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Long term development of Flow and Storage in Halslon Reservoir

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The 690 MW Karahnjukar Hydroelectric project currently under construction will utilize the greatest part of the hydro enengy potential of the rivers Jokulsa a Dal and Jokulsa i Fljotsdal, which stem from the NE-part of the Vatnajokul ice cap in Iceland. The power station will start production in 2007 and Alcoa's new aluminum smelter in Reydarfjordur will consume the majority of the electricity production. According to the Environmental Impact Assessment report from 2001, the project's reservoir is expected to fill up with sediments in 400-500 years, based on the present sediment transport rate. The EIA-study did not account for the influence of climate warming on Icelandic glaciers, but it is expected that the glaciers will decrease significantly during the next few hundred years due to climate warming resulting in much less sediment load being carried into the storage reservoir, the sediment load being largely dependent on the glacier area. In this study the long term effect of climate warming and melting of the Bruarjokull outlet glacier on the reservoir is discussed. The following factors are considered: Sedimentation in the reservoir, annual stream flow distribution, annual run-off, increased precipitation and evapotranspiration due to climate warming, increased precipitation due to lowering of the water-divide under the ice cap in the south that gives better access to southerly storms. The influence of land upheaval is also considered. According to the above mentioned factors the Karahnjukar reservoir will not have silted up during the next 400-500 years, as stated in the EIA report from 2001, but will at that time be less than half full of sediments and as sediment load

from the glacier will have almost disappeared at that time, it would most likely take 5-6 thousand years for the reservoir to silt up completely. Probable scenario at the Karahnjukar reservoir after 400 years could be like this: Active storage is approximately 60% of original storage, but as the yearly flow distribution is more dispersed into spring and autumn, compared with the present concentrated summer flow peak, there is less need for storage. Very little glacial meltwater is present, as the glaciers have practically disappeared, so sediment load is insignificant compared with present value. Based on climate warming predictions, precipitation on the Karahnjukar reservoir watershed will have increased up to 35% due to warmer air masses already after 200 years, resulting in increased flow to the reservoir. Lowering of the water-divide with the disappearance of the ice cap in the south will cause further increased precipitation (approx. 10%) as southerly storms have easier access to the Karahnjukar watershed. According to this scenario the total annual flow to the reservoir will be larger than at present, and more even during the year.