

New features in burnup framework in Serpent

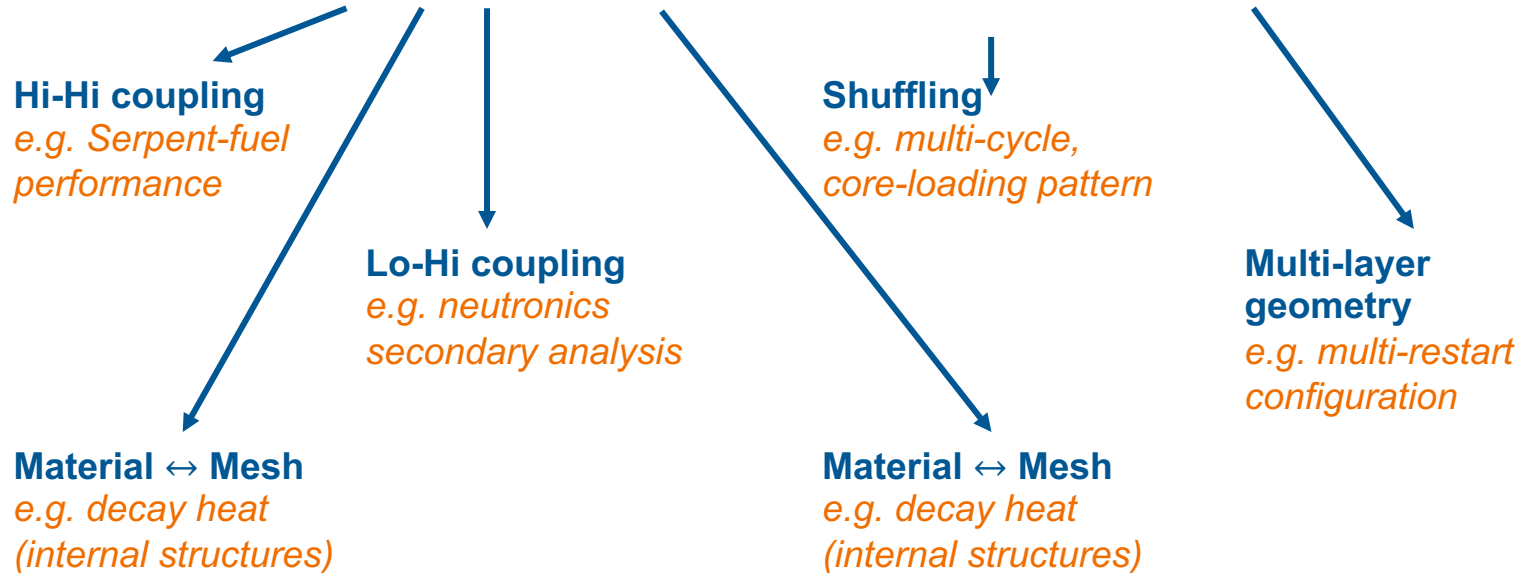
**11th Serpent User Group Meeting
Garching, Germany, Aug. 29 – Sept. 1, 2022**

Ana Jambrina, Research Scientist, VTT

30/08/2022 VTT – beyond the obvious

Burnup Material Characterization

How do we handle these scenarios?



