



ENERGY



Pathways to Sustainable Energy – Deep dive on Gas Workshop

Improved Understanding on the role of Natural Gas in Achieving
the 2030 Agenda

24 September 2019, Geneva



Exploring Synergies between Natural Gas and Renewable Energy

ENERGY



Presentation

John Roberts

Energy Security Specialist, Consultant, UNECE

Discussion

Moderator

Torstein Indrebo

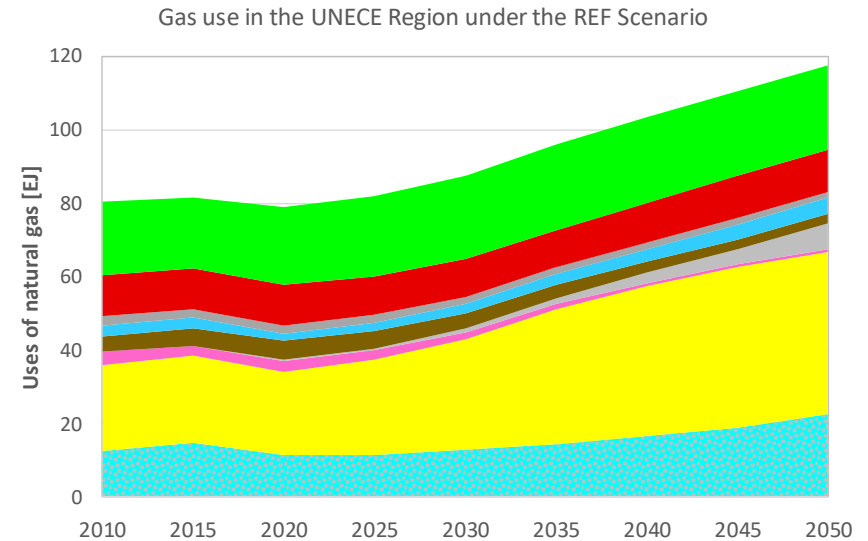
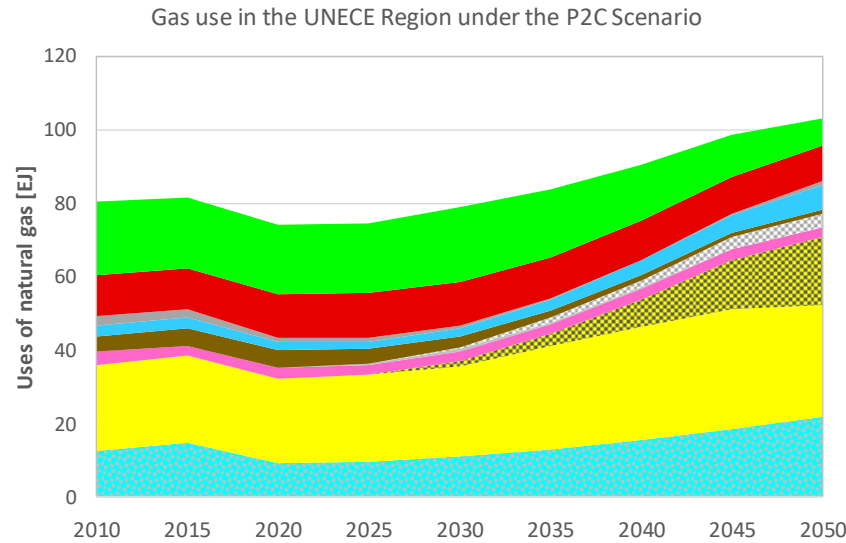
Executive Director, TI Energy Advisory Services

Natural Gas Supporting the Uptake of Renewable Energy

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Gas Use in the UNECE Region



Exports Electricity Electricity CCS District heat Synfuels Synfuels CCS T/D losses Feedstock Transportation Industry Resident/Commercial

Natural Gas Supporting the Uptake of Renewable Energy

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Complementarity or Competition?

Commercial competition with renewables in some areas

Social opposition in others

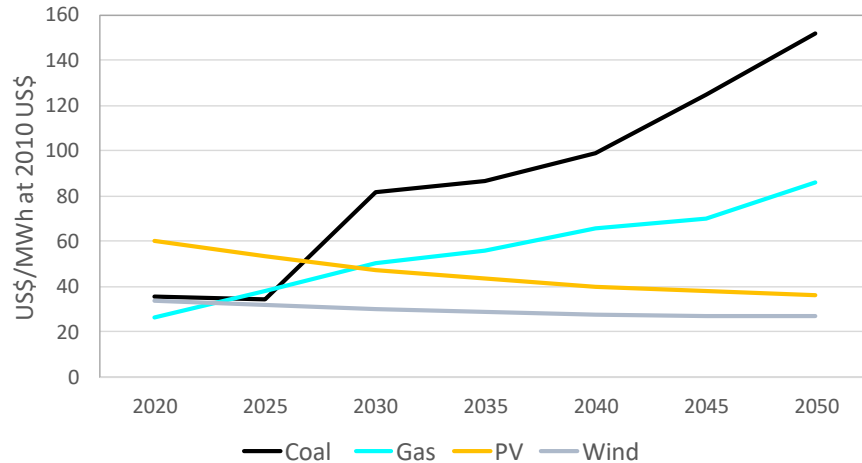
Regulation and taxation; the importance of market design

Natural Gas Supporting the Uptake of Renewable Energy

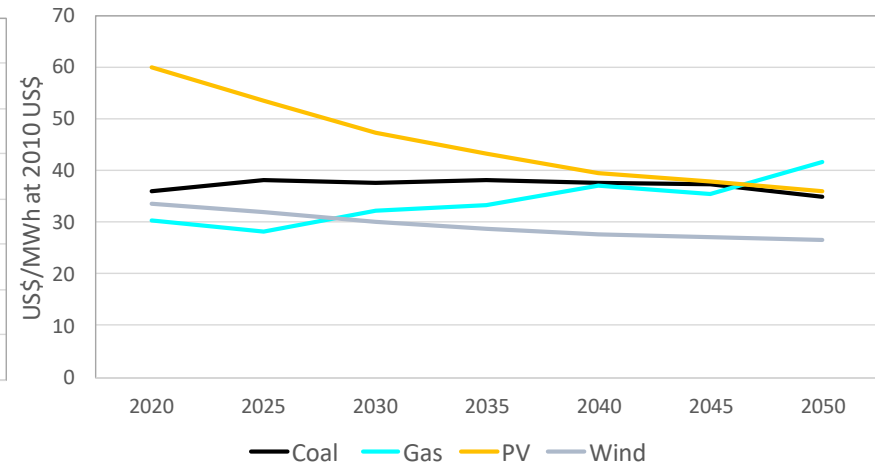
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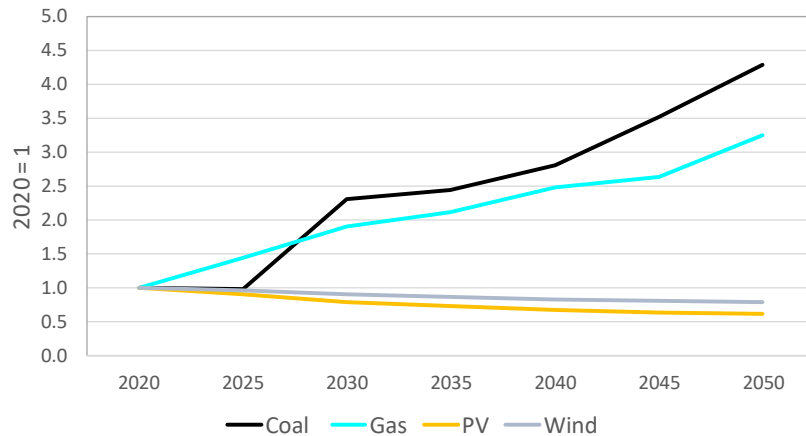
Electricity generating cost trends: UNECE, P2C Scenario



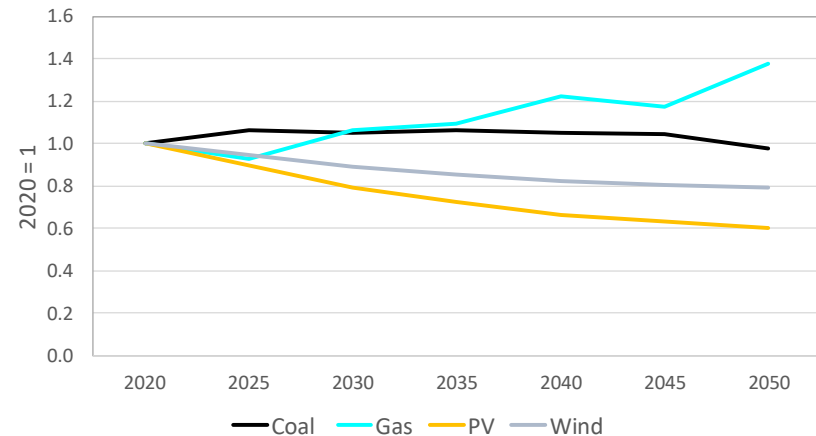
Electricity generating cost trends: UNECE, REF Scenario



