CRITERIA REGARDING SUSTAINABILITY OF HYDROPOWER – TESTING OF THE INTERNATIONAL HYDROPOWER ASSOCIATION (IHA) SUSTAINABILITY GUIDELINES

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ABSTRACT

The International Hydropower Association (IHA) has recently developed a first version of a new quantitative tool for measuring sustainability performance, "Sustainability Guidelines" and "Compliance Protocol". The work set out below represents a test of this tool. The assessment includes overall principles and criteria and a test of the propensity for sustainability in two specific power projects, that is the existing Trollheim power station (805 GWh/year) and the planned rehabilitation and expansion Helgeland Project (1.5 TWh). The projects attained 88 and 89 points respectively out of a possible 100 on a rating assessment for sustainability performance.

The Sustainability Guidelines establish overall principles and criteria that give comprehensive coverage of the concept of sustainability. The Compliance Protocol is, however, a tool for making relative measurements. The sets of indicators used in the Compliance Protocol are characterised by a discretionary element and often require better explanations. When further development is undertaken, emphasis should be placed on greater clarity so that comparisons of energy projects at national and international levels can be carried out. Our experience show that the relationship between the size of a facility (energy production) and the environment is not considered. It is absolutely necessary that this relationship is made quite clear in order to be reflected in the rating assessments. Tools such as the Sustainability Guidelines and the Compliance Protocol first achieve significance if they gain general acceptance with producers, the authorities and Non-Government Organisations (NGOs). The further development of the tools should initiate processes which contribute to ensuring such an acceptance. The Sustainability Guidelines and Compliance Protocol are considered a sound and positive contribution to an environmentally friendly and sustainable development of energy production in general, and of hydropower in particular.

IHA GUIDELINES AND COMPLIANCE PROTOCOL

Statkraft AS is a Norwegian company that produces, exchanges, and sells renewable energy. Together with its alliance partners (Skagerak Energi, Trondheim Energiverk, Agder Energi, and BKK), Statkraft is the second largest energy company in Europe on renewables. Statkraft receives electricity from 93 hydro plants – of which the company owns 57, totalling 10,055 MW - and from 95 MW of wind generation that came on line in 2002 and 2004.

Presently, a number of more or less well developed testing tools for documenting and comparing the environmental performance of different energy sources and technologies exist. Statkraft has experience from several of these, including LCA (ISO-14040-43), EPD (Environmental Product Declarations, ISO/DIS 14025), ExternE and EIA. The International Hydropower Association (IHA) has recently developed a first version of a new quantitative tool for rating sustainability performance, "Sustainability Guidelines" and "Compliance Protocol". This paper describes a test of this tool. The main principles and criteria in the Sustainability Guidelines are evaluated and two specific hydropower projects are tested according to the Compliance Protocol in regard to their sustainability performance.

The Governing Council of the International Hydropower Association (IHA) adopted the Sustainability Guidelines in November 2003 (IHA 2003). The Compliance Protocol was submitted in draft in February 2004 (IHA 2004).

The Sustainability Guidelines have been developed "to promote greater consideration of environmental, social and economic aspects in the sustainability assessment of new hydro

projects and the management and operation of existing power schemes" (Sustainability Guidelines 1.1). The IHA applies the definition of sustainability coined by the Brundtland Commission (World Commission on Environment and Development 1987), i.e. "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The principles set out in the Sustainability Guidelines include IHA's policy (sustainable development, eco-efficiency and precautionary approach), the role of the authorities, the decision-making process, and environmental, social and economic aspects of sustainability in relation to hydropower. The IHA claims that the Sustainability Guidelines are in line with the key values listed in the final report of the World Commission on Dams (WCD 2000), i.e. equity, efficiency, participatory decision-making, sustainability and accountability. The Sustainability Guidelines aim to "provide a framework for good practice which is in accordance with these values" (Sustainability Guidelines 2.1). The Sustainability Guidelines define a series of key criteria and essential environmental, social and economic aspects which must be considered or satisfied in order to achieve sustainability.

