



# **Uncertainties in neutron activation calculations**

Stefan Coninx

# Agenda

1. Introduction
2. Uncertainties in neutron activation calculations
3. Validation of neutron activation calculations and its uncertainties
4. Summary

# 1. Introduction – Process of neutron activation calculation

The basic process according to ISO 16966 for performing activation calculations for the purpose of estimating radionuclide concentrations in activated wastes involves several steps:

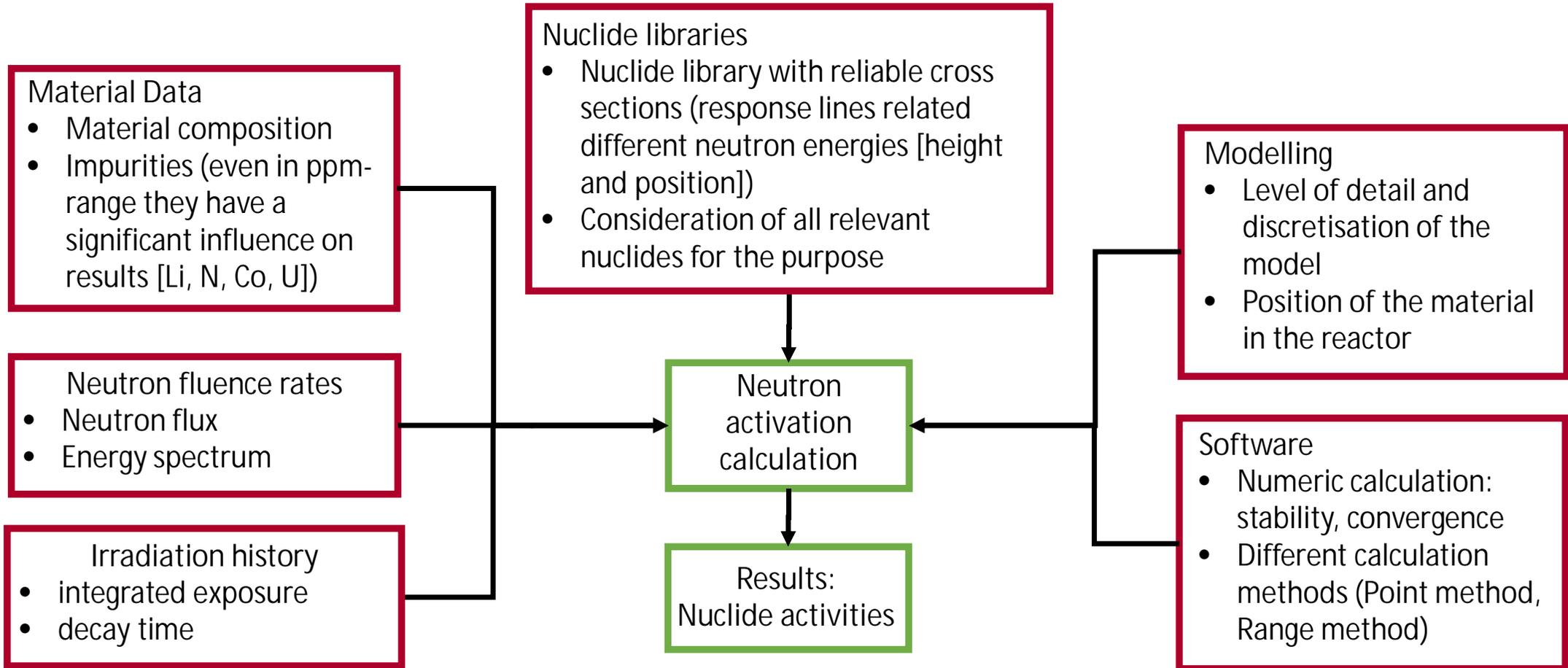
- a) Establish the context.
- b) Select the calculation methodology. The selection depends on the context of the calculation and the availability of input data.
- c) Select and determine the input parameters: Material Data, Neutron fluence rates, Irradiation history, nuclide libraries, model of the system
- d) Perform the calculation(s) using the selected methodology.
- e) Process the raw results of the calculation(s) to determine correlation factors, conversion factors, etc., depending on the chosen methodology (Validation).

