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POST – FUKUSHIMA IMPROVEMENT OF THE EMERGENCY PLAN FOR THE TIHANGE AND DOEL NUCLEAR POWER PLANTS IN BELGIUM

Namiddag rond Nucleair Noodplan, Huidige Stand van Zaken, Lessen en Perspectieven (BVS-ABR)

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EMERGENCY PLANNING
IN A NUCLEAR POWER PLANT

WHY AN EMERGENCY PLAN?

To protect people & environment against radiation exposure

If radionuclides are released into the environment,
all efforts and all barriers to avoid this from happening notwithstanding

EMERGENCY PLAN

OBJECTIVES

- To ensure information of the federal government
- To bring personnel and visitors on the site into safety
- To coordinate the interventions on site and to have them carried out safely *
- To assess the potential radiological consequences
- To ensure coordination with the external emergency services (if intervening on site)

* All actions outside the site are carried out by the government

EMERGENCY PLAN

Organisation de l'urgence au sein d'ELECTRABEL

GDF - Suez	Active l'entraide internationale
Electrabel Corporate Crisis center	Active l'entraide nationale et prend les décisions stratégiques
Cadres d'astreinte du site	Management de crise et contacts avec les autorités
Salle de commande	Appelle les secours et gère la technique
EPI / Pompiers / Ambulanciers / SMUR / Police	Collaborent sur le terrain

EMERGENCY PLAN

People on site for coping with a nuclear accident

- **During working hours (< 25% of time)**
  - » Everybody
- **Outside working hours (>75% of time)**
  - » Shift personnel
    - Operations
    - Chemistry/Radiation protection
    - Site Security
    - On site fire brigade
  - » On-call team members, effectively on duty
  - » Extra people that are mobilised (by telephone, GSM, …..)

EMERGENCY PLAN

On-site emergency centers

Centre Opérationnel de Site (COS) / Noodplankamer

Gestion de la crise par une partie de l'équipe de crise :

- ✓prises de décision,
- ✓interface avec les Autorités,
- ✓suivi des rejets radioactifs,
- ✓recensement du personnel,
- ✓communication de crise.

Salle de commande + annexe (COT/BK)

Gestion de la crise par l'autre partie de l'équipe de crise et par la salle de commande:

- ✓conduite des installations et gestion de l'incident/accident,
- ✓suivi de l'état de sûreté des installations,
- ✓gestion des équipes techniques d'intervention.

Fall Back Emergency Locations

On-site

- ✓ OTSC (On-Site Technical Support Center) / COT

Awirs & Scaldis

- ✓ Preparation of interventions
- ✓ Back-up crisis center location
- ✓ Reception of worker's families
- ✓ (Decontamination facilities)

On-site emergency locations

Locaux EPI

Point de rendez-vous des Équipes de première intervention et des secours extérieurs si aucun relais EPI n'a été indiqué.

Présence d'une partie du matériel d'intervention : moyens de communication, extincteurs, moyens de protection individuels, bonbonnes d'air comprimé, masques, chariot anti-pollution, matériel médical, civières, …

On-site emergency locations

Locaux et points de regroupement

Regroupement et recensement du personnel en cas d'accident

Chaque bâtiment a un ou plusieurs locaux de regroupement (hors zone)

Matériel disponible : monitoring de la radioactivité, comprimés d'iode, gants, surbottes, masques, lecteurs de recensement, etc.

Chaque bâtiment a un point de regroupement

BELGIAN STRESS TESTS OVERVIEW

BELGIAN STRESS TESTS

Definitie

- Een gerichte herevaluatie van de veiligheidsmarges van nucleaire centrales, in het licht van de gebeurtenissen van Fukushima : extreme natuurlijke voorvallen die de veiligheidsfuncties van de centrale ondermijnen en leiden tot een ernstig (nucleair) ongeval