Electricity generating cost trends: UNECE, P2C Scenario



Electricity generating cost trends: UNECE, REF Scenario

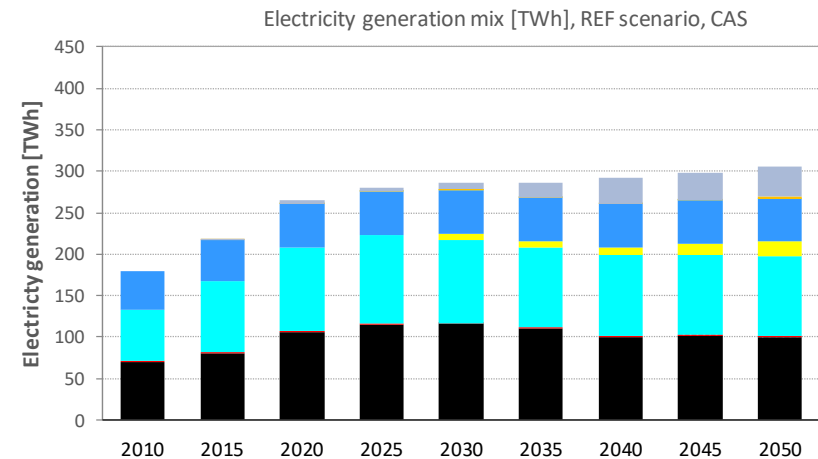
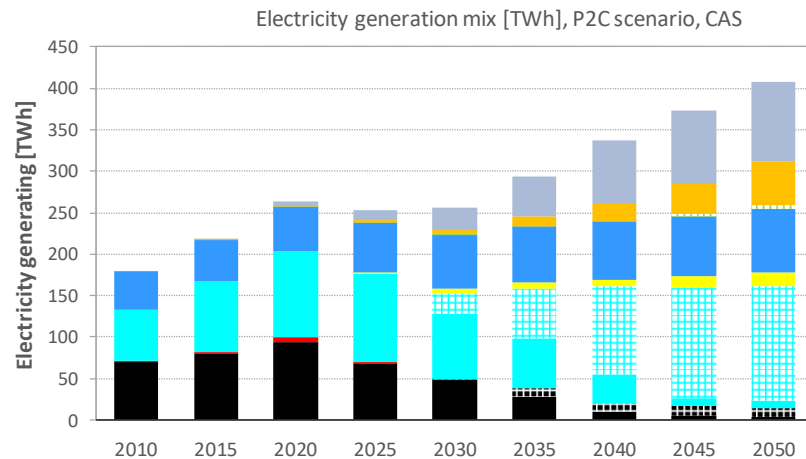


Natural Gas Supporting the Uptake of Renewable Energy

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Central Asia (CAS) – Fuel Mix in electricity generation



Coal Coal CCS Oil Oil CCS Gas Gas CCS Nuclear Hydro Biomass Biomass CCS Geothermal PV CSP Wind Onshore Wind Offshore Other

Natural Gas Supporting the Uptake of Renewable Energy



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An Uncertain World

What we know, what we think.

What we might have to think.

Don't take anything for granted.

Natural Gas Supporting the Uptake of Renewable Energy



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A complex relationship

The twin imperatives:

Rapid decarbonisation and sustainable energy development

The cost of investment

The cost of failing to take action

Natural Gas Supporting the Uptake of Renewable Energy



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Energy efficiency

A consistent issue throughout the UNECE Region

LOOK FOR THE PINK

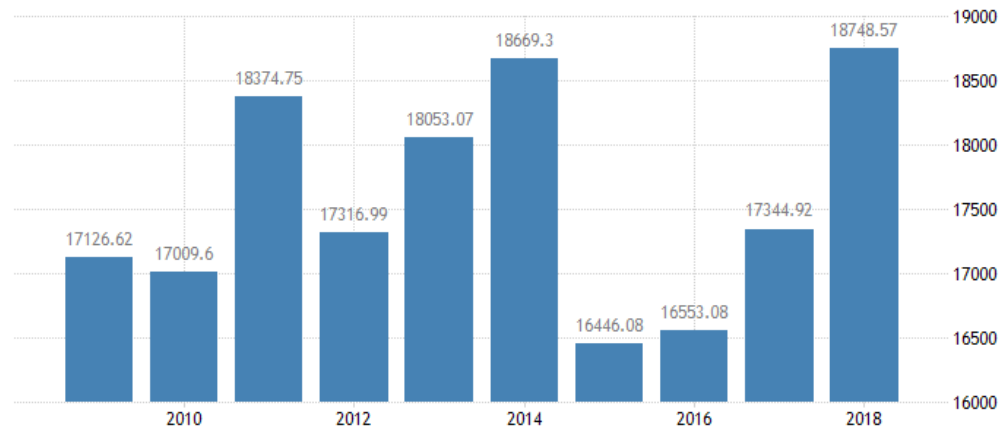
Natural Gas Supporting the Uptake of Renewable Energy



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A Start in Energy Efficiency: EU GDP and Energy Consumption

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Primary Energy (in MTOE)	1818.1	1714.8	1777.1	1719.1	1705.8	1694.4	1631.7	1652.9	1670.4	1691.8	1688.2
GDP (in \$ Bn)	19163.62	17126.62	17009.6	18374.75	17316.99	18053.07	18669.3	16446.08	16553.08	17344.92	18748.57



SOURCE: TRADINGECONOMICS.COM | WORLD BANK

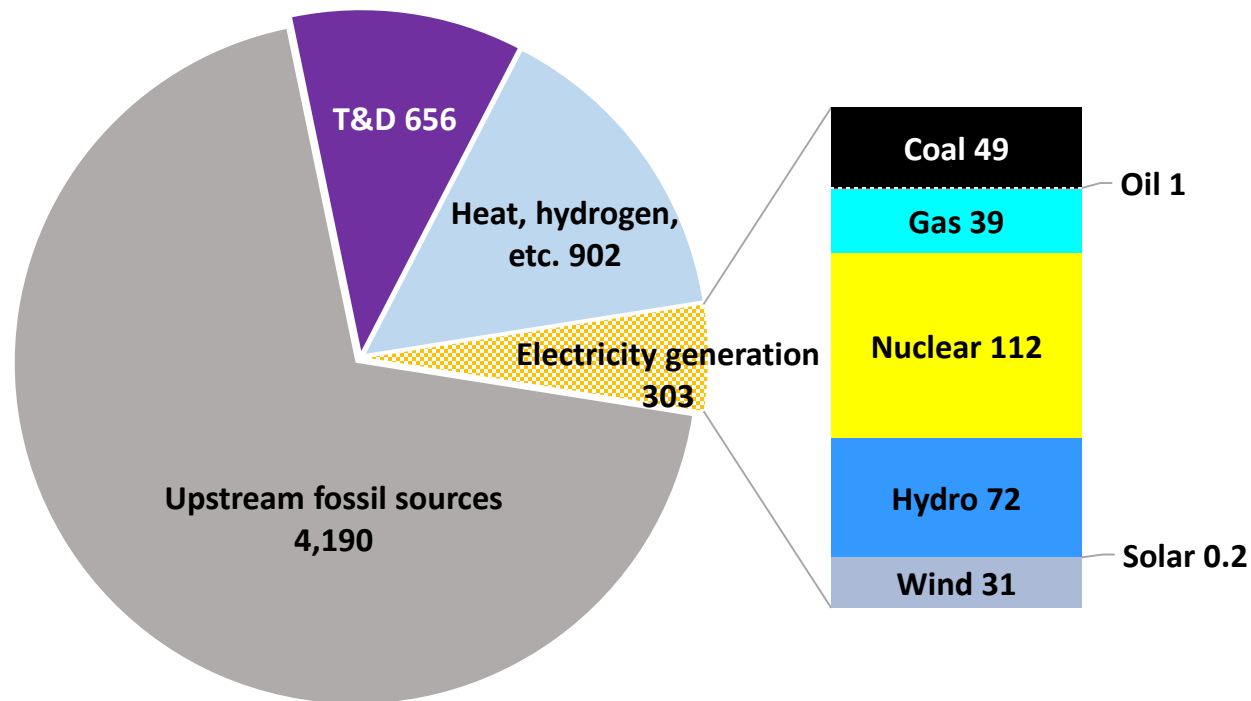
Modeling Results: Indicators

Invest. needs: Russian Federation – REF

ENERGY



Cumulative investments 2020-2050: *6,051 billion US\$*
REF – RUS Region



■ Upstream fossil sources
■ T&D
■ Heat, hydrogen, etc.
■ Energy efficiency
■ Coal
■ Coal CCS

■ Oil
■ Oil CCS
■ Gas
■ Gas CCS
■ Nuclear
■ Hydro

■ Biomass
■ Biomass CCS
■ Geothermal
■ Solar
■ Wind

■ T&D: transmission and distribution of electricity and district heat
■ Investments in US\$ at 2010 prices and exchange rates

