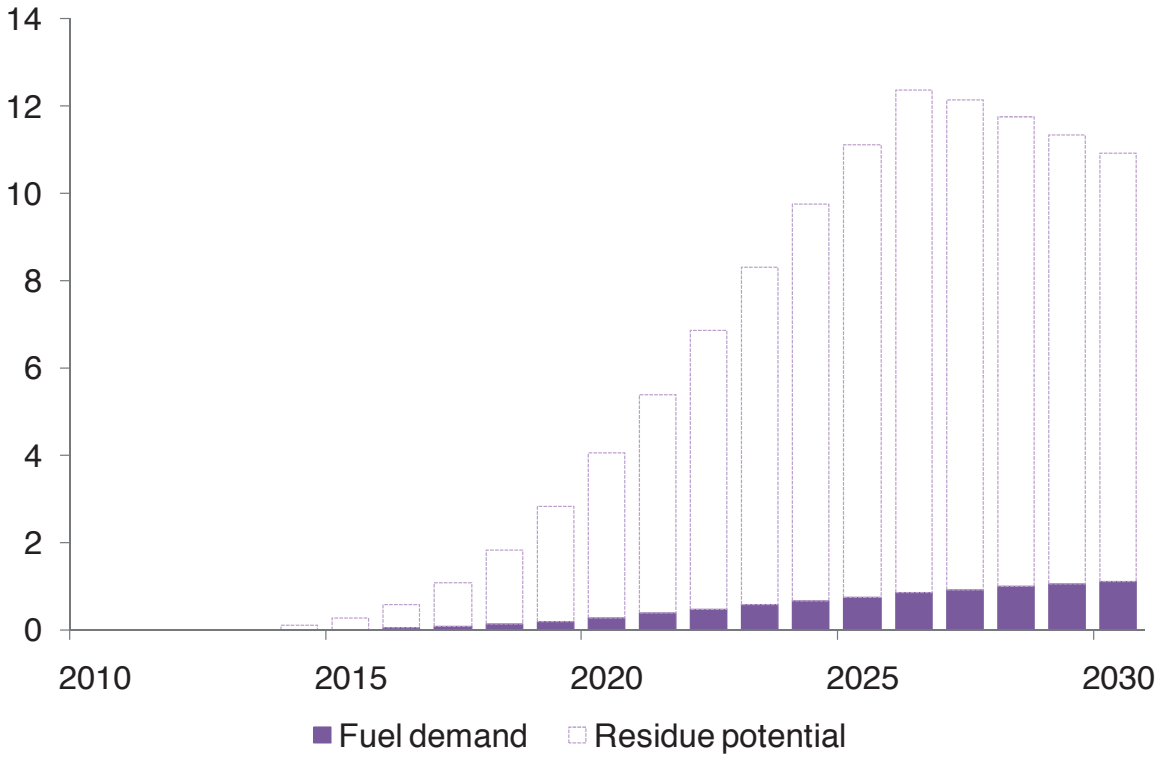
ROMANIA JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Bloomberg New Energy Finance

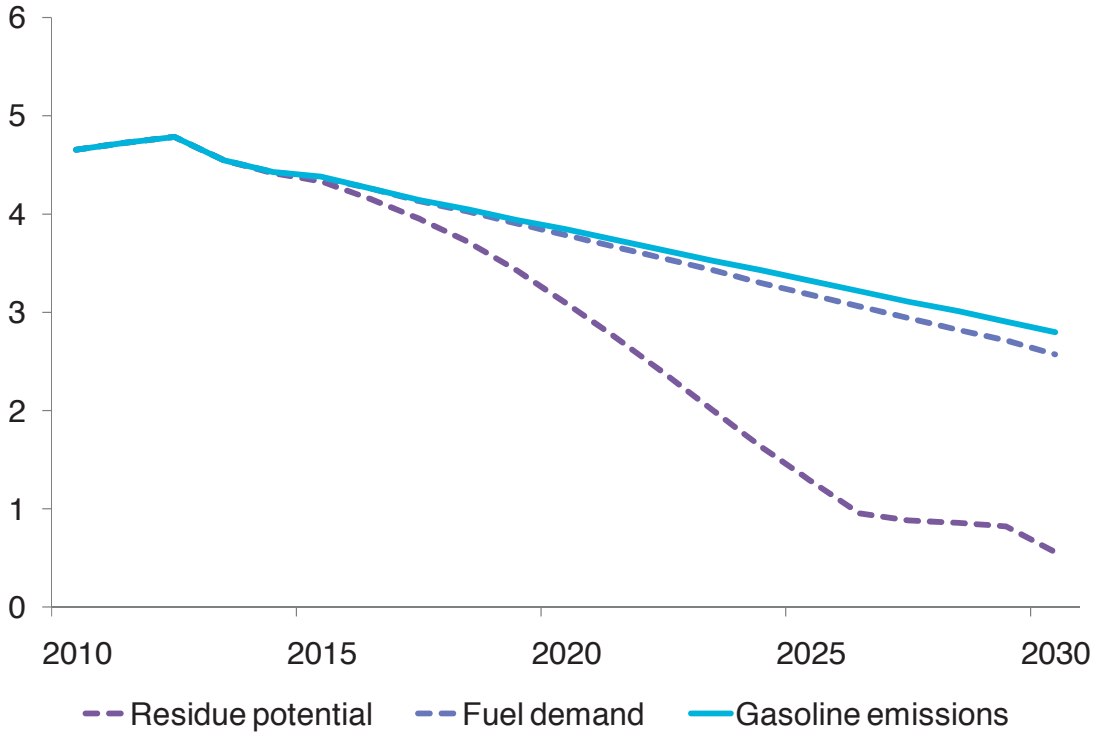
ROMANIA REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

