Harmonization of the IAEA and EU early notification systems

G. de Vries¹, M. De Cort¹, V. Tanner²
¹European Commission, DG JRC, Institute for Environment and Sustainability, I-21020 Ispra, Italy
²European Commission, DG TREN, Unit H.4, Radiation Protection, L-2920 Luxembourg

Abstract

Both the IAEA and the EU operate legally binding early notification systems for nuclear accidents. Although the information that has to be transmitted by the Member States of the two organizations is largely overlapping, the data-formats and transmission methods required by the two systems are rather different. The latter is a concern for 28 European countries that have obligations towards both Organizations. This paper reviews the differences between the two systems and outlines ongoing and planned actions undertaken by the Organizations to interface and harmonize their early notification systems.

Keywords: Early Notification, Nuclear and Radiological accidents, harmonization, EMERCON, ENATOM, ENAC, ECURIE, Euratom, CoDecS

1 Introduction

Shortly after the Chernobyl nuclear power plant accident in 1986, the Member States of the International Atomic Energy Agency (IAEA) and the European Community (EC) concluded that more appropriate legislation was necessary to improve national and international emergency preparedness and response procedures for nuclear and radiological accidents. For the IAEA this resulted in the Conventions for Early Notification [1] and Assistance [2]; and
for the European Union (EU), in Council Decision 87/600/Euratom [3].
In the beginning the two systems created by the IAEA (ENATOM) and the EC (ECURIE) to implement this legislation were based upon a common data-format: the Convention Information Structure (CIS) [4]. In the course of time, however, the IAEA migrated to a much smaller and different subset of the format (EMERCON) while the EC continued to use the original data-format. Whereas the EC developed a network and software (CDS, later called CoDecS) for compiling, sending and receiving notifications in the CIS format, the IAEA merely used fax for transmitting notifications in the EMERCON format and only recently introduced the possibility to send notifications by Email or enter them through a web-site (ENAC) [6]. As a result, the two systems are now incompatible.
The current situation is that the 28 ECURIE participants i.e. the 25 EU Member States, Switzerland, Romania and Bulgaria are obliged to notify a radiological accident to the IAEA and the EU, by using two different systems and data-formats. Following pressure from the Competent Authorities of these Member States, in 2003 the two organizations agreed to harmonize the ENATOM [5] and ECURIE [7] systems. A mid-term solution will be to build a gateway between ECURIE and ENATOM by interfacing the IAEA website (ENAC) and the ECURIE software (CoDecS). The interface should be ready by July 2006. In addition the IAEA and EC are negotiating a formal agreement that notifications sent through one system will also fulfil obligations under the other. A long-term, sustainable solution should include (again!) a common data-format and more compatible data-transmission protocols.

2 Differences between the data-formats
A detailed comparison of the two formats is given in Chapter 4.

2.1 CIS format:
The two major design requirements at the basis of the CIS format were the needs to: 1) transfer any kind of information related to all phases of the accident, and 2) create a compact code to reduce the transmission times. The format is therefore characterized by
comma-delimited values, a strong format and syntax description and the use of numerical tags at the beginning of each record. The encoded message is very compact and the numerical tags greatly facilitate the implementation of language-independent information transfer (except for free-text fields). The CIS format is used for all levels and types of ECURIE messages, except for the information message that contains unformatted text.

An example of an **encoded** CIS notification is given below:

```
001:PORTUGAL, DIRECCAO GERAL DO AMBIENTE
002:199406080040
003:PT,DGA,X,001
004:TRAJECTORY FORECAST=
100:0=

200:3
201:85KR,90SR,137CS,239PU

203:1
```

The two fields 200 and 201 highlighted above are shown in **decoded** format as:

- **Type of release is expected to be:**
  - Gaseous and particulate

- **Anticipated qualitative composition of the release in descending order of importance of activity:**
  - 85KR
  - 90SR
  - 137CS
  - 239PU

The CIS format has the following hierarchical structure:

- Report ID
- Notification
  - Date/Location
  - Nature
The CIS format includes a total of 174 fields.