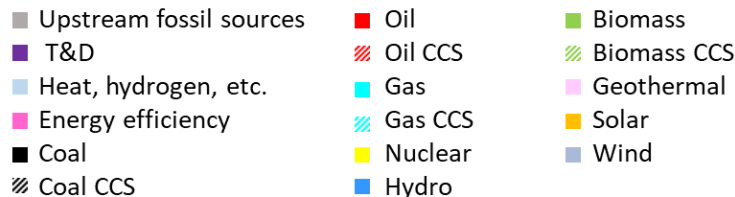
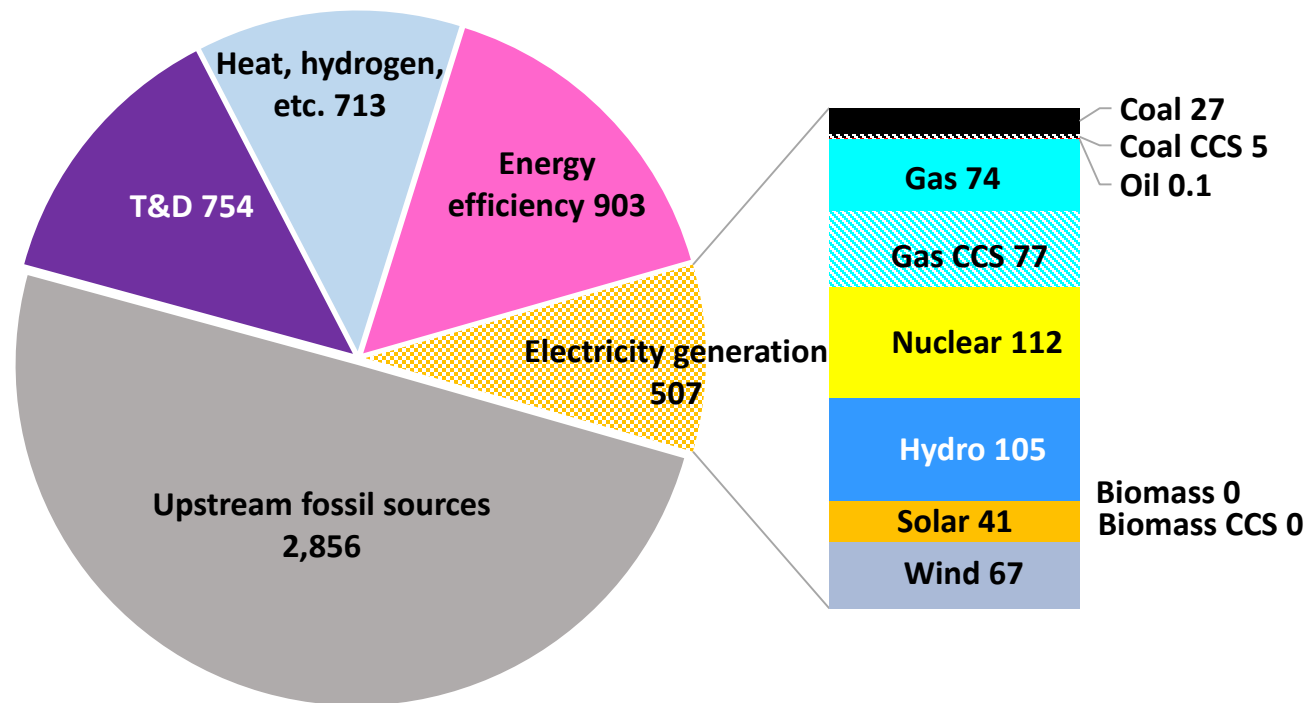
Modeling Results: Indicators

Invest. needs: Russian Federation – P2C

ENERGY



Cumulative investments 2020-2050: **5,734 billion US\$**
P2C – RUS Region



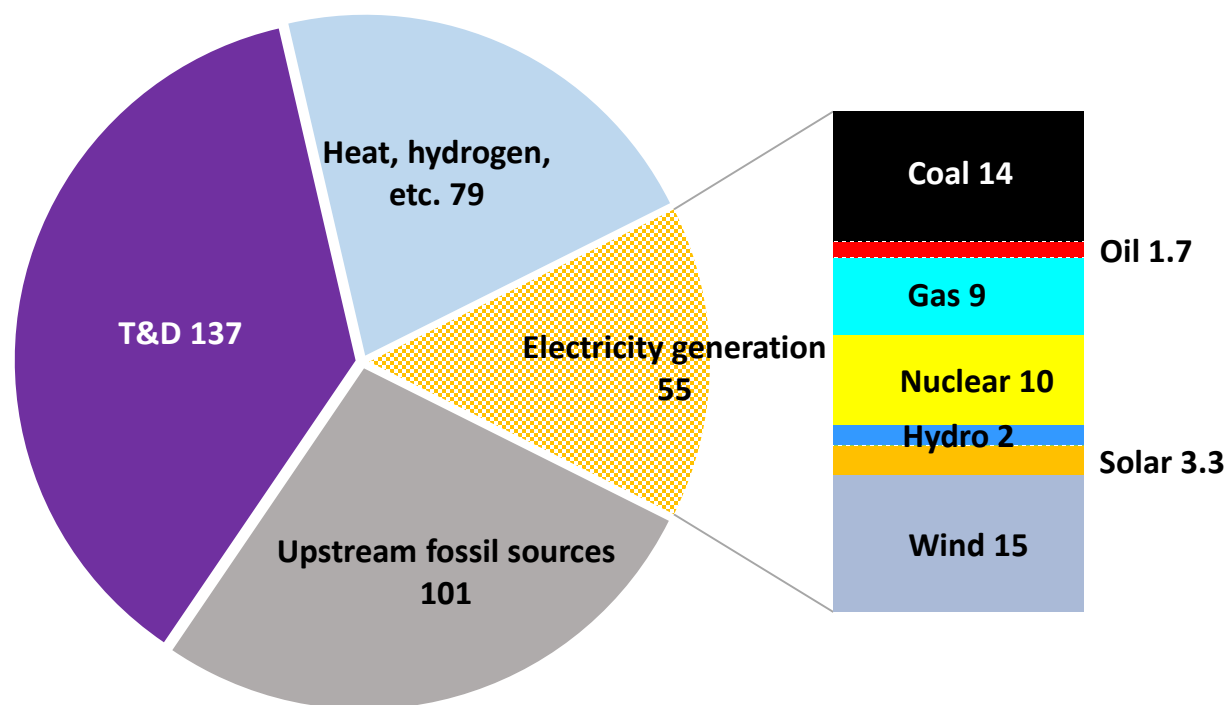
- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

Modeling Results: Indicators

Invest. needs: Belarus, Moldova, Ukraine – REF

ENERGY

Cumulative investments 2020-2050: **372 billion US\$**
REF – BMU Region



- Upstream fossil sources
- T&D
- Heat, hydrogen, etc.
- Energy efficiency
- Coal
- Coal CCS
- Oil
- Oil CCS
- Gas
- Gas CCS
- Nuclear
- Hydro
- Biomass
- Biomass CCS
- Geothermal
- Solar
- Wind

- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

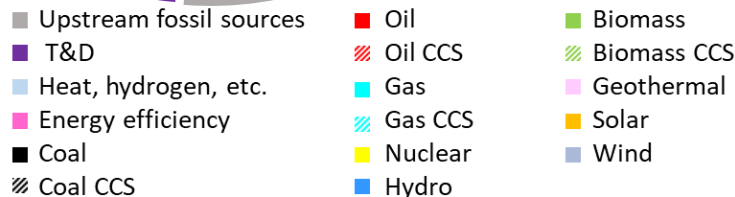
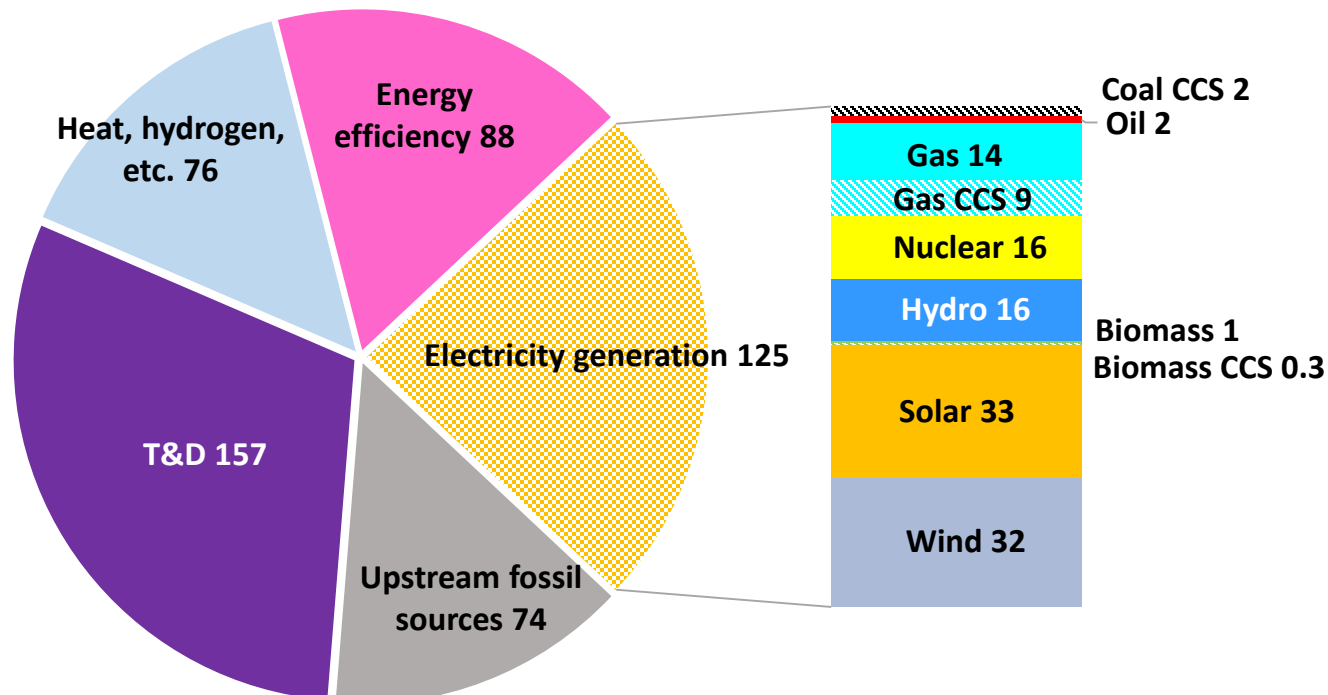
Modeling Results: Indicators