# 1. Introduction - Uncertainties

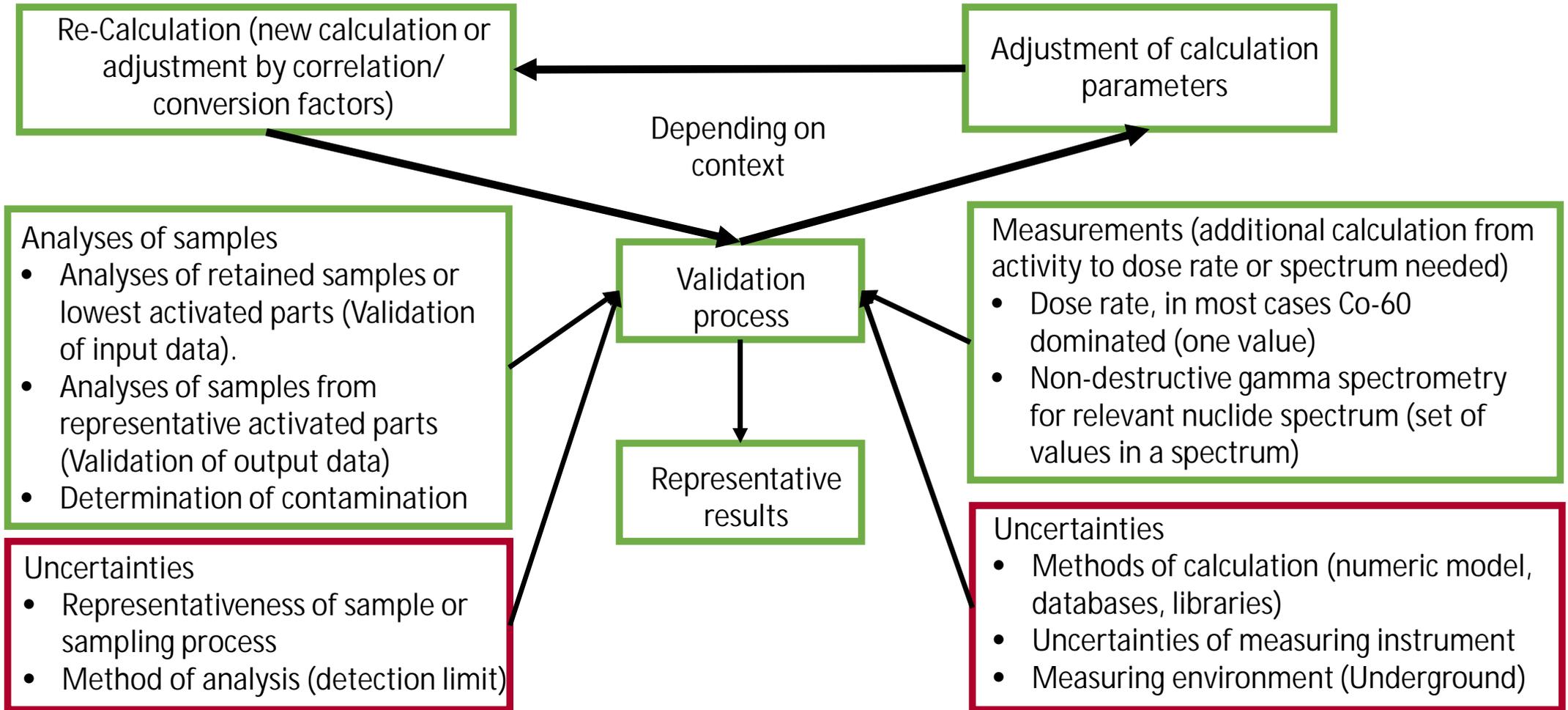
- Every calculation or modelling of a real situation is subject to uncertainties.
- All input data contain uncertainties (e.g. unknown impurities in the material).
- The calculation program uses numeric calculations which have variable accuracies depending on different factors and the duration of the calculation.
- The representativeness of the results depend strongly on the input variables.

The aim of the presentation is to raise your awareness of the uncertainties.

## 2. Uncertainties in neutron activation calculations



### 3. Validation of neutron activation calculations and its uncertainties



## 4. Summary

- The entire process of neutron activation calculation contains uncertainty options whose effects on the result are not always known.
- Modern measurement and analysis methods can increase the representativeness of the calculation immensely, but these are also burdened with uncertainties.
- To obtain reliable results, it is important to be able to describe the uncertainty and the accuracy. For this, an understanding of the calculation method is required and parameter studies as part of the iterative calculation-validation-process are maybe needed, when the required representativeness (degree of accuracy and uncertainty) of the results is not given.
- The necessary representativeness of the results depends on the context.

Measurement and analysis procedures in advance can significantly reduce uncertainties and, together with verified input data (nuclide libraries, reactor models, irradiation history), can increase the degree of representativeness.



# PREDIS

## Uncertainties in neutron activation calculations

Stefan Coninx

DMT GmbH & Co. KG

Große Bahnstr. 31, 22525 Hamburg

Tel.: +49 40 8557 2572

Mobile: +49 160 888 2565

E-Mail: [stefan.coninx@dmt-group.com](mailto:stefan.coninx@dmt-group.com)

