

Speech by Lars-Olov Höglund

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Ladies and gentlemen, my name is Lars-Olov Höglund and I have been working as a nuclear expert for the last 30 years. I held a leading position at the Swedish State Power Board (today Vattenfall) during the time that the company erected 3 nuclear power stations in Forsmark, about 120 km north of Stockholm. In the 20 years following my time at the Swedish State Power Board I owned my own consulting company, “the Nuclear Power Technology Company, Kärnkraftteknik AB”, and was adviser to the Swedish nuclear industry.

I am very honoured and pleased to be here with you today and to have the opportunity to say a few words about the Forsmark incident. I would like to describe why this must be classified as one of the most serious incidents known.

I would also like to say something about lifetime extensions and power increases for old nuclear power plants, and explain why I am hesitant about such projects.

I read about the Forsmark incident in the morning paper at breakfast whilst on vacation, and recognized immediately that this must be one of the most serious incidents ever in a nuclear power plant, but the newspapers didn't appear to realise this. I therefore sent an e-mail to UNT, Uppsala Nya Tidning, a local newspaper near Forsmark.

UNT did some research and wrote an article explaining my opinions on the incident. To my surprise this article not only re-started the nuclear debate in Sweden, it also attracted even more attention in Germany. At the time, public opinion about nuclear power in Sweden had reached a more-or-less “hallelujah” atmosphere, following the Forsmark incident this was abruptly but healthily interrupted.

As you probably know, all safety systems used to protect power plants from a nuclear core meltdown need electrical power. At those times when the power plant has to be shut down and the external power supply disconnected, quite a normal occurrence, the power plant must produce its own electric power. This is required for example, to allow the reactor containment and the fuel core to be isolated from the surroundings, to feed the reactor tank with water, to power the pumps and activate valves for the emergency cooling systems, as well as to drive in the control rods and stop nuclear fission. Electrical power is also needed for the control room in order to check that the safety systems are working properly, as well as enabling relevant safety measures to be initiated.

On August 25, 2006, Forsmark was disconnected from the external high voltage 400 kV net. There was an immediate need for emergency electrical power from one safety system that consisted of four industrial diesel generators, as well as from the uninterruptible battery power system UPS, which also consists of four redundant parts capable of supplying the nuclear plant with low voltage electrical power.

The safety systems in Forsmark are so designed that these two electrical power supply safety systems should function independently of each other. They are both built up of four redundant parts A-D, each part producing 50 % of the power needed, which means that two redundant

parts must always be working. Consequently, you need at least two redundant 50% parts of each system for a safe shut down of the power plant.

It is also important to understand that the battery back up net could not be used for the power supply, which needs power from the diesel generator system.

In the early nineties the crew working at Forsmark, a crew really just responsible for operating and maintaining the nuclear power plants, decided to modernize the uninterruptible power supply UPS. However, they did not call upon the expertise of any of the nuclear power plant supplier such as, ABB, Westinghouse or General Electric, nor did they consult specialists at their own head office in Stockholm. SKI, the Swedish supervising authority for all Swedish nuclear power plants, was given no information about this project, or any information enabling them to check that the modernized UPS was in accordance with general or specific safety design criteria. Fact is, SKI did not actually get any information at all!

As a consequence of this small but fundamental project to modernize the UPS at Forsmark 1 and 2, Forsmark, by ignorance, installed an uninterruptible power supply with a **Common Cause Failure (CCF)**. This means, all four uninterruptible battery systems had the same potential for malfunction in a certain situation, a classical Common Cause Failure situation.

But, as if this wasn't serious enough, Forsmark also made the mistake of connecting the UPS system in such a way, that if one of the four uninterruptible battery systems did not work because of the Common Cause Failure, one of the diesel generator power supply systems would also not work. As we are talking of a real Common Cause Failure, this also means that potentially, ***all power supplies to all safety systems in Forsmark could have failed at the same time.*** In that situation nothing would have saved the nuclear power plant from a loss of coolant accident (LOCA), with an enormous discharge of radioactive substances. In my opinion this could have led to the release of radioactive substances, with even more extensive consequences than those following the Chernobyl disaster.

OK, we were lucky, somebody might say, so what's the problem? Two redundant parts of four of each power supply safety systems did not fail.

No problem, says the nuclear industry to everybody listening. We'll just install a smarter technical solution and then, as always, we will have the safest nuclear power station in the world again!

But don't forget, at the same time Germany, France, Great Britain, the USA etc are also world champions in nuclear safety. Unfortunately, I personally don't know how this is possible. Sweden continues to proclaim that Sweden is always world champion, despite the fact that at this moment in time four Swedish nuclear power stations are not allowed to operate because of serious safety deficits.

