Energy and Energy Security in a Carbon Constrained World

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EUROPEAN COMMISSION
European Research Area

SEVENTH FRAMEWORK PROGRAMME

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Scenario Definition

Full Adaptation Scenarios

- SSP2 (Reference/BAU scenario)
- RCP-4.5 (mitigation scenario)
- RCP-2.6 (mitigation scenario)

Limited Adaptation Scenarios

- SSP2-LA-BIO-TCH-TRD (BAU scenario)
- RCP4.5-LA-BIO-TCH-TRD (limited biomass potential)
- RCP2.6-LA-BIO-TCH-TRD (limited biomass potential)
- SSP2-LA-REN (BAU scenario))
- RCP4.5-LA-REN (limited penetration of renewable technologies)
- RCP4.5-LA-REN (limited penetration of renewable technologies)

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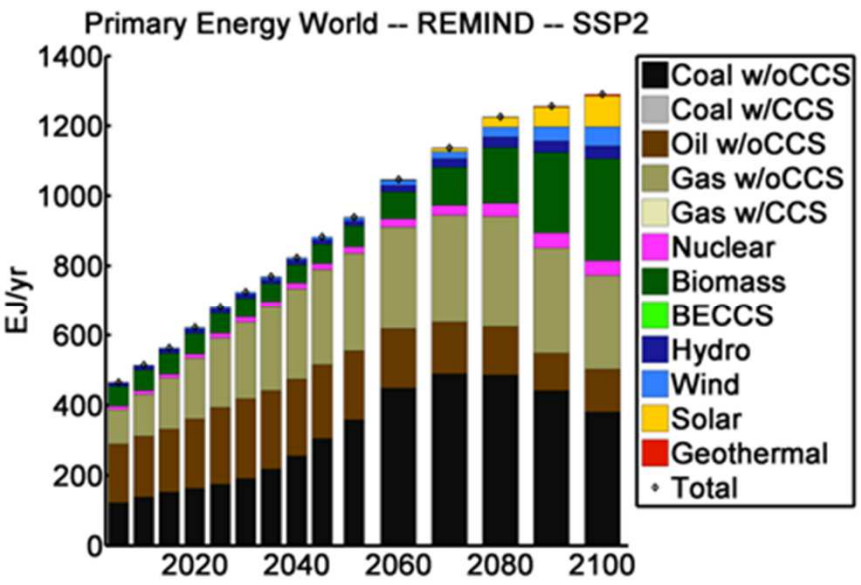
Primary Energy Consumption (global)

REMIND



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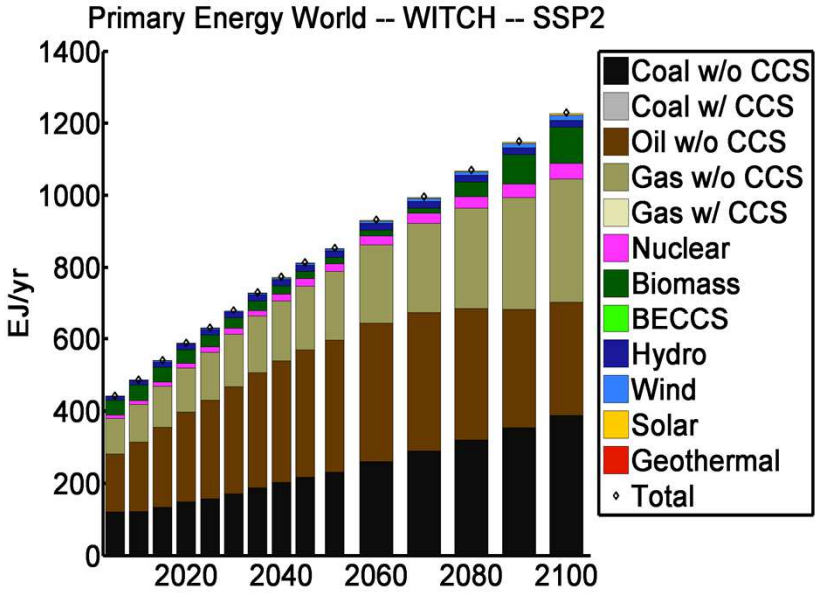

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Primary Energy Consumption (Europe)

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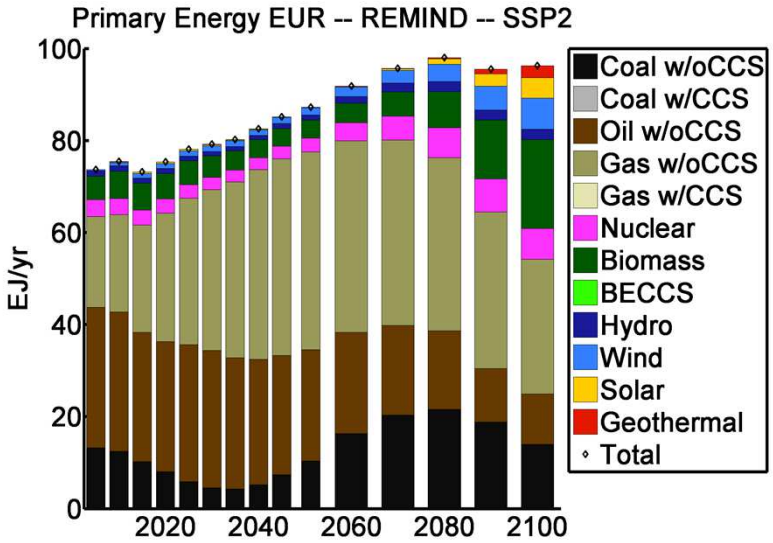

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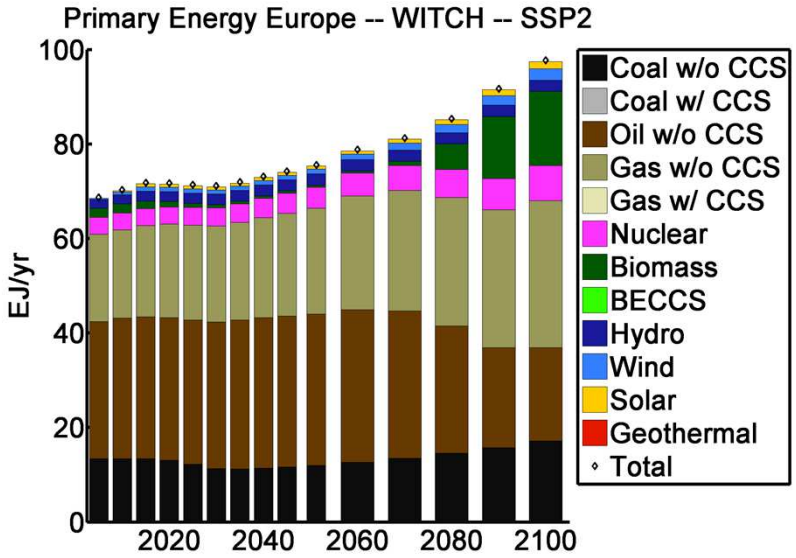