The Compliance Protocol is a set of requirements presented in three sustainability rating assessments (scorecards) which define achievement goals in relation to the Sustainability Guidelines. The Compliance Protocol is "intended to be a simple and easy-to-use approach" (the Compliance Protocol, introduction). Scorecard A is applied when choosing between energy sources and technologies, Scorecard B assesses planned hydropower projects, and Scorecard C assesses existing power plants. The assessments are carried out for aspects related to the three dimensions of economy, society, and environment. Each of the three scorecards contains 20 aspects with at least four statements which give from 0 to 5 points. Most of the statements contain words and concepts which give scope for the extensive use of discretion (see Table 1 for an example). Some statements are, however, of a more objective, absolute nature.

Table 1. Aspect 17 in section C of the Compliance Protocol.

C17	**Aspect:** Community support (or lack of opposition) for reservoir level management and environmental flow regime.	
Measures the effectiveness of the reservoir level management and downstream environmental flow regime to meet agreed environmental and social outcomes.		
Sustainability Scoring		
Score	**Understanding of the environmental issues and stakeholder concerns**	**Agreement on reservoir level and downstream flow**
5 = Highest	Thorough understanding of associated environmental issues and stakeholder concerns	**and** good community and regulator support (or no significant opposition) for reservoir level management and downstream flow regime.
3 = Medium	Good understanding of associated environmental issues and stakeholder concerns	**and** only minor opposition to reservoir level management and downstream flow regime.
1 = Low	Limited understanding of associated environmental issues and stakeholder concerns	**or** some continuing opposition to reservoir level management or downstream flow regime.
0 = Zero	No consideration of stakeholder objectives in implementation of any reservoir level management or downstream flow regime.	Not applicable

The assessment of the individual aspect assumes presentation of evidence. IHA has recently prepared guidelines to assist in strengthening objectivity in the assessments (Obtaining Objective Evidence (Draft), IHA 2004, in preparation). An appendix in the Compliance Protocol links the aspects of the rating assessments to the different principles and criteria in the Sustainability Guidelines. One aspect in the Compliance Protocol will often test several criteria in the Sustainability Guidelines. For example Aspect C17 (Table 1) tests for eco-efficiency (Sustainability Guidelines 2.2.1), downstream hydrology and environmentally based water flow (Sustainability Guidelines 5.1 point 3 in the table).

Rating assessment A compares energy options and assesses the sustainability of different alternatives. IHA points out that this assessment is best carried out by national authorities (Sustainability Guidelines 4.1). This seems to be well taken care of in Norway. Development

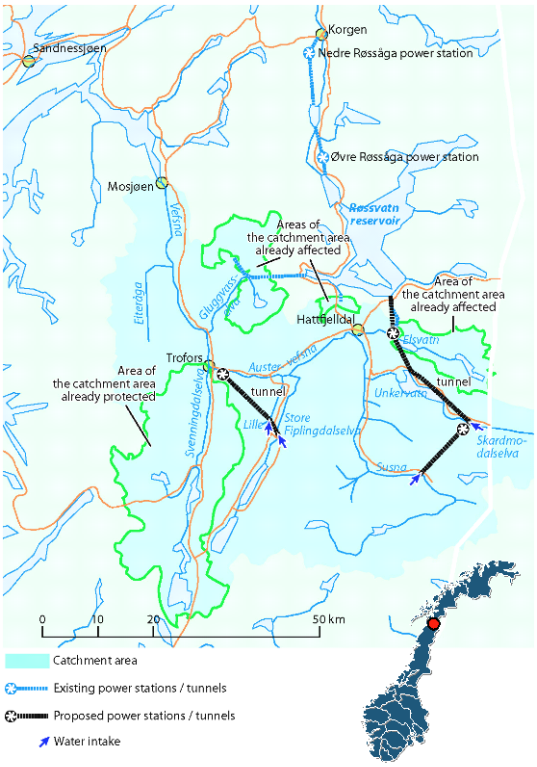
of new renewable energy production has strong political support and individual projects are assessed and decided upon through the licensing processes. In recent years natural gas has also been assessed by way of licensing processes. National political guidelines have established the premises for the use of this energy source in Norway. Other fossil fuel sources and atomic power have hitherto been considered of no current interest in Norway. The development and construction of hydropower in Norway is guided by considerations in the Master Plan for Water Resources, Conservation Plan I-IV, a series of laws and provisions and more recent arrangements such as the Masterplan for National Salmon Watercourses. The EU Water Framework Directive will also influence these issues in the coming years.. Altogether about 24 pieces of legislation govern or influence today hydropower directly or indirectly (personal communication from M. Toven, Statkraft's Legal Department). Major hydropower projects are studied through comprehensive environmental impact assessments (EIA) and are thereafter assessed in licensing processes with widespread participation by the affected parties. On this basis, rating assessment A is only assessed on a general basis. Scorecards B and C are, however, tested against actual projects.