Invest. needs: Belarus, Moldova, Ukraine – P2C

ENERGY



Cumulative investments 2020-2050: *520 billion US\$*
P2C – BMU Region



- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

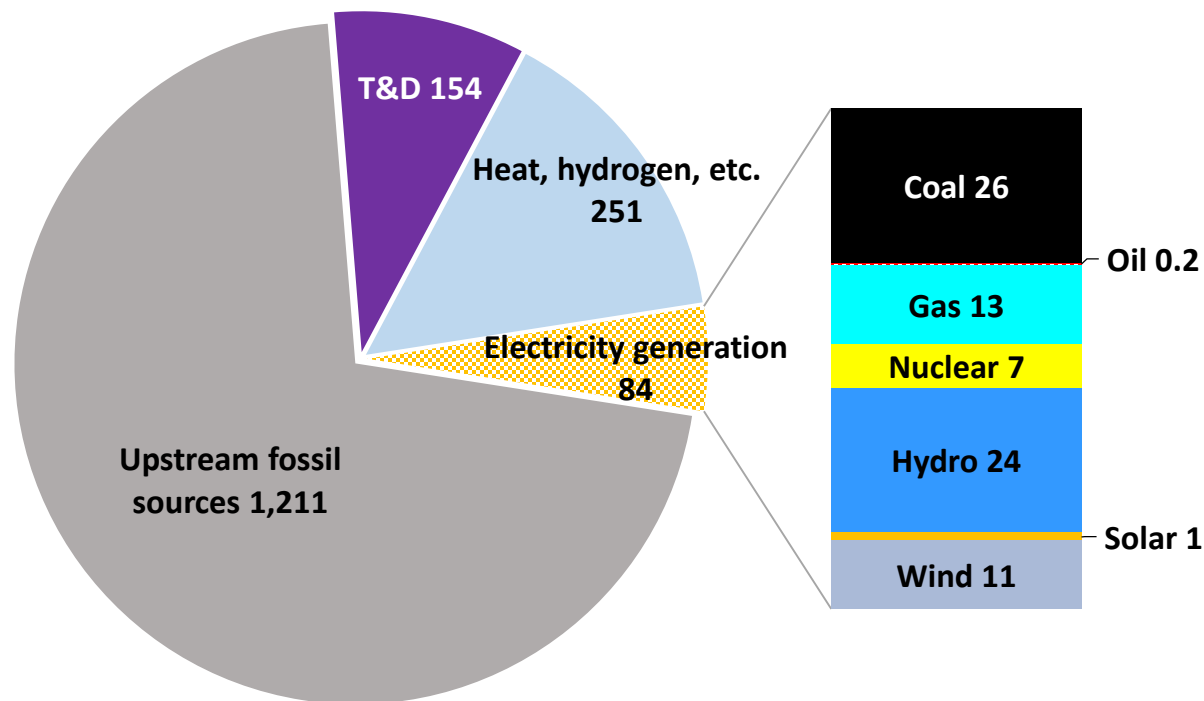
Modeling Results: Indicators

Invest. needs: Central Asia – REF

ENERGY



Cumulative investments 2020-2050: *1,700 billion US\$*
REF – CAS Region



- Upstream fossil sources
- T&D
- Heat, hydrogen, etc.
- Energy efficiency
- Coal
- Coal CCS
- Oil
- Oil CCS
- Gas
- Gas CCS
- Nuclear
- Hydro
- Biomass
- Biomass CCS
- Geothermal
- Solar
- Wind

- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

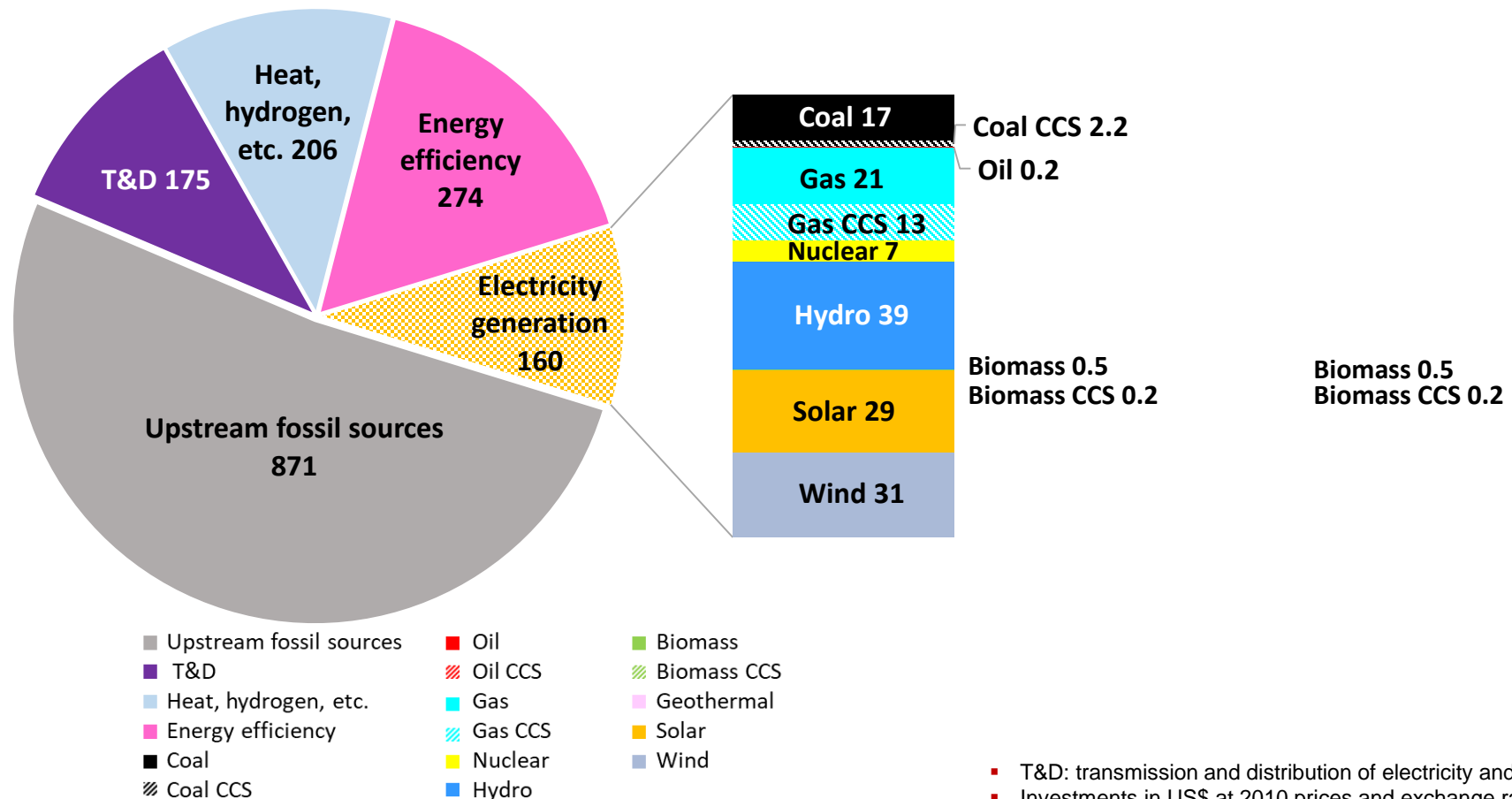
Modeling Results: Indicators

Invest. needs: Central Asia – P2C

ENERGY



Cumulative investments 2020-2050: *1,686 billion US\$*
P2C – CAS Region



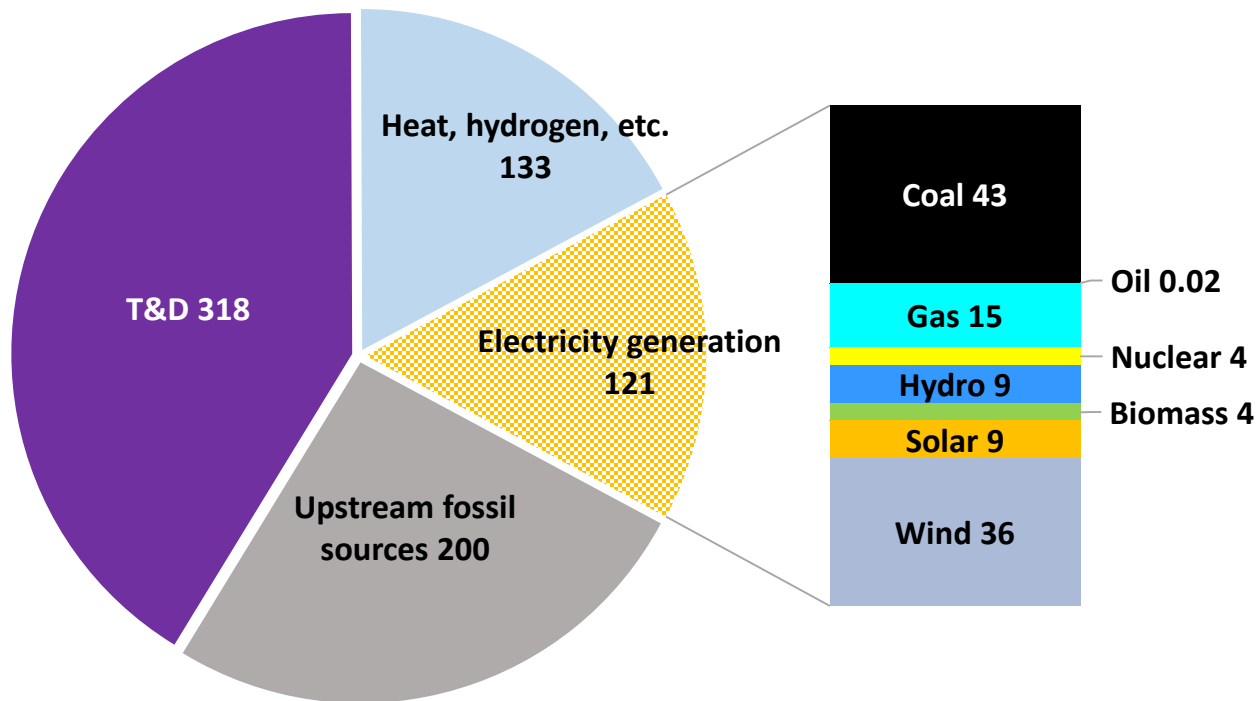
Modeling Results: Indicators

Invest. needs: Eastern Europe - REF

ENERGY



Cumulative investments 2020-2050: *771 billion US\$*
REF – EEU Region



■ Upstream fossil sources
■ T&D
■ Heat, hydrogen, etc.
■ Energy efficiency
■ Coal
■ Coal CCS

■ Oil
■ Oil CCS
■ Gas
■ Gas CCS
■ Nuclear
■ Hydro

■ Biomass
■ Biomass CCS
■ Geothermal
■ Solar
■ Wind

■ T&D: transmission and distribution of electricity and district heat
■ Investments in US\$ at 2010 prices and exchange rates

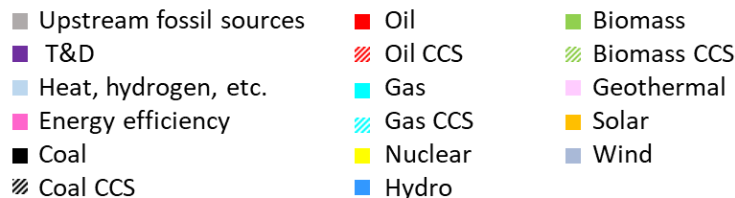
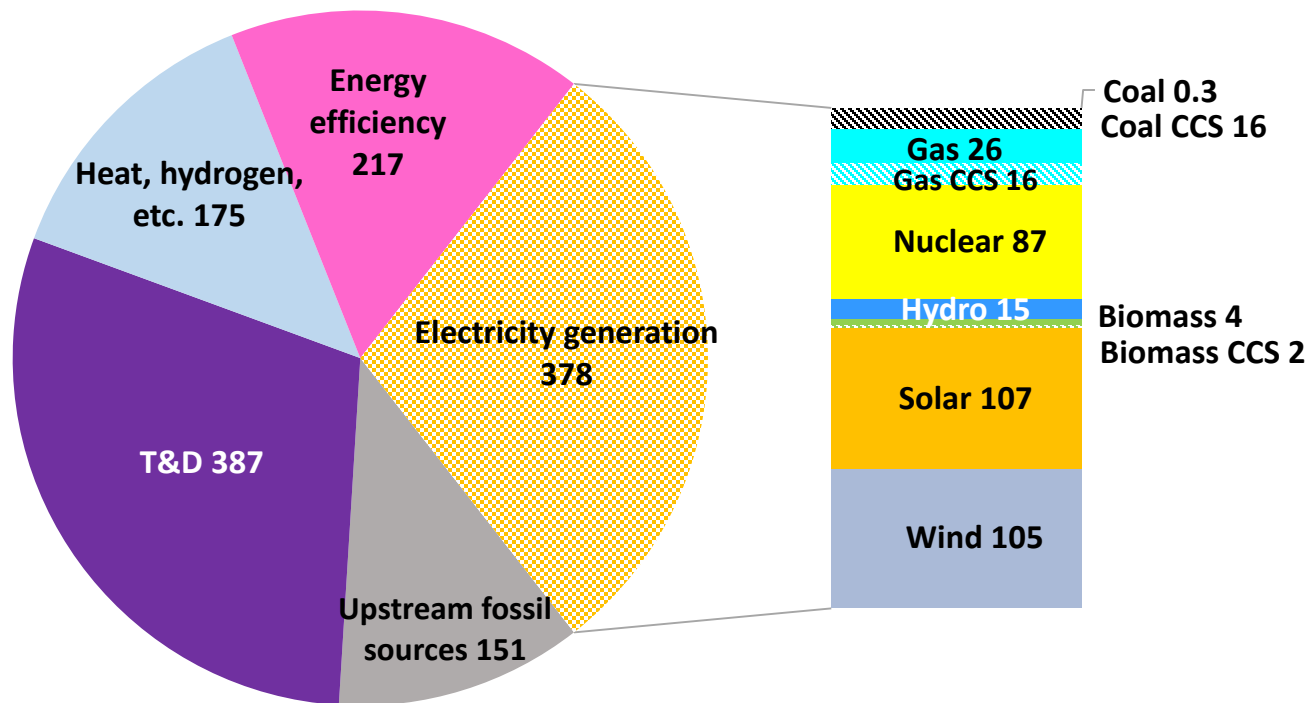
Modeling Results: Indicators

Invest. needs: Eastern Europe – P2C

ENERGY



Cumulative investments 2020-2050: *1,308 billion US\$*
P2C – EEU Region



- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

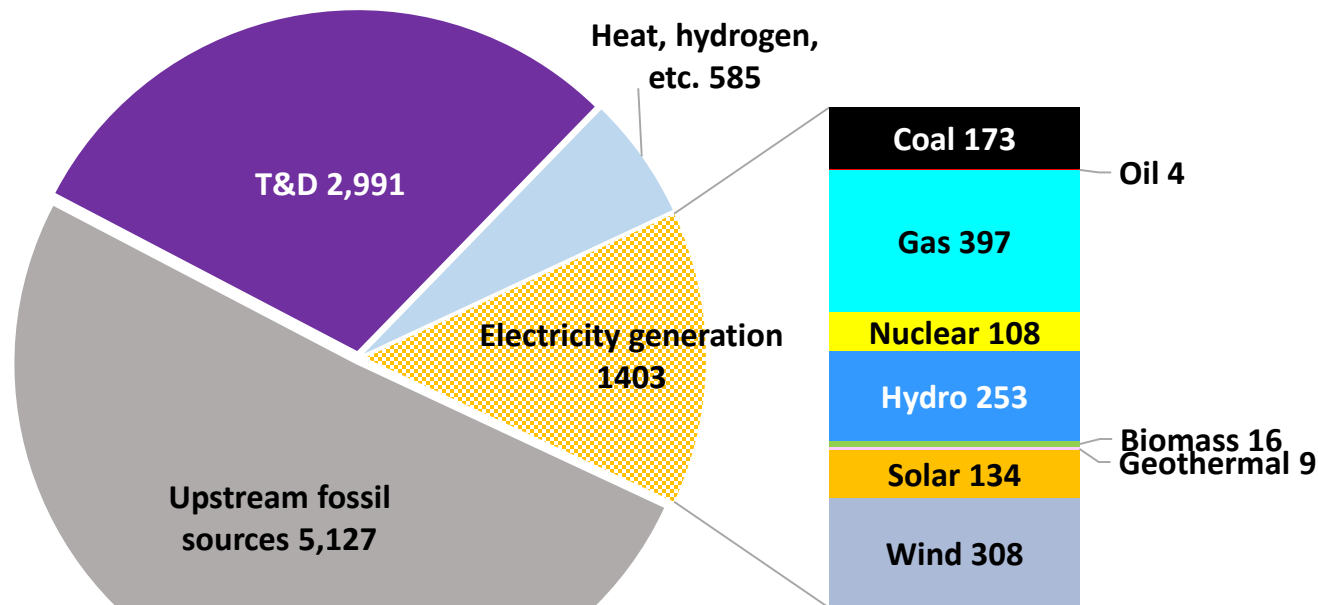
Modeling Results: Indicators

Invest. needs: North America - REF

ENERGY



Cumulative investments 2020-2050: *10,105 billion US\$*
REF – NAM Region



■ Upstream fossil sources
■ T&D
■ Heat, hydrogen, etc.
■ Energy efficiency
■ Coal
■ Coal CCS