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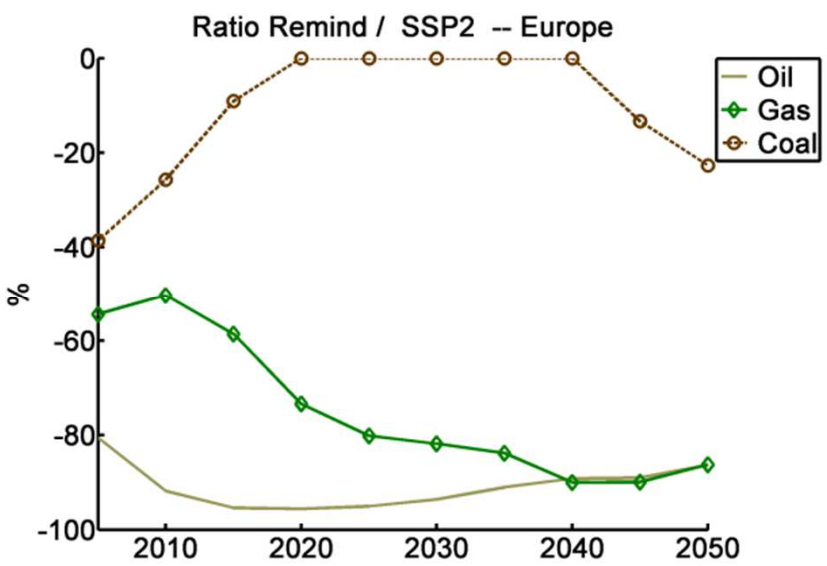
Energy Import Shares

REMIND



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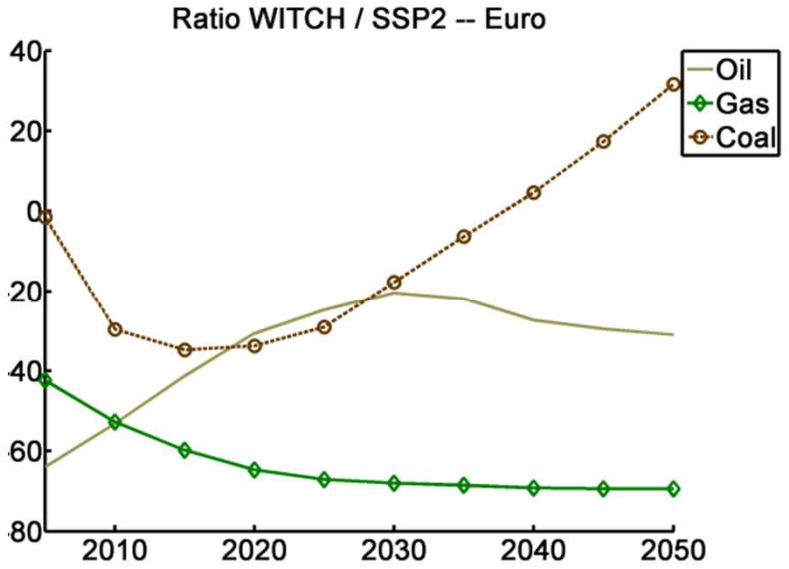

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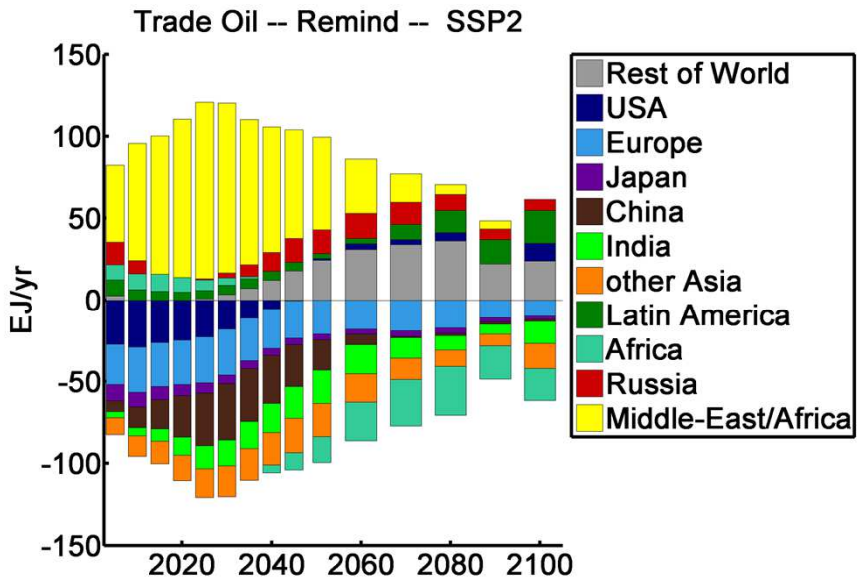
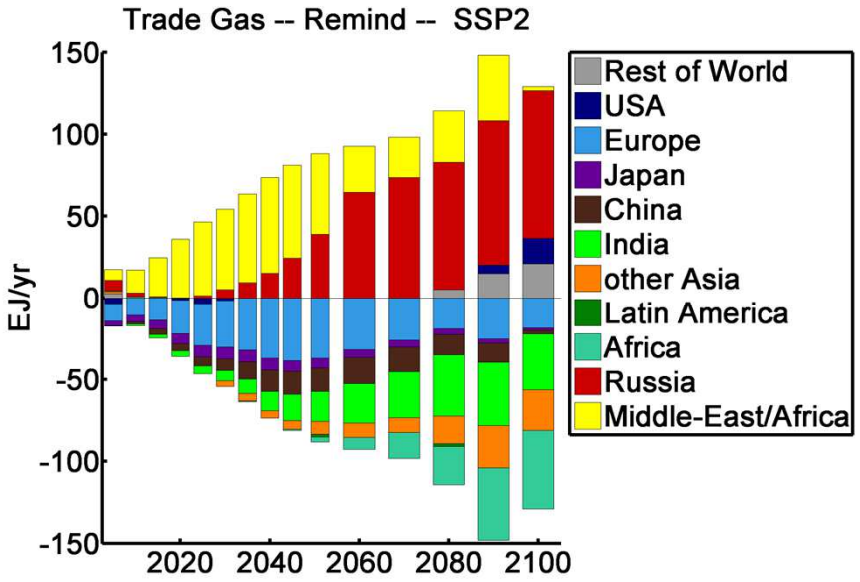
Trade in Energy Resources

