Certification for HydrO: Inproving Clean Energy

Summary

In many European countries hydropower is often opposed by public bodies and NGOs, worried about the risk of adverse effects on the “good status” of water bodies, that, according to the Water Framework Directive (2000/60/EC, WFD), has to be reached by the end of 2015. Many opportunities of more sustainable hydro power generation are lost, due to the lack of assessment criteria to identify them.

The CH_2OICE Project – started in September 2008 and expected to finish in March 2011 – aims at developing a technically and economically feasible certification procedure for hydro power generation facilities of high environmental standard. This includes developing a general, agreed and widely transferable approach for such a certification, discussed by all relevant stakeholders, and developing and testing “at real scale” in Italy and Slovenia a “country specific” operational methodology.

The basic features of the methodology can be briefly summarized as follows:

1. it is explicitly coherent with the WFD, in the sense that criteria adopted by the WFD to assess the status of water bodies are included in the certification procedure among environmental criteria to be taken into account, even though the label is not a "certification of compliance with the WFD";
2. it is not based on generic requirements, but measures required are closely connected with the actual impact on ecosystems, to be defined in a specific management programme for the hydropower plant, connected to the monitoring process;
3. it involves local stakeholders at different stages;
4. simplified procedure(s) are foreseen for specific types of hydropower plant;
5. it is based as much as possible on empirical evidence and it has to be progressively adapted following the increase in available knowledge and data.

The certification process will be managed by and independent Label Management Body with high scientific and environmental awareness credibility, to be created in each country, eventually involving scientific institutions or environmental NGOs.

Energy produced by certified hydropower plants could be put on the market as “high quality energy products” to be distinguished by “only renewable” energy, eventually under the umbrella of existing or new “green labels”.

Renewable energy and water: conflicting Directives

With Europe's rising energy dependency, urgent need to cut down greenhouse gases and fight against climate change and environmental degradation from fossil fuel use, there is an increasing interest in developing HP. The EU has set the legally binding targets for increasing renewable energy use up to 20% by 2020, with the adoption of the RES Directive in December 2008. Indeed, this considerable, yet untapped HP potential can make a significant contribution to future energy needs in Europe and to EU's goal to make the transition to a low-carbon economy by 2050.

In year 2000, however, the 2000/60/EC "Water Framework Directive" (WFD) has been approved, drastically changing the point of view of European water policy, a policy that has always looked at water protection thinking mainly to its human use. With the WFD the focus of water policy shifted from human use to natural water bodies (rivers, lakes, aquifers), environmental conditions of which are recognized as the main target of any action. The Directive sets new criteria to assess the "status" of water bodies and envisage River Management Plans aiming at defining the present state of each water body, identifying environmental pressures and putting in place measures to mitigate them, so that each river body could reach "good environmental status" by year 2015.

Presently, in many European countries, preservation and development of hydro power is often opposed by public bodies and NGOs, worried about the risk of adverse effects on the "good status" of water bodies. Even though several cases occur where hydro power plants are a major cause of environmental impact on rivers, still many opportunities of more sustainable hydro power generation are lost, due to the lack of assessment criteria to clearly distinguish detrimental effects related to hydro power plants from impacts due to other possible pressure factors.

Nowadays appears clearly that the implementation of the two directives is many times conflicting and there is very little coordination and shared knowledge between the respective ministries in the member states. Reconciling the targets of these two directives, RES and WFD, remains as the main challenge for European environmental policy, for the benefit of both climate stabilization and river protection.

The role of Certification to reduce conflicts among the two Directives

The implementation of WFD will most likely imply new requirements for hydropower plants, that will be set up by new River Management Plans. However, Plans enforcement will not be quick and easy, taking into account the possible judicial trials by operators who may consider themselves unjustly damaged by the plans. Moreover, several hydro power plants are located along minor streams, not considered "significant" according to WFD criteria, and their role as pressure factors affecting the attainment of quality objectives will not be clear. Meanwhile opportunities of new hydro power plants could be lost due to resistance of public bodies to release new concessions fearing public opinion opposition.

Thus, is clearly evident that the enforcement of the two directives through conventional "command and control" policy will require years. A volunteer commitment aimed at the improvement of hydro

power plants management to reduce its impact on the river could certainly ease the enforcement of both Directives and help to overcome both mentioned problems.