■ Oil
■ Oil CCS
■ Gas
■ Gas CCS
■ Nuclear
■ Hydro

■ Biomass
■ Biomass CCS
■ Geothermal
■ Solar
■ Wind

■ T&D: transmission and distribution of electricity and district heat
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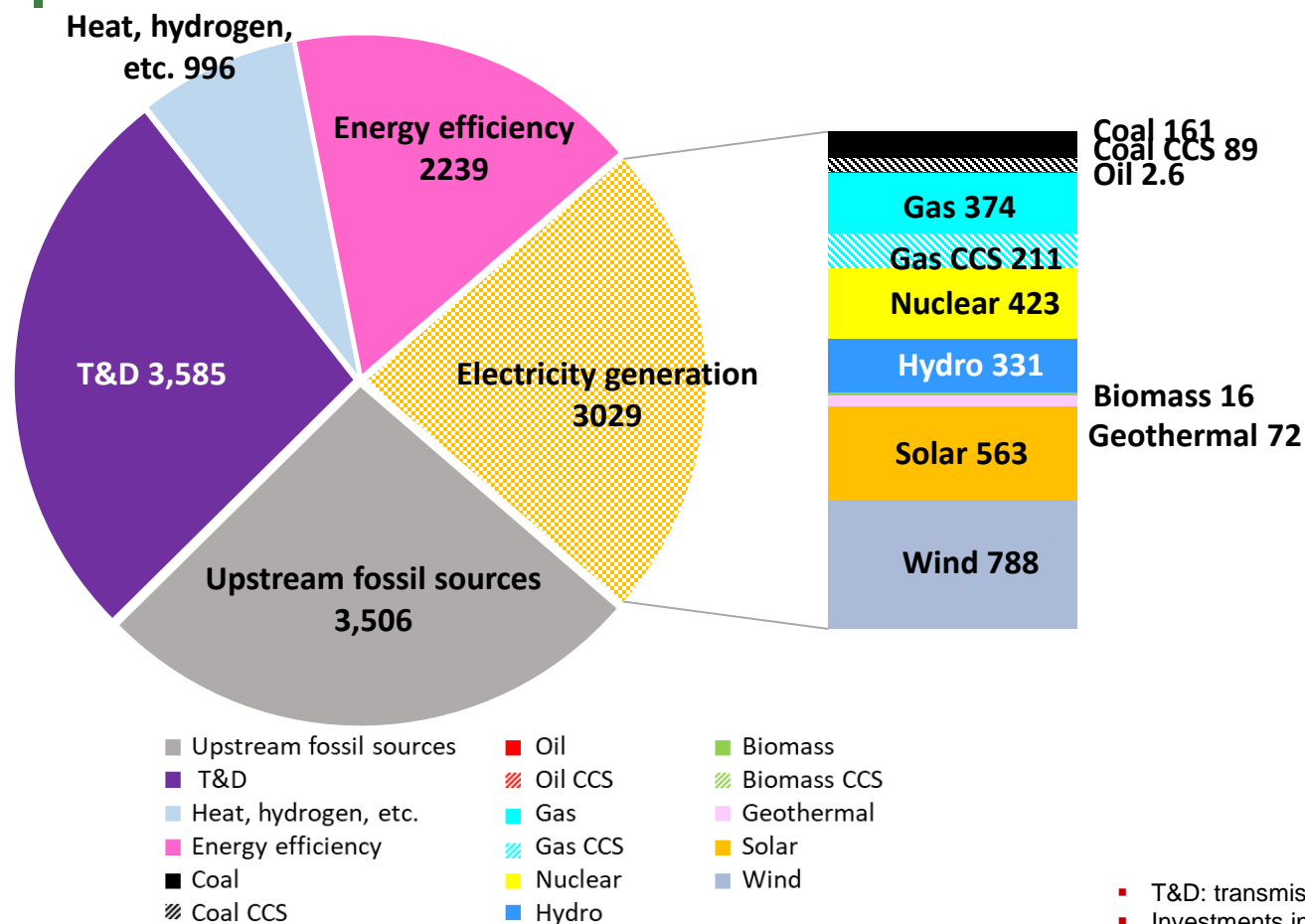
Modeling Results: Indicators

Invest. needs: North America – P2C

ENERGY



Cumulative investments 2020-2050: **13,354 billion US\$**
P2C – NAM Region



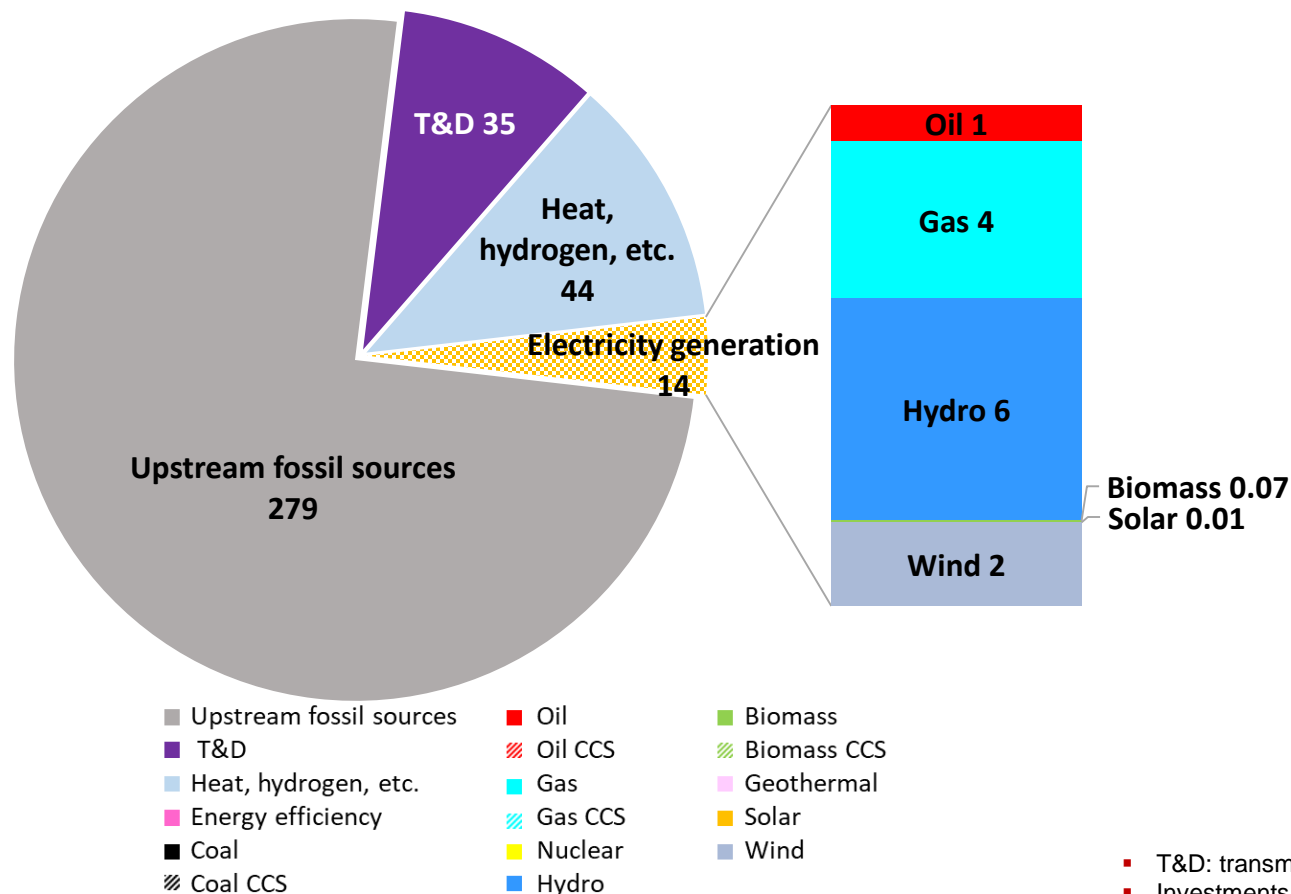
Modeling Results: Indicators

Invest. needs: the Caucasus - REF

ENERGY



Cumulative investments 2020-2050: **371 billion US\$**
REF – SCS Region



■ T&D: transmission and distribution of electricity and district heat
■ Investments in US\$ at 2010 prices and exchange rates