Burnup Material Characterization

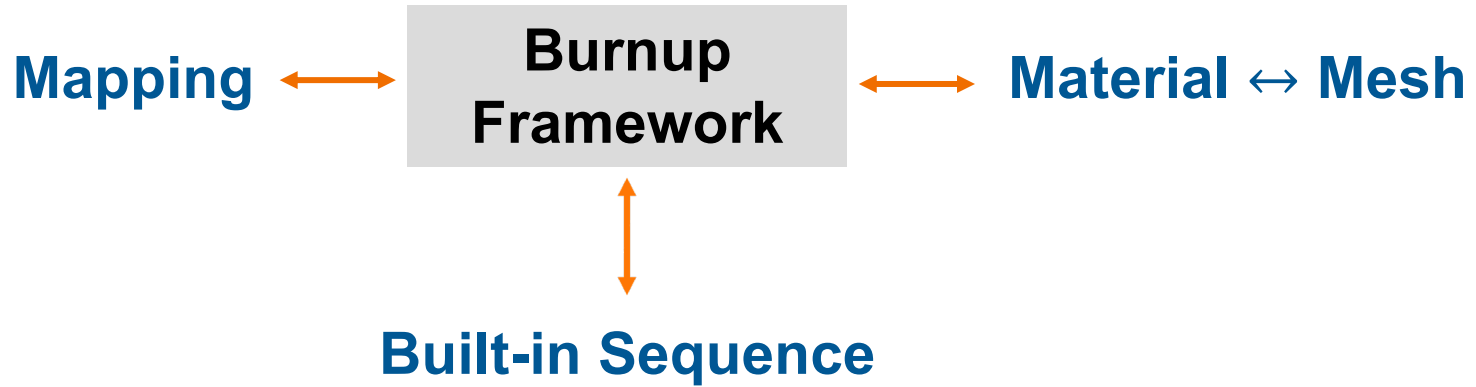
How do we handle these scenarios?



Re-configuration ???

Burnup Material Characterization

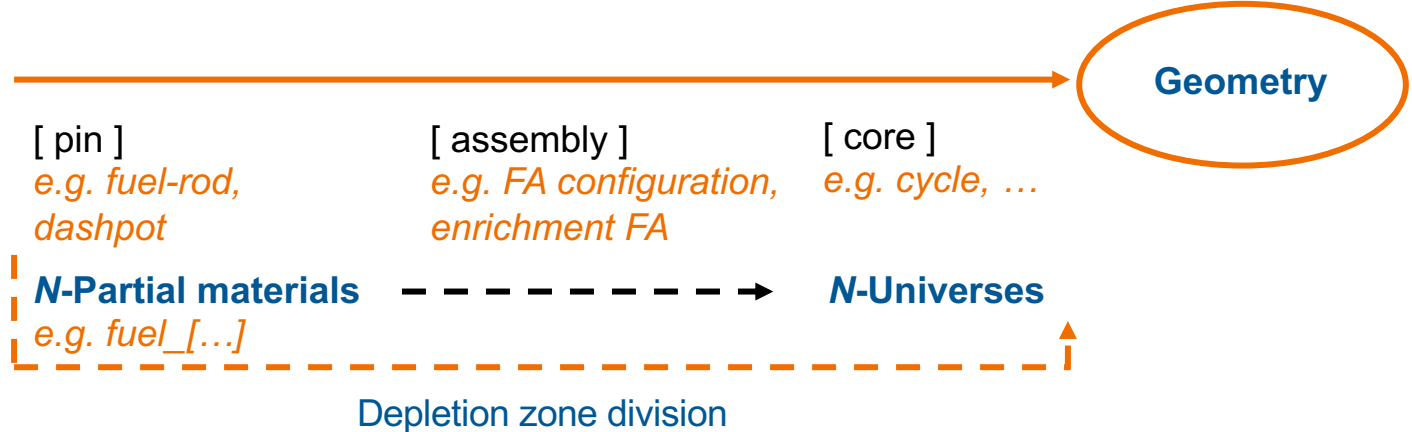
How do we handle these scenarios?