CHOICE OF CASES

The Helgeland project - upgrading and expansion of the Røssåga Power Plant by sustainable use of the river Vefsna (Scorecard B) is a well advanced proposal which has been tested before the formal planning processes have started. Trollheim Power Plant has been tested in accordance with Scorecard C. The power plant was built in the early 1960s and was commissioned in 1968. Both cases have been chosen because the available data are sound.

The Helgeland project

The Helgeland Project will utilise the large volumes of water in the Vefsna watercourse by way of an expansion of the existing Røssåga scheme. The project has developed its own environmental goals as a central design criterion and is viewed as a pilot project where environmental criteria play a major role.



The Helgeland Project includes four river intakes, a new run-of-river power station and two small power stations in the transmission tunnels. Two of the intakes are planned for the eastern branch of the river Vefsna. A tunnel will transfer water to the lake Røssvatnet, which is the reservoir for the existing power stations. Rehabilitation of the 50 year old power stations will produce about 1.1 TWh. The water from the two intakes in the rivers Fiplingdal and Little Fiplingdal, respectively, will be used in a new power station at the settlement of Trofors. The power station will be without reservoirs and will produce 0.4 TWh. The Helgeland Project will primarily utilise high water flows. In the case of low water flows the intakes will be closed in order to conserve the riverine ecology.

The most important impacts on the natural environment are changes in water flows, physical encroachments and the risk of transferring non-native species to the lake Røssvatnet. The change in water flow will be most noticeable directly downstream of the power plant intakes. The river Vefsna previously had a large population of Atlantic salmon which unfortunately was nearly wiped out by the *Gyrodactilis salaris* parasite. Eco-hydraulic models indicate that a future, healthy salmon population will encounter roughly the same conditions as today, after a possible realisation of the Helgeland Project. The four intakes will be visible, but will be of limited extent. The soil and rock from the tunnels will have to be stored in various ways, influencing the local landscapes. 45 % of the soil and rock volume can probably be used for agriculture, roads and construction purposes, or be dumped under water. The rest can be landscaped at suitable locations. The tunnel from Austervefsna to Røssåga may transmit aquatic species, but as the composition of species seems to be the same in the two biotopes, this will be of no consequence. The Helgeland Project reduces the flow of water in the river Vefsna at its estuary by about 15% (yearly average). The project does not create new reservoirs, new large power lines, and only about 6 km of new roads will be constructed.

The Vefsna River has been proposed for inclusion in the Conservation Plan for Watercourses on two occasions. The watercourse was considered for a third time in 2005 in connection with the ongoing process concerning the augmentation of the Conservation Plan. On the basis of broad local and regional engagement, and the projects environmental approach, the Parliament (Storting) has now opened up for å comprehensive study of the Helgeland Project.

Trollheim

Trollheim Power Scheme is located in the municipality of Surnadal in Møre and Romsdal County (Table 2). The power plant is situated in the Surna Valley some 20 km east of the municipal centre and releases its operational water into the Surna River. The power plant utilizes water from a drainage basin that encompasses the mountainous areas south of the valley, parts which reach into the Trollheim Mountains. Intakes

of have been built in rivers and transfer tunnels bored into two artificial lakes, Follsjø and Gråsjø. The Surna River was recently (2003) designated as a Norwegian National Salmon Watercourse due to valuable populations of Atlantic salmon (*Salmo salar*). Both smolts and fry of Atlantic salmon are released into the river each year by Statkraft.

Table 2. Details of the Trollheim Power Scheme.

