

Dam Safety – Pilot Project “Special Examination”

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1. Background

Svenska Kraftnät is the authority that provides guidance in the supervision of questions of dam safety, and it thus works with the question of how the supervision of dam safety in Sweden should be carried out. The official supervision of dam safety is regulated by The Environmental Code, which is general environmental legislation, while the county administrations are operative supervisory authorities. Dam failure at some of the dams in Sweden could lead to very serious consequences that would place a heavy burden on society. It may, for example, concern the loss of many human lives, serious disturbance in the electricity supply of the country, or the destruction of roads, railways, bridges and other infrastructure that is important to society. Svenska Kraftnät believes that it is reasonable that society carries out a more extensive examination of this category of dam than the normal basic supervision. The complexity of the issues requires that the examination takes place with the aid of experts.

The power industry has at the same time discussed the need to verify that the work of dam safety carried out by the member companies of Svensk Energi - Swedenergy maintains an acceptable level when placed in an international context. As a complement to the current system of self-inspection, the possibilities of introducing some form of special examination for the dams that have been mentioned above have been discussed, with expertise having special skills and experience from international work in dam safety.

Svenska Kraftnät and Svensk Energi – Swedenergy decided to carry out a joint pilot project during 2005 in order to investigate the possibility of satisfying the requirements (if any) of both dam-owners and of society for some form of special examination of dam safety. The aims of the pilot project were to:

- evaluate the need for this type of special examination based on the need for dam-owners to maintain the dam facilities at a high level in an international perspective
- evaluate whether society has a need for more highly qualified supervision of dam plants with particularly serious consequences in the event of dam failure, and if this is the case, to discuss how this need can be satisfied.

2. The Pilot Project

Part of the pilot project was an examination that Fortum commissioned using international expertise of the dam in Trängslet. This examination has formed the basis for discussions concerning the need and the design of special examinations not only from the perspective of society, but also from that of dam-owners. These discussions have been carried out within a reference group whose members are representatives of the dam safety committee of Svensk Energi - Swedenergy, Svenska Kraftnät and the county administration in Dalarna. A subcommittee of this reference group was formed with the principal task of preparing topics for discussion in the reference group.

Svensk Energi - Swedenergy and Svenska Kraftnät arranged a joint seminar in May 2006 with participants from dam-owners, county administrations, and consultancy companies, in order to inform these about the pilot project and about the plans to proceed with further trials, and in order to obtain opinions from a broader circle.

2.1. Discussions

Some of the discussions that have been carried out within the pilot project are summarised below. It must not be concluded that the issues have been solved: they must be followed up and discussed further during the coming trial period.

2.1.1. Balance between self-inspection and supervision (executed by the authority)

Svenska Kraftnät's initial idea when the discussions started was that the examinations were to be carried out as a simple supervision measure, while the dam-owners believed that the examinations were to be carried out solely as part of the self-inspection system. Apprehension was expressed in the project that the introduction of expert examinations as a supervision measure may involve the risk that the initiative in the work of dam safety passes from the operators to the official bodies. The basic principle that the operator must carry out the self-inspections that are needed to ensure dam safety must not be placed at risk, and it must not be considered that the fundamental responsibility for dam safety lies anywhere else than on the operator.

On the other hand, the opinion was expressed in the discussions that it may be difficult to achieve the trust and security of the general public if more highly qualified examination was not carried out within the framework of the official supervision. The relationship of trust between authorities and operators is important, but the system must also contain a qualified control function for the risks (although they may be small) for such serious consequences as is the case in this category of dam. It is important that the system for managing dam safety in Sweden functions well and inspires confidence. The general

public expect that society is able to check by supervision that the safety of dangerous operations is high.

The model that is suggested for the coming trial period means that the examinations are self-inspection measures carried out by the owners, with the possibility for insight and influence from the monitoring authorities.

2.1.2. Can the examinations be regarded as independent?

The importance of the examinations being seen as independent has been discussed in the project. What are the requirements such that the examinations will be accepted as independent with respect to, for example, financing and who nominates the examiners? Are the opportunities for insight and influence granted in the suggested model to the supervisory authority sufficient for the examinations to be regarded as independent?

