What are the limits to current policy success?

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Policies push RE growth



| | Wind | Bioenergy | Solar PV | Hydro | other |
|--------------------------|-------|-----------|----------|-------|-------|
| Generation 2010 [TWh] | 338 | 296 | 31 | 3503 | 74 |
| CAGR 2005- 2010 [%] | 26.5% | 8.8% | 50.8% | 3.1% | 4.6% |



Deploying

2011

Renewables

POLICIES

MARKE

ERGY

ES

Costs are Falling

- Hydro and some
 biomass and
 geothermal already
 cost-competitive
- Additional technologies getting competitive in a broader set of circumstances
- Opens up new deployment opportunities



Data from Breyer and Gerlach, 2010



Mature Markets Facing New Challenges



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- Strong wind, low load case depicted
- Expected load flows for 2013 (based on 2009 analysis)
- Enhancement required







Flexibility is key for managing v-RE

There are 4 flexibility resources



Source: IEA, Harnessing Variable Renewables, 2011



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A biomass-fired power plant



Industrial



residential



A pumped hydro facility

Scandinavian interconnections



Example: Germany

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Example: Spain





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- Hydropower generation continues growing as fast as all non-hydro renewables together since 2000
- Global pumped-hydro capacities: 98 GW by 2005, 140 GW today, up to 200 GW by 2015 or soon thereafter



Lack of Policy Coordination Jeopardising Outcomes?





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Source: IEA, C. Philibert, 2011



Reducing Conventional Capacity Factors

Example: Spain



Exposure to fuel price variability in spot markets

Schematic representation of profit variability from electricity generation

Gas plant

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Average spot price Ceneration costs fuel, carbon, capital repayments) Profit

Source: IEA, C. Hood, 2011

Renewable or nuclear plant

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Market design and the "missing money" issue

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Conclusions

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- RE policies successful in driving down costs and deploying RE to take-off phase
- New challenges emerging at system and market design level
 - How to foster investment in flexibility resources?
 - How to reduce investment risk in low-C, up-front capital intensive energy technologies?
 - How to coordinate with climate change policies?
- Portfolio-, system-, and investment risk-oriented policy approach needed