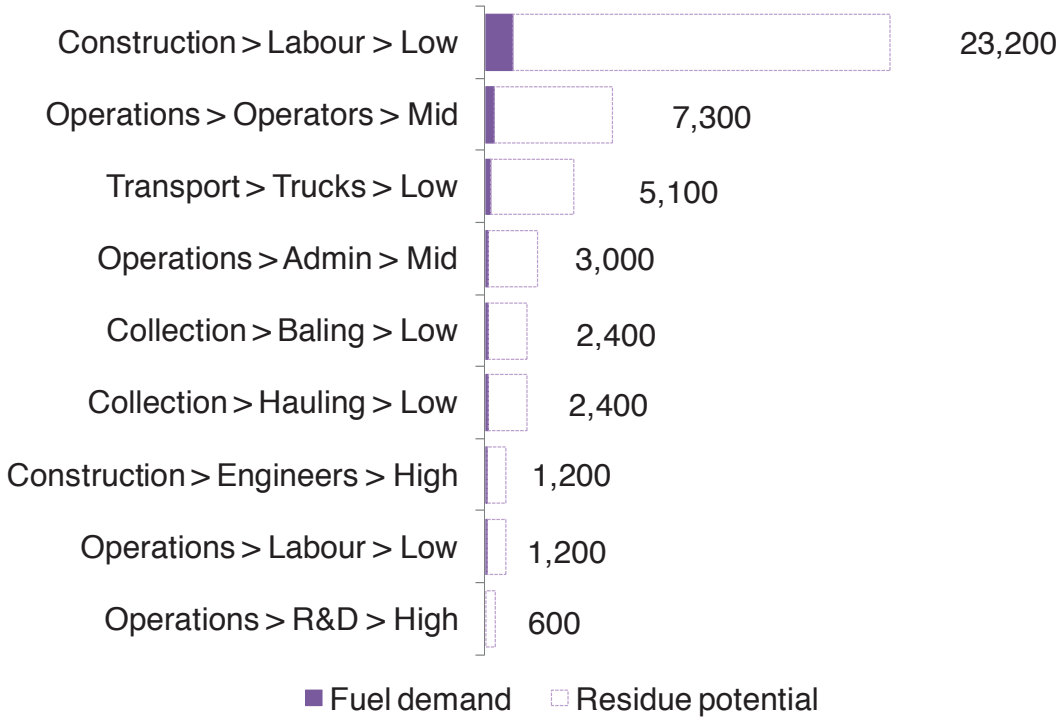
ROMANIA GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%.

Source: Bloomberg New Energy Finance

ROMANIA JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance Danish Construction Association