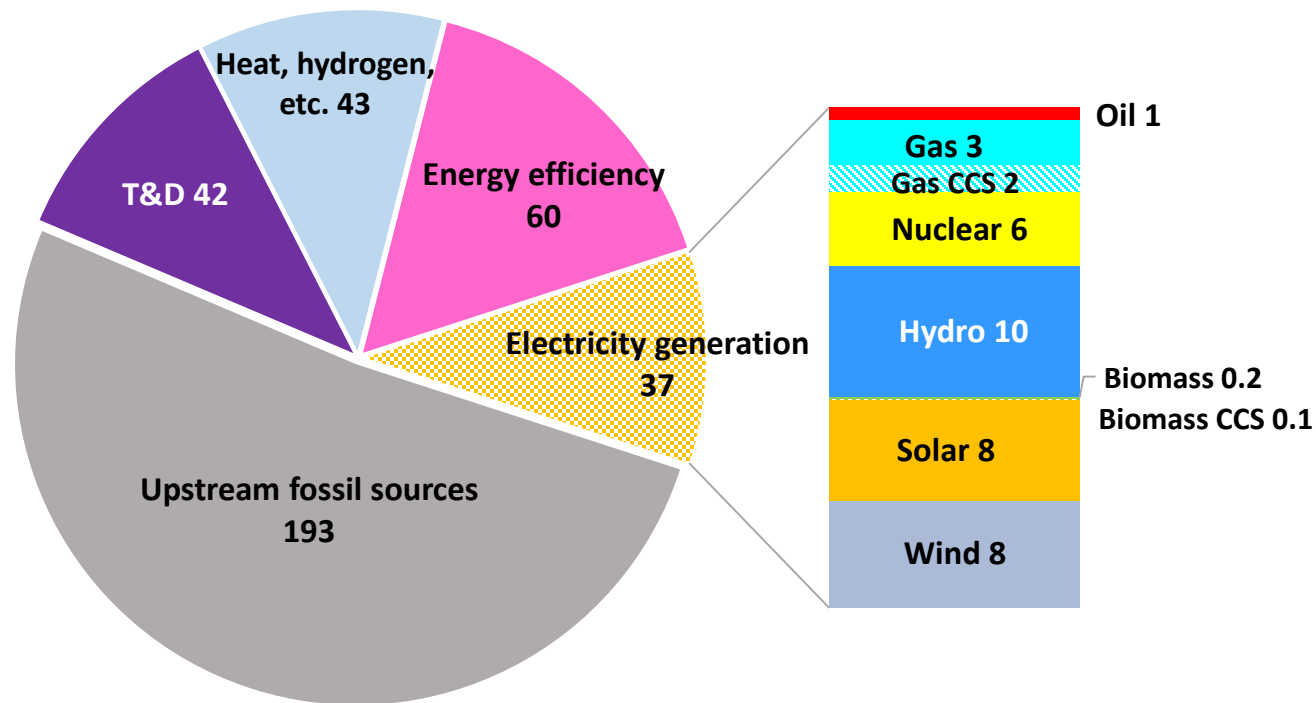
Modeling Results: Indicators

Invest. needs: the Caucasus – P2C

ENERGY



Cumulative investments 2020-2050: **375 billion US\$**
P2C – SCS Region



- Upstream fossil sources
- T&D
- Heat, hydrogen, etc.
- Energy efficiency
- Coal
- Coal CCS
- Oil
- Oil CCS
- Gas
- Gas CCS
- Nuclear
- Hydro
- Biomass
- Biomass CCS
- Geothermal
- Solar
- Wind

- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

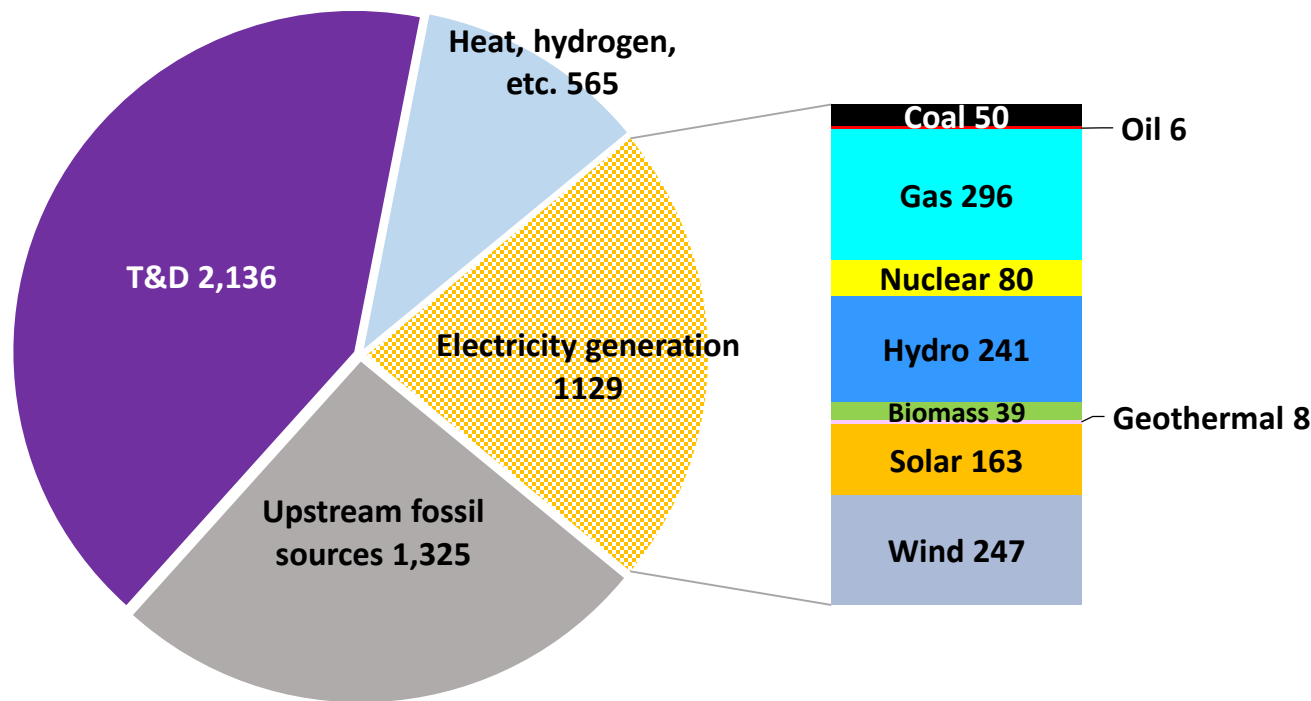
Modeling Results: Indicators

Invest. needs: Western Europe - REF

ENERGY



Cumulative investments 2020-2050: *5,156 billion US\$*
REF – WEU Region



- Upstream fossil sources
- T&D
- Heat, hydrogen, etc.
- Energy efficiency
- Coal
- Coal CCS
- Oil
- Oil CCS
- Gas
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- Biomass
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- Geothermal
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- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates

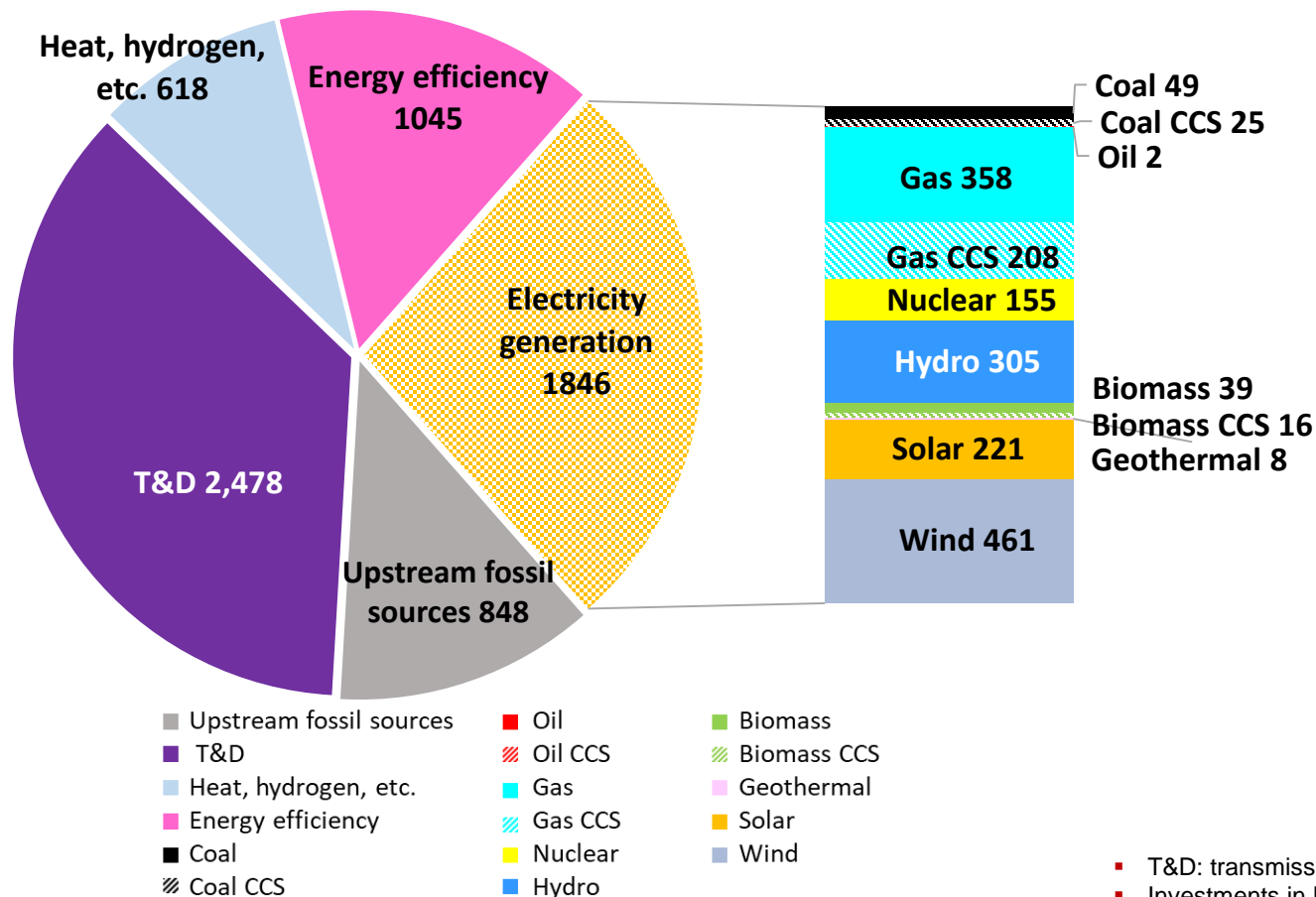
Modeling Results: Indicators

Invest. needs: Western Europe – P2C

ENERGY



Cumulative investments 2020-2050: *6.835 billion US\$*
P2C – WEU Region



■ T&D: transmission and distribution of electricity and district heat
■ Investments in US\$ at 2010 prices and exchange rates