The possibility of the authority being able to commission its own expert who participates in the work of the expert group has been discussed, but it has not been assessed as being a good solution.

The assessment of the pilot project at present is that it should be possible to consider examination carried out according to the proposed model as sufficiently independent. The supervisory authority is given the opportunity to state its opinion concerning the choice of experts made by the owner, and is given access to the background information for the examination that is sent to the experts. If the examination group consists of at least three experts, there should be a low risk that all members of the group feel that they depend on the dam-owner. One point that was mentioned in the project was that the formulation of the terms of reference given to the examiners may be significant for whether the examination is regarded as independent or not.

2.1.3. Financing

The model that discussions in the pilot project has arrived at is based on the examination being fully financed by the dam-owner. It has been discussed whether the fact that the examiners are fully financed by the dam-owner entails the belief in the independence of the examiners being weakened.

Svenska Kraftnät suggested at an earlier stage a system in which examinations of a similar type would be carried out by experts commissioned by the authority as a supervisory measure. The intention in that case was that Svenska Kraftnät would be responsible for the financing of the experts using funds assigned to power supply contingency planning allowance. The Environmental Code, Chapter 26, Section 22, contains provisions for the supervisory authority to carry out such investigations that are necessary for the supervision at the expense of the operator.

It is, however, unreasonable to request the dam-owner pay this type of extensive expert examination if they are carried out purely as a supervisory measure.

2.1.4. Selection of dams

It is dams for which the consequences of dam failure would be particularly serious that are to be considered for this type of examination, based on the needs of both the dam-owner and on those of the supervisory authority. The special examination that is now being discussed is to be a complement in order to investigate and verify that the safety of these dams maintains a high level in an international perspective.

The possibility of drawing up criteria for dams, or lists of dams, that are to be examined in this manner has been discussed in the project. The discussions, however, have not been completed and they should for this reason be continued during the planned trial period 2006 - 2008.

It is a basic tenet that the dam-owner plans the dams that are to be examined and the order in which they are to be examined, although the authorities are to be given the opportunity to state their opinion about this.

2.1.5. What is to be evaluated?

What both the dam-owner and society most of all want answered is the question of whether the dam safety is sufficient. The answers to the following two questions of principle are required for this:

- What is the probability of dam failure?
- What probability is acceptable (sufficiently low)?

It is not possible to determine the probability of dam failure in absolute terms using currently available technology. A firmly based determination, and one that is generally accepted by society, of where the limit lies between acceptable risk and unacceptable risk is also missing. The discussions in the project have led to the conclusion that it is more reasonable at the moment to seek to answer the question of whether dam safety at the dam in question maintains a high level in an international perspective.

2.1.6. Status of the expert report

The report that is drawn up by the experts should contain their opinion and recommendations for the dam-owner. The dam-owner is to be given the opportunity to pass an opinion on the report, but it is the experts who determine the final contents of the report.

2.1.7. Confidentiality

The dam-owners have expressed concerns during the pilot project that sensitive information may become public when passed to the authorities in association with the special examination according to the proposed model.

The dam owner should analyse whether the material contains information that should be held confidential, and if this is the case, inform the authorities which information this is, and the determinations of confidentiality legislation that it is intended to apply. This should primarily be Chapter 2, Section 2 of the Official Secrets Act, which deals with confidentiality with respect to national security.

When a person requests that the authority concerned publish information, it is the authority that assesses whether the information requested is to be subject to confidentiality. The dam-owner does not have the right to impose the condition before passing on information that the authority treat the material in a confidential manner. The supervisory authority has the right to request the information and the documents that are required for the supervision.

2.1.8. How is the final report of the expert group to be used?

The dam-owner should respond to the expert report after the examination has been carried out, and, where necessary, draw up a plan for measures to take. The dam-owner should send the final report of the expert group to the county administration, and inform the county administration in writing whether, and if so which, measures it is intended to take, following the statement of the expert group. If the county administration assesses the plan of action of the dam-owner to be unsatisfactory, the imposition of a penalty may arise, and a request that operating permits be reassessed.