Oil



Gas



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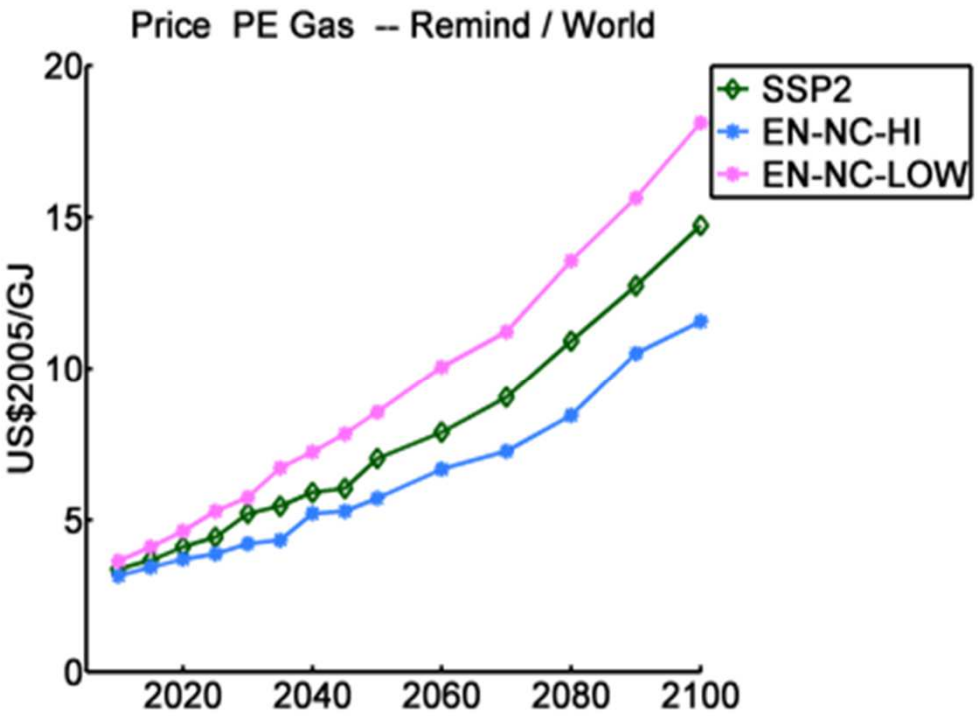
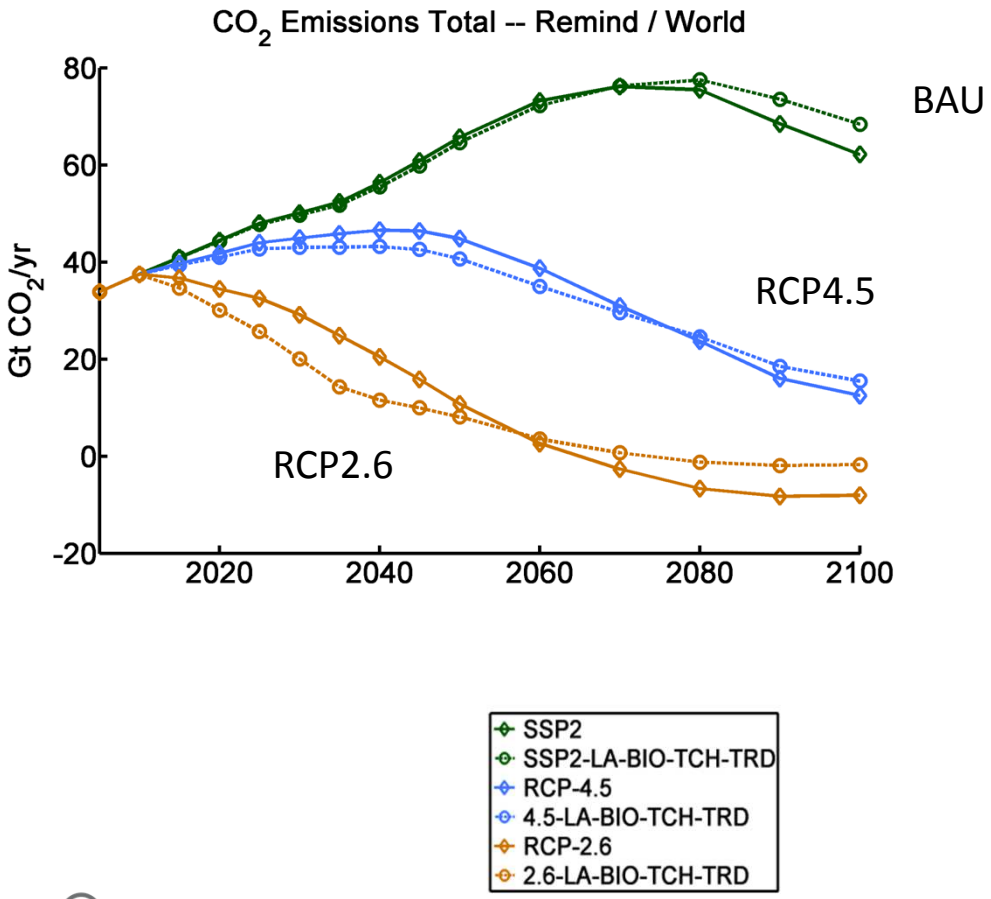
Gas price


Price PE Gas -- Remind / World
US$2005/GJ
0
5
10
15
20
2020
2040
2060
2080
2100
SSP2
EN-NC-HI
EN-NC-LOW

CO_2 Emissions (global)



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Carbon Price (global)

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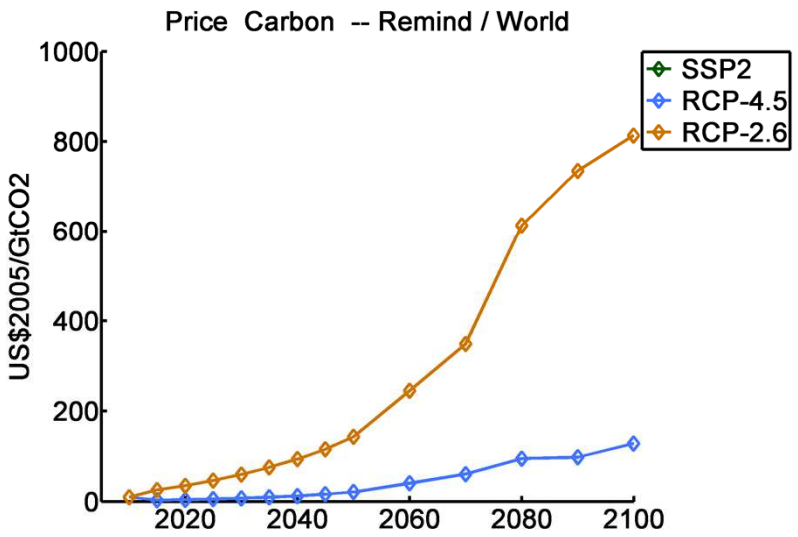