2.2 EMERCON format:

Since the EMERCON data is historically meant to be transmitted by fax, a simple template made up of lines and boxes is used to compile a notification. Where appropriate, the syntax is indicated, and the reverse side of the paper-form gives extensive instructions on how to compile the notification. There are three specific types of notifications: the SRF (Standard Report Form, EMERCON Advisory/GS-R-2), GENF (General Emergency at Nuclear Installation, EMERCON General Emergency) and MPA (Measurements and Protective Actions, EMERCON Advisory/GS-R-2) forms. The header and basic-information sections of the three forms are rather similar, while further contents are specific to the message type and hence rather different. The SRF, GENF and MPA forms contain a total of 78 EMERCON fields.
3 Differences between the two early notification systems

The ECURIE system is an EU early notification system that mainly relies on creating, sending and receiving messages by aid of a dedicated piece of software (CoDecS, developed by the JRC-REM group). This software also has a wake-up and alerting function through an Alarmbox attached to the CoDecS PC. Notifications have a digital signature for authentication purposes and may have attachments. CoDecS uses Internet with automatic fail-over to ISDN to transmit the ECURIE notifications, while traditional fax is used as backup. The correct working of all CoDecS stations is verified each day in an automated and unattended manner. The ECURIE system is a star-network with the DG TREN (European Commission, Directorate General Transport and Energy) as central node. For increased reliability, the DG TREN operates two stations in Luxembourg and two in Brussels (Belgium), and any of these four stations can handle the entire load of distributing the notifications. A Member State that wants to notify an accident sends its message to DG TREN both in Luxembourg and Brussels. The DG TREN duty-staff located in Luxembourg is alerted by the 24h Contact Point in Brussels and in addition through an automated dialup system connected to the CoDecS station at the DG TREN in Luxembourg. The DG TREN staff in Luxembourg will take care to forward all incoming messages to every ECURIE Competent Authority and Contact Point and to the IAEA.

The ENATOM system is a world-wide early notification system that accepts notifications from Competent Authorities sent: 1) by fax using the appropriate template, 2) by compiling a notification through the IAEA website (ENAC) and 3) by Email. The ENATOM system is a star-network in which the central node is the Incident and Emergency Response Centre (IERC) of the IAEA in Vienna. Incoming notifications will alert the IERC staff on duty. The IAEA will forward all notifications by fax to the national competent authorities of countries within a range of approximately 1000 km from the country of the accident and to the DG TREN in
Luxembourg. In addition, relevant notifications will be posted on the protected ENAC website. In an effort to detect network deficiencies, fax communication exercises are kept regularly.

4 Automated data-exchange between ECURIE and ENATOM

As mentioned earlier in this paper, the IAEA and EU early notification systems differ regarding various aspects such as the information items, the data-formats and the used transmission methods. In order to make data-exchange between the two systems possible, the EC and IAEA decided to make some changes to their data-formats. The resulting data-sets, together with the rules for converting data between the two formats, will be described in a forthcoming, joint IAEA-EC publication.

The EMERCON and CIS formats share ten identical fields. In addition 29 fields have the same contents, but different format that can be mutually converted. There are five CIS fields with information not contained in the current EMERCON format that will be included in the new enhanced EMERCON format. These five new EMERCON fields will use the same format as the corresponding CIS fields. As illustrated in Fig. 1 there are 39 fields in the EMERCON format that do not have a direct correspondence in the CIS format.

![Figure 1: comparison of the EMERCON and CIS data-formats](image-url)
These 39 fields will be included in the enhanced CIS format (Superset CIS format) and for these fields the EMERCON field characteristics will be used. Another 130 CIS fields have no correspondence in the EMERCON format and are not of direct interest to the ENATOM system.

The final result will be an enhanced EMERCON data-format with 83 (78 old and 5 new) fields that all have a direct correspondence in the CIS data-format and a Superset CIS format that has 83 fields all compatible with the corresponding EMERCON fields and 130 fields that will be used for ECURIE purposes only. The compatibility of the 83 fields in the two enhanced data-formats will allow the interfacing – and automated data-exchange between – the ECURIE and ENATOM network. The changes necessary in the two data-formats have been approved by the IAEA and the EC and will be formalized in a Memorandum of Understanding.

5 Description of the ENATOM <->ECURIE interface

For the interface between the ENATOM and ECURIE networks the agreed implementation foresees operating a CoDecS station at the IAEA. The functionality is as follows:

5.1 From ECURIE to ENATOM:

All ECURIE notifications will be automatically exported by the CoDecS station at the IAEA to a file in a specific directory. The conversion software will check this ec-to-iaea directory each minute for new files. Each new file will be converted from the Superset-CIS format to the Enhanced EMERCON format and again stored in a file. The ENAC website will poll the ec-to-iaea directory each minute for EMERCON data-sets and upload them into the ENAC system. After upload, the ENAC software will delete both the CIS and the EMERCON files from the ec-to-iaea directory, which is a proof of delivery for the CoDecS system. In fact, the CoDecS station will send EMERCON files by Email and SMS in case they are not removed by the ENAC system within a certain time. Notifications deriving from the ECURIE system will be handled by the IAEA duty-staff in the same manner as notifications arriving by fax, Email or Web, which means that they
will cause the wake-up of the duty-staff and that they will be forwarded only after manual inspection by the IERC staff.

