

# Koeberg NPP: Accident Assessment & Prognosis

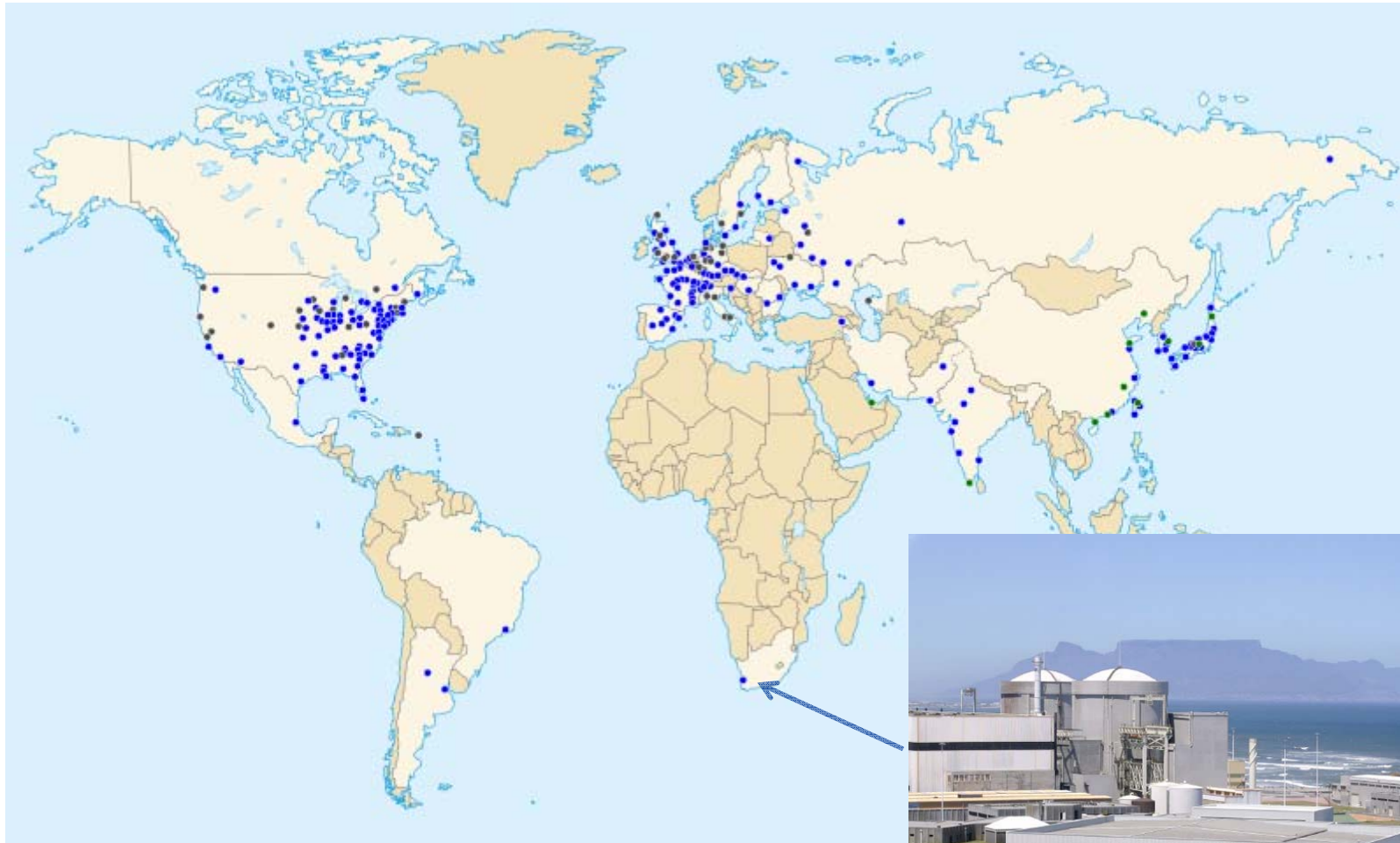
Revision 1

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- Introduction (2 slides)
- Pre-assessment of accidents (5 slides):
  - The site specific pre-assessment provides important insights to decision makers.
- Real-time accident prognosis (4 slides):
  - Current status of real-time accident prognosis at Koeberg NPP.