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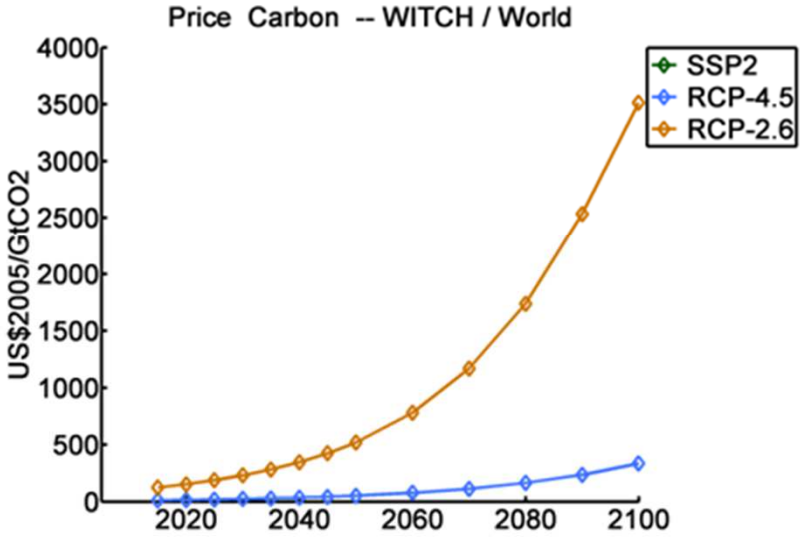