BELGIAN STRESS TESTS

Milestones

March 11 2011
Accident @ Fukushima

April 21 2011
WENRA Stress Test specifications

October 31 2011
Final Report delivered at FANC

Dec 31 2011
Final Report verified by FANC

January – April 2012
Peer Reviews

June 30 2012
Consolidated Report to the European Council

2013 – 14 - 15
Action plan

BELGIAN STRESS TESTS

Stress tests specifications

Issues highlighted by events in Fukushima, combination of initiating events

- **Initiating events conceivable at the plant site**
  - ✓ Earthquake
  - ✓ Flooding
  - ✓ Other extreme natural conditions (tornado, rain, snow,…)
  - ✓ *Man-made hazards (airplane crash, cyber attack, gas explosion, toxic gases ,explosive gases)*
- **Consequential loss of safety functions**
  - ✓ Loss of electrical power, including Station Black Out (SBO)
  - ✓ Loss of the Ultimate Heat Sink (UHS)
  - ✓ Combination of the two
- **(Severe) Accident management issues and Emergency Preparedness**

FANC federaal agentschap voor nucleaire controle

BELGIAN STRESS TESTS

RESULTS

- Onze centrales zijn robuust + specifieke troeven in vergelijking met andere landen:
  - ✓ Dubbel containment reactorgebouw
  - ✓ Twee niveaus noodsystemen (bijv 19 dieselaggregaten kunnen elektrische voeding leveren)
  - ✓ Dubbele uitvoering ultieme koude bron (vb. KCD: Scheldewater én noodkoelvijvers)
- Mogelijke verbeteringsacties gedefineerd
  - ✓ Heel wat daarvan al lopende in het kader van Tienjaarlijkse Herzieningen en project LTO (Long Term Operations)

BELGIAN STRESS TESTS

AREA	Principal Improvements
Earthquake	Enhancement of some structures, systems and components (SSC's) (e.g. pipings)
Flooding	Peripheral protection around site of Tihange
Electric Power	Alternative electric power supply by additional equipement , connections, cables, breakers
Water Supply	Alternative water supply by additional equipement and hydraulic connections
Severe Accident Management	Filtered Containment Vents
Emergency Planning	Focus on multi units event induced by extreme external conditions

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IMPROVEMENTS IN THE DOMAIN OF EMERGENCY PLANNING AND PREPAREDNESS

IMPROVEMENTS IN THE DOMAIN OF EPP

- The objective of the Post Fukushima project is to prepare the plant for larger scale disasters and implies an extension of available personnel and equipment

IMPROVEMENTS IN THE DOMAIN OF EPP

AREA	Principal Improvements
Organization	• Development of a new mode "High": Enhanced emergency organization for multi-unit accident
Logistics	• New Nuclear Logistic Support Cell (NLSC) to be created at Corporate level
Communication means	• Additional communication means – enhanced use of satellite communications
Infrastructure	• Construction of a new on-site emergency center @ Tihange
Radiological dispersion models	• Upgrade of the code for the calculation of atmospheric radioactive releases
Work @ contaminated site	• Guidance / Additional RP means • Fixation of contamination – mngmt of large volumes (potentially contaminated water)