# Koeberg NPP 2 x 970 MWe PWRs commissioned in 1984 & 1985



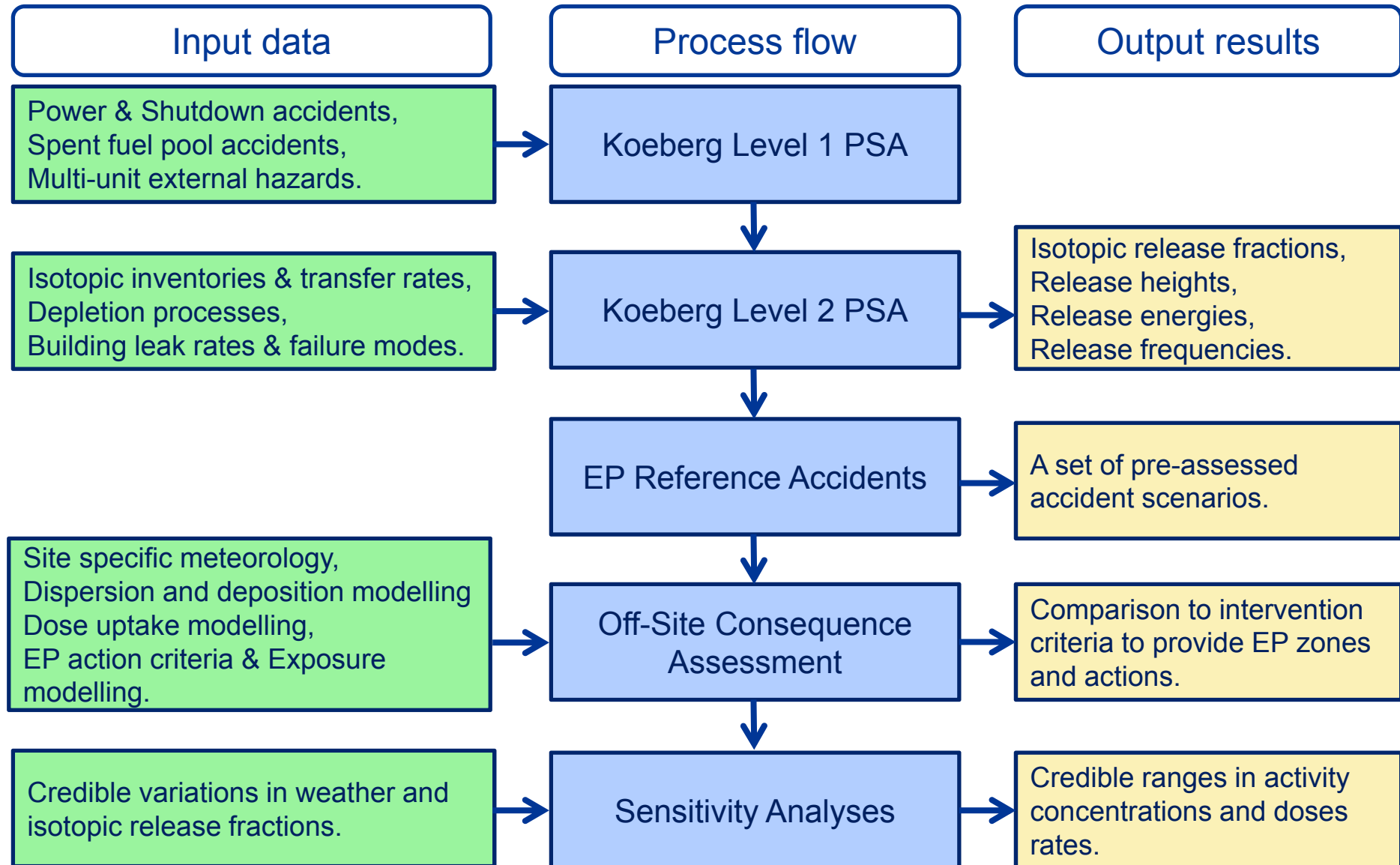
# Presentation Outline



- Introduction (2 slides)
- Pre-assessment of accidents (5 slides)
- Real-time accident prognosis (4 slides)