UKRAINE KEY METRICS IN "FUEL DEMAND" SCENARIO

MAJOR RESIDUE SOURCES

Wheat, maize, barley

JOB OPPORTUNITIES, 2011-30

36,000 man-years

ETHANOL POTENTIAL, 2030

1.8 BLPA

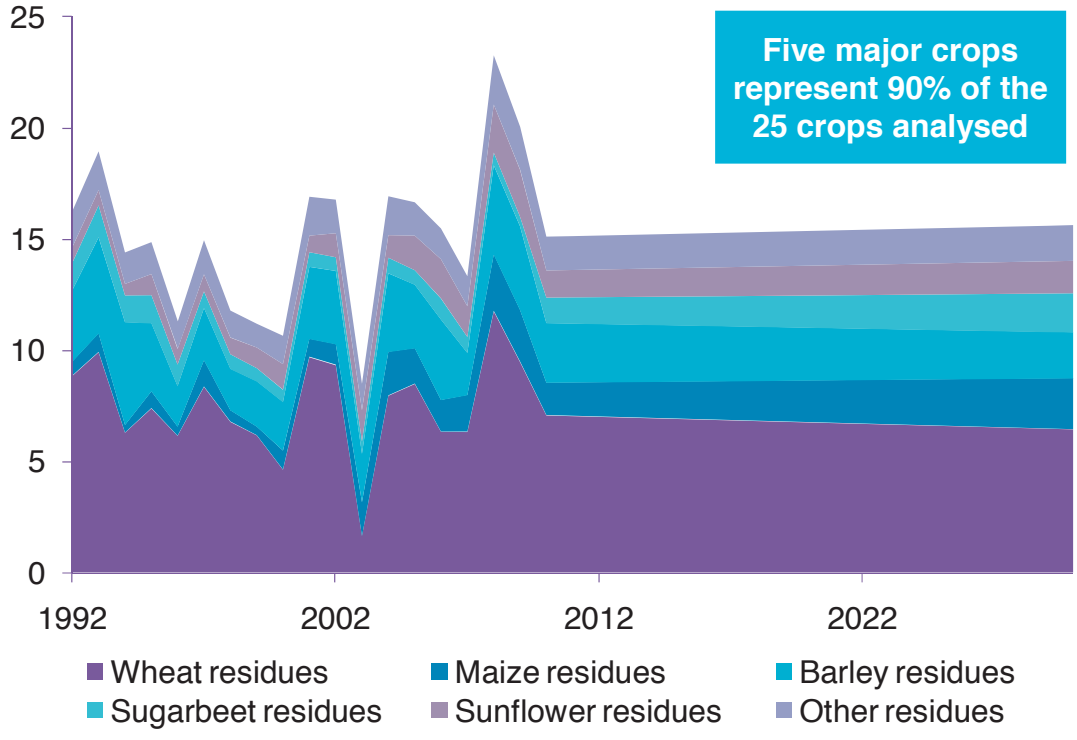
REVENUE, 2011–2050

EUR 12.2bn

POTENTIAL GHG SAVING, 2011-30

17.2 mtCO2

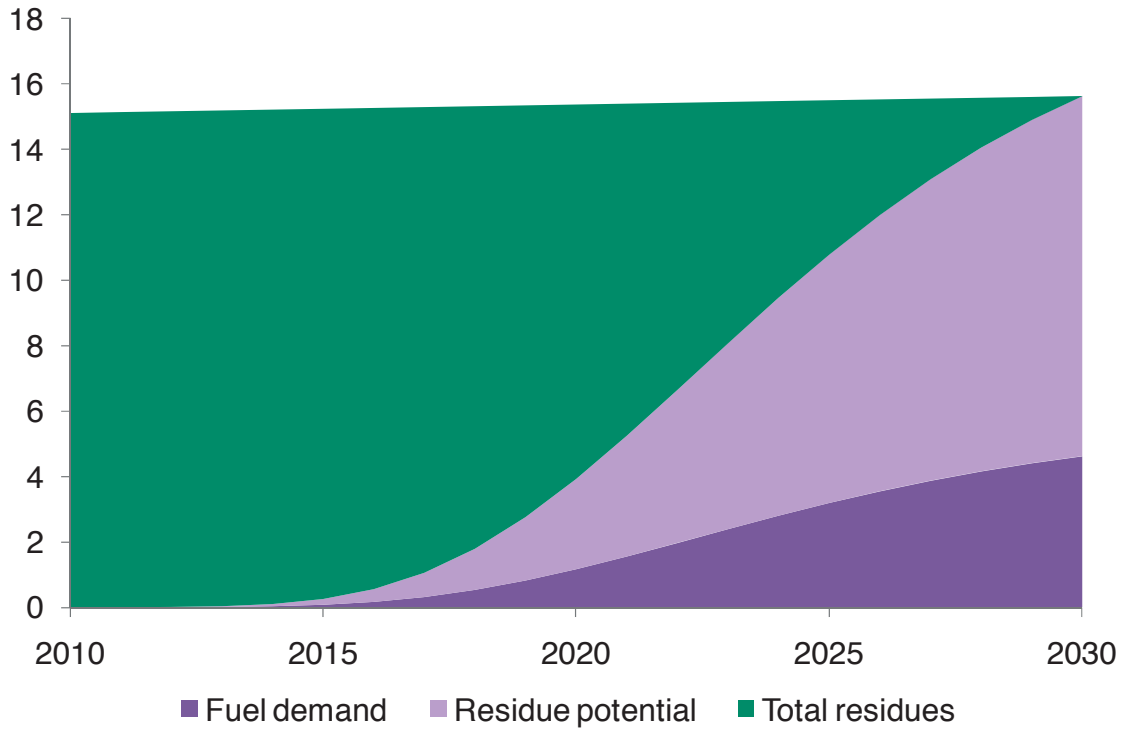
UKRAINE AGRICULTURAL RESIDUE AVAILABILITY, 1989—2030 (MILLION DRY TONNES)