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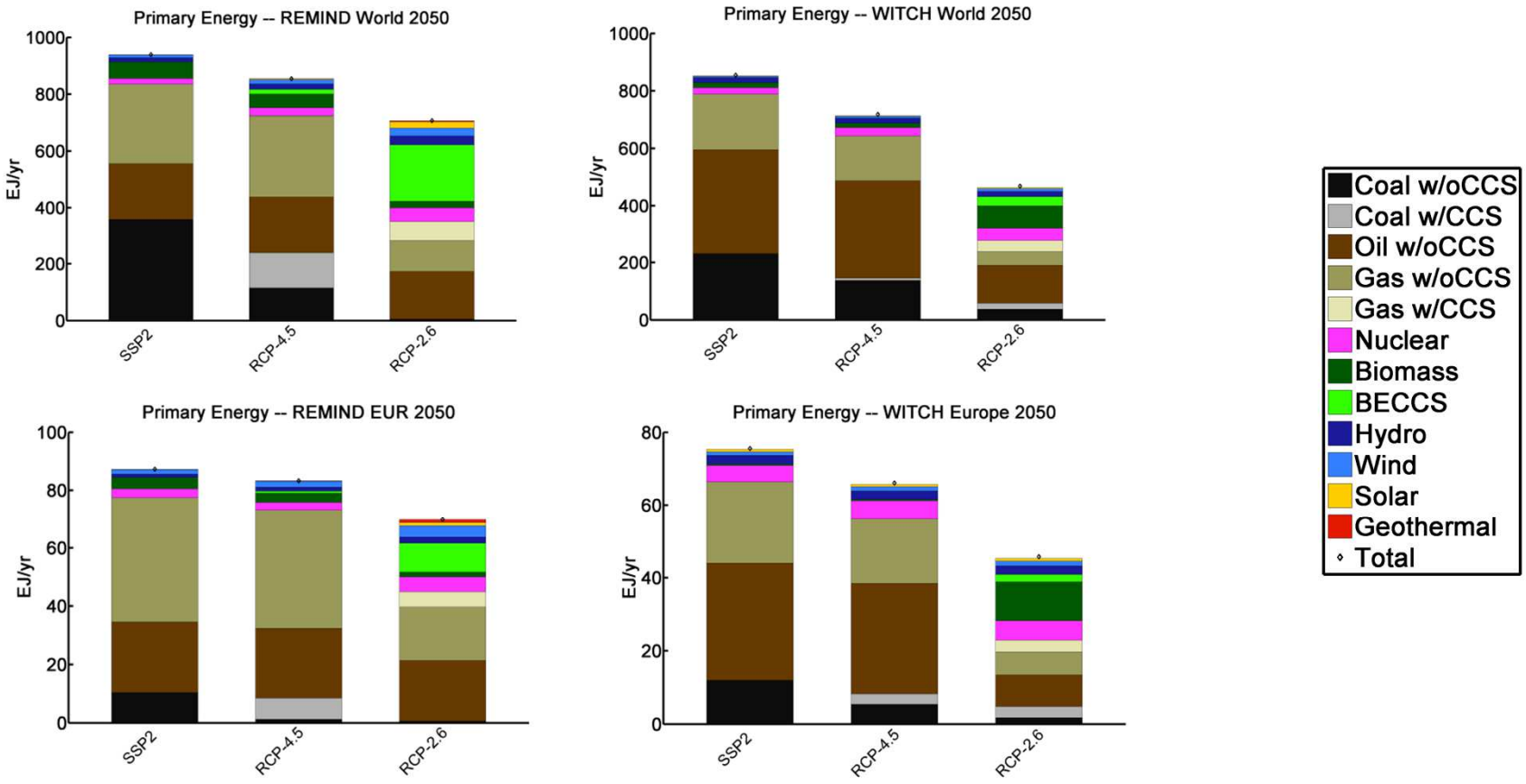
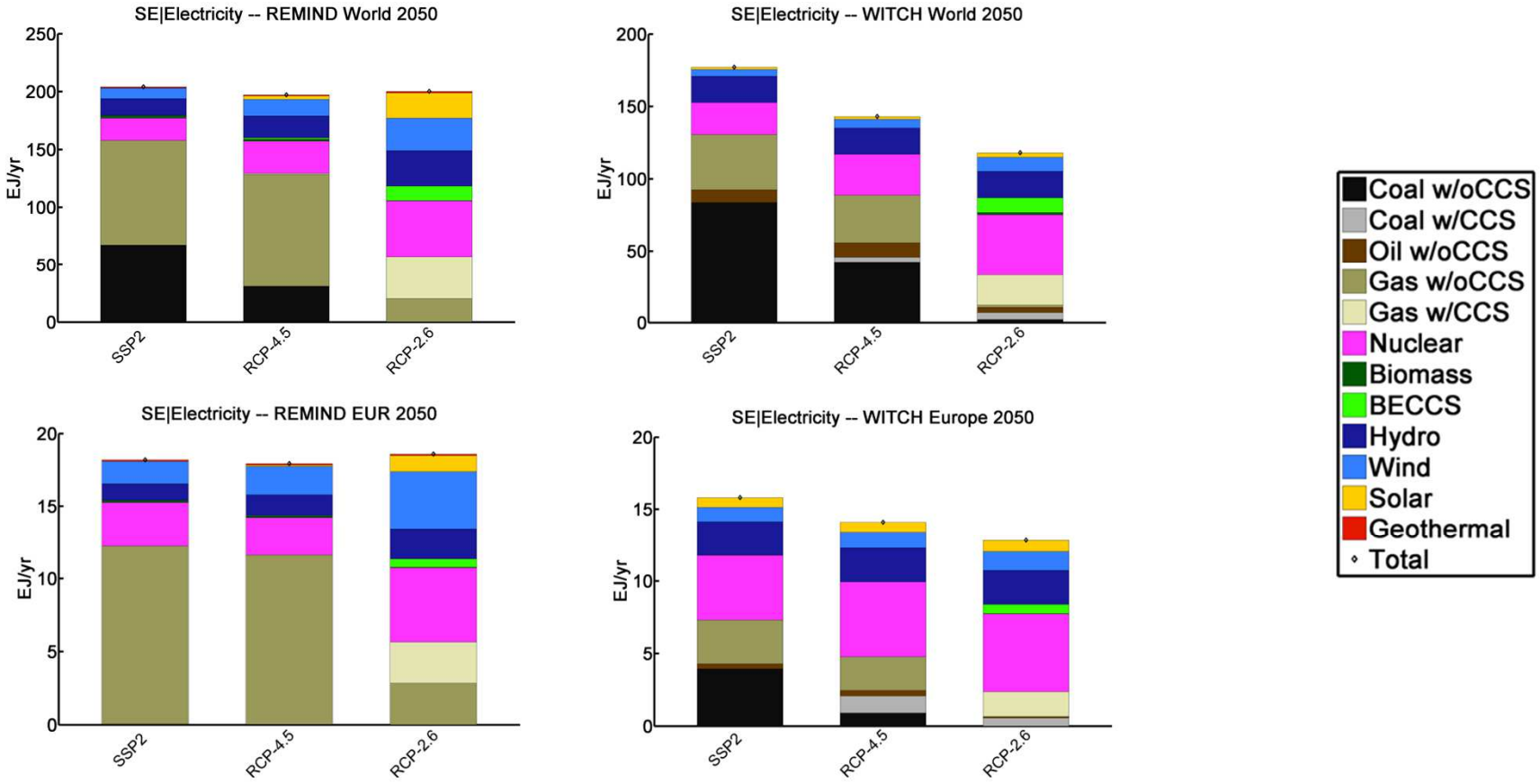
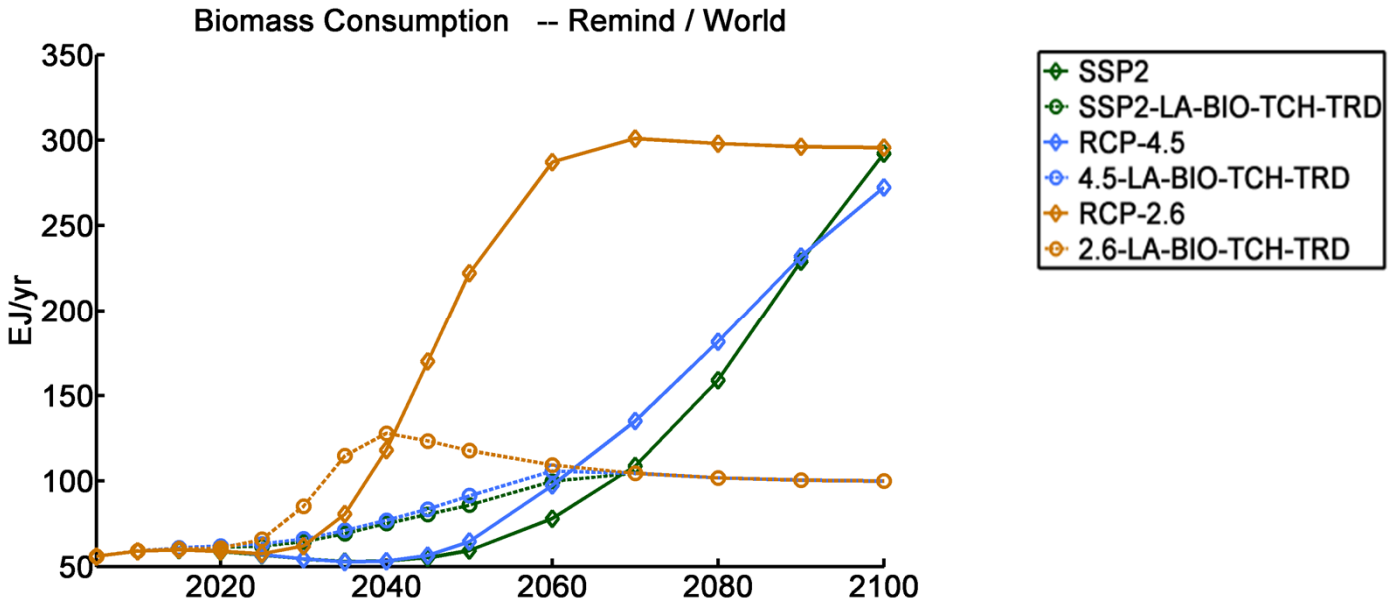
Primary Energy Consumption in 2050



Electricity production in 2050



Biomass consumption (global)