The CH_2OICE project (www.ch2oice.eu) has developed a technically and economically feasible certification procedure for hydro power facilities of high environmental standard, being explicitly coherent with the requirements of the Water Framework Directive. A general, agreed and widely transferable approach for such a certification has been developed, discussed by all relevant stakeholders, and an operational methodology, has been tested in two partner countries - Italy and Slovenia. The certification methodology refers to existing plants. However, the issue of new hydropower plants licensing has also been considered: a set of guidelines has been produced, to be used by decision makers during planning and authorization procedures and by plants proposers in their EIA and SEA studies.

Certification could work as a driving force to overcome conflicts between RES and WF Directives. It could help boosting the image and give greater visibility to HP and make producers to seek for improvements in the operation of the scheme. Currently European level certification for hydropower doesn't exist. At its best certification could bring more harmonized rules and benefits to all: consumers, producers and to the environment.

Main features of CH_2OICE certification are the following.

1. Certification is voluntary

Decision to recur to CH_2OICE certification depends only on the will of hydro power producers. The certification is not aimed at dividing hydro into 'good' and 'bad'. The aim of the certification is to smoothen and to fasten the implementation of already existing environmental legislation and it doesn't add other obligations, which could add confusion or overlap with the legislative framework.

2. Certification system is technically and economically feasible

The certification is technically and economically feasible: in the worst case, the costs of the environmental analysis (where very little data is available) could reach a few tens of thousands euros, whereas the added management costs due to certification are variable, but may not be relevant for a plant correctly designed to minimize its impact on the river. The size of the plant is not really significant: both large and small plants can be certified, even though reservoir-plants generally produce impacts that are more difficult, and expensive, to mitigate. Since costs of certification procedure could be significant for very small plants (mini hydro): a simplified procedure for such plants should be elaborated in the next future.

However is important underline that certification can open up new management solutions, such as cooperatives and virtual power plants. Several HP schemes on the same river stretch or catchment area could be grouped to form a Cooperative. The 'cooperative of plants' could be managed as one, creating a system of environmental friendly HP which could then obtain a "system certification". This would allow all linked certification costs to be shared among all the operators and the energy produced by all the plants could be offered to the market together, providing more flexibility and marketing power.

3. Certification system is trustworthy

The product (certified energy) is trustworthy. Consumers need to trust, understand and support the added environmental value of the HPP certification. Therefore, the role of the certification body is very important: it should be known and trusted by the general public. The first CH_2OICE labeling body will operate in Italy with a technical committee of recognized river experts and a guarantee committee which will involve the main national hydro producers association and environmental organization.

4. European level harmonized certification rather than 27 individual ones

CH_2OICE certification procedure is envisaged as an European harmonized system, but flexible enough to allow some national specificities. Even if one central system would be a cost-efficient solution, 27 separate Labeling Management bodies would still be required. Harmonised system could also be challenging when taking into account the site-specific nature of HP and how the implementation of the WFD already varies even between region to region in one member state. At the same time certification could help harmonising rules in the EU-27.

5. Market driven system

As a volunteer tool, certification is expected to work mainly as a market driven system, based on a responsible choice of consumers in a liberalized energy market. However public regulatory tools and public incentives could profitably be integrated with the certification system in several ways (see next paragraph “Recommendations for European and National Policies”).
In general terms reasons that can motivate producers to be certified could be:

- Direct economic reason – certified energy could be sold at higher price.
- New Marketing Tool: ‘top quality green energy’ could be attractive for environmentally aware customers.
- Access to public incentives (requires the certification to be recognized by existing incentive systems) – here as return for investment with certified HPPS is lower, a higher feed-in tariff would level it up.

Overview of the methodology

In order to be certified, a given hydropower plant has to commit to carry out appropriate measures in order to mitigate and/or compensate its impacts on specified environmental objectives, in such a way to fulfil predefined environmental targets and prescriptions. These measures have to be described through a specific management programme, based upon a dedicated environmental study, supported mainly by existing data, but, when necessary, complemented by ad-hoc assessment. The realization of both the environmental study and the management programme must be supported by public consultation; both documents must be approved through an auditing process.

The main steps of the procedure are illustrated in Figure 1.

Simplified procedure

For some types of hydropower plants, operating in totally artificial networks and not entailing direct or indirect impact on water related ecosystems, a simplified procedure is foreseen: only the description of the system and proof of fulfilment of the above conditions and of specific prescriptions is requested, instead of the detailed environmental analysis, related management programme and stakeholders involvement.