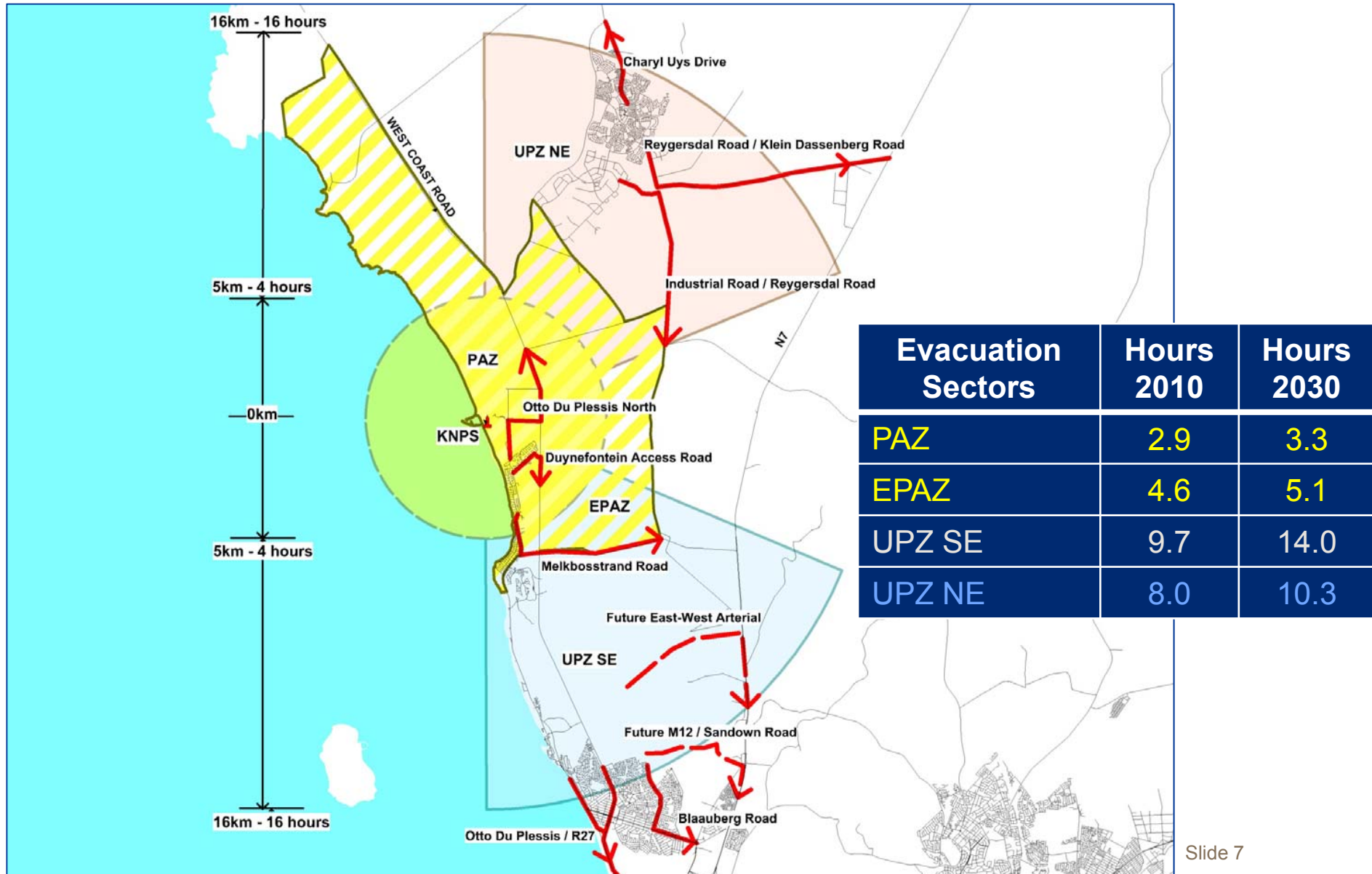
- The Koeberg PSA was used to derive a set of EP Reference Accidents based on frequency and consequence.
- Regulations require the choice of Reference Accidents to be representative of the overall risk but also suggest accidents whose sum have a cumulative frequency of less than  $1 \times 10^{-6}$  per year can be deemed “incredible”.
- For a given a source term and dose / contamination limits, the distances for each of the following EP actions can be estimated:
  - Evacuation
  - Sheltering
  - Iodine tablet distribution
  - Resettlement
  - Relocation
  - Food banning

