Surveillance of external radiation in Finland – past and future

Janne Koivukoski, Ministry of the Interior
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Abstract

- Finland has a long history in external dose-rate monitoring that began in the early 1960’s when the first monitoring sites were equipped with manual meters measuring exposure rates.
- Today the monitoring network is fully automatic and consists of about 260 stations with Geiger-Müller (GM) tubes. In addition, little over twenty stations have also a LaBr₃ spectrometer.
- In this presentation I will go through the history and major development stages of the Finnish dose-rate monitoring arrangements and also have a brief look at the possible future.
- Picture: Radiation monitoring stations 1965
Beginning of Radiation monitoring

• The first arrangements for a nation-wide radiation monitoring programme were started in 1956 by the Finnish Meteorological Office (currently the Finnish Meteorological Institute, FMI), the Defence Forces, the Finnish Marine Research Institute and the University of Helsinki.
• 1958 – the Institute of Radiation Physics (currently Radiation and Nuclear Safety Authority, STUK) was established.
• In the late 50’s and early 60’s the underground and atmospheric nuclear weapon tests carried out by the Soviet Union at Novaya Zemlja since 1954 aroused public concern.
• The general atmosphere for civil defence was positive after the second world war
• Finnish company (Wallac Oy) manufactured radiation monitoring instruments.
• These were probably the main reasons to decisions to found a nationwide radiation monitoring network.
• As a result, external radiation has been measured in Finland on a regular basis since the early 1960’s.
The first Radiation monitoring network

- The first version of the network was established during the series of atmospheric nuclear weapon tests at Novaya Zemlja 1961-1962 for the purpose of general civil defence and military NBC (nuclear, biological and chemical) protection.

- The network consisted of a few tens of monitoring stations administrated by the Defence Forces and Ministry of the Interior.

- In 1962 Ministry of the Interior set up the Radiation Monitoring Committee.

- In its final document in July 1965 the Committee proposed a nationwide radiation monitoring system that would consist of a central monitoring organ, a comprehensive monitoring network and a laboratory system covering the whole country.
Nuclear Power Plants

• Planning to built up a Nuclear Power Plant in Finland was started 1965 and the production of nuclear energy started in 1977
• Off-site nuclear emergency planning including external radiation monitoring started 1976 when the first public plan for nuclear emergencies was prepared
• Off-site emergency plans are nowadays required by the rescue legislation
• Earlier there were separate instructions for emergencies with nuclear power plants, radiation sources, satellites and for war time nuclear emergencies.
• The requirements for off-site planning are provided in the Decree of Ministry of the Interior
Before Chernobyl
1980's

• At the time of the Chernobyl nuclear accident 26.4.1986 there were over 400 external-radiation monitoring stations in Finland.
• In total there were 320 stations in the network of the Ministry of the Interior and 85 stations in the network of the Defence Forces.
• The locations of the stations are shown in the picture.
• At every station there were one permanently installed Geiger-Müller (GM) detector and at least one portable GM detector (a universal radiation meter; Wallac RD-6, RD-7 or RD-8).
Equipment
Past Chernobyl
Development

• Based on the experiences gained from the Chernobyl accident the radiation monitoring authorities and equipment manufacturers worldwide started to put efforts into improving radiation measuring systems and related data management techniques.

• It was recognized that there was need to measure external radiation continuously and to near real time transmission of results to central databases to create and maintain a comprehensive overview of the radiation situation.
Where we stand now and what's the future
Now and the Future

- STUK is today the main player in this field.
- The network scheme of the ULJAS network and the USVA system is shown in the Picture →
- There are also portable dose-rate meters intended for check measurements at the monitoring stations. Some of those have also GPS and data transmission capabilities and real time connection to common database.
- The automatic nation-wide network includes some 260 GM stations that are mostly situated at alarm centres, fire stations or the facilities of the frontier guard.
- The main target is to follow development and keep own systems in the development pace
Surveillance strategy

• Efficient, comprehensive and real-time use of monitoring data in radiation emergencies and an improved decision-making in radiation and nuclear emergencies is needed and we are developing field command systems and situation overview systems for national and regional level to develop the decision-making process and cooperation in nuclear and radiological emergencies.

• Various sensor networks and sensor carrying platforms and robots as well as communication of systems via internet (IoT) are becoming more prevalent and that's why we need to have national strategies and also common standards to built up well working networks of devices and organizations to use all data most optimally.

• Citizen science also plays a role in radiation detection and data and information from various sources can be exploited in situation awareness.
Civil protection

• Monitoring of threats
• Warning the population
  – Sirens, RDS radio messaging, Social Media
• Protection indoors or in shelters
• Evacuation
• Rescue Services
• Both public authorities and the private sector are responsible for the preparation of protective measures