The types of plants presently admitted to simplified procedures (others may be included in the future) are: hydropower plants in sewage and aqueduct networks. All the other types of plants have to follow the standard procedure. Hydropower plants impacting water bodies defined as artificial or heavily modified (following the definitions of the WFD) in most cases have to fulfil more limited environmental targets, therefore the environmental analysis may be simplified, but anyways compulsory.

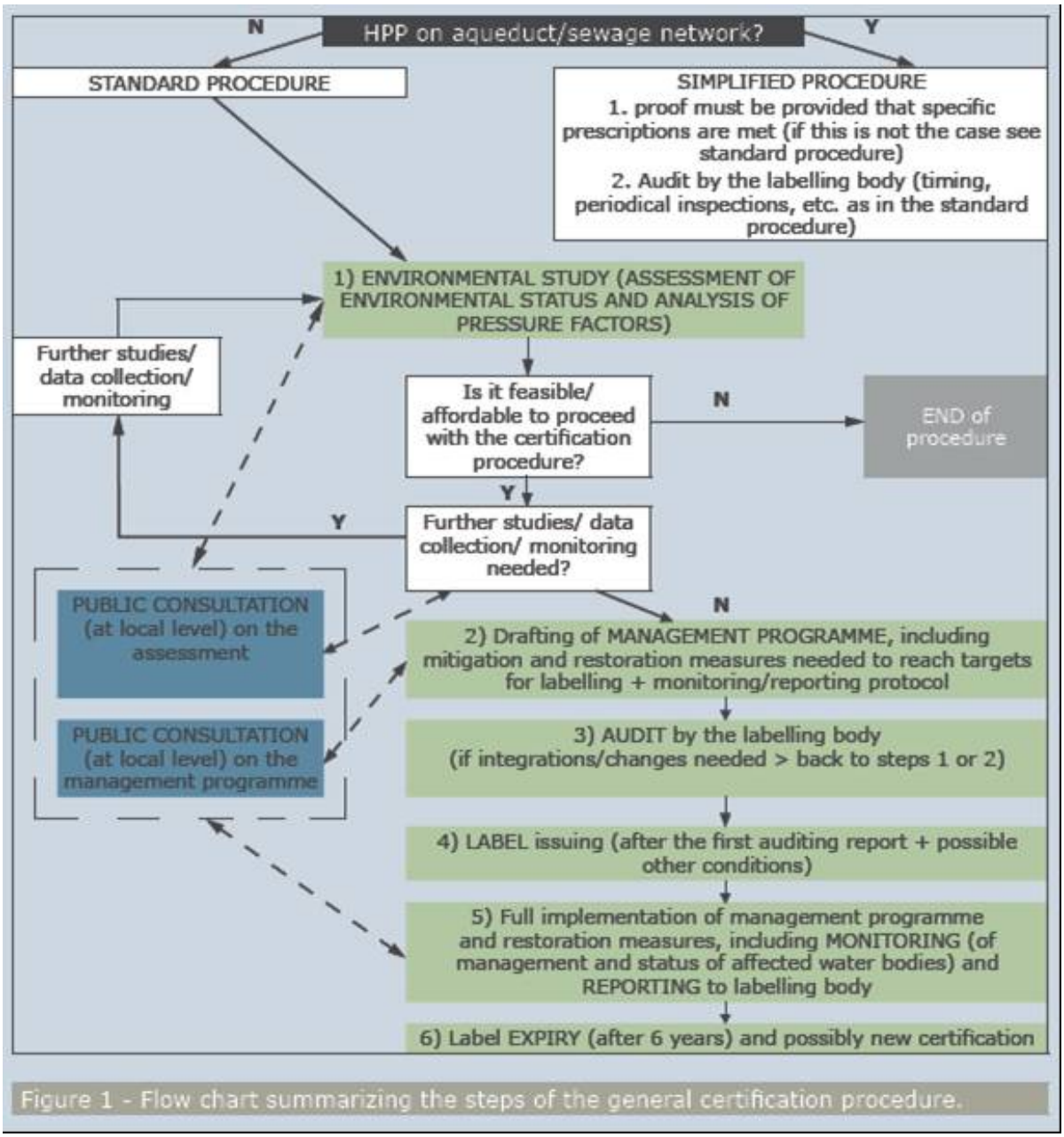

Figure 1 - Flow chart summarizing the steps of the general certification procedure.