Note: Residue projections are based on food yield projections.

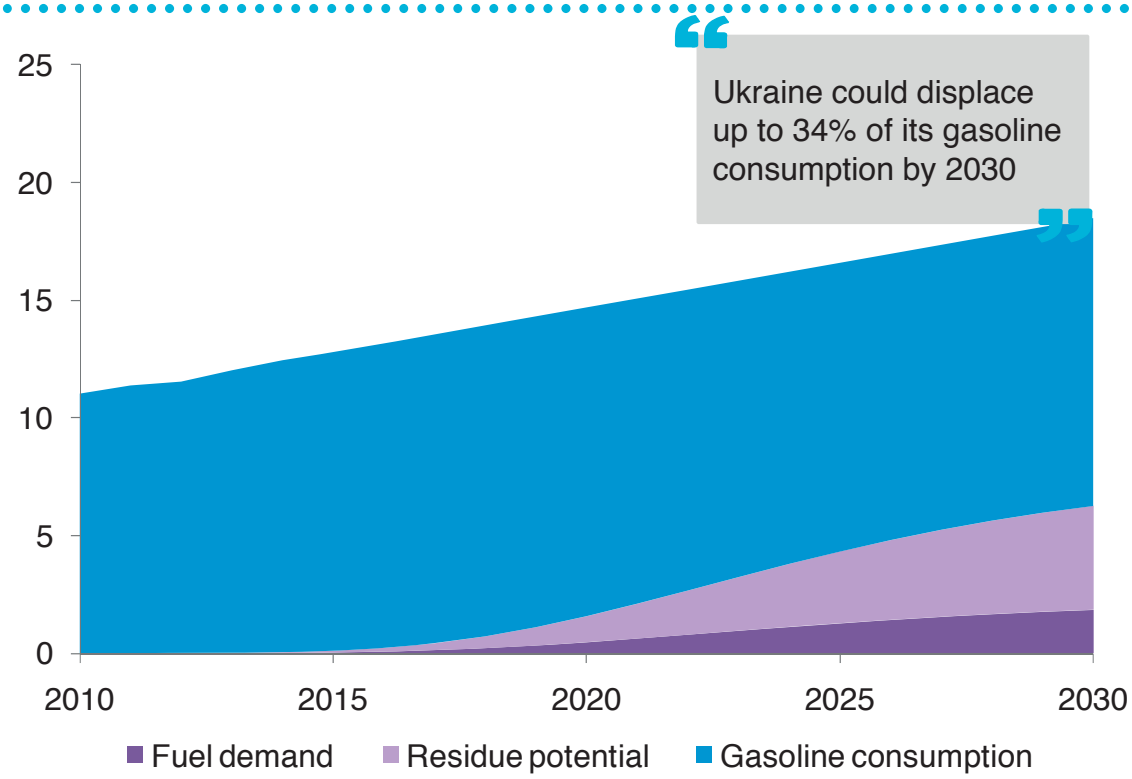
Source: Bloomberg New Energy Finance, FAO

UKRAINE AGRICULTURAL RESIDUES, 2010-30 (MILLION DRY TONNES)



Source: Bloomberg New Energy Finance, FAO

UKRAINE NEXT-GENERATION ETHANOL POTENTIAL, 2010–2030 (BN LITRES)