ENHANCED EMERGENCY ORGANIZATION FOR MULTI-UNIT ACCIDENT

3 OPERATIONAL LEVELS

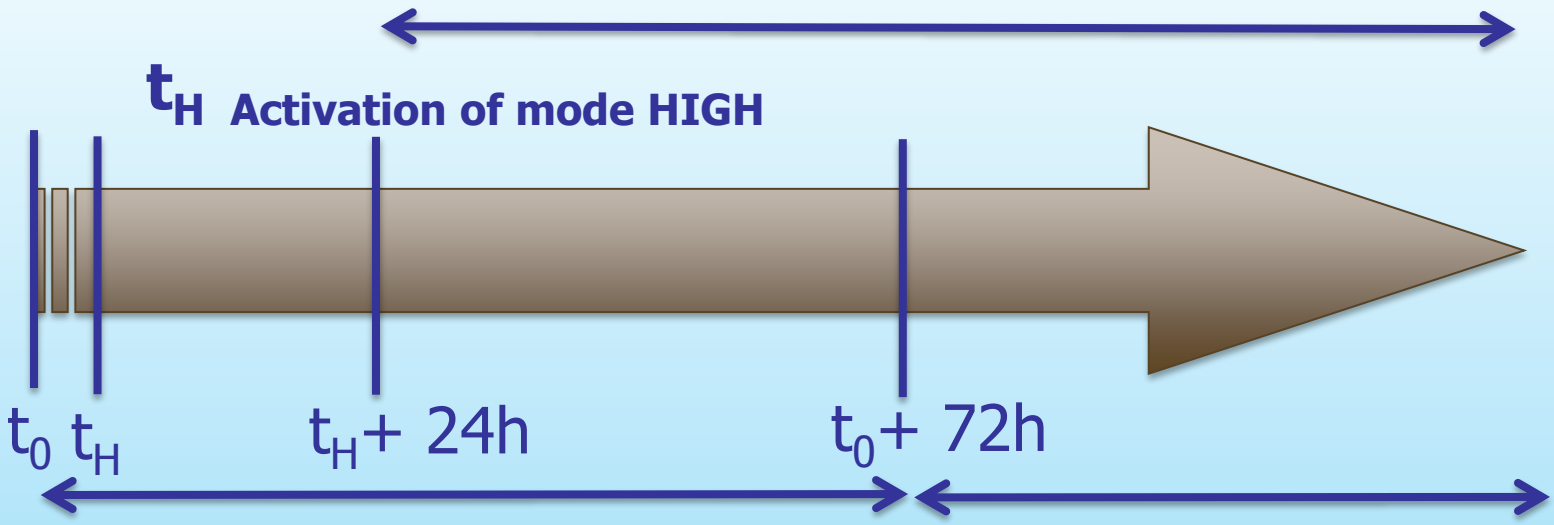
- The emergency management organization of Electrabel will work according to three operational levels:

  - ✓ A "**standard** level", currently in force
  - ✓ An "**alert** level"* with preventive measures in case of predictable events such as flooding affecting the whole nuclear site
  - ✓ A "**high** level", foreseen to cope with unpredictable events affecting more than one unit at the same nuclear site.

* "**alert** level" mainly consists in having on-call crisis team already present at the site, in shift, during the pre-defined "alert" phases. This period is also used to take all preventive additional measures.

TIME LINE IN MODE HIGH

Extended fleet assistance is provided (NLSC), that will be operational at the latest 24 hours after activation of the mode HIGH



t_0 Extreme external event

As dimensioning assumption, the site must have the necessary material to be autonomous up to t_0+ 72h