Standard procedure

Step 1 - Environmental study: assessment of the environmental status of the affected ecosystems and analysis of pressure factors

The goal of this activity is to define how is the present status of the affected ecosystems; to compare it to set environmental objectives and, based upon modelling and/or on expert judgment, determine what are the main pressure factors causing these impacts. This will allow to define the "responsibilities" related to the plant to be certified, and to identify the appropriate mitigation and/or compensation measures to be integrated in a dedicated management programme.

The assessment must be carried out, in general, at two different scales: at the **water body scale** (coherently with the WFD classification scheme) and at **local scale**, i.e. at a scale smaller than the water body, variable according to the specific pressure factors.

The environmental study must provide the description of the plant, including maps, pictures and relevant operational information, as well as data (quantitative wherever possible) on present (and possibly tendential) values for the indicators representing all environmental criteria. The study must indicate estimated relevant pressure factors for all criteria not already fulfilling the goals defined for certification (Figure 2).

The involvement of local stakeholders (environmental NGOs, anglers, citizens associations, etc.) must be ensured during this step. The outcomes of the preliminary public consultation process have to be explicitly included in the study.

Step 2 - Management programme

Based upon the previously described environmental assessment (step 1), a coherent set of management and/or restoration measures on the affected water bodies (compensation on other water bodies is not allowed) have to be defined, judged appropriate to fulfil the objectives for label compliance. The management programme must also define a monitoring plan, in order to follow the implementation of the measures and their effects, and include measures related to transparency and public availability of data concerning plant management.

The involvement of local stakeholders is required during the definition of the management programme and comments on the programme (if any) must be reported.

Step 3 - Auditing by national labelling body

The documents produced in steps 1 and 2 must be verified by auditors accredited by the national labelling body. In case deficiencies are highlighted, previous steps must be reiterated. The final decision is up to the management board of the national labelling body.

Step 4 - Label issuing

The certification can be issued after the first auditing report and possibly when further conditions are fulfilled (e.g. first monitoring campaign, structural measures completed, etc.).

Labelling fees must be defined in order to support the labelling body.

Step 5 - Monitoring

Monitoring and periodical reporting to the labelling body must be carried out following the protocols defined in the management programme. Monitoring must cover both the actual implementation of the management programme and resulting ecological improvements. Local stakeholders must have the

possibility to comment on the implementation of the management programme and on possible new impacts.

Step 6 - Label expiry and possible new certification

The duration of the label is 6 years, after which a new certification procedure has to be followed to keep the label. A “progressive” approach should be applied, i.e.: the new procedure should integrate all new sources of information and knowledge about the system, not available in the previous certification round.

In case of non-compliance with the agreed management programme (check on annual basis) the label can be withdrawn before its expiration date.

CORPO IDRICO, VALLE RILASCIO	*opera di restituzione*	*hydropeaking*	*gestione sedimenti grossolani*	*gestione sedimenti fini*	*gestione passaggi per pesci*
fitobenthos		impatto trascurabile	impatto trascurabile	impatto trascurabile	
macrofite		impatto trascurabile (pressione principale non legata all’impianto)	impatto trascurabile (pressione principale non legata all’impianto)	impatto trascurabile (pressione principale non legata all’impianto)	
fauna ittica		impatto da mitigare	impatto da mitigare	impatto da mitigare	impatto trascurabile
macroinvertebrati bentonici		impatto da mitigare	impatto da mitigare	impatto trascurabile	
qualità acqua – condiz. generali		obiettivi di qualità già raggiunti		obiettivi di qualità già raggiunti	
condizioni morfologiche	impatto trascurabile	impatto trascurabile	impatto da mitigare	impatto trascurabile	

Figura 2 - Example (based on a simplified matrix) of summarized results of the environmental assessment for one of the impacted reaches downstream the plant release section.

Results of the pilot implementation of the certification procedures in Italy and Slovenia

The certification proposed is technically feasible.