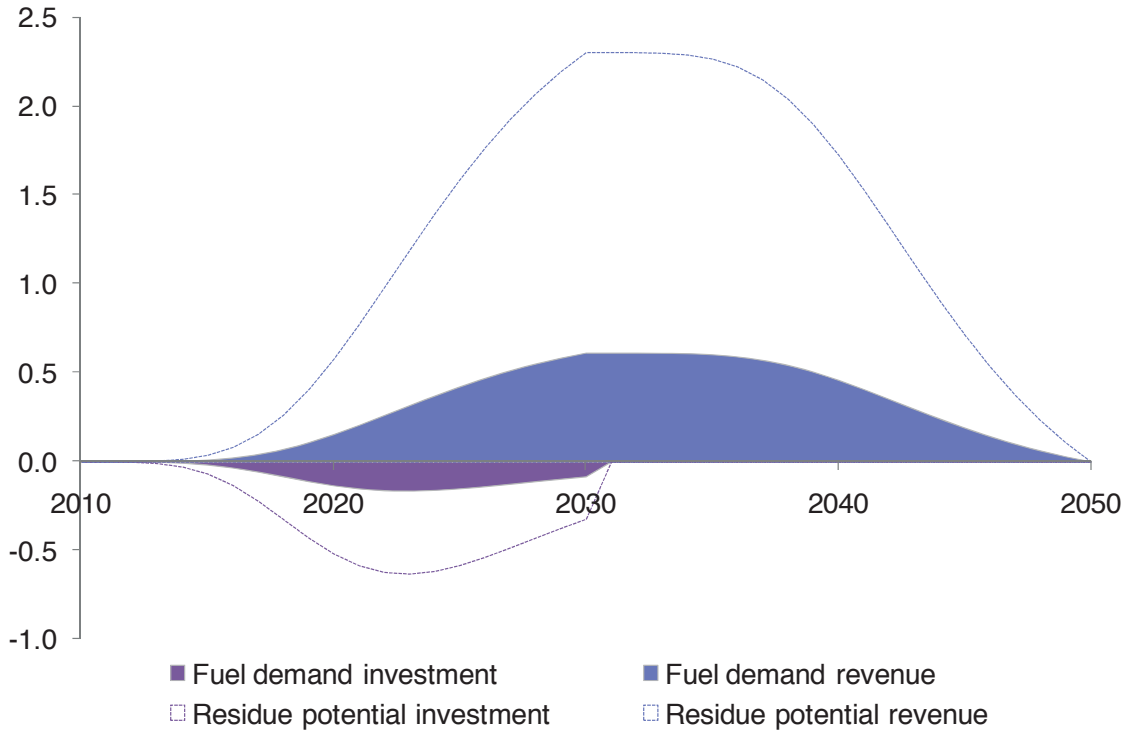


> Ukraine could displace up to 34% of its gasoline consumption by 2030

Note: Ethanol supply expressed in gasoline energy equivalent terms.