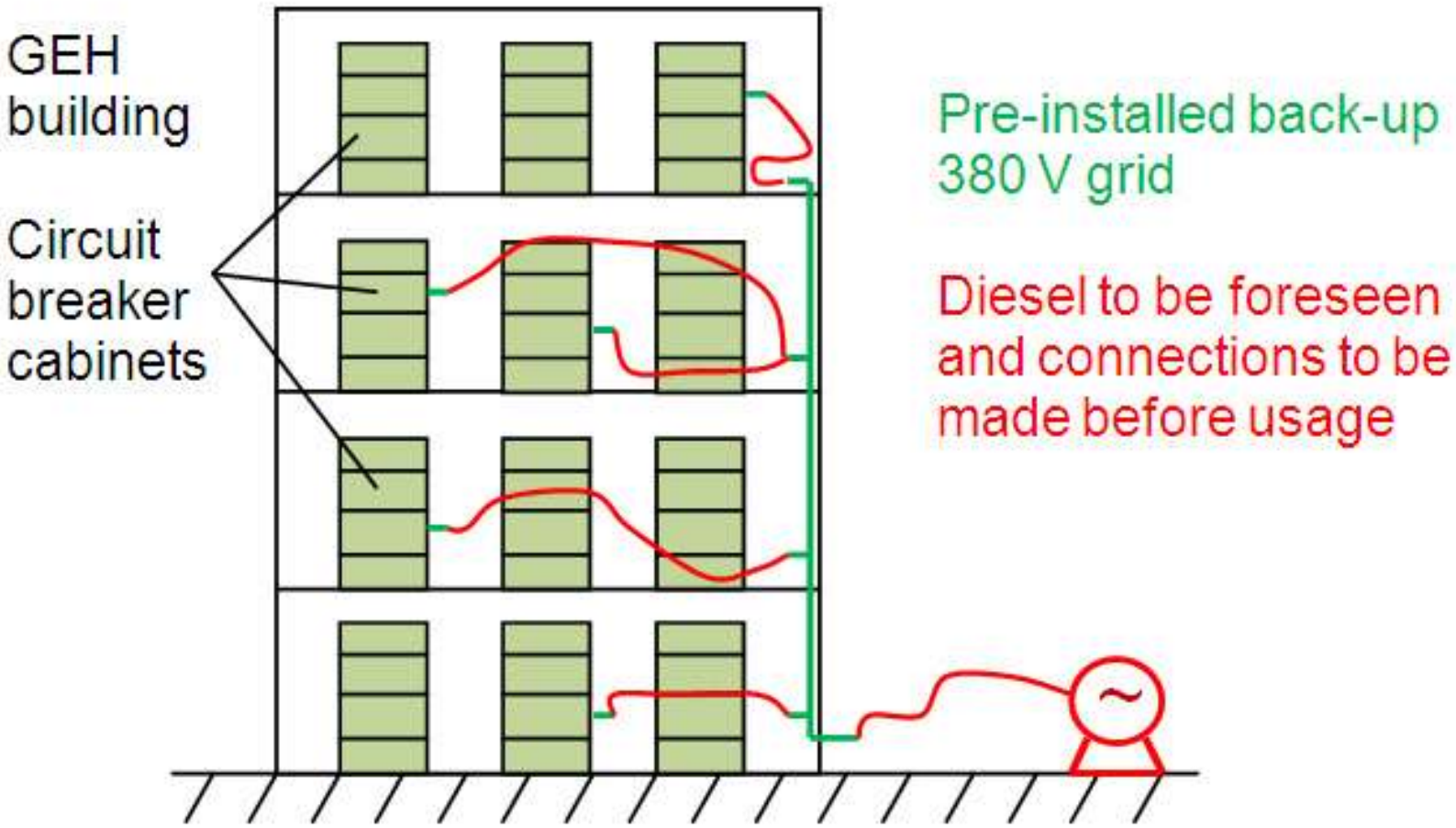
It is most probable to reach the site with heavy equipments and large fuel supply for diesel operated engines, as well as needed manpower.

NON CONVENTIONAL MEANS (1)

Non conventional means to avoid cliff edge effects:

- Alternative 380V means to source batteries, pumps, compressors ,valves
- Mobile pumps and fire hoses connected to available water sources

NON CONVENTIONAL MEANS (2)



NUCLEAR LOGISTIC SUPPORT CELL

NUCLEAR LOGISTIC SUPPORT CELL (NLSC)