Parameter	Value
Construction year	1968
Catchment area	575 km^2
Reservoirs: Follsjø + Gråsjø	384 mill.m^3
Follsjø	6,4 km^2, min. elevation 375, max. elevation 420
Gråsjø	8,8 km^2, min. elevation 449, max. elevation 483
Generator capacity	130 MW
Maximum flow rate	38,5 m^3/s
Number of turbines	1
Average annual operation time, full capacity	6192 hours
Average annual production	805 GWh (369 summer, 436 winter)
Falls with periods of extensively reduced flow rate (more than 50% reduced	none mentioned
Rivers with periods of extensively	Ca 12 km in total

reduced flow rates (more than 50%)	
New roads	10 km
New power lines	1 km
Rivers with anadromous species of fish	72 km in total (with tributaries), ca. 35 km impacted by power plant.
Main impact from Power Plant	Changes in flow regime in Surna river. Changes in temperature first 2 km downstream outlet from power plant.
GHG from reservoir	As in natural reference lake most of the year. Possible detection of CH_4 in early spring of 2003. Research ongoing.

METHODOLOGY

In the document "Obtaining Objective Evidence (IHA 2004, draft)", IHA proposes four approaches to the assessment of relevant projects (Table 3)

Table 3. Different types of audits as defined in the IHA (Obtaining Objective Evidence. IHA 2004. Draft)

Self Assessment	A self assessment is like an audit because it examines results versus criteria. However, a self-assessment is performed by part of an organisation on its own work, where those responsible perform the assessment of their own work.
First Party (Internal) Audit	A first party audit is performed by an organisation on its own work. A first party audit is conducted by a part of the organisation that is independent of the area being audited.
Second Party (External) Audit	Second-party audits are conducted by parties having an interest in an organisation, such as customers, or by other persons on their behalf. .
Third Party (External) Audit	Third-party audits are conducted by external, independent auditing organisations, such as those offering certification of conformity to requirements of a particular standard.

The Helgeland and Trollheim Projects are measured by testing known facts on each project against the individual criteria set out in Scorecards B and C. Assessment of the projects are carried out as a Self Assessment. Statkraft's intimate knowledge of the projects forms the basis for this. Presentation of the evidence is made up of Statkraft's own assessments and those carried out by others to the extent that these are available. Emphasis is placed on data and information from audits, studies and R&D projects carried out by third parties. Accountability, transparency and objectivity are desired aims. Thereafter we have given a score based on the relationship between the data basis and the statements in each aspect. In addition the results are reviewed by Statkraft staff with particular knowledge of the two projects.

The data basis

The data basis for the test is shown in Table 4. Documentation derived from external institutions is understood to be assessments by third parties. However we would like to emphasise that none of the work listed was undertaken with the present test in view.

Table 4. Basis for evidence used when testing the two schemes.

Trollheim Power Plant	The Helgeland Project - Upgrading the Røssåga Power System by Sustainable use of the river Vefsna
• Internal audit • Internal procedures • Licensing provisions • The Advisory Forum for the Surna Watercourse • The Cooperative Body for the Surna Watercourse • Surnadal Municipality • The River Owners' Association • Environmental inspection 2004, the Norwegian Water Resources and Energy Directorate • Monitoring and studies of the River Surna. Directorate for Nature Management Monitoring the salmon population, Norwegian Institute for Nature Research, NINA. • Implementing models of the River Surna: flow regime, eco-hydraulics, meso-habitat mapping, biological properties related to physical models. SINTEF Energi AS. On-going R&D. • Greenhouse gas emissions from the reservoir, SINTEF Energi and SINTEF Kjemi AS, on-going R&D. • LCI/LCA for the Trollheim Power Plant	• 5 years of process based planning • Extensive dialogue with local society, objectors, local, regional and national authorities at both administrative and political levels • Field excursions with stakeholders • Documented changes to the project proposals as a result of comments from affected parties • Documentation and assessment of the planning process. Civitas and Nordland Research. R&D project managed by the Electricity Association of Norway. • Third party evaluations of the process. Norwegian Institute for Water Research (NIVA) R&D project managed by the Electricity Association of Norway. • Implementation of models of the River Vefsna: flow regime, eco-hydraulics, meso-habitat mapping biological properties related to physical models. SINTEF Energi AS. Norwegian Institute for Nature Research, (NINA) and Freshwater Ecology and Inland Fisheries Laboratory (LFI),

• EPD for Trollheim based on ISO/DIS 14025	Natural History Museum, University of Oslo) • Joint Planning Programme. Provisional impact assessment of conservation, non-conservation and/or development. Civitas
Statkraft: • ISO 14001, ISO 9001 • Systematic and extensive contacts with host municipalities and different authorities	

Degree of discretion
Discretion in the scorecards is assessed by reviewing each aspect. Only absolute requirements, with quantitative limits, or of the type: have/have not been carried out, are interpreted as objective.