# Emergency Planning Technical Basis Process





# Example of EP action modelling: Evacuation



- A set of 23 EP Reference Accidents were derived which scoped:
  - Extreme external hazards impacting both units,
  - Internal single unit events at power and during shutdown,
  - Spent fuel pool accidents.
- For each Reference Accident, dose versus distance data for different weather conditions were generated and compared to IAEA dose intervention criteria.
  - For example, for a primary pump seal cooling failure leading to loss of primary circuit coolant outside containment without replenishment with “average” weather conditions the thyroid dose limit is exceeded as far as 10 km given 1 day of exposure.
- The assessment of these Reference Accidents support the determination of EP zones (PAZ, UPZ and LPZ) and the EP action implementation times.
- Further, this pre-assessment provides a set of accident outcomes and so support the knowledge base used for real-time accident assessment and off-site action decision making.



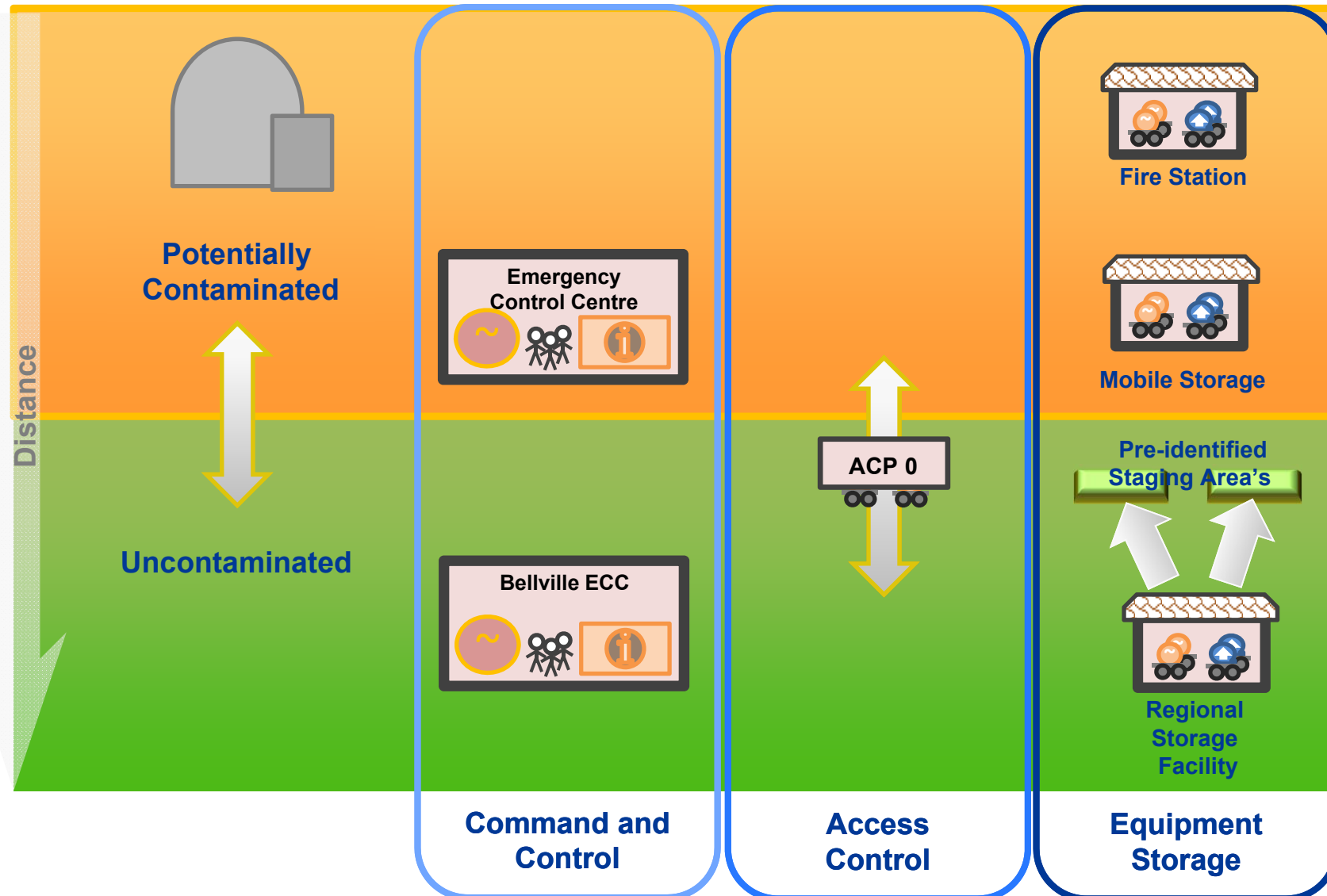
- Isotopic release fractions
  - For similar accidents these can vary by more than a factor of 10 based on the accident specifics which may not be known during an actual event.
    - This can be mitigated by using radiation monitors directly rather than predictions.
- Weather
  - For similar accident types the dose rates can also vary by more than a factor of 10 based on variations in weather.
    - This can be mitigated by using off-site radiation monitors directly rather than predictions.
- Plant data (to be discussed later)