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Oil-to-Biomass Transition

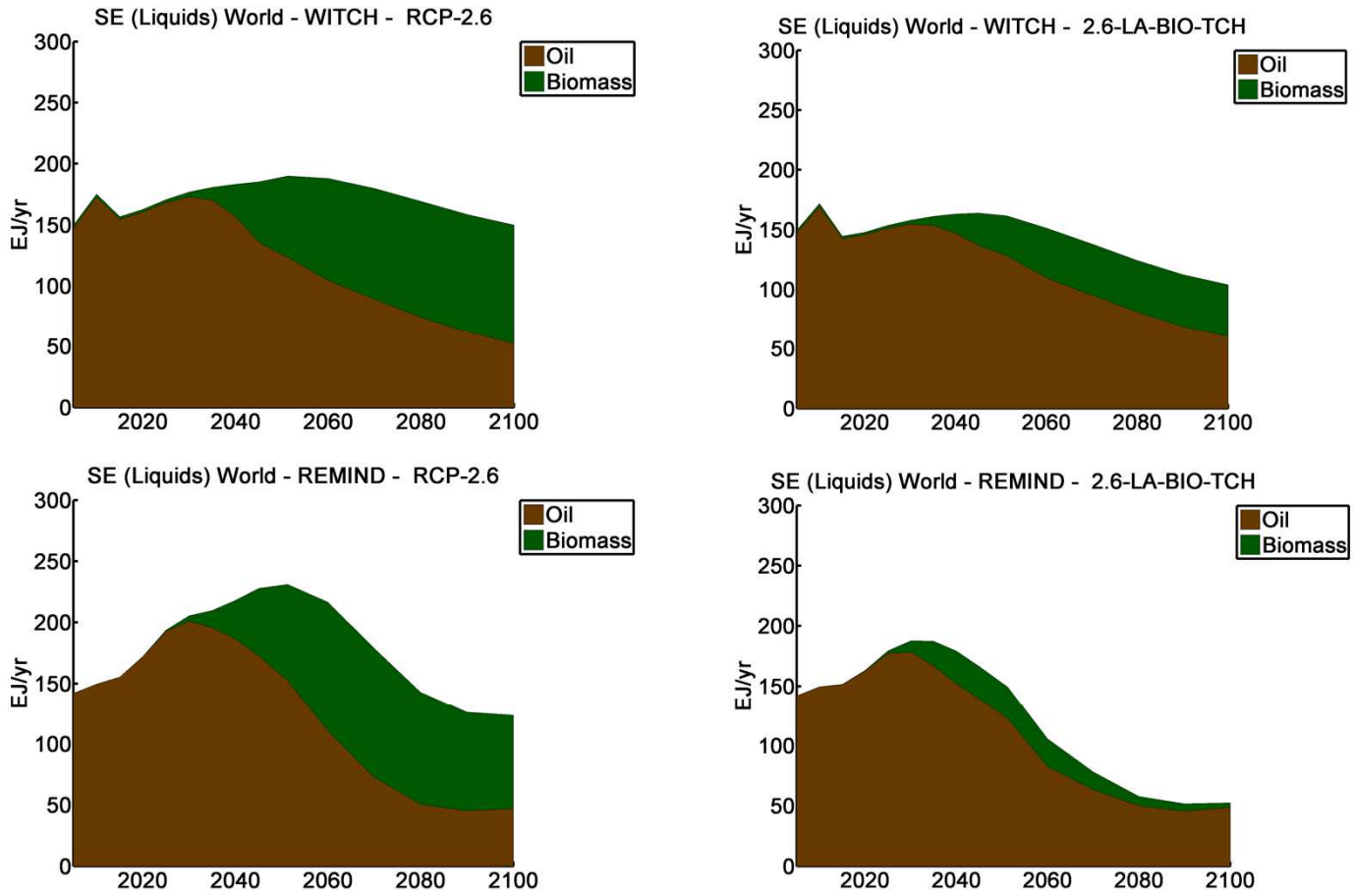
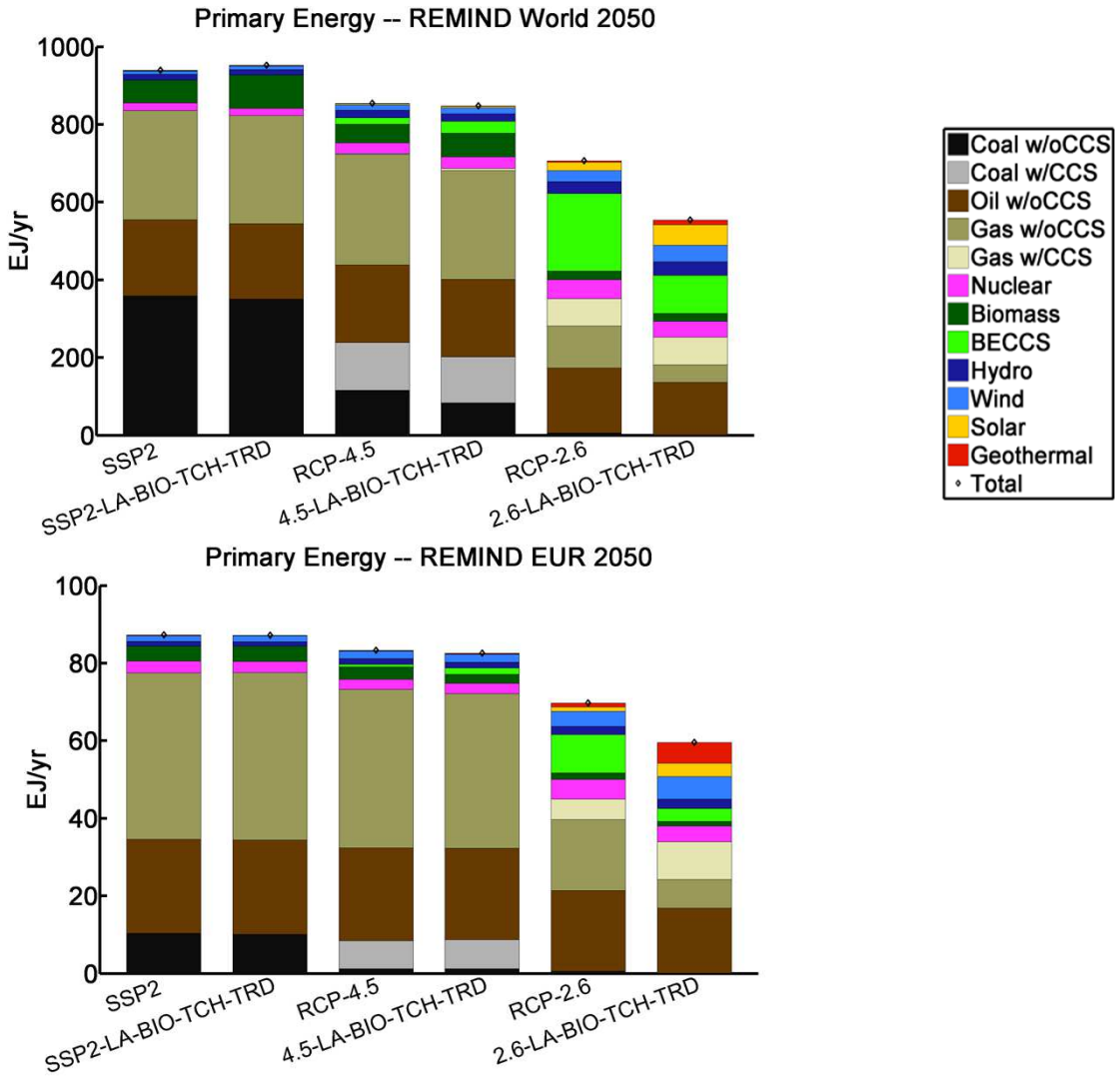


Figure 3.1-4: Oil-to-biomass transition (including REMIND results for comparison purposes).