RESULTS

Weighting of aspects
Rating Assessment A (energy options) puts greatest emphasis on the economic aspects, rating assessment B (planned hydropower alternatives) on environmental aspects and rating assessment C (existing hydropower plants) puts greater emphasis on the social than the environmental aspects, and least on the economic aspects (Table 5)

Table 5. Distribution of different aspects within each of the three main sections of the Compliance Protocol

Section	Economic aspects weight (%)	Social aspects weight (%)	Environment weight (%)
A Options Assessment	50	25	25
B Evaluation of hydropower projects	15	30	55
C Appraisal of Hydropower Operation and Management	25	40	35

Degree of discretion in the rating assessments
Reviews of the statements relating to each aspect show that about 80% of the statements shall be considered as discretionary. The remaining 20% are considered as objective.

Test result
The results achieved for each aspect on rating assessment B and C (the Compliance Protocol) are shown in Appendix A.

The total score for the Helgeland Project is 89 out of a possible 100 points. For the economic, social and environmental dimensions the percentage degrees of goal achievement were 100, 80 and 91 respectively (Table 6). Trollheim power plant achieved 88 points in total with a percentage degree of goal achievement for economic, social and environmental dimensions of 96, 90 and 80 respectively (see Table 5)

Tabell 6. Principal results for the test of the Helgeland Project and the Trollheim Power Scheme

	Main aspect	Theoretical maximum	Actual score	Percent compliance
The Helgeland Project	Financial	15	15	100
	Social	30	24	80
	Environmental	55	50	91
	Total	100	89	89

	Main Aspect	Theoretical maximum	Actual score	Percent compliance
The Trollheim Power Scheme	Financial	25	24	96
	Social	40	36	90
	Environmental	35	28	80
	Total	100	88	88

DISCUSSION

The Sustainability Guidelines constitute a framework with principles and criteria intended to improve sustainability performance in planned and existing energy production. The Compliance Protocol consists of three scorecards for the assessment of projects in terms of the requirements of the Sustainability Guidelines. The aspects within the rating assessments are based on what is known today on effects of energy production in general and of hydropower in particular. The problems that are addressed lie within themes which touch upon sustainability, and the relation between the Compliance Protocol and the Sustainability Guidelines seems good.

The three rating assessments implicitly give different weights to the significance of economy, social and environmental aspects. Neither the Sustainability Guidelines nor the Compliance Protocol are clear regarding the reasons for the difference in weighting. Furthermore, there is no requirement for a minimum score. This makes it possible to achieve a high score despite achieving no points for important aspects. In a choice between energy options it will be possible to achieve 75 points in total without getting one point for the environmental dimension and a planned hydropower project can score as much as 85 points with zero points for economic aspects of sustainability. Even though 85 points will be perceived as a high score in sustainability performance, projects without any points within whole dimensions cannot be described as sustainable. It ought not to be possible to obtain a high point score in sustainability performance with zero points for important aspects. These problems ought to be dealt with in the further development of the Compliance Protocol.

The 20 aspects in each of the rating assessments B and C contain between four and 24 statements (for example C17, with nine statements). 80% of the statements are governed by relative concepts such as “some”, “clearly demonstrated”, “indicate very high – “, “adequate”, “considerable certainty that –“, “uncertainty”, “significant” and “effective”. The degree of discretion creates uncertainty and can lead to the results having limited use. Furthermore the scale of points for some aspects can be difficult to understand. Under aspect B7 five points are earned when the project does not lead to population displacement, but also for “Minor population displacement **and** strong community support(**or** no significant community opposition) for planned resettlement and rehabilitation program.”. These are not necessarily events of equal value. Under aspect B17 five points are earned when the measure does not affect migratory fish, but they are also earned when the fish population is actually affected and when there is a need for mitigating measures. The Appendix in the Compliance Protocol is intended to be of assistance, both in the case of the rating assessments and to clarify principles and criteria in the Sustainability Guidelines. However the references in the Appendix are often difficult to understand. Unambiguous references and better examples will improve the usefulness of the Appendix.