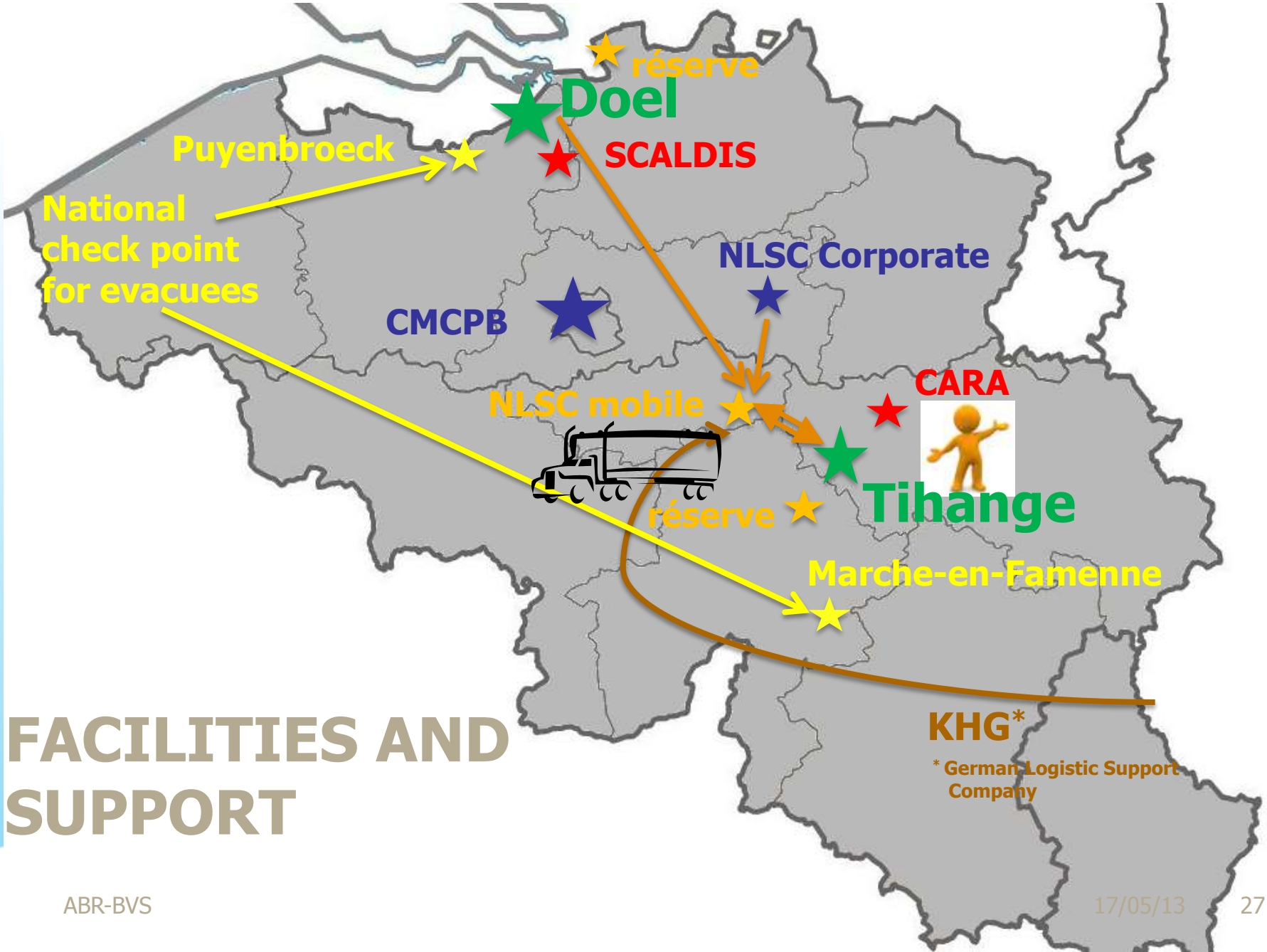
OBJECTIVE: relieve the operator at affected site of logistic tasks organized outside of the site

TASKS

- **Coordination** , through a Liaison Officer (LO), sent to the affected site, in mode high, in order, for him, to understand and cover their needs in Logistical Support (extra means & manpower)

- **Preparation** of Logistical Support (extra means & manpower) :
  - ✓ Extra means, i.e.: equipment & goods stored in specific warehouses or available under contract with suppliers (NCM, refueling capacity, protective equipment, RP & decontamination means, remote handling technology, special tools, catering,…)
  - ✓ Extra manpower, i.e.: human resources available from Electrabel, GDF SUEZ, or contractors.

- **Transfer** of Logistical Support to the affected site through a backup infrastructure (fixed or mobile) located as close as possible of the affected site, operational less than 24h after activation of NLSC by Corporate Crisis Center



FACILITIES AND SUPPORT

NUCLEAR LOGISTIC SUPPORT CELL (NLSC)

Support from KHG (Germany)

- ✓ Infrastructure Group for Transportation, Communication, Power supply
- ✓ Radiation Protection Group for Measurement and Protection
- ✓ Decontamination Group for mobile Decontamination
- ✓ Remote Handling Group for access to areas with high dose rate

REMOTE HANDLING TECHNOLOGY

COMMUNICATION MEANS

Enhanced use of satellite communications

- Deploying wireless communications is typically among the first priorities in any emergency situation
- In the context of the emergency plan, both sites possess **diverse and redundant means of communication.**
- When setting up this communications infrastructure, however, possible extreme scenarios such as examined here were not taken into consideration.