# Presentation Outline

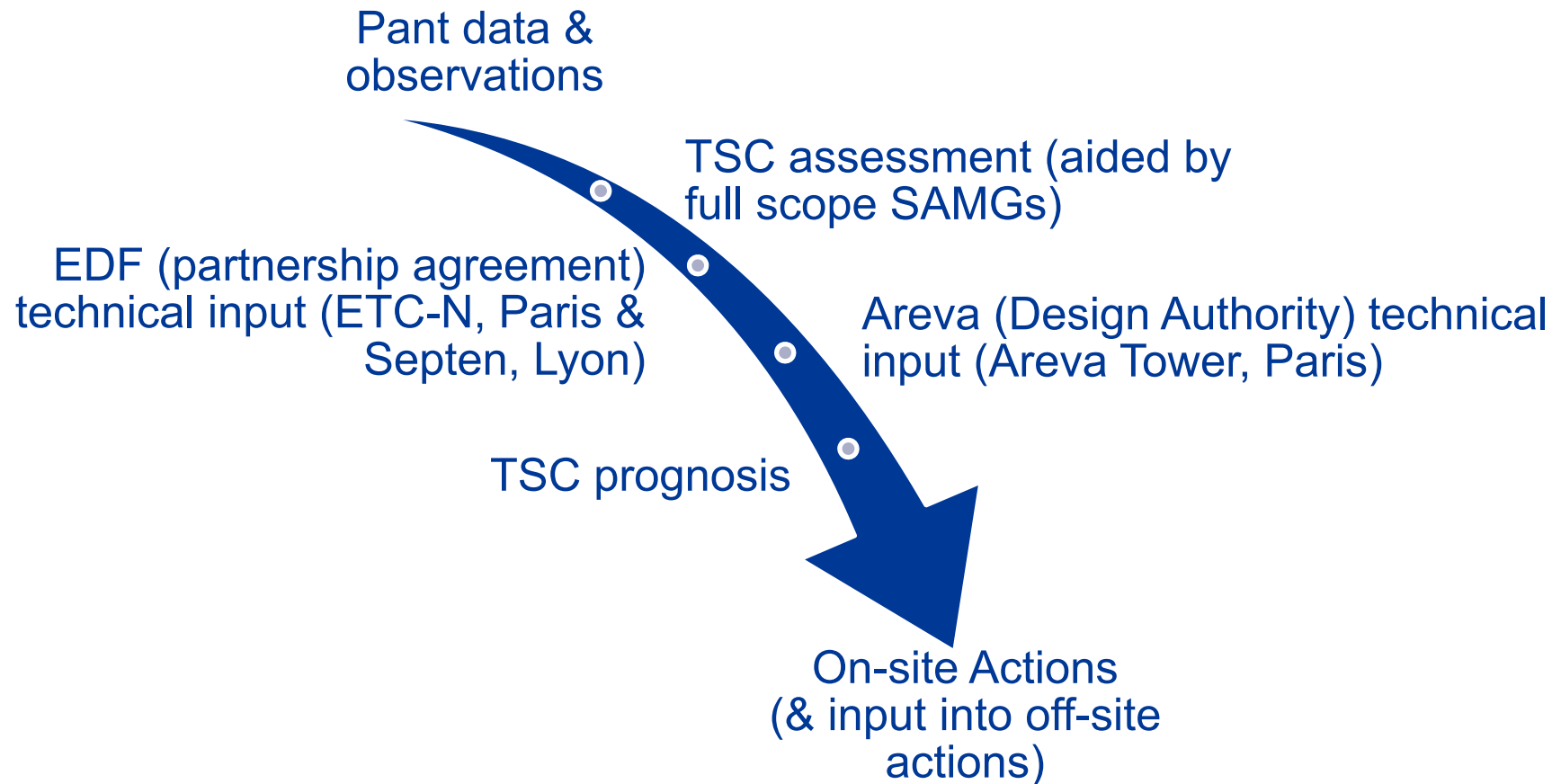


- Introduction (2 slides)
- Pre-assessment of accidents (5 slides)
- **Real-time accident prognosis (4 slides)**

