



Welcome to EPZ

Thursday, 17 November 2022

Welcome to the NCS symposium after lunch session

Gido will tell you all about our
wonderful nuclear industry today.

But... Safety first!



Nuclear safety at EPZ



Nuclear safety is the protection of people and environment from harmful effects of a radioactive release and ionizing radiation.

At EPZ we do this by constantly improving our technology, organisation and culture.



We produce electricity

EPZ produces clean, climate-neutral electricity for more than 1.3 million households every day.

With our nuclear power plant, wind farm and solar park we are a unique employer in Zeeland and far beyond. We have about 400 direct and about 300 indirect colleagues working for us.





nuclear power plant

- 91% availability
- 3.800 GWh production per year
- Over 10% of carbon-neutral power generated in NL
- 0% subsidized
- **Over 1.3 million households**
(Zeeland + Noord-Brabant)





TOP 25% safest nuclear plants

The Borssele nuclear power plant has been continuously upgraded since 1973 to include the latest technology.

The plant is one of the top 25% safest water cooled reactors in the Western World.





Nuclear Power Plant Borssele

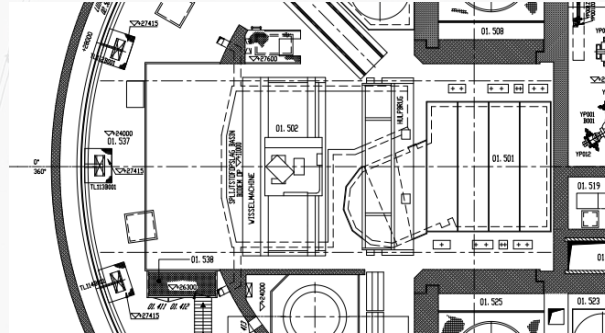


RP survey in the nuclear industry:

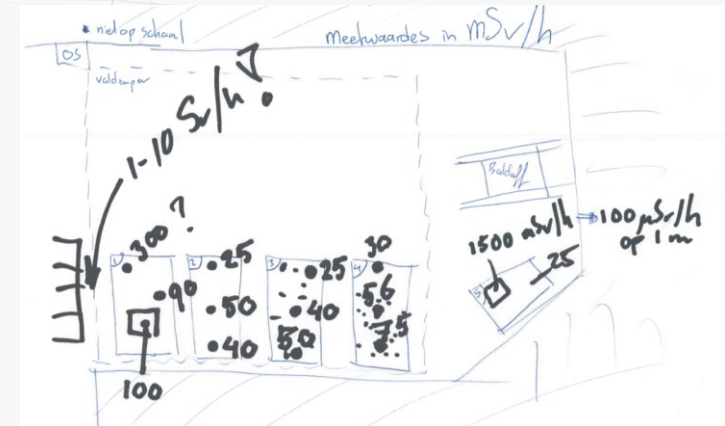
How did we do it in the past? (20th century)



RP devices



RP Plant Walkdown



RP data

Major down side: RP personnel is in the radiation field!
This is not As Low As Reasonably Achievable!!!

How are we doing it now?

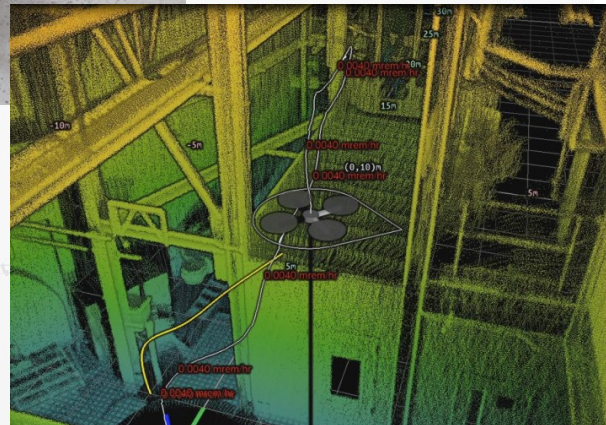
Question: How do we optimize this?

Answer: Take Human factor out of equation by using...?!

