CHANGED RISK PREMIUMS AND EQUITY DEBT REQUIMENTS DUE TO DIFFERENT RES-E POLICY INSTRUMENTS FOR MARKET INTEGRATION OF RENEWABLE ENERGIES IN GERMANY

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Overview

In the year 2000, with the implementation of the Renewable Resource Act (EEG) and Feed-In-Tariffs (FIT) as main policy instrument for renewable energy sources of electricity (RES-E) deployment, the German government has risen the share of power generation form RES-E very successful from initially five to over 25 % in the year 2013 (BDEW 2014). With the strong increase of RES-E mainly from variable renewable energy sources (VRES) like Wind and Photovoltaic politics and also scientists have called for a better market integration of RES-E to better synchronize fluctuating generation with the yet quite inelastic demand. Therefore the so called floating market premium (MPexpost) was introduced in the year 2012 in order to confront the RES-E plant operators and there electricity production on the one side to the prices signals of the wholesale power market. On the other hand, it is expected that the floating market premium effects investment decision of RES-E investors in order to construct power plants in a way that increases their market value and marketing revenues. Within the revision process of the EEG 2014 also (ex-ante) fix market or feed-in premiums (MPexante) and capacity payments (CP) have been discussed as future RES-E support schemes to further incentives a better market integration of RES-E. All policy instruments go along with higher remuneration risks compared to FITs, with higher risks usually resulting in risk premiums for debt financing. Due to the specific cost structure of VRES with high shares of fix investment cost and almost negligible marginal cost, changes in policy support can have deep impacts in RES-E capacity expansion. In order to elaborate risk premiums and changed requirements in the equity-debt ratio of financing future RES-E projects under changed RES-E policy frameworks in Germany 15 semi-structured interviews with experts from project developers, financers and investors have been carried out. The results serve as input for a newly developed risk evaluation model (RESMIP) as well as for the agent-based AMIRIS simulation model in order to calculate the most cost effective way for the expansion and market integration of RES-E in Germany.

Methods

Agent-based models (ABM) are particularly suitable for the analysis of complex and multiple linked systems with autonomous actors (Wooldridge 2009). The agent-based simulation model AMIRIS has been developed during the PhD thesis of the author and within different projects of the system analysis department financed by the German Ministry for the Environment, Nature Conservation and Nuclear Safety and offers an innovative approach for the analysis and evaluation of energy policy instruments and mechanisms for the integration of renewable energies into the electricity markets (Reeg et al. 2013). Past experiences have shown that energy policy instruments have often not achieved the originally intended effects as initially planned, and were often accompanied by unintended side-effects like windfall profits for specific market actors. A central reason for this is seen in the fact that the underlying assumptions of conventional equilibrium models and the classical economic theory of purely rational actors acting with complete market information does not reflect the reality adequately.

In a first step a qualitative and quantitative risk evaluation model (RESMIP) shown in figure 1 has been developed (Labib 2014).

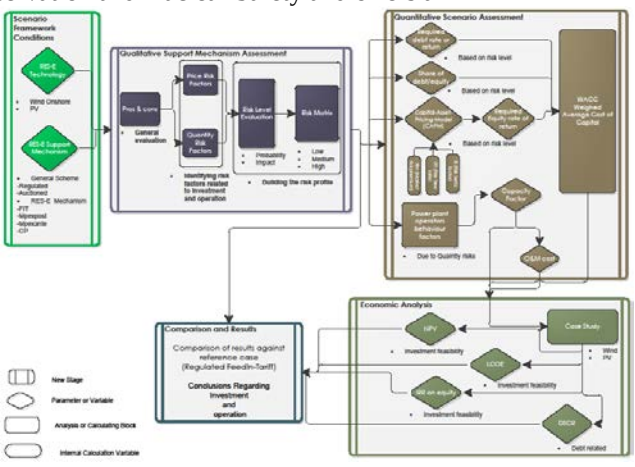

Figure 1: The Qualitative and quantitative risk evaluation model RESMIP for RES-E projects.

For simulating the most cost effective expansion and integration of RES-E semi-structured interviews have been carried out to elaborate risk premiums and changed requirements in the equity debt ratio due to different RES support schemes which expose the relevant market actors like investors, project developers, debt financers and RES-E power plant operators to different revenue risk levels. Thirdly, these results are translated into a formalised model language and implemented into the AMIRIS model with an hourly resolution.