Scoring of the two projects is a result of a self assessment. However, the evidence presented is as objective as possible and based on third party assessments when available. In our opinion, the self assessment approach nonetheless reduces the credibility of the evaluation and the scores achieved. The award of points in relation to the rating assessments assumes a considerable degree of interpretation and discretion. Use of the test results can be of great interest and can be of significance in the development and presentation of the company’s environmental profile. The results will also be included in a dialogue with society at large, the authorities, Non-Government Organisations and local society. It will be of particular interest in the case of the planning of new projects like the Helgeland Project to use an assessment based on the Sustainability Guidelines as an argument for environmental friendliness and

sustainability. In order to ensure credibility, assessments should therefore be verified or preferably be carried out by an independent third party trusted by all stakeholders.

The concept of sustainability is comprehensive, and it is difficult to define precisely. The understanding of the concept is continuously evolving in keeping with both the general development of knowledge and the development of society. When the Compliance Protocol seeks to establish a benchmark for sustainability, the result must necessarily be of a relative and discretionary nature. It will not be possible, nor will it be desirable, to establish precise measurements of sustainability. The Compliance Protocol exists today in a provisional version and will be developed further. Even though the concept of sustainability assumes a large degree of discretion, a closer examination should be made to see whether words and concepts can be elaborated so that the tests can developed in closest association possible with the understanding of the concept and frames of reference. The exercise of discretion can therefore be carried out with a somewhat higher degree of precision and results can be more easily compared from test to test.

An important purpose of the Sustainability Guidelines and the Compliance Protocol is benchmarking of hydropower projects. The quality of comparisons of sustainability performance can probably be improved if the Compliance Protocol is supplemented by other types of tools for comparing watercourses and energy projects. IHA also encourages the use of more precise tools such as LCA (Sustainability Guidelines page 3). However, it is not apparent in the rating assessments whether and how such data can be used. Trollheim Power Plant (scorecard C) has been tested as it operates today, and Life Cycle Assessment (LCA) or developments over time have not been taken account of. At the start-up of the power plant in 1968 changes in the ecosystem took place, including changes in water discharges and the temperature in the River Surna. It is difficult to see how this type of information can be used. In addition a scale is often absent. For example the size of the power project does not emerge well enough and the aspects within the rating assessments do not seem to distinguish small from large power production. It is also unclear how the relationship between volume of energy and environmental aspects shall be assessed. Rating assessment B is primarily an instrument that IHA wants to use in decision-making processes. But as of today the rating assessment is not good enough for this purpose.

The concept of sustainable development and its relationship to the economic, social and environmental dimensions were described and elaborated in “Our Common Future” in 1987 (World Commission on Environment and Development). The main principles from this work have since then been further elaborated and also operationalised in the form of different tools which, to various extents, directly or indirectly, aim to measure sustainability. Such attempts are to be found, amongst others, in FTSE4GOOD (ref), the Dow Jones Sustainability Index (ref), Global Reporting Initiative (ref), World Business Council for Sustainable Development (WBCSD 2002) and in the report from the World Commission on Dams (2000).

The WCD and the IHA represent a first attempt to establish sets of criteria/indicators adapted to hydropower – enabling producers to assess alternative projects and existing power production against sustainable development.

The IHA goes further than the WCD in establishing rating assessments which measure sustainability performance with the assistance of a points system. Both the WCD criteria and IHA’s guidelines lie within what would be regarded as the requirements for sustainable development. The WCD goes somewhat further in indicating processes and puts considerable weight on a negotiated consensus in decisions on dam projects – and indirectly; hydropower projects in general. However the WCD states that good projects with sizeable social benefits for large population groups must not be halted for the lack of consensus. In such cases the WCD points to the authorities and to the use of “arbitration” (WCD chapter 7). The IHA does the same in principle. The Sustainability Guidelines put considerable emphasis on

participation and consultation with all affected parties, but point more rapidly than the WCD to the role of the authorities in the decision-making processes. The differences in views between the two systems seem to be, first and foremost, that the IHA, to a greater extent than the WCD, assumes a well developed and sound public administration system. The IHA point out that sound management systems are necessary conditions for sustainable development (chapters 3 and 4). In the assessment of concrete projects, however, the Sustainability Guidelines appear to make use of very much the same process as the WCD, with extensive use of involvement, consultation and dialogue with all affected parties.