Let's take a sneak peak into the near future of RP @ NPP's->

Autonomous Drones

Autonomous Drone Demonstration at Peach Bottom Nuclear Facility



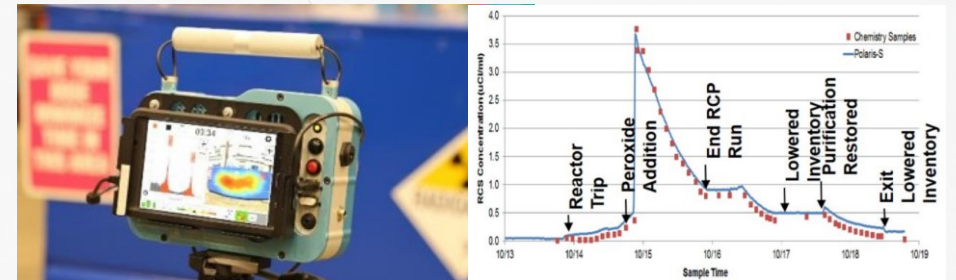
Summary of EPRI Aerial Drone at Demonstration

- Drone performed a number simulated tasks without operator control (i.e., autonomously):
 - Surveys for area dose rates
 - Inspection of plant systems, structures and components (SSCs)
 - Performed thermal imaging test
- Created a 3D map of a large portion of the unit Auxiliary Building in 5 secs without leaving the staging point
- Dose rates were successfully recorded every 3 seconds and instantaneously displayed on the 3D map
- Video and infrared cameras were able to simulate inspecting components during drone flights
- Drone's navigation system detected and safety flew around a new obstacle in its autonomous travel path
- EPRI Deliverables:
 - EPRI Quick Guide 3002018409
 - Narrated video of demonstration: <https://youtu.be/97lyDoAOif4>

ARAMIS

ARAMIS: Autonomous RADIATION Mapping Integrated System

- The Mobile and Autonomous Mapping Solution for nuclear facilities
- ARAMIS is a mobile robotic system enabling to safely **detect, localize, characterize and measure gamma radioactivity** in nuclear facilities, using real-time spectroscopy and 360° imaging transmission provided by the [H400 spectrometer gamma camera](#) manufactured by H3D, Inc.
- This project with intuitive robot [Spot](#) manufactured by Boston Dynamics aims to **keep operators away from hazardous areas and situations** during inspection tasks.
- https://youtu.be/f_5yl3LvGOo
- <https://youtu.be/UrVhQOmZR3s>

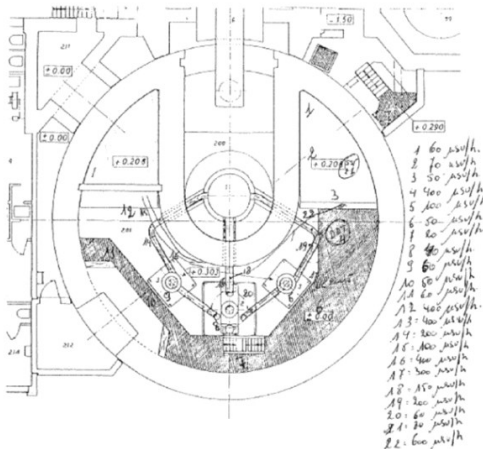


LIDAR & Advanced 3D RP planning

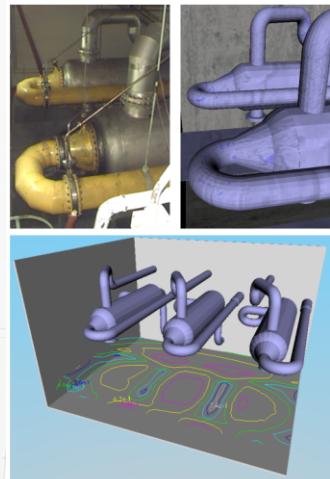
Radiological work preparation the next level!