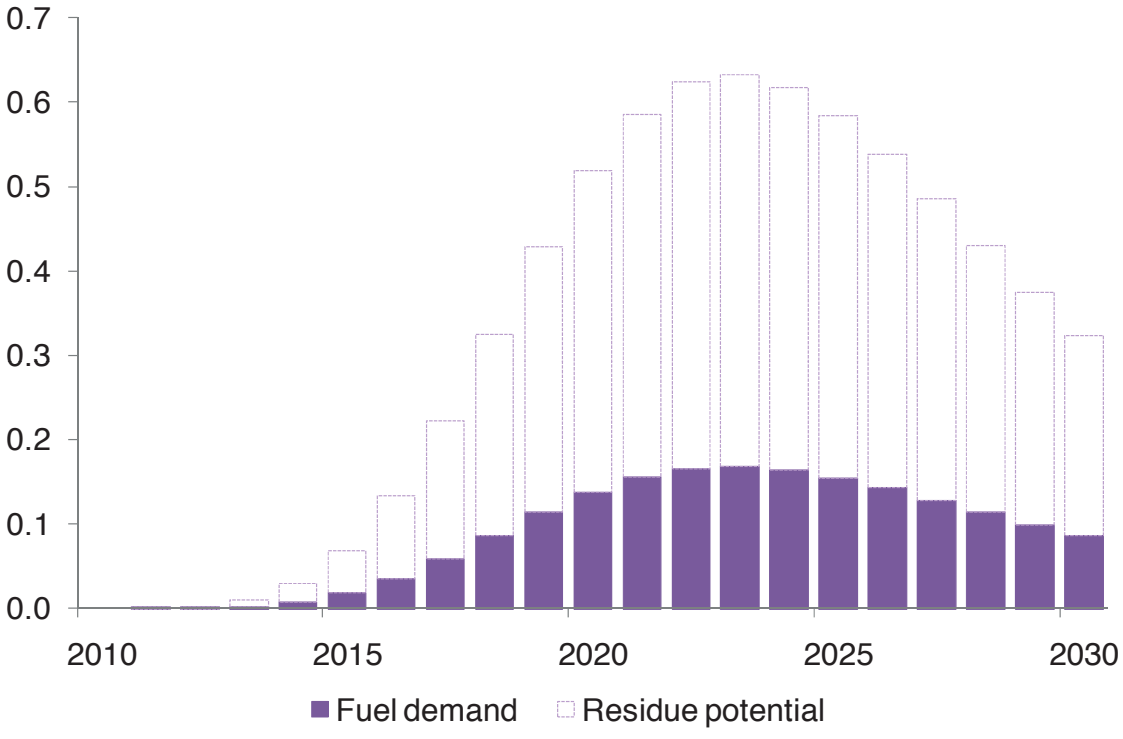
Source: Bloomberg New Energy Finance

UKRAINE REVENUE VERSUS INVESTMENT, 2011–2050 (EUR BN)



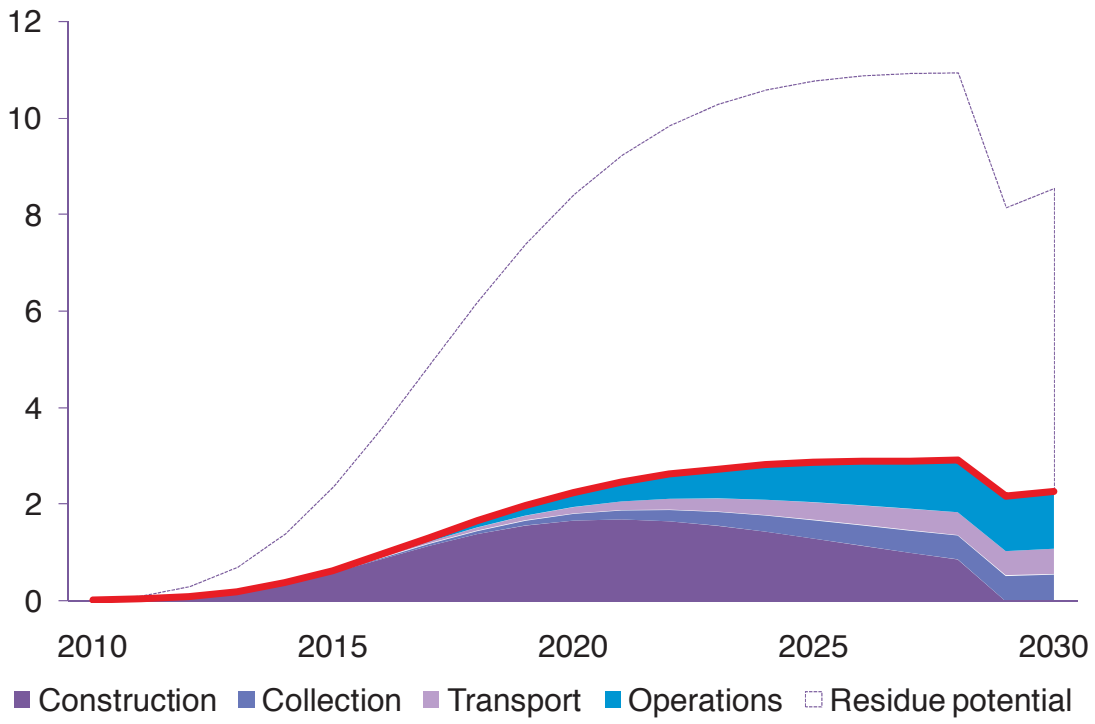
Note: Biorefineries are assumed to operate and produce revenue for 20 years, hence the steady drop off from 2030 as 2011 plants get decommissioned. All investment takes place between 2011 and 2030. Source: Bloomberg New Energy Finance

UKRAINE TOTAL INVESTMENT, 2010–2030 (EUR BN)



Note: We assume total facility costs for a next-generation ethanol refinery will be approximately $1.50 per litre of annual installed capacity. Source: Bloomberg New Energy Finance