Conclusion

The Sustainability Guidelines set out overall principles and criteria which cover the concept of sustainability. The Compliance Protocol, however, is a tool for the measurement of relative values. The sets of indicators in the Compliance Protocol are characterised by discretion and often need more clarification. In the case of further development, greater clarity should be emphasised so that comparisons of energy projects, both at national and international level, can be carried out. Our experience is that the relationship between the size of the facility (energy production) and the environment is not considered. It is quite imperative that this is taken up adequately in the rating assessments. Tools such as the Sustainability Guidelines and the Compliance Protocol first assume significance if they are generally accepted by producers, the authorities and Non-Government organisations. The further development of the tools should prepare for processes which contribute to ensuring such acceptance.

The relation between energy and environment has been emphasised to an increasing extent by world society. This is especially so in relation to Mankind's perhaps greatest challenge, that is climate change. No energy source or technology, however, is without an environmental impact, and thus without significance for sustainability. In a situation like this sound tools for the benchmarking of future environmentally friendly and sustainable energy projects will be of steadily increasing significance.

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COMPLIANCE PROTOCOL – EVALUATION OF HYDROPOWER PROJECTS

SCHEME NAME:	The Helgeland Project -Upgrading the Røssåga Powerplant by sustainable use of the river Vefsna
LOCATION DETAILS:	Northern Norway
DATE OF ASSESSMENT:	September 2004
NAME AND POSITION OF STAFF CARRYING OUT ASSESSMENT:	Vilde Eriksen Tormod Schei
DETAILS OF OTHER PERSONS / ORGANISATIONS CONSULTED DURING ASSESSMENT:	
SIGNATURE OF AUTHORISING OFFICER:	

No.	Aspect	Score	Evidence	Audit*
B1	Demonstrated need for the project	**5**	• NVE, Report no 4/2002 • National statistics and documents from national authorities	TP
B2	Economic viability and planned monitoring for ongoing performance	**5**	• Project development and planning at Statkraft • Third party evaluations by social economists (Preliminary EIA)	SA TP
B3	Distribution and sustainability of economic benefits	**5**	• Project development and planning at Statkraft • Extensive involvement of local municipalities and regional authorities in planning process (Preliminary EIA).	SA SP/ TP
B4	Community acceptance	**3**	• Extensive and continued cooperation and dialogue between Statkraft and local communities ("Mulighetenes kunst. REF) • Stakeholder consultations • Third party R&D • Preliminary EIA • Political processes in affected municipalities	TP TP TP
B5	Multiple use benefits	**1**	• Preliminary EIA	TP
B6	Opportunities and threats to vulnerable social groups.	**5**	• Preliminary EIA	TP
B7	Population displacement	**5**	• No displacement	
B8	Enhancement of public health and minimisation of public health risks	**5**	• No affected population and no public health risk	
B9	Dam safety	**5**	• Procedures for environmental, health and safety planning prior to and during construction	FP
B10	Environmental impact assessment	**4**	• Preliminary EIA	RP
B11	Previously developed river basins	**5**	• Master Plan for Water Resources (SP, in Norwegian)	TP
B12	Area flooded per unit of energy produced	**5**	• Master Plan for Water Resources (SP, in Norwegian)	TP
B13	Avoiding exceptional natural and human heritage values	**3**	• Preliminary EIA	TP
B14	Rare, vulnerable, or threatened species; high-quality habitats; and habitat restoration	**5**	• Preliminary EIA • Meso habitat modelling	TP
B15	Community-support (or lack of opposition) for planned reservoir level management and environmental flow regime	**4**	• No new reservoirs. • Hydrological/biological modelling, Scientific reports (SINTEF) • Political processes in four municipalities • Preliminary EIA	TP
B16	Reservoir and downstream sedimentation and erosion risks	**4**	• Preliminary EIA	TP
B17	Passage of fish species	**5**	• Hydrological/biological modelling, Scientific reports (SINTEF) • Preliminary EIA	TP
B18	Water quality	**5**	• Preliminary EIA	TP
B19	Planning to manage construction impacts	**5**	• Procedures for environmental, health and safety planning prior to and during construction	FP
B20	Planned environmental management system	**5**	• ISO 9001 and ISO 14001 certificates	TP

