



**Advanced Model Development and Validation for the
Improved Analysis of Costs and Impacts of Mitigation Policies**

Sustainable power supply and the role of wind and solar

The ADVANCE consortium
Presenter: Robert Pietzcker

ADVANCE Final Conference
Brussels, 24 October 2016



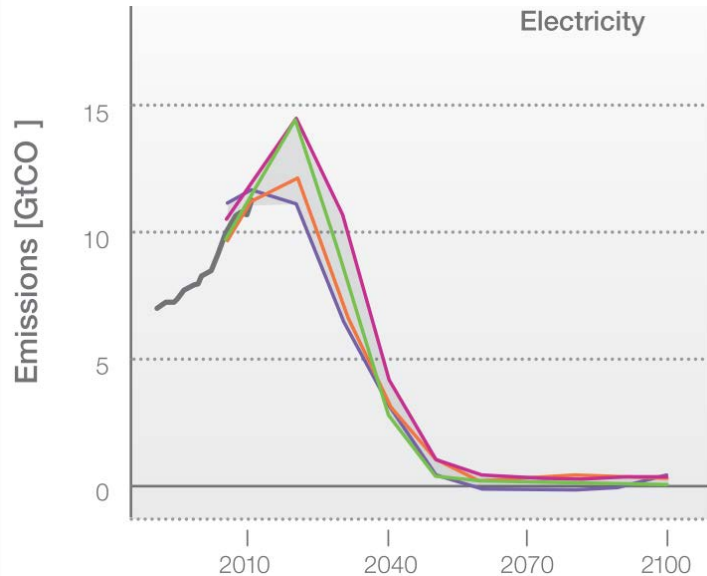
This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308329.

Motivation

Most previous studies (including ADVANCE) find:

Immediate decarbonization of the power sector

- a) is crucial for limiting global warming to well below 2°C
- b) has comparatively low costs



**Power sector decarbonization
is a low-hanging fruit on the way to
2°C climate stabilization**

There are different options for power sector decarbonization



Carbon Capture and Storage (CCS)

- \$\$\$?
- Not fully proven ?
- Public opposition ?



Nuclear

- \$\$\$?
- Technological risks ?
- Public opposition ?



Biomass

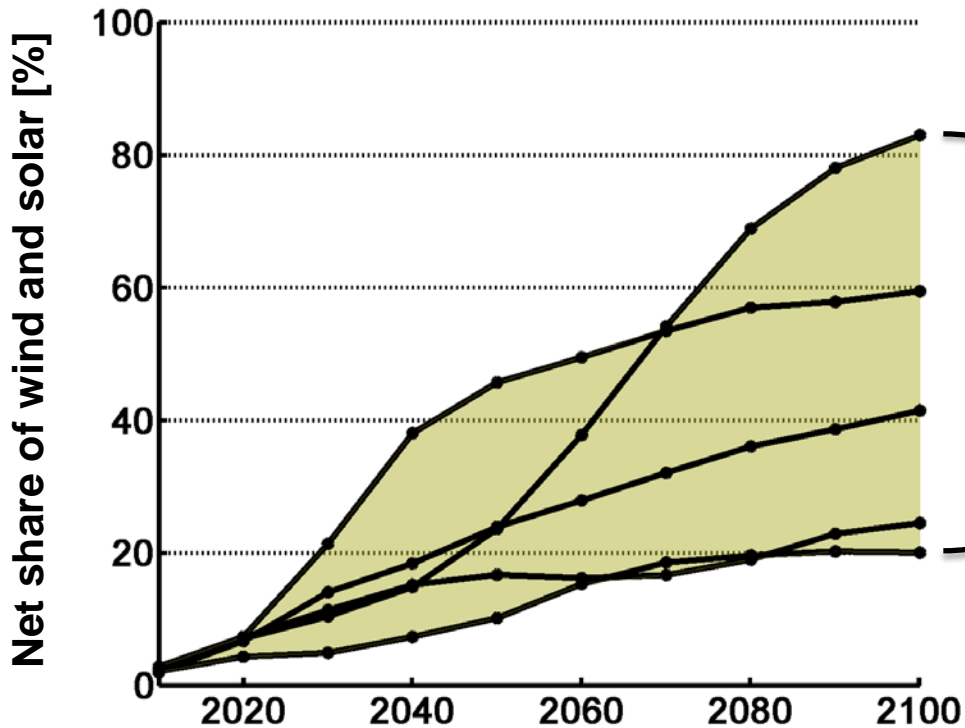
- \$\$\$?
- Effect on food prices ?
- High land requirements ?



