Jaroslav Knápek, Martin Beneš and Oldřich Starý

SETTING DISCOUNT RATE FOR GREEN BONUS CALCULATION CASE EXAMPLE OF THE CZECH REPUBLIC

Jaroslav Knápek, Czech Technical University in Prague, Faculty of Electrical Engineering, K13116, Technická 2, 166 27 Praha 6, Czech Republic, e-mail: knapek@fel.cvut.cz
Martin Beneš , Czech Technical University in Prague, Faculty of Electrical Engineering, K13116, Technická 2, 166 27 Praha 6, Czech Republic, e-mail: benes@fel.cvut.cz
Oldřich Starý, Czech Technical University in Prague, Faculty of Electrical Engineering, K13116, Technická 2, 166 27 Praha 6, Czech Republic, e-mail: staryo@fel.cvut.cz

Overview

The support scheme for electricity purchase generated from renewable energy sources is based on feed-in tariffs and green bonuses schemes. Tariffs and bonuses are differentiated by the RES type. Their values are derived from NPV analysis of reference projects for each type of RES. Net present value calculation needs setting of discount factor.

Methods

Feed-in tariffs and green bonuses should assure the positive motivation for investors into RES-E projects. Rational investors accept projects having return from capital invested greater than adequate rate for given type of business. It means that feed-in tariffs and green bonuses should assure positive NPV of the projects for the investors.

The discount rate used for NPV calculation has to reflect the total risk of given type of business. The risk consists of operational risk, business risk, technological risk, political risk, etc. Business risk depending on market rules and support scheme for RES utilization represents major part of risk for RES-E projects. The independent regulatory office dealing with setting of feed-in tariffs and green bonuses sets up their values so that NPV of typical projects for given type of RES would be equal to zero. In this case the investor gains the rate of return from equity equal to applied discount rate.

The discount rate for calculation of feed-in tariffs and green bonuses is set in following steps: (a) Utilization of capital asset pricing model for determination of primal discount rate for power branch. This model requires identification of proper values of beta coefficient and risk-free rate. (b) Risk depends on capital structure of the company that makes the investment in RES projects. The knowledge of the mean debt and equity values is required as well as the return from external capital (e.g. interest rate) and the income tax rate. (c) Weighted average cost of capital (WACC) is calculated. This value is used as proper discount rate for feed-in tariff calculation. (d) Modification of calculated WACC value for green bonuses calculation.

The support scheme applied in the Czech Republic is based on right of producers to choose between feed-in tariffs or green bonuses. Feed-in tariffs scheme assumes that regional power distribution company should purchase green electricity and to pay fixed feed-in tariff. Responsibility for power deviations (including economic consequences) is on the side of distribution company. Green bonus scheme assumes that producer of green electricity sells this electricity in power market under the usual business conditions including responsibility for power deviations. In this case producer receives the green bonus as additional revenue to the market price. It means that green bonus scheme is more risky for producers. Green bonuses determination also needs calculation of

expected market price of electricity from different RES types. Green bonuses cannot be calculated as the difference between feed-in tariff for given RES type and expected market price. Higher level of risk in the green bonus scheme should be respected by higher discount rate.

Discount rate for the green bonus calculation also differs by type of technology used, e.g. in the case of cogeneration the discount rate should be modified based on structure of revenues (electricity/heat). It results from the fact that selection of way of support should not influence the business with heat.

Results

Authors developed methodology for feed-in tariffs and green bonuses calculation used by the Czech Energy Regulatory Office for setting their values. This methodology includes analysis of conditions in the Czech power market for proper beta coefficient calculation. Discount rate for feed-in tariffs calculation taken as WACC at the level of 7% (nominal) has been identified as proper value for the Czech conditions. Discount rate for green bonuses calculation varies in the range of 7 to 10% based on type of RES, share of green bonus on total electricity revenues and also based on share of electricity and heat revenues.

Conclusions

Setting the proper discount rate level for this type of calculation is crucial factor. On one hand, too low level results in creation of not favorable condition for RES development, too high level leads to inadequately high rate of returns on side of investors and too high increase of electricity prices with all subsequent consequences, on the other hand.

References

Name, Surname (2000) “Title of the article”, Title of the Journal, 20(2000)2, 20

1. Knápek, J. - Vašíček, J (2004) “Different Aspects of Electricity and Heat Price Produced from Planted Biomass - Case Example of the Czech Republic”, Biomass for Energy, Industry and Climate Protection. 2004, vol. 2, pg. 2324-2327. ISBN 88-89407-04-2.

2. Knápek, J. - Kranzl , L. - Haas , R. (2006) “Methodology of Feed-in Tariffs and Green Bonuses Calculation in the Czech Republic and Comparison with Austrian Approach”. World Renewable Energy Congress IX - Book of Abstracts. Oxford: Elsevier, 2006, p. 57. ISBN 0-08-045056-3.

3. Starý, O. - Knápek, J. - Beneš, M. - Vašíček, J. “Support Scheme for Green Electricity in the Czech Republic”. World Bioenergy 2006 - Proceedings. Stockholm: SVEBIO - Swedish Bioenergy Association, 2006, vol. 1, p. 151-156. ISBN 91-631-8960-7.