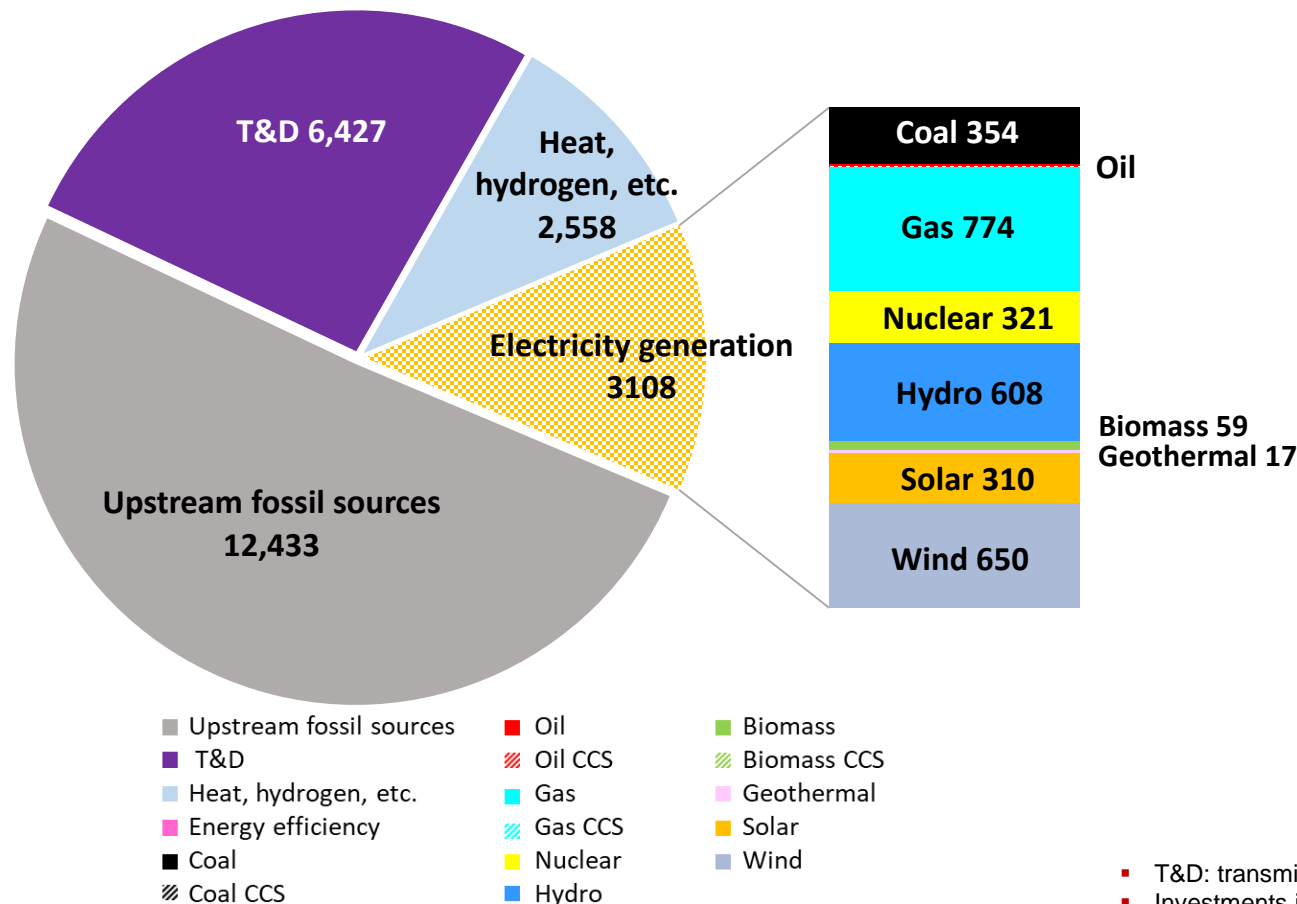
Modeling Results: Indicators

Invest. needs: UNECE - REF

ENERGY



Cumulative investments 2020-2050: **24,526 billion US\$**
REF – UNECE Region



■ T&D: transmission and distribution of electricity and district heat
■ Investments in US\$ at 2010 prices and exchange rates

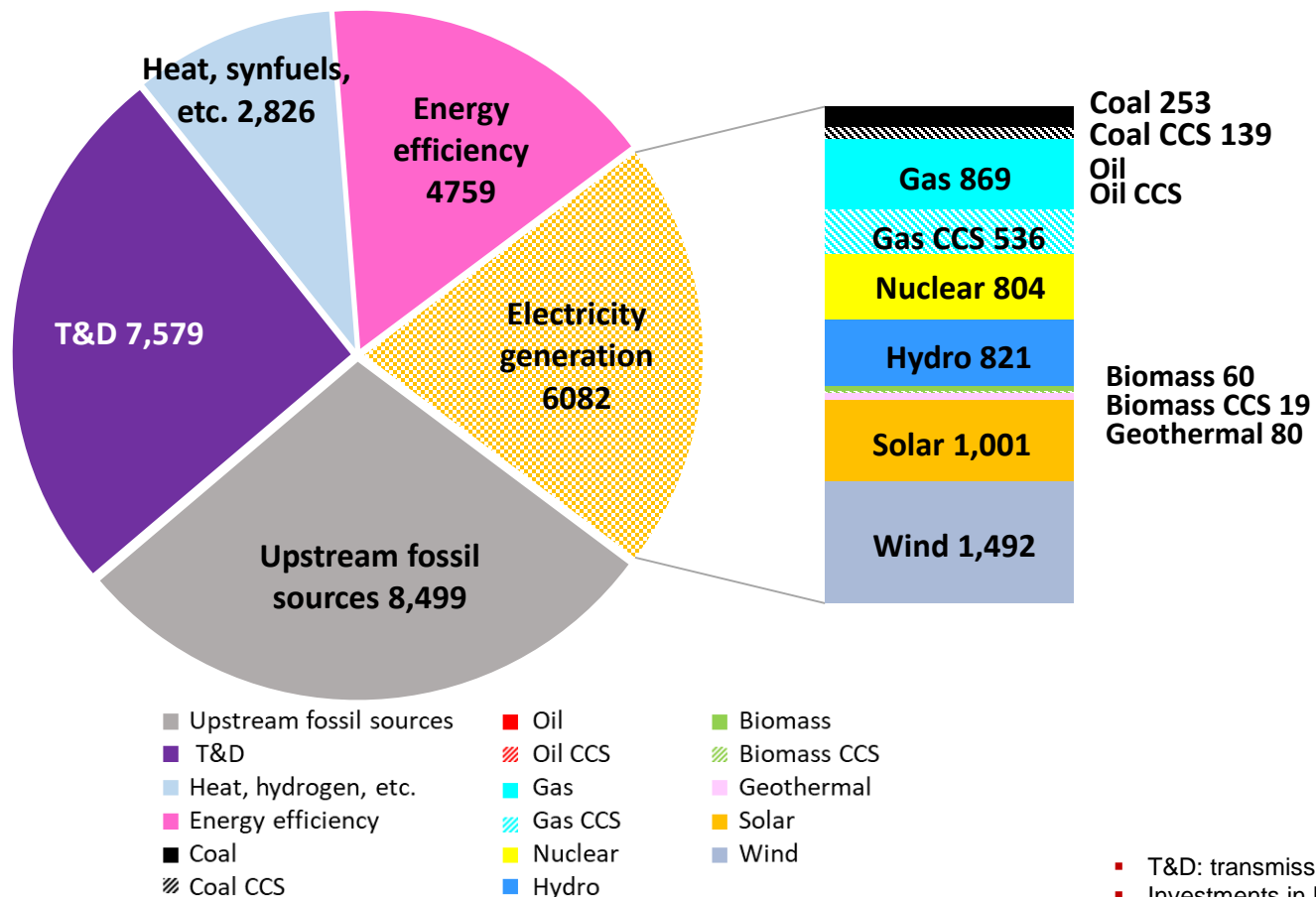
Modeling Results: Indicators

Invest. needs: UNECE – P2C

ENERGY



Cumulative investments 2020-2050: **29,746 billion US\$**
P2C – UNECE Region



- T&D: transmission and distribution of electricity and district heat
- Investments in US\$ at 2010 prices and exchange rates



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Thank you!

Sustainable Energy Division

UNECE

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