It is intended for each site to possess an **"ultimate" communication system** in order to meet a number of **basic communication needs** in the given circumstances. Such system should :

- ✓ **operate on wireless (satellite) technology**
- ✓ with an autonomy larger than 72h, and
- ✓ should be rapidly deployed by someone who has a minimum of training to do this (plug & play, etc.)

INFRASTRUCTURE

Construction of new on-site emergency center @ Tihange

- La localisation et la structure actuelle du bâtiment abritant le COS ne garantissent pas une fonctionalité absolue en cas de conditions externes très dégradées (séisme notamment)
- Le COT de chaque unité est équipe de manière à pouvoir servir de COS de repli en cas de perte du COS principal

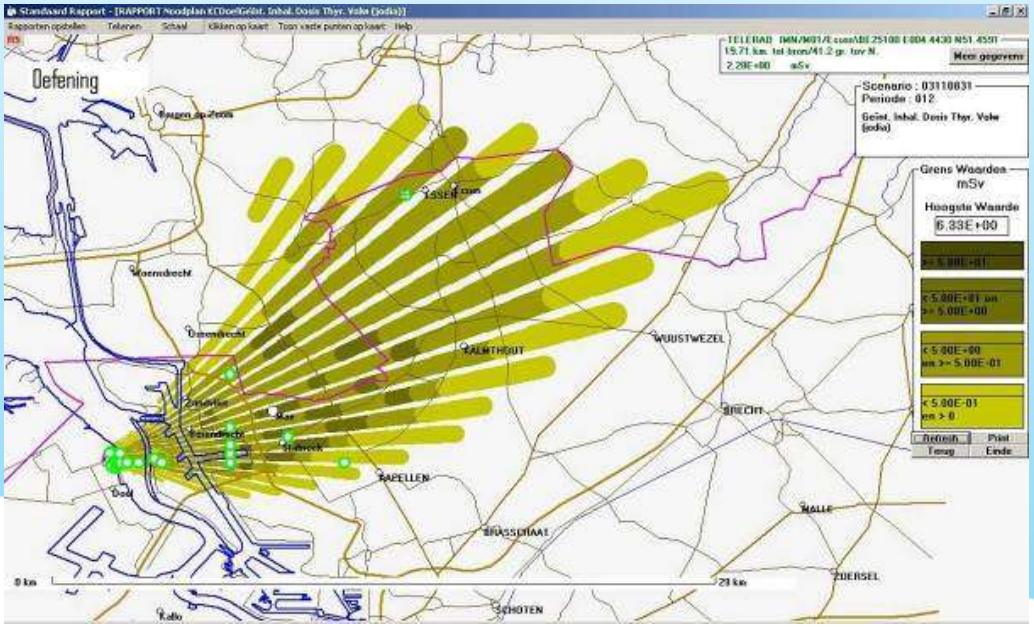
⇨ Construction d'un nouveau COS

- ✓ Hors inondation
- ✓ Résistant au DBE (design base earthquake)
- ✓ Pourvu d'une infrastructure de décontamination
- ✓ Secouru par groupe électrogène indépendant
- ✓ Pourvu des dispositifs de filtration de l'air extérieur

RADIOLOGICAL DISPERSION MODELS

Upgrade of the code for atmospheric radioactive releases calculations

- ✓ Multi-unit releases
- ✓ Long duration of releases (> 24 h)
- ✓ Longer range for releases
- ✓ Use of different meteo data
- ✓ Etc.



WORK MNGMT @ CONTAMINATED SITE

- ✓ Guidance / Additional RP means
- ✓ Fixation of contamination – mngmt of large volumes (potentially contaminated water)

TO SUM UP

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- Onze centrales zijn robuust + specifieke troeven in vergelijking met andere landen:
  - ✓ Dubbel containment reactorgebouw
  - ✓ Twee niveaus noodsystemen
  - ✓ Dubbele uitvoering ultieme koude bron

- Mogelijke verbeterpistes kunnen ons helpen verder te werken aan continue verbetering

Vous avez l'énergie.

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