What happened in the Forsmark nuclear power plant some weeks ago was a natural consequence of the status the nuclear power industry has in Sweden today, and probably in other countries too. We have old nuclear power plants that do not comply with the best available techniques (BAT), which also means not with the highest safety levels. But we are also greatly lacking adequate competence and resources to be able to keep these old power plants at an acceptable level of safety until their technical life span is reached.

Many years ago, when the Swedish nuclear power plants were designed, constructed and built, we strongly believed in the future of this technology. It was easy to recruit qualified personnel, and there were always vast resources available for every matter of importance. Vattenfall, part of the Swedish State Power Board at that time, carefully scrutinized, without exception, all new technical solutions and nothing was left to chance or good luck. The contracting partners of the Swedish State Power Board at the time, both large and small companies, employed highly qualified technical staff. This was an important aspect if a company was to stay competitive in this so-called prospective business.

SKI, the Swedish supervising authority for nuclear power plants, and SSI, the Swedish Radiation Protection Authority, trusted the safety analyses made by the nuclear power plant owners, such as Vattenfall, and suppliers such as Siemens, Westinghouse, GE, Framatom and ABB.

The personnel recruited to operate and maintain the nuclear power plants needed no deeper technical knowledge of power plant design as there was sufficient expertise available amongst the central staff of the nuclear industry to solve any problem that could arise. Today, we have a completely different situation!!

The nuclear power production companies have cut most of the specialized nuclear power staff. Research institutions such as Studsvik have completed all their nuclear development projects, and ABB the main nuclear power plant supplier in Sweden, had the last order for a nuclear power plant in 1976. Thousands of qualified nuclear engineers in hundreds of companies have left their jobs in the nuclear industry and not been replaced.

Some people might say that this is okay. The nuclear power stations in Sweden have been completed and only need a little modernizing to enable them to survive until they reach the final stage of their safe or technical lifetime, when they will be shut down anyway

But where do we then find the resources, the competence to realize investments in the magnitude of 2-4 billion dollars to modernize and increase the output of the Swedish nuclear power plants, investments equivalent to the cost of building all the Swedish nuclear power plants? And how can we guarantee that these huge investments, which affect many of the safety functions, will be made under conditions that then guarantee the highest nuclear power plant safety level in the world?

The answer is, that we no longer have the competence nor the resources for fulfilling such important safety conditions.

Despite the fact that the nuclear industry is aware of this problem they do not say so. Instead, they are already carrying out huge reconstruction, modernization, power increase and lifetime extension projects estimated at 2-4 billion dollars, giving the impression that they are being carried out under the same rigorous conditions as in earlier days.

The SKI is aware of this problem, but instead of forcing the nuclear industry to take the consequences, they cultivate the myth of Sweden as world champion in nuclear safety. Unfortunately this storyline, as in a Donald Duck comic strip, doesn't correspond to reality, and after the Forsmark incident this has become obvious to everybody.

It is true that in 2005 the SKI announced new and strengthened safety regulations for the nuclear power plants in Sweden; they called them ‘the most powerful safety regulations in the world’. However, the moment the regulations came into force SKI allowed unlimited exemption from all safety criteria covered by these regulations. The SKI nomination of the Swedish nuclear safety rules as ‘first class worldwide’ is no more than cheap propaganda, even nonsense.

Complicated technical systems in the car, aircraft, computer or nuclear power industry do not become world class by repairing, modernizing, or upgrading old models. You don’t try to put airbags, ABS-brakes, four-wheel drives, or a new wheel suspension into a 1960’s Volkswagen Beetle and update its technical status to the level of modern cars. Influenced either by instinct or competence, you drive your old car to the junk dealer and buy a new one.

And, just because your old car got through the annual motor vehicle inspection doesn’t mean it’s the best, most modern and safest car in the world. But this is the logic applied by the nuclear industry and accepted by the authorities, as they argue for lifetime extension but do not make the necessary investments.

But what would ‘necessary investments’ really mean? Perhaps the nuclear power plant industry has discovered a perfect and cheap way of reconstructing old nuclear power plants making them as safe as new nuclear power plants at such low cost that it allows them to produce electrical power for more than the 30 years originally planned?

In 2005, the civil court in Sweden responsible for the examining the Ringhals nuclear power plant application for environmental permission to continue operations, asked Vattenfall, as owner, “what must be done to modernize Ringhals so that it conforms to the highest safety levels in the world, for example in the new nuclear power plant Finland-5?”

