Environmental design of regulated rivers

“Design environnemental” de rivières régulées

Atle Harby[1], Torbjørn Forseth[2], Charmasson Julie[1]

[1)] Centre for Environmental Design of Renewable Energy (CEDREN), SINTEF Energy Research, 7465 Trondheim, Norway
atle.harby@sintef.no

[2)] Centre for Environmental Design of Renewable Energy (CEDREN), Norwegian Institute for Nature Research, 2624 Lillehammer, Norway
torbjorn.forseth@nina.no

RÉSUMÉ

La récente publication d’un « Guide pour concilier hydroélectricité et préservation de l’habitat du saumon » est l’objet de cette présentation. Le guide décrit comment analyser, développer et mettre en œuvre des mesures permettant d’améliorer les conditions de vie du saumon atlantique dans les rivières aménagées et exploitées pour la production d’hydroélectricité, dans une démarche de meilleur compromis. Les grandes lignes du guide ainsi que les principes sous-jacents sont décrits, et la démarche est illustrée par une étude de cas dans plusieurs rivières de Norvège. Grâce au concept de « design environnemental », le développement de l’hydroélectricité et l’amélioration de tronçons de rivières propices au saumon, combinés à des mesures d’amélioration des débits et des habitats, permettent de trouver des solutions « gagnant-gagnant » pour l’hydroélectricité et les populations de saumon. Le guide et le concept de « design environnemental » peuvent également être utilisés pour d’autres espèces et d’autres usages afin de trouver des solutions pour la coexistence de l’hydroélectricité et d’un écosystème aquatique en bonne santé.

ABSTRACT

The recently published “Handbook for Environmental Design in Regulated Salmon Rivers” is presented. The handbook describes how to explore, develop and implement measures that improves conditions for Atlantic salmon in regulated rivers in optimal trade-offs with hydropower production. The major outline of the handbook and the underlying principles are described, and the approach is illustrated through a case study in several Norwegian rivers. Through the use of the environmental design concept, expansions of the hydropower system and the salmon producing river stretch, combined with environmental flows and habitat measures, win-win solutions could be developed for hydropower and salmon production. The handbook and the environmental design concept may also be used for other species and other end user interests to highlight and find good solutions for the co-existence of hydropower production and a wealthy aquatic ecosystem.

KEYWORDS

Envrionmental design, regulated rivers, salmon, power production

1. INTRODUCTION

Challenges of climate change, the EU Renewable Energy Directives and the established el-certificate market are drivers for increased renewable energy production, also for the hydropower sector in Norway. On the other hand, upcoming revision of a large number of hydropower operation licenses, implementation of the European Water Framework Directive and new national legislations (The Nature Diversity Act), exerts pressures on the same industry by establishing targets for improved environmental conditions in regulated rivers, potentially at the cost of power production. These drivers and pressures calls for knowledge- based solutions that optimizes the trade-offs between renewable energy production and local environmental conditions. In Norwegian rivers, the societally and economically important Atlantic salmon populations are the main focus of environmental concerns. To meet this challenge, the major scientific institutions working with salmon and hydropower regulation in Norway have joined forces to produce a Handbook for Environmental Design in Regulated Salmon Rivers that was published in September 2013. The handbook describes how to explore, develop and implement measures that improves conditions for Atlantic salmon in regulated rivers in optimal trade-offs with hydropower production. The methods from the handbook are applied to several rivers in Norway, and examples will be given in the presentation.

2. THE HANDBOOK

The handbook is based on targeted studies within the EnviDORR project (under CEDREN), filling important knowledge gaps, nearly 50 years of studies of Atlantic salmon in numerous regulated rivers in Norway and the extensive international knowledge on population dynamics of this species. Environmental design for Atlantic salmon is based on the idea that hydropower regulation allows the environmental condition to be specially designed to meet the particular requirement of salmon during their life history. The book consists of a diagnostic section where several classification systems are used as tools to identify the major habitat and hydrological bottlenecks for salmon production, and a design solution section where habitat mitigation measures to reduce the effect of habitat bottlenecks and flow releases and water use measures to reduce effects of hydrological bottlenecks are presented. Several tools (building block method, water bank and water negotiations and priority tables) aid the development of optimal trade-off between habitat and water use measures and between salmon and hydropower production. The diagnostic section is accompanied by methodological descriptions for data collection and analyses, and the design solution section by detailed description of how to implement mitigation measures.