Variable renewable energies (VRE)

- \$\$\$??
- Variability ?

Past IAMs had diverging views on importance of wind and solar



Large differences across IAMs in the results of 2013 EMF27 study

The main drivers that determine VRE deployment

Resources



Country-based quality-binned resource data

Technology costs



Updated costs assumptions

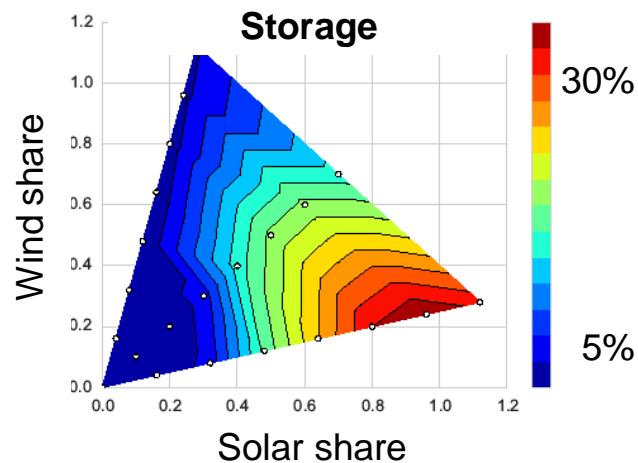
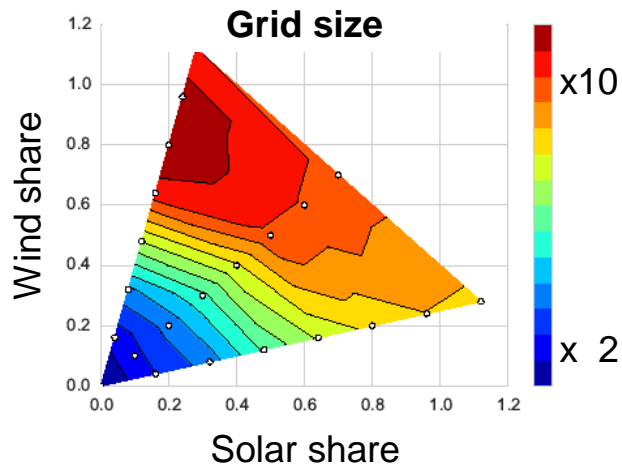
Integration challenges
due to variability



Developed new modeling approaches to
represent variability

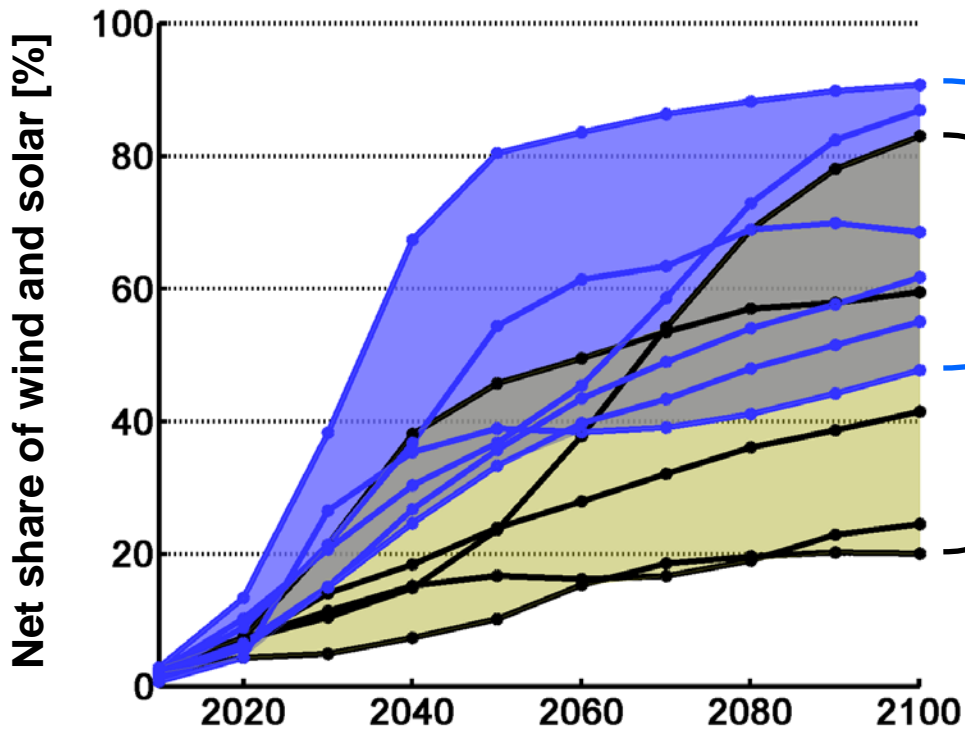
How we improved the understanding of integration challenges