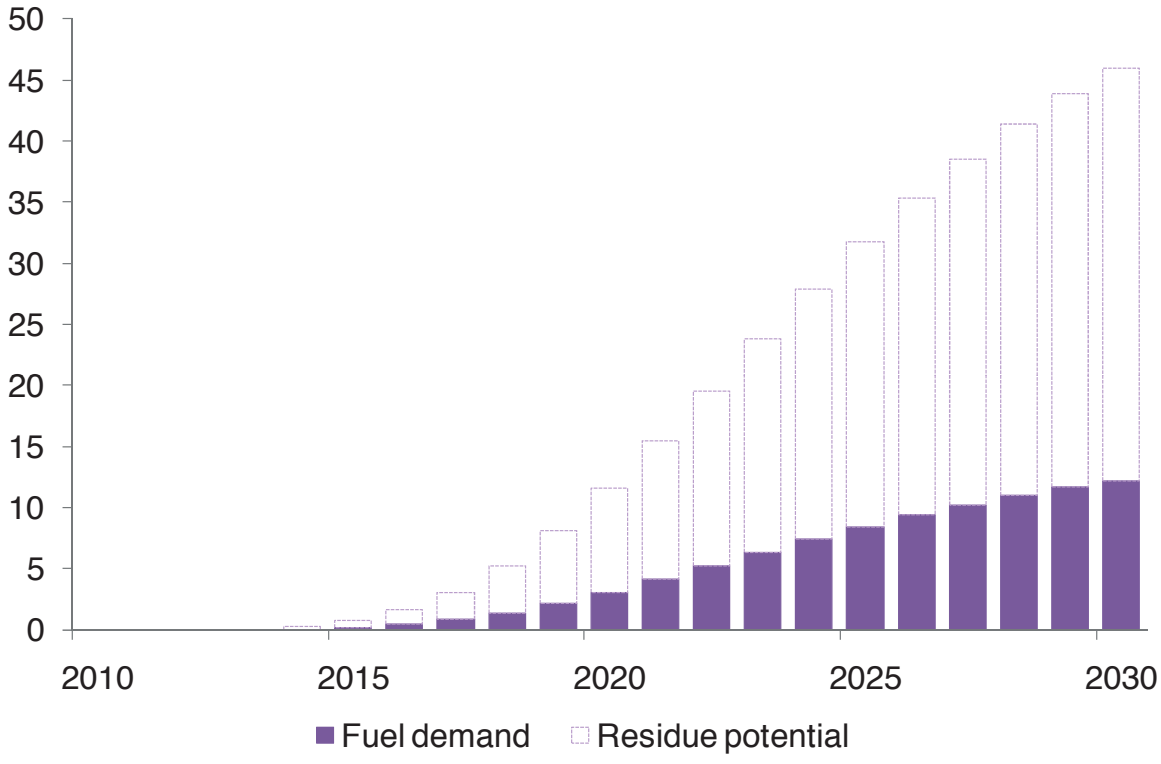
UKRAINE JOB CREATION, 2011–2030 (THOUSAND MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the next-generation industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Bloomberg New Energy Finance

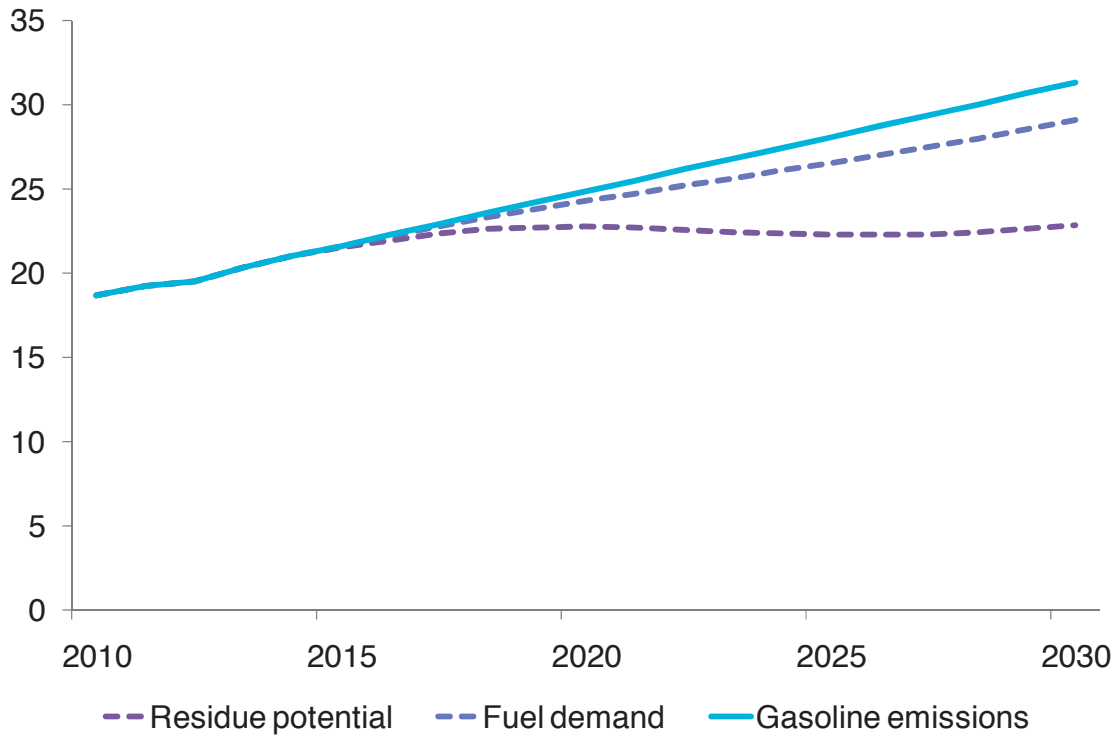
UKRAINE REVENUES, 2011–2030 (EUR BN)



Note: Revenues calculated for delivered next-generation ethanol. Revenues are generated by plants throughout their 20 years lifetime with the last plant being built in 2030.