Primary Energy Consumption in 2050



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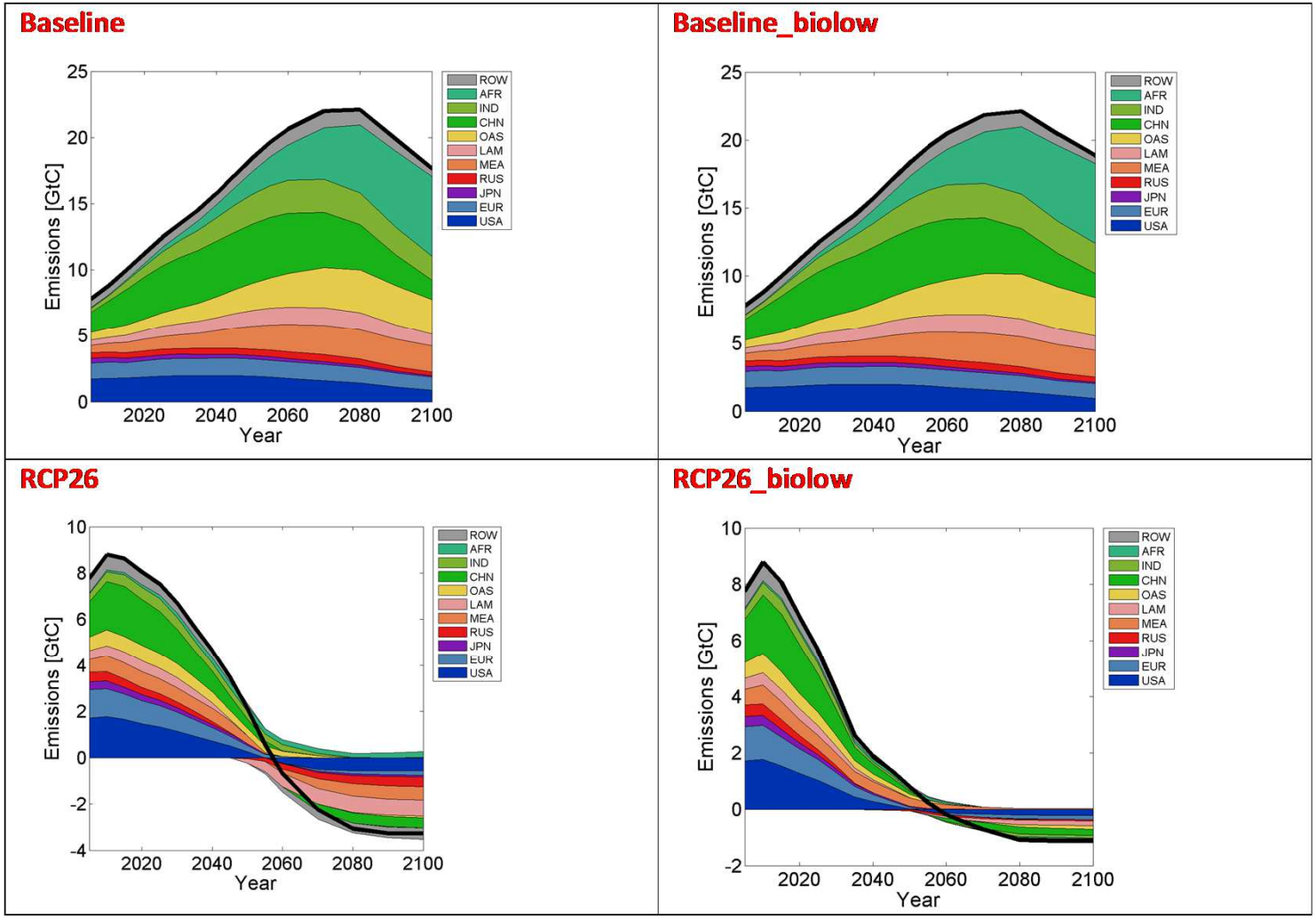
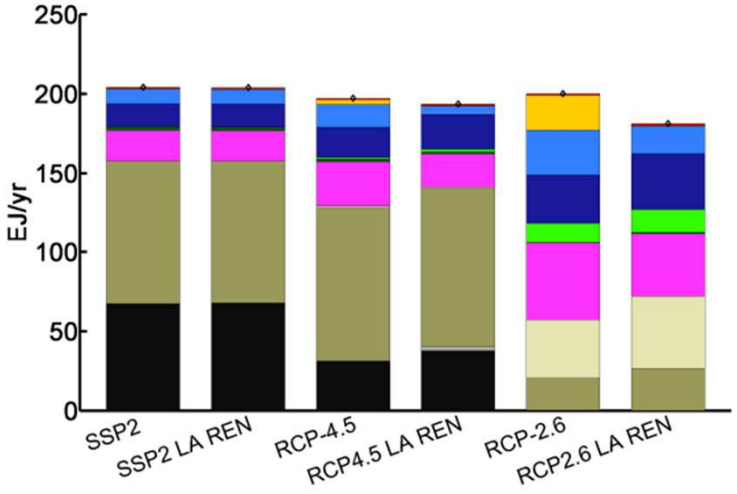
CO_2 emissions (FF&I)

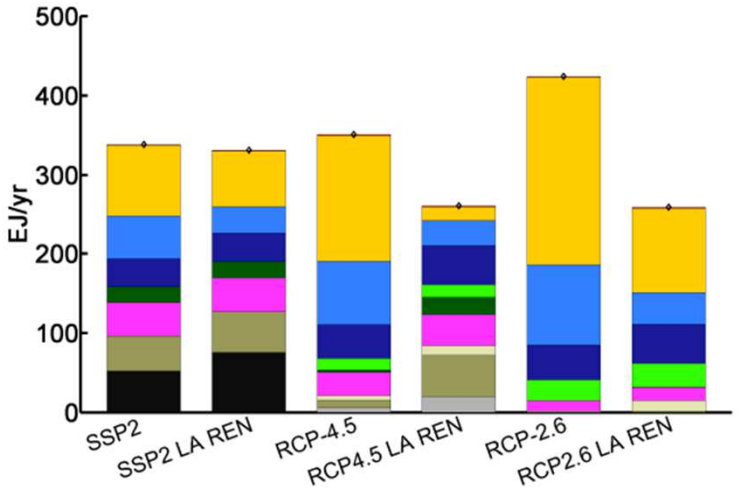


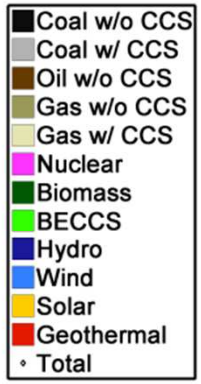
Electricity Production (global)