1. REMIX: hourly power sector model with member state detail
2. Run large number of REMIX scenarios to cover parameter space
3. Extract key dynamics to implement in IAMs



Scholz et al (2016): „Application of a high-detail energy system model to derive power sector characteristics“

What is the effect of improving the models?



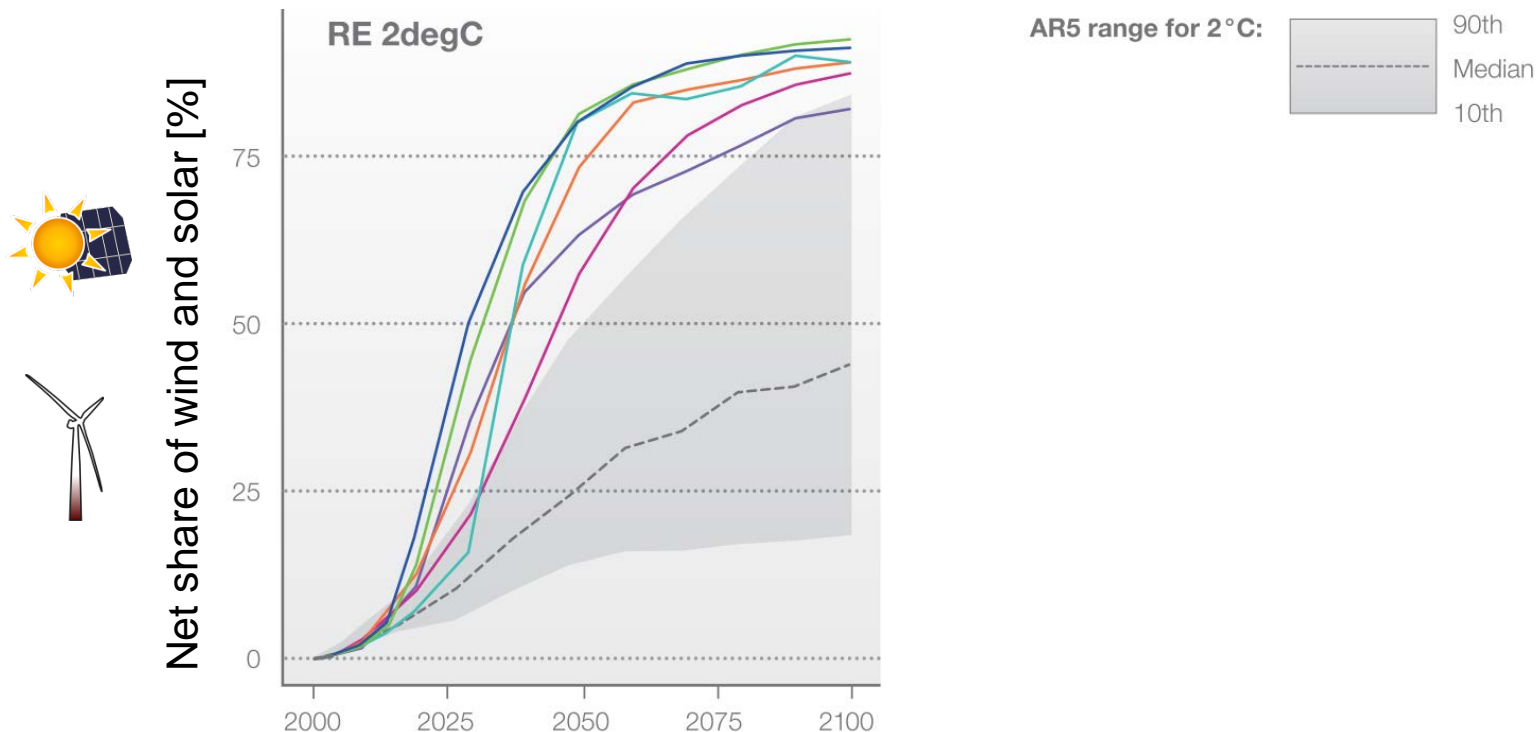
Results from 2016 model version with updated wind & solar representation