Results

First results with yet own assumptions of different risk levels and real case study data from a wind project in Germany as shown in figure 2 demonstrate the big differences in selected financial parameters like the net present value (NPV), levelized cost of electricity (LCOE), the internal rate of return (IRR) and the debt service coverage ratio (DSCR) due to different policy instruments. Eight scenario analyses for each VRES have been carried out to cover all discussed variations in RES-E support schemes in Germany in the last year: the cases of FIT, MPexpost, MPexante and CP with a regulated fixations of the support level as well as with an auctioned price setting.

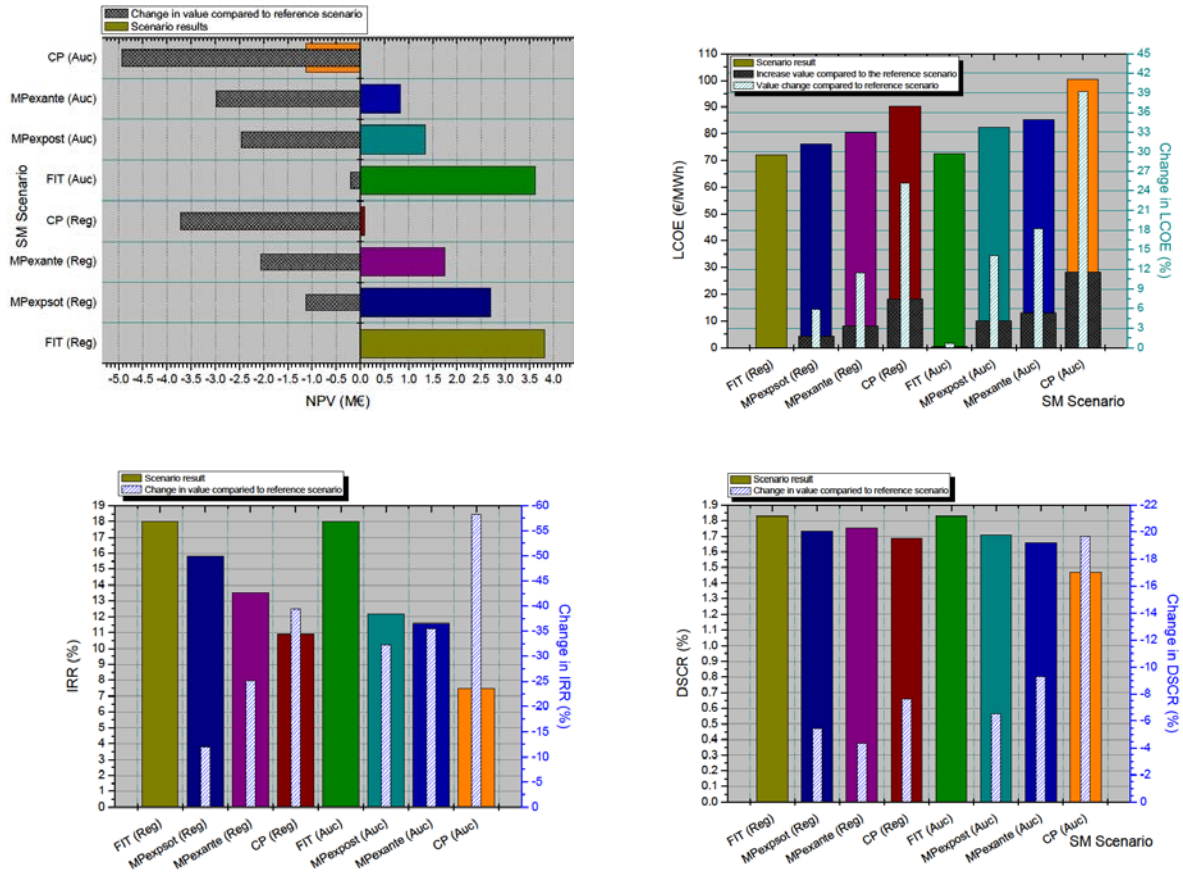

Figure 2: Results of the RESMIP model for different financial parameters for the wind onshore case.

Conclusion

Within the necessary organizational transformation of the energy system and its accompanying financial adjustments a huge variety of heterogeneous actors is involved. They are connected through complex interdependencies and can react very differently to changes in the policy framework. These inter-relationships and interactions at the micro level of the actors as well as its effects on the macro level of the energy system must be taken into account when policy instruments and frameworks are being designed. Results of the presented work show that policy makers should have in mind that small changes in the policy framework might have diverse effects on different market actors. Especially in the case of VRES with their specific fix cost structure exposure to unknown market risks at an early stage can impact important financial figures like LCOE tremendously (LCOE might rise up to 40 % in the auctioned CP case compare to regulated FIT) and therefore can lead to an inefficient and costly integrations of RES-E into the electricity system.

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