- 3D laserscan (LIDAR) technology to make digital twin (NRG-NL)
- Visiplan 3D RP planning software (SCK-BE)

FROM:



TO:



Based on:

- 3D model including material, geometry and sources
- Point-kernel dose calculation, with build-up correction



Allows:

- Dose assessment for tasks, routes or trajectories and scenarios
- Individual (MID) and collective dose (S) assessment
- Source strength calculation from measured dose rate sets.
- Source Sensitivity Analysis

Detailed planning

Préparation - à choisir	min	h
Préparation des cellules de la piscine BC (1)	2	4
Maintenance piscine BC	2	4
Travail de démontage (travaux) (choix)	2	12
Travail de nettoyage	2	12

Modification des éléments	min	h
de la piscine	2	12
de la centrale	2	12
de la salle	2	12
de la salle	2	12

Réactivation chimique de câbles	min	h
de la piscine	2	2
de la piscine	2	2
de la piscine	2	2
de la piscine	2	2

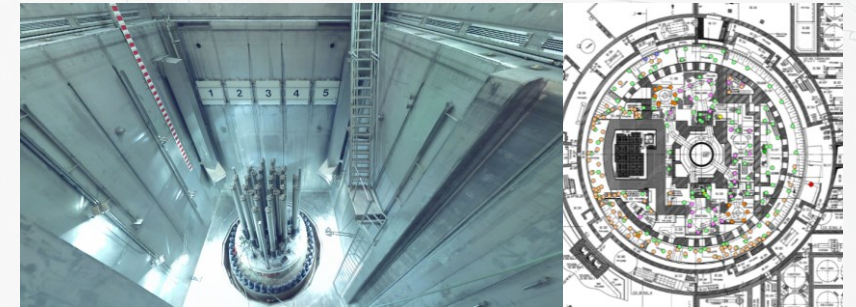
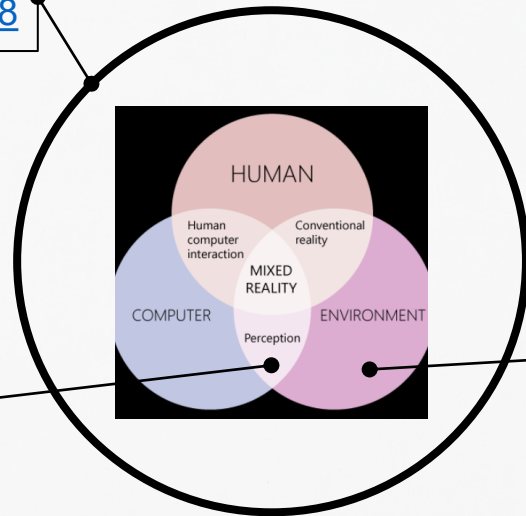
Mixed Reality & Immersive Technology

To facilitate advanced radiological work simulation, practice & training!

Igloo Immersive Technology
<https://youtu.be/FWm5YLmkYh8>



Augmented reality ARMAS
<https://youtu.be/u5mSU8zev38>



3D work training & practice environment by laserscanning technology (LIDAR)

Changing the paradigm of RP H3D! <https://youtu.be/egmi1BGdf7s> bonus video!

Augmented reality NDO <https://youtu.be/EEv9VEwnJvY> bonus video!

Kairos 3D Igloo <https://youtu.be/dgiwRlaZdFI> bonus video!



Future RP HQ?!

War Games (1985)!



RP@EPZ (2022)!



RP Room (2023)?

Goal

- Apply advanced technologies to
 - enhance worker and public radiological safety
 - enable risk and condition based planning and practices
 - optimize RP operations

Anticipated outcomes:

- 20% - 30% cost reduction
- Reduced dose
- Timely, comprehensive, and integrated understanding of radiological conditions



Summary

- 1) ALARA RP data (ROV's) +
- 2) 3D ALARA planning & workprep +
- 3) Mixed Reality Visualisation!

=

RP NextGen in nuclear industry!



RP challenges in nuclear industry:

- IT (Cybersecurity)
- Research & Development
- Skilled RP workers
- Funding (€)
- Management Awareness & Vision



Questions





Thank you



Have a safe day!