Results from 2013 model version with previous wind & solar

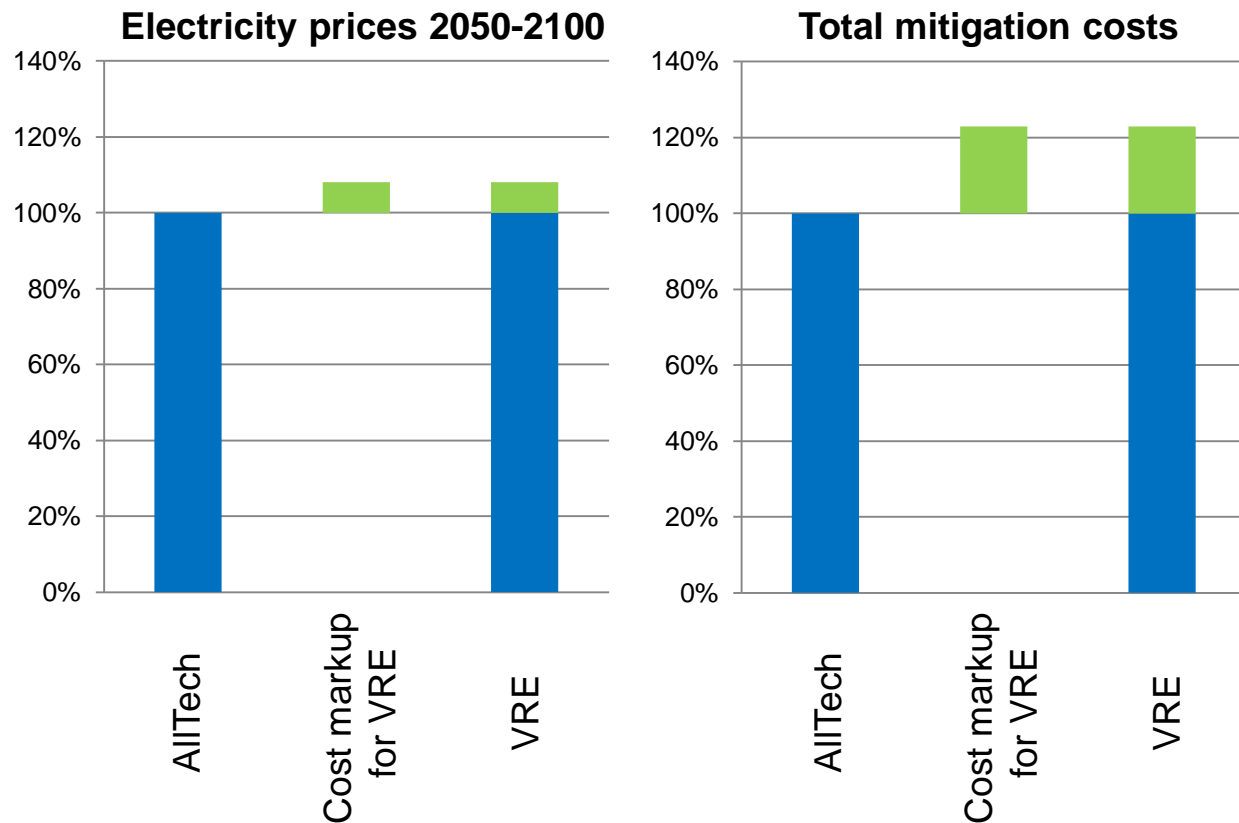
The updated IAMs see 63% more VRE contribution (+ 24 %-points) in cost-optimal climate mitigation scenarios

Is power sector decarbonization without nuclear and CCS possible?