The two operational methodologies were tested in different types of hydropower plants in Italy (5 plants) and Slovenia (4 plants). As expected, the effort for the environmental analysis and the subsequent definition of a management programme widely varied according to the complexity of the hydropower scheme and on the availability and quality of monitoring data. Nevertheless, in all the pilot sites the procedure and the quantitative approach foreseen could be followed within a reasonable

timespan and without major technical constraints, excepted an unavoidable role of expert based approaches for several cause-effects relationships. The implementation of the simplified procedure, applied to plants in aqueducts, was confirmed as quick and easy to apply.

Many hydropower plants could be certified with acceptable measures and costs

The limited number of experimental plants included in project activities in both Italy and Slovenia does not allow drawing general conclusions on economic sustainability of the proposed certification and related minimum targets. However, the following results can be described.

The efforts required in order to be certified (i.e. the present sustainability of hydropower plants) is neither directly related to the typology of the plant, nor to its size. However, the impacts determined by storage plants, especially older ones, are usually more difficult to mitigate than recent run-of-the-river ones. This is especially due to specific impacts connected to sediment transport and hydropeaking, whose mitigation or compensation is often expensive.

In order for a hydropower plant to be certified, three groups of costs have to be considered: administrative costs of the certification procedure, costs of the environmental analysis and costs related to mitigation and compensation measures needed to obtain the certification. The costs of the certification procedure will be fixed as low as possible to cover the administrative costs of the labelling body. The costs of the environmental analysis are generally comparable to the costs of an EIA study. In the case where available operational and environmental data are scarce, the costs can reach indicatively few tens of thousands Euros. The costs related to needed mitigation and compensation measures are widely variable, depending on the location, the plant design and the present management rules. For instance, the pilot application of the CH2OICE methodology in two Italian run-of-the-river plants showed that the production losses required would have been between 1% and 4%.

To summarize, the certification developed appears in general terms economically feasible at least for average-sized plants. Since the costs of the procedure could be significant for several small plants (mini hydro, <1 MW) a simplified administrative procedure for such plants may be needed.

However, it is important to underline that certification can open up new management solutions, such as cooperatives. Several hydropower schemes on the same river stretch or catchment area could be grouped to form a cooperative. The ‘cooperative of plants’ could be managed as one, creating a system of environmental friendly HP which could then obtain a “system certification”. This would allow all related certification costs to be shared among all the operators and the energy produced by all the plants could be offered to the market together, providing more flexibility and marketing power.

Open issues

Member States being obliged to reach the targets of the RES directive should be involved in the increasing of awareness and advertising campaign - there should be additional public funding for the support of the renewables. In order for the system to be successful, there needs to be a way to motivate the consumers to buy the product. Therefore, targeted advertising, promotion and marketing by electricity suppliers is needed to form a clear message with a verifiable result (in terms of reduction of the present environmental impact on river ecosystems).

The EU could promote a European harmonized certifications system, based on the CH_2OICE experience, maintaining sufficient degrees of flexibility in order to allow some national specificities. Even if one central system would be a cost-efficient solution, 27 separate labelling management

bodies would still be required. A centralized system could also be challenging when taking into account the site-specific nature of hydropower and how the implementation of the WFD already varies even between regions in one member state. At the same time the certification could help harmonizing the implementation of the WFD in the EU-27.

In order to promote “sustainable” renewable energies, Member States should redraw national renewable energy subsidizing systems (support schemes) in order to support certified hydropower plants with more favourable incentives than uncertified ones.

Final consumers awareness should be raised and they should be given the chance to choose. The lack of transparency with information on energy sources and subsidies should be overcome. The consumer side can also be activated by creating and increasing the demand for renewable and ‘more sustainable’ CH_2OICE certified energy. For instance, adding within the criteria to obtain certifications such as ISO 14001 or EMAS that a certain percentage of consumed energy should come from CH_2OICE certified power plants. Another proposal would be to ask municipalities or other public bodies to use at least a percentage of energy from CH_2OICE certified plants (this is similar to what already happens with Green Public Procurement policies). The public body could then use this as a promotion tool for its “green policies”.

The EU and Member States could define new rules in order to drive the electricity suppliers to diversify their green products by energy source and by price. An image of an attractive environmentally conscious company should be created. Pooling hydropower plant producers together could be one part of the market scheme.

The EU and Member States could promote the application of environmental certification procedures, similar to CH_2OICE certification, to other RES (e.g. wind, biomass, photovoltaic, geothermic) as a tool to promote more sustainable ways to design and operate energy production plants. Certified energy produced by different sources could be sold on the market as a single “top environmental quality” energy product.