An appeal may be lodged by the dam-owner against all penalties that the supervisory authority imposes.

2.2. Special Examination of Trängslet

2.2.1. Execution

The examination of Trängslet was commissioned and financed by Fortum, as a self-inspection measure. Three internationally recognised experts in dam safety were recruited from England, France and Norway to carry out the examination. These experts received as background information before the examination copies of an English translation of the report from the FDU that had been carried out in 2002. The reference group also were given copies of the FDU in advance.

Fortum arranged a seminar on site at Trängslet in June 2005. Fortum presented its work with dam safety on this occasion, both its general work and its specific work at Trängslet, and the result of the FDU was presented by the consultant who had carried it out. The experts were given the opportunity to question both Fortum and Fortum's consultant, and they were given the opportunity to visit the dam. The reference group of the pilot project also participated at the seminar, as did other dam-owners and representatives of the Svenska Kraftnät's advisory committee on dam safety.

A second seminar was arranged in September 2005 at Fortum's offices in Stockholm. The experts presented the results of the preliminary report, which had been previously sent to Fortum, at this seminar. The members of the reference group of the pilot project were also given access, through Fortum, to the report before the seminar. The members of the reference group of the pilot project took part also at this seminar, as did other dam-owners and representatives of the Svenska Kraftnät's advisory committee on dam safety. Fortum and other participants were given the opportunity to pose questions and express opinions for the experts, as were the other seminar participants.

The experts wrote their final report after the seminar and this was delivered to Fortum. Fortum in turn distributed copies of the final report to the members of the reference group.

2.2.2. Evaluation

The reference group unanimously agreed that the examination of the dam at Trängslet had been a useful exercise, and that Swedish and international expertise is a useful complement to the current routines of self-inspection and supervision. The examination gave a good insight into the work with dam safety carried out by the dam-owner. Even though the focus was on technical aspects, the examination indirectly also gave insight into how the dam safety organisation of the dam-owner functioned. The dam-owners were of the opinion that the examination was a positive contribution to their work with dam safety that satisfied their desire for help in identifying any weaknesses that might exist. The opinion of the county administration was that the examination had given good insight into the dam safety at the dam.

Consultants in many other countries have a more independent relationship to the dam-owner than is the case in Sweden. The experts who are employed for the examination should realise that it is the dam-owner who is responsible for the work with dam safety at the dam and not, for example, the consultant who carried out an FDU at the dam. It may therefore be necessary to inform the experts before the examination about how the Swedish system of managing dam safety works.

The discussions in the pilot project have led to a proposed model for international expert examination as a component in work with dam safety in Sweden. The examination of the Trängslet dam, however, did not provide sufficient information to allow a decision concerning a general model to be taken, and several questions remain. These include, for example, the criteria for selecting the dams to be examined. It is therefore necessary to test the proposed model during a trial and development period.

3. Plan for the Trial and Development Period

A trial and development period will be carried out during 2006-2008. Vattenfall will carry out international examinations of two dams during this period, while Fortum, E.ON and Vattenregleringsföretagen will each carry out an international examination of one dam.

It is planned that the examinations will take place according to the model that is described below. Follow-up of experiences will take place throughout the trial period, which will be monitored by a project group with representative from the dam-owners and from Svenska Kraftnät. Svenska Kraftnät will collect the views of the county administrations during the trial period. The needs of both dam-owners and of society will be considered during the evaluation that will take place during the trial period.

Based on the experiences that have gradually emerged during the trial period, the project group has made minor revisions in chapter 4 "Proposed Model for Special Examination".

4. Proposed Model for Special Examination

Aim

The aim of special examination is to review if the dam safety at dams for which the consequences of dam failure would be particularly severe maintains a high level in an international perspective, and provide basis for the dam owners continued dam safety work and the supervision of the authorities.

Which dams are to be evaluated? When?