2050

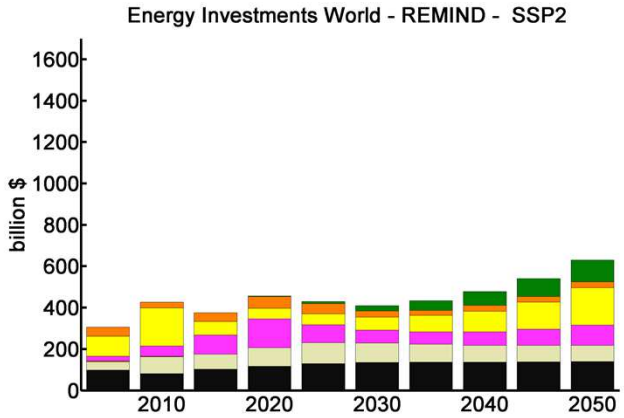


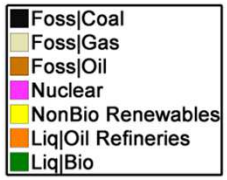
2100

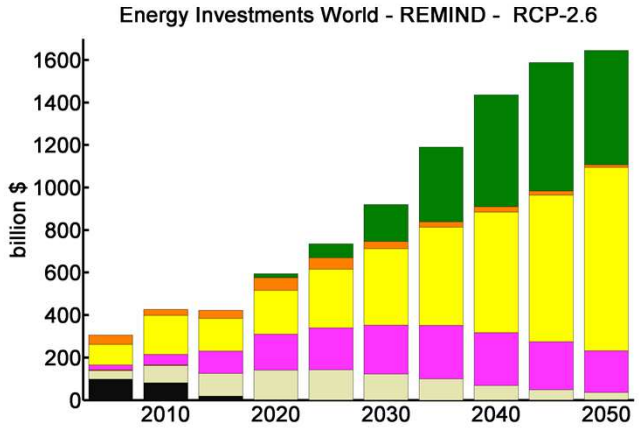


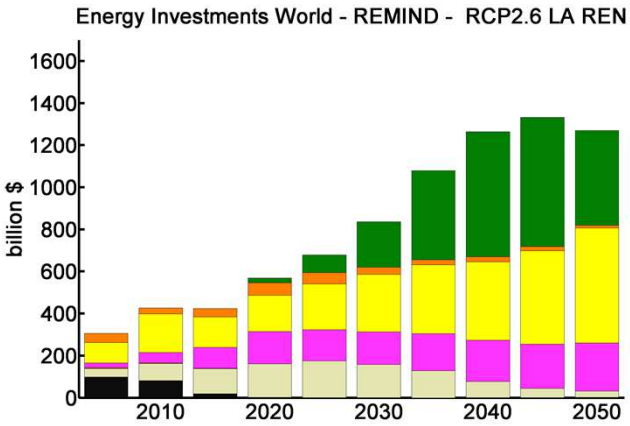


Energy System Investments



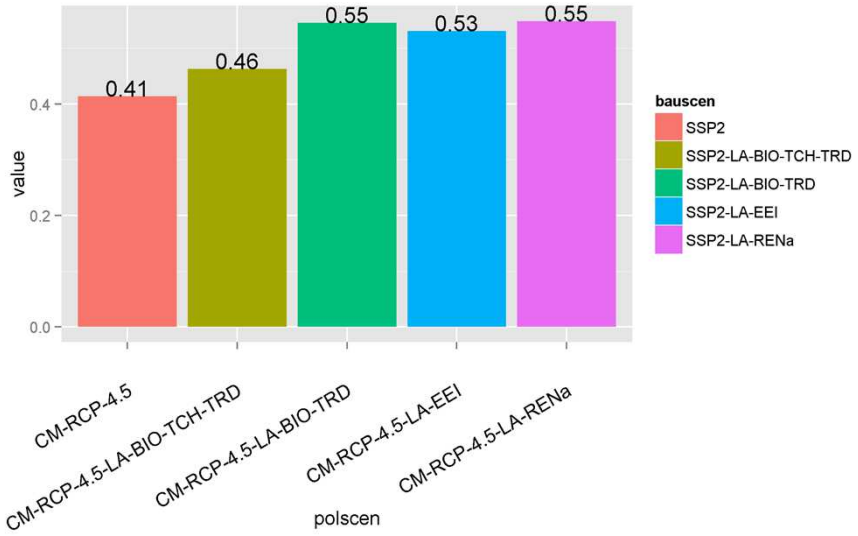




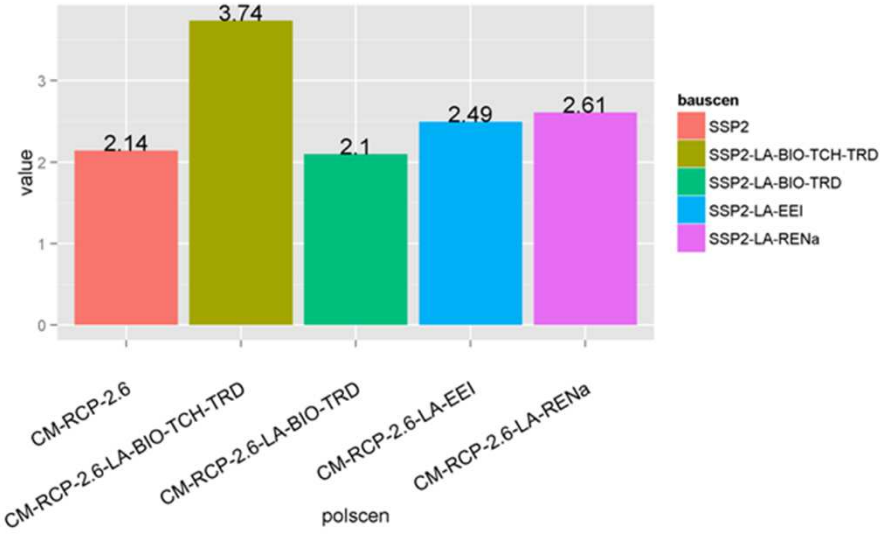


Climate Policy Costs

RCP4.5



RCP2.6



Cumulated Consumption losses in % of BAU consumption (discounted by 3%)

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Policy Conclusions

- Climate change challenge requests for a transformation of the energy system triggered by a significant and over time increasing price for carbon (RCP2.6)
- Major transformation in the RCP2.6 scenario includes substantial reduction of energy consumption (up to 40% in 2050) and a diversification of the energy technology portfolio
- For 2050, REMIND simulates a biomass share on the total primary energy of 30% in RCP2.6 scenario; biomass is mainly used in the transport sector and combined with carbon capture and sequestration
- Limited adaptation to mitigate climate change due to a biomass potential reduced from 300EJ to 100EJ may almost double the mitigation costs (RCP2.6) and will in Europe also result in a reduced level of gas consumption
- Limited potential in using renewable energy technologies will have major long-term effects; globally, nuclear and gas will substitute for the missing renewables, whereas at the European level biomass without CCS and coal with CCS enter the technology portfolio (RCP2.6)

Thank you !

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