5.2 From ENATOM to ECURIE

All new notifications on the ENAC website will automatically be exported to the iaea-to-ec directory. The conversion software will check this directory each minute and convert each EMERCON file into a CIS file. The CoDecS station operated at the IAEA will poll the iaea-to-ec directory each minute for CIS files. In case a new CIS file is detected, it will be uploaded and forwarded to the DG-TREN in Luxembourg and to the EC Contact Point in Brussels. Then the related EMERCON and CIS file will be deleted from the iaea-to-ec directory. The ECURIE notification(s) deriving from EMERCON/ENAC will cause the wake-up of the EC duty-staff and be handled in the same manner as any other ECURIE notification.

In order to avoid a loop of notifications between the two systems, ENAC will flag notifications originating from the ECURIE network, so that these messages are not exported to the iaea-to-ec directory. CoDecS makes a checksum of each notification, including those from ENAC and uses this checksum to avoid exporting duplicate notifications to the ec-to-iaea directory.

6 CoDecS implementation

The CIS format has some 213 numerical tags in the ranges 001-699 and 900-999. To facilitate export and import from EMERCON data, new tags in the range 700-783 will be used to contain all the 83 EMERCON fields, so that there is a one-to-one relation between each new tag in the 700-783 range of CIS fields and the corresponding EMERCON fields. All these new [700-783] fields can be edited through an EMERCON-like user-interface divided in SRF, GENF and MPA forms. It means that the new CoDecS can be used to create an EMERCON notification using an interface with EMERCON layout. Each of the [700-783] fields is replicated with another CIS field. For 29 of these fields automatic conversion between CIS and corresponding EMERCON/CIS fields will be done, while for 54 fields (see the section on “automated data-
exchange between ECURIE and EMERCON") the contents of the corresponding fields is exchanged without conversion.

The final result of the [700-783] CIS field extension and the addition of 39 new CIS fields inserted in the appropriate sections of the “old” CIS format is that any information compiled in or imported from the EMERCON format will automatically and immediately be inserted in the corresponding CIS fields. Vice versa when the user compiles an EMERCON field then automatically the corresponding CIS line will filled with the same value. An example of the automatic EMERCON to CIS transfer is given in Fig. 2.

![Figure 2: Compiling the INES rating on the SRF form will automatically result in the INES scale compiled in the corresponding CIS field 022.](image)

This mechanism implies that the external conversion software - taking care of polling the ec-iaea and the iaea-ec directories for
new files to convert – exclusively needs to consider the [700-783] CIS fields.

7 Current status and planning

At the beginning of November 2005 all software development – new CoDecS, conversion software and ENAC extensions – is ongoing. All software is planned to be ready and tested by the end of the first quarter of 2006. The conclusion of the formal arrangements and the official operation of the interface are foreseen by the end of 2006.

The CoDecS software will be replaced by a web-based ECURIE system at the beginning of 2008, but an interface with the ENATOM/ENAC system will be implemented also in this new system.

In order to assure a sustainable compatibility between the ECURIE and the ENATOM systems, representatives from both the IAEA and the EC participate in working groups that aim to develop a new data-format and a common platform for exchanging information on an international level during a radiological emergency.

8 Remaining problems

Once the ECURIE-ENATOM interface will be technically and formally operational, two flaws will remain:

1) Notifying the EC by means of an IAEA notification (and vice-versa) will introduce some delay;

2) All ECURIE Competent Authorities will receive each notification twice: once through ECURIE (as CoDecS message) and once through ENATOM (as fax).

Conclusion

The ongoing software developments at the IAEA and the EC as well as the completion of a formal agreement between the two organizations are a first, but important, step towards harmonizing the ENATOM and ECURIE Early Notification systems. Once that the interface between the two systems will be operational, the
Competent Authorities that have legal obligations towards both systems will benefit from a reduced overhead compared to the current situation where the IAEA and the EC use two different formats and incompatible notification systems.

The ongoing software developments at the IAEA and the EC as well as the completion of a formal agreement between the two Organizations are a first but important step towards harmonization of the ENATOM and ECURIE Early Notification systems. The benefit for those Competent Authorities that have legal obligations towards both ENATOM and ECURIE is reduction of the overhead because a single system can be used to notify both Organizations.

Sustainable harmonization in the long term is assured by the participation of both the IAEA and EC in working groups that have to define a new data-set, data-format and communication protocols. These working groups will evaluate existing systems and make sure that the benefits resulting from the integration will continue to exist in a future, harmonized platform.

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