The model is to be applied for dams for which it is possible that dam failure lead to heavy burden on society. Thus, the model is to be applied to a selection of dams in the highest consequence class.

The selection of the dams that belong to this class is carried out by the dam-owners, who also draw up a plan for the scheduling of the examinations of the dams. The authorities will be given the opportunity to influence the selection and schedule drawn up by the dam-owners.

What is to be evaluated?

The extent and the quality of the owner's dam safety work on the studied dam is to be evaluated. The basis for this evaluation will principally be constituted by the dam owner's routines for dam safety management, the position of the dam-owner with respect to dam safety at the dam, and by material that has formed the basis for this, such as, for example, an FDU report and risk analyses. The OMS-manual and as-built drawings should also be included in the background documentation. The following general issues should always be considered:

- Does the dam satisfy high international standards for high-consequence dams with respect to design, operating experiences; and programmes for the operation, condition monitoring, and maintenance?
- Have sufficient investigations been carried out to allow the dam safety to be sufficiently well assessed?
- Have the required measures been taken with respect to the results of previous investigations?
- Does the examination group have any other comments concerning dam safety?

How is the evaluation to be carried out?

The dam-owner commissions and facilitates an examination by international experts as part of the dam-owner's self-inspection, with opportunity for insight and influence by the supervisory authority and Svenska Kraftnät.

1. A programme for the evaluation is drawn up by the owner. The county administration and Svenska Kraftnät will be given the opportunity to state their opinion of the programme.

2. An expert group is appointed (described under in the section “Selection of expert group for a dam”).
3. Selected parts of the FDU and OMS manual, etc., are translated to English and the documents are sent to the experts. The same documents are also sent to the county administration and Svenska Kraftnät, unless otherwise agreed.
4. The expert group sends a list with questions that they want the dam-owner to clarify during the seminar at the dam site. The list is sent to the dam-owner, the county administration and Svenska Kraftnät.
5. A seminar with visit at the dam is arranged. The dam-owner describes dam safety and the work with dam safety generally in the company, and the particular work at the particular dam. The owner also answers the questions from the expert group. The county administration and Svenska Kraftnät take part in the site visit in addition to the dam-owner and the expert group, together with any other participants that the dam-owner desires to invite. The municipality in its role of supervisory authority for 2:4 dams as defined by the Civil Protection Act will also be invited.
6. The expert group will write a preliminary report (a working document) that is sent to the owner. The owner, in turn, sends copies of this report to the county administration and to Svenska Kraftnät, after having carried out an assessment of the need of secrecy and marking any information as to the opinion of the owner should be categorized as restricted information.
7. A meeting for reporting and discussion is to be held within one month of the owner receiving the preliminary report. The owner is given the opportunity to make a statement at the meeting concerning the preliminary report, as are the authorities. The participants at the meeting are the expert group, the owner, the county administration, Svenska Kraftnät and any other participants that the dam-owner desires to invite. The municipality will also be invited to participate.
8. The expert group draws up a final report that is presented to the owner, without unnecessary delay. The owner, in turn, sends copies of this report to the county administration and to Svenska Kraftnät within two weeks of receiving it. The owner carries out an assessment of the need of secrecy and marks any information as to the opinion of the owner should be categorized as restricted information, before the report is distributed.
9. The dam-owner draws up a plan of action that describes how any comments in the final report of the expert group will be handled. A copy of the plan of action is sent to the county administration within approx. a month after the final report was sent to the authorities.

Selection of expert group for a dam

The complexity of the issues involved requires that this type of evaluation be carried out with the aid of expert competence.

The expert group is to be appointed by the dam-owner. The authorities will be given the opportunity to state their opinion of the owner's choice of experts.

The evaluators are not to have any previous strong coupling, such as having carried out an FDU or having carried out measures to improve dam safety, etc., with the dam in question. The group should consist of three experts, at least two of whom should come from outside of Sweden. The composition of the group should be adapted such that all relevant aspects of dam safety at the dam in question will obtain expert treatment.

What standards are to be applied?

The opinion of the experts based on their experience and on internationally accepted high standards is the standard to be applied.