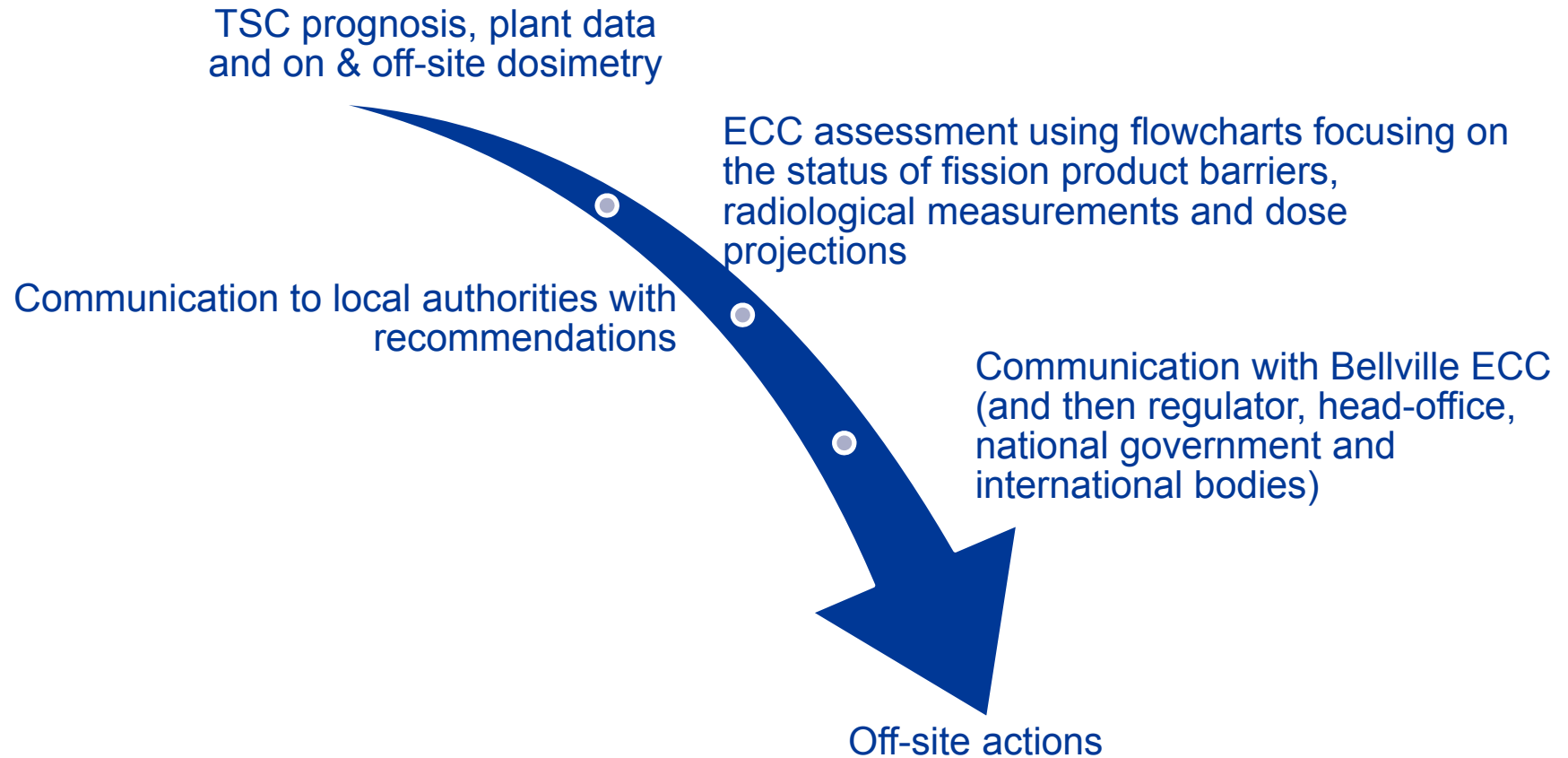
# Emergency Response Strategy



# Technical Support Centre: On-site Accident Assessment & Prognosis Process



# Emergency Control Centre: Off-Site Prognosis & Communication Process



# Data Acquisition Strategy



## Core

- **Core Exit Temperature**
- Core Neutron Flux
- *Core Level [RVLIS]*

## Primary System

- **RCS Pressure [Wide-Range]**
- Hot-Leg Temperature
- Cold-Leg Temperature
- RCS Pressuriser Level
- PTR Tank Level
- *RCS Injection Flow*

## Secondary Side

- **SG Pressure**
- **SG Level [Wide-Range]**
- Aux. Feedwater Tank Level
- *SG Injection Flow*

## Containment Integrity

- **Containment Pressure**
- Containment Radiation Levels
- Containment Temperature
- Basemat Temperature
- *Containment Spray Flow*
- *Containment Sump Level*
- *Reactor Cavity Level*
- *Reactor Cavity Temperature*

## Spent Fuel Pool

- **SFP Level**
- SFP Temperature
- SFP Radiation Levels
- *SFP Make-up Flow*
- *SFP Building Radiation Release*

## Emergency Plan

- **On-Site Radiation**
- **Off-Site Radiation**
- Meteorological Measurements

## Other Indication

- Diesel Tank Levels
- Long-Term Water Reservoir Levels

## LEGEND

### **Critical Indication [Bold Text]**

1. Independent Hardened System [MCR, ECC and local indication]
2. Read without battery supply
3. Extended battery supply

### **Other Indication [Normal Text]**

1. Extended battery supply
2. Read without battery supply

### **New Indication [Italic Text]**