Vattenfall answered, that if this was what the environmental court required then it would be easier and cheaper to tear down all four nuclear power stations in Ringhals and start from scratch than to modernize and modify the existing power plant to conform to higher safety levels.

This opinion, given by the biggest nuclear power plant owner and operator in Sweden, should be a warning to all those who want to rush off and authorize lifetime extension, prolonging operating time beyond 30 years, and power increases in nuclear power plants that are already more than 30 years old.

In addition, operating nuclear power plants with increased power is contrary to the original general basic design criteria.

At that time, the Swedish State Power Board (Vattenfall) performed in a regulated market and had the responsibility of supplying Sweden with cheap but safe electrical power. Therefore, they also built most of the nuclear power plants in Sweden. A number of very important safety principals governed all people and organizations involved in the nuclear business, for example:

- The nuclear power plants were built with the best-known approved techniques in order to avoid beginner’s mistakes.

- Nobody even considered calculating the narrowest possible safety margins.
- It was important to stay well within the given safety limits and create robust safety conditions, thus allowing for possible faults in the calculations. The power plants were built with large safety margins because of a rigorous safety culture and not because of substandard calculating methods.
- All maintenance measures influencing safety had to be carried out whilst the power plant was shut down and not operating.
- Shutting down the power plant was given higher priority than the production of electricity.
- The pressure for profit was limited and the general attitude was to put nuclear safety first.

In my opinion, the deregulated, maximum profit oriented electricity market in Europe and Sweden is a serious threat to nuclear safety. The nuclear industry, of course, claims the opposite is true, but honesty and moral values are no longer the guidelines of people working in the nuclear business. Extensive modifications to increase power, modernize and extend power plant lifetime are being carried out whilst reactors are still fully operational, in order to maintain production capacity and profit. Safety systems are sometimes disconnected, even when they are essential for stand-by safety functions.

Even now, and more so in the future, nuclear power plants in Sweden are dependent on temporary technical solutions for systems that are essential to nuclear safety. This situation is not, and never can be, covered either by official safety reports or by the safety calculations, which the nuclear industry has presented to the authorities in their applications for licences to operate nuclear power plants.

In spite of the facts, the SKI pretends to have calculations showing that a core meltdown is impossible, and if it did happen it would be 'business as usual' after just a few days. But SKI omitted to tell the decision-makers at high level that the statistical material is not of a quality that could be used to calculate the risk of a nuclear accident. Chernobyl, Three Miles Island (Harrisburg) and Forsmark happened, but according to these calculations, they did not!

Apart from this, it is not possible to calculate the probability of sabotage or an attack from a well-trained paramilitary terrorist group. Swedish nuclear power plants are protected by just unarmed guards not trained for such an attack, and by an ordinary fence made of steel wire netting.

The SKI even claims that the Swedish nuclear power plants are "more resistant than calculated" against a terrorist attack using commercial aeroplanes, such as that on September 11 in New York. Unfortunately, SKI forgets to explain that the Swedish nuclear power plants are not designed or calculated to withstand commercial aeroplanes at all. This means SKI is misleading the Swedish people by giving out a message that, depending on the situation, can be interpreted at will. This behaviour does not inspire great confidence in the SKI, especially as the so-called 'evidence' SKI refers to is secret, and the nuclear power companies themselves have made the basic investigative analysis of this secret 'evidence'.

Fact is, that the Swedish nuclear establishment is so degenerate that it does not fulfil justified demands and deal with important safety questions. At the same time however, there are plans to modernize old nuclear power plants for a further 20-30 years of operation, power plants that the owner Vattenfall also wants to upgrade to an even higher power level.

I believe that the Forsmark incident should be taken as a serious warning, otherwise we will see more of the same kind in the future and will perhaps not have as much luck.

The Forsmark incident is really the logical consequence of a degenerate nuclear market.

To re-build the competence and resources we need for an extended nuclear period, we have to start building new nuclear power stations on a large scale. This is the only school of thought that can create and produce the competence and resources we need for reasonably safe new, as well as old, nuclear power plants. The negative aspects of such a nuclear revival are obvious, even for the most pro-nuclear parties, and it will never happen. So what can be done?

I think one solution could be; that the authorities and the nuclear power plant operators concentrate the few remaining resources and use them together. This solution will not give us the safest nuclear power plants in the world, but it will help us to bridge the time gap until all nuclear power plants are shut down.

To keep the existing power plants at an acceptable safety level we also have to keep our hands off lifetime extension projects and power increase projects. Every time such a project is started there is a new, and maybe even higher, risk of creating hidden Common Cause Failures.