	Total	Average	Percentage	Range
Score	**89**	**4.45**	**89% (??)**	**1-5**
Comments	Project is in a pre feasibility phase that has been in operation for 5 years. The score given here is preliminary and is based on plans, discussions, local involvement, stakeholder consultations and assessment by third party. Also the planning method has been subjected to R&D evaluating and documenting the process. A final score cannot be given until the formal phases of planning are completed.			

*Audit (Ref:IHA xxxxxxxxx): SA=Self assessment, FP=First party audit, SP=Second party audit, TP=Third party audit.

COMPLIANCE PROTOCOL –
APPRAISAL OF HYDROPOWER OPERATION AND MANAGEMENT

SCHEME NAME:	Trollheim Power Station
LOCATION DETAILS:	North Western Norway
DATE OF ASSESSMENT:	September 2004
NAME AND POSITION OF STAFF CARRYING OUT ASSESSMENT:	Vilde Eriksen Tormod Schei
DETAILS OF OTHER PERSONS / ORGANISATIONS CONSULTED DURING ASSESSMENT:	
SIGNATURE OF AUTHORISING OFFICER:	

No.	Aspect	Score	Evidence	Audit*
C1	Economic viability and monitoring for economic performance	5	• Annual reporting • Record of basis for economic rent	FP FP
C2	Distribution and sustainability of economic benefits	5	• Record of tax payment • Record of concession (licence power) • Record of compensation industry funds	TP TP TP
C3	Range of services and flexibility of electricity supply services	4	• Record of production	FP
C4	Reliability of primary energy supply	5	• Record of production	FP
C5	Energy efficiency of operations	5	• Technical documentation • Record of production	TP FP
C6	Community acceptance	4	• Stakeholder fora • Regular talks with local municipality	SP SP
C7	Multiple use benefits	2	• Hydrological records • Record of production	TP FP
C8	Enhancement of public health and minimisation of public health risks	5	• National, regional and local authorities	
C9	Dam, power station and associated infrastructure safety	5	• ISO 9001 certification • Internal safety procedures • Auditing by Norwegian Water Resources and Energy Directorate (NVE)	TP FP TP
C10	Employee safety program	5	• ISO 9001 certification • Internal safety procedures	TP FP
C11	Employee opportunity and equity	5	• Employee policy (“Job satisfaction and development”) • Organization and management evaluation	FP FP
C12	Effectiveness of resettlement and/or compensation program	5	• National, regional and local authorities	TP
C13	Cultural heritage and vulnerable social groups	5	• National, regional and local authorities	TP
C14	Environmental impact assessment and environment management plans	0	• No IEA • EMP is in operation and meets expectations o Yearly internal auditing (ISO 14001) o Third party auditing (ISO 14001)	- FP TP
C15	Environmental management system	5	• ISO 14001 certification o Internal auditing o Third party auditing	
C16	Environmental compliance	4	• The Norwegian Water Resources and Energy Directorate (NVE) • Regional authorities • Yearly sustainability report	TP TP SA
C17	Community support (or lack of opposition) for reservoir level management and environmental flow regime	4	• Stakeholder for a	SP
C18	Reservoir and downstream sedimentation and erosion risks	5	• Stakeholder fora • The Norwegian Water Resources and Energy Directorate (NVE) • EMP	
C19	Passage of fish species	5	• Monitoring of Atlantic Salmon and Sea-run trout	TP
C20	Water quality	5	• Local and regional authorities	TP

	Total	Average	Percentage	Range
Score	89	4.45	89% (??)	1-5
Comments				

*Audit (Ref:IHA xxxxxxxxx): SA=Self assessment, FP=First party audit, SP=Second party audit, TP=Third party audit