The updated IAMs all say yes:



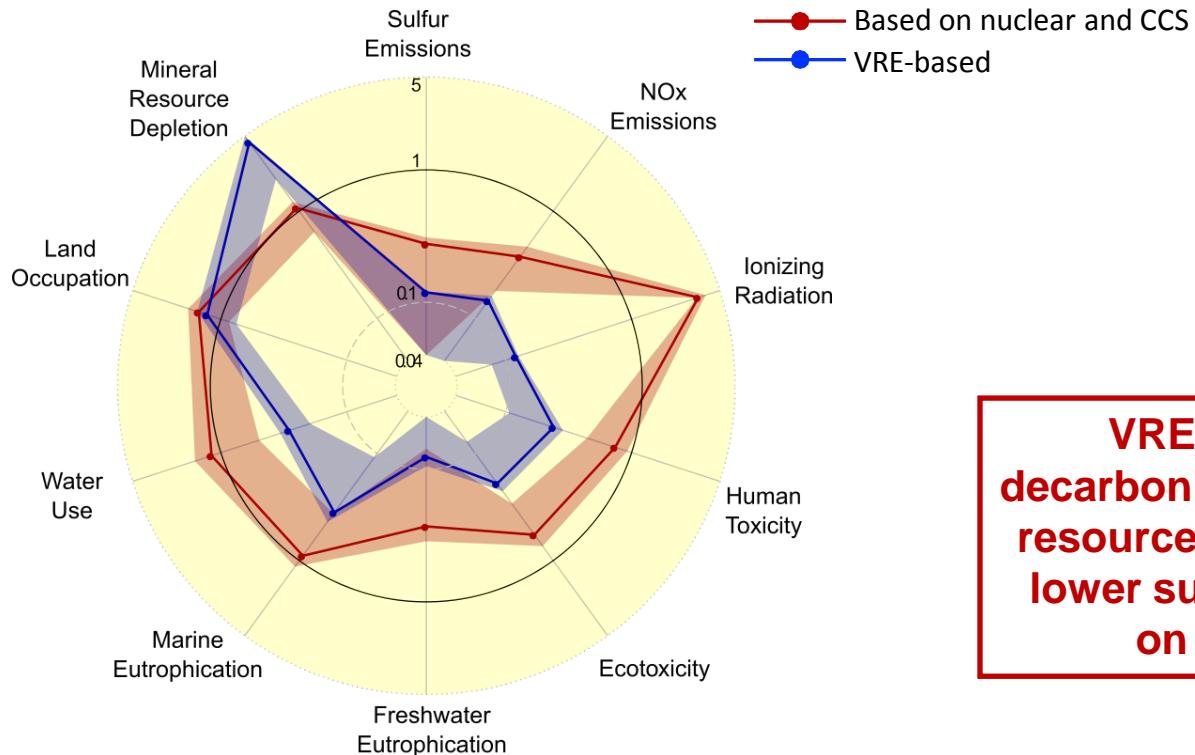
VRE-based electricity decarbonization comes at low additional costs



Clarification:
CCS important for other sectors, e.g. industry processes

VRE-based electricity decarbonization brings sustainability benefits

We developed a prospective LCA analysis of IAM scenarios:



VRE-based power sector decarbonization has higher mineral resource depletion, but has much lower sustainability implications on all other indicators

Summary

- ADVANCE improved the modeling of wind and solar power:
 - developed new resource datasets
 - updated costs
 - developed new approaches to represent integration challenges
- The updated models show substantially more wind and solar in cost-optimal climate mitigation scenarios – on average 63% more
- The models say that refraining from nuclear and power sector CCS
 - results in low additional costs
 - brings substantial advantages in most sustainability indicators
- Clarification: CCS important in other sectors, e.g., industry processes



Thanks!

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308329