Source: Bloomberg New Energy Finance

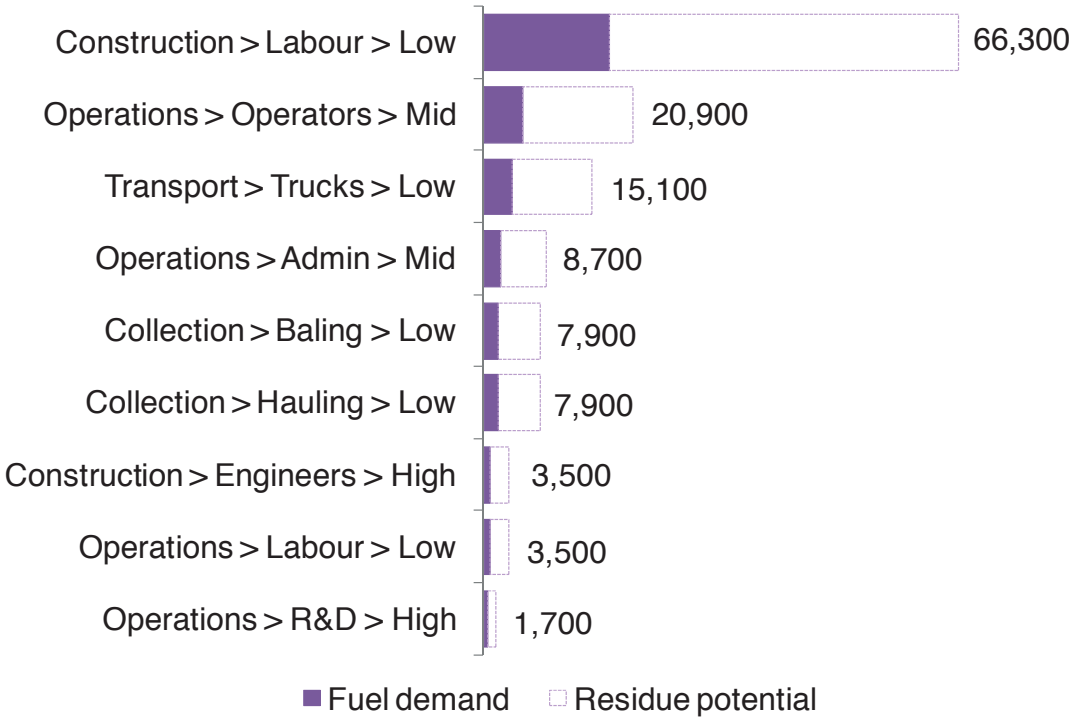
UKRAINE GHG SAVINGS, 2011–2030 (MILLION TONNES CO2E)



Note: EU sustainable transport group data shows a litre of gasoline has a well-to-wheel emissions footprint of 2.42kg/CO2e. Following RED indications, the study assumes next-generation ethanol, using the enzymatic hydrolysis technology, reduces GHG emissions by 80%.

Source: Bloomberg New Energy Finance

UKRAINE JOB CREATION BY TYPE, 2011–2030 (MAN-YEARS OF EMPLOYMENT)



Note: Total annual job creation, or one man year, in the bioproduct industry comes in two parts: firstly, biorefinery construction and operation jobs; and secondly, agricultural residue supply chain jobs.

Source: Bloomberg New Energy Finance
Danish Construction Association

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CEI - Executive Secretariat

Via Genova, 9
34121 Trieste, Italy
Tel. + 39 040 7786 777
Fax + 39 040 3606 40
cei-es@cei-es.org

More information available
on the CEI official website:
www.ceinet.org

Office for the CEI Fund at the EBRD

One Exchange Square
London, EC2A 2JN, UK
Tel. + 44 207 338 6862
Fax +44 207 338 6538
cei.ebrd@cei-es.org / www.ebrd.com

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CENTRAL EUROPEAN INITIATIVE