

EVALUATION OF HOUSEHOLDS' PREFERENCES FOR THE PLANNED HYDROPOWER STATION IN GRAZ-PUNTIGAM USING A CHOICE EXPERIMENT

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Introduction

Hydropower plays a substantial role in the Austrian energy sector. Currently (2010) 58.5 percent of total electricity produced in Austria comes from hydroelectric power stations. Nevertheless there is still potential for new hydropower facilities, especially for small-scale hydropower. The hydropower potential study of PÖYRY ENERGY GMBH (2008) provides a value for the reduced techno-economic potential of 13,000 GWh, which is effectively exploitable. The expansion of hydropower utilisation also represents an important measure to meet future energy goals in the *Austrian Master Plan* as well as in the *Austrian Energy Strategy*. Currently 100 new hydropower plants are in the stage of planning, whereas 70 of these projects are small-scaled with a capacity less than 15 megawatt (MW). In the province of Styria 22 new hydropower stations are planned to be built, among them the project "Graz-Puntigam". The construction of this hydropower station with a total capacity of 16 MW is planned within the city limits of Graz. The overall investment volume adds up to € 87 Mio. The construction works are scheduled to start in autumn 2013 and will be finished by the end of 2015. Moreover the power station will be able to generate an electricity amount of 74 gigawatt hours (GWh) per year. However, the use of hydropower implies a considerable conflict potential. On the one hand there are the targets of climate and energy policy (e.g. reduction of greenhouse gas emissions, intensified use of renewable energy sources) and on the other hand the standards of nature and water protection as for instance the European Water Framework Directive (WFD). Accordingly, the installation of new hydropower stations is associated with external costs and benefits. Positive effects from the use of hydropower are the emission-free generation of electricity and the associated CO₂ avoidance, impacts for the local economy (especially employment effects) as well as the improvement of domestic energy security. Important environmental concerns related to the operation of hydropower plants are the visual impact of a power plant on the landscape and the natural environment, erosion, sedimentation and oxygen-deficiency problems due to the alteration of the water flow in the river, and correspondingly the impacts of these changes on fish and other water-dependent wildlife. Hence, all these social, economic and environmental impacts have to be taken into consideration if socially-optimal investments are to be made.

The aim of this paper is to examine public perception and preferences for the planned hydropower project in Graz-Puntigam. In particular, we estimate willingness to pay (WTP) values for the external costs and benefits associated with the new hydropower plant. In addition we use the estimated model results to calculate total consumer surplus for different policy scenarios. Finally we analyse determinants of overall WTP for the extension of hydropower use in Austria (Contingent Valuation).

Methodology

The costs and benefits associated with the hydropower plant Graz-Puntigam are estimated by conducting a choice experiment (CE). In this CE the value of the new hydropower station is expressed by several attributes, namely the number of households that can be provided with "green" electricity, the impact on landscape and natural environment, the impact on recreational activities as well as additional monthly electricity payments. Within the scope of a CE respondents are asked to choose

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between a selection of different alternatives described by the choice attributes in a hypothetical setting. Usually respondents are asked to make a sequence of choices. This sequence of choice outcomes enables to model the probability of an alternative being chosen and provide information on the willingness of respondents to make trade-offs between the individual attributes. Due to the inclusion of a monetary attribute it is further possible to obtain WTP values for the different attributes used in the CE.

In order to examine public preferences for the hydropower plant Graz-Puntigam a web-based questionnaire consisting of 43 questions was developed and used to interview about 200 people living in Graz und its surrounding communities (online survey). The sample is representative with regard to sex, age, income and regional distribution. A mixed logit model (also called random parameter logit model) is used to estimate households' preferences. Furthermore a contingent valuation question is included in the questionnaire asking directly how much people are willing to pay for the expansion of hydropower. Using a Tobit regression model for censored (truncated) data we explore determinants of respondents' WTP.

Results

At first, public perception for renewable energy and hydropower use in Austria respectively Styria is elicited and analysed through a series of questions. The main part of the respondents has a very positive or rather positive attitude towards the construction of new hydropower plants along the Mur. Moreover the hydropower project Graz-Puntigam is well known throughout the local population. About three quarter of respondents know that there are plans to build a new hydropower station. Two third out of these respondents reported not to be affected by the planned hydropower project, while slightly more than one quarter stated to feel positively affected.

The results of the mixed logit model show that the choice attributes used to describe the hydropower project have a statistically significant impact on choice with the expected signs. First, respondents have some inherent propensity to vote for the construction of the new hydropower plant. Second, the supply of additional households with "green" electricity from the new hydropower plant is valued positively and therefore exhibits a positive WTP. Furthermore people have a positive WTP for power plant constructions which create new possibilities for recreational activities. Finally, people do not favour power plant alternatives which cause strong impacts on landscape and natural environment. Therefore WTP is negative, meaning that overall WTP decreases with a strong environmental impact. Consequently, the realisation of the new hydropower plant must come with a small environmental impact in order to gain a significant welfare increasing impact.

Additionally people were directly asked to state their monthly willingness to pay for the extension of hydropower. The median WTP amounts to € 5.0 per month. Using a Tobit regression model we are able to identify five determinants of WTP.