Burnup Framework

Step 1: Mapping

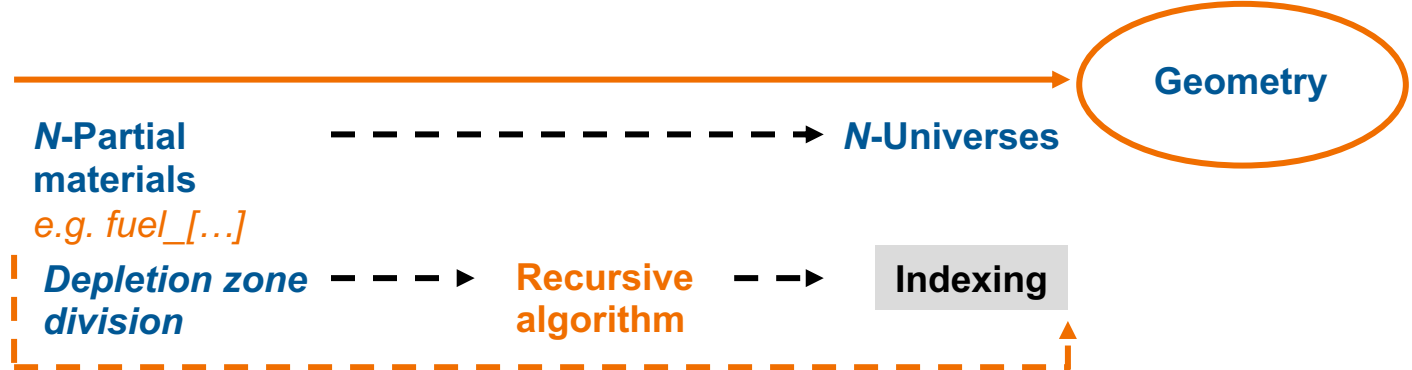
Parent material
e.g. fuel



Burnup Framework

Step 1: Mapping

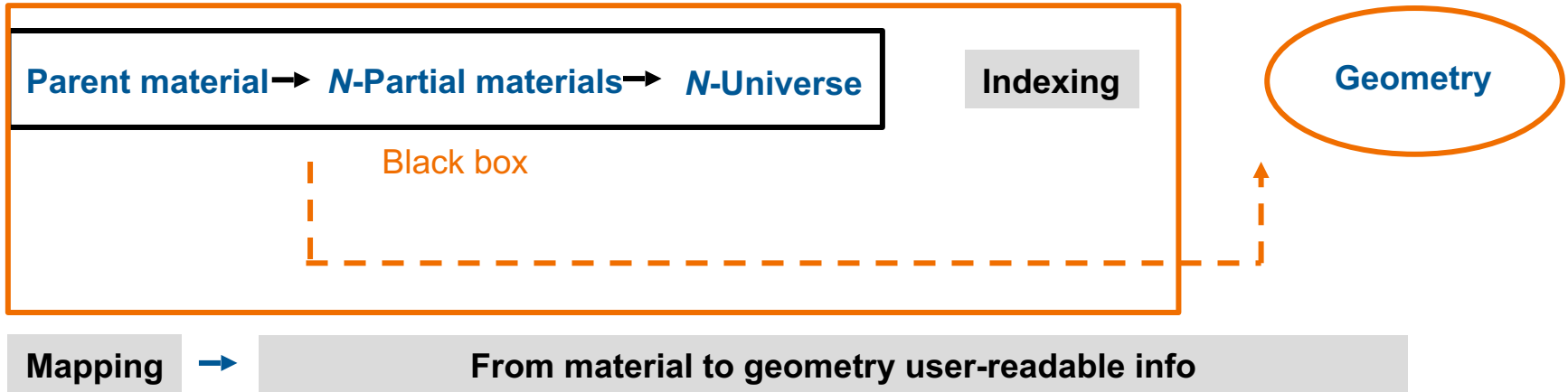
Parent material
e.g. fuel



From averaged to independent treatment/values

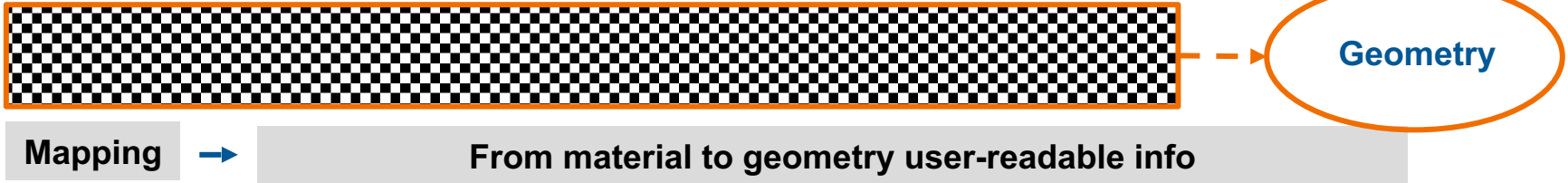
Burnup Framework

Step 1: Mapping

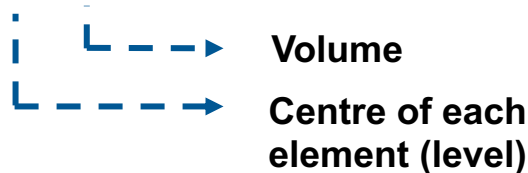


Burnup Framework

Step 1: Mapping



Based on Monte Carlo sampling



Based on known info

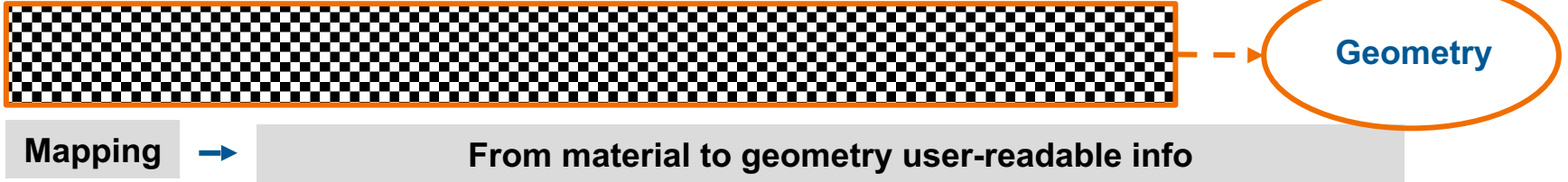
- division structure
- Recursive algorithm

Reconstruction
(reverse-engineering)

Centre of each element (division)

Burnup Framework

Step 1: Mapping



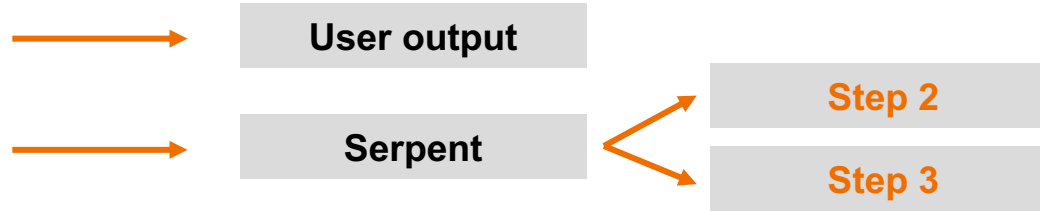
- 1 **Who are you?**
 - Parent material
 - Partial material
 - Universe index

- 2 **Where are you?**
 - Relative location
 - Lattice, pin, division
 - Absolute location
 - (x,y,z) centre of each depletion zone

- 3 **What do you got?**
 - Partial material density
 - Partial material burnup
 - [Nuclide specific info]

Burnup Framework

Step 1: Mapping



- Who are you?** 1
- Parent material
 - Partial material
 - Universe index

- Where are you?** 2
- Relative location
 - Lattice, pin, division
 - Absolute location
 - (x,y,z) centre of each depletion zone

- What do you got?** 3
- Partial material density
 - Partial material burnup
 - [Nuclide specific info]

Burnup Framework

Step 2: Material ↔ Mesh

Data Mesh
↕
Material

Data mesh (*user input*)

Geometry

Non physical material
Based on activation detectors

Match level division
(x,y,z) element centre

one-on-one discretization

Procedure is based on Monte Carlo sampling

Burnup Framework

Step 2: Material ↔ Mesh



User output



One-on-One: material ↔ mesh

** For external or internal use*

- 1 **Who are you?**
 - Parent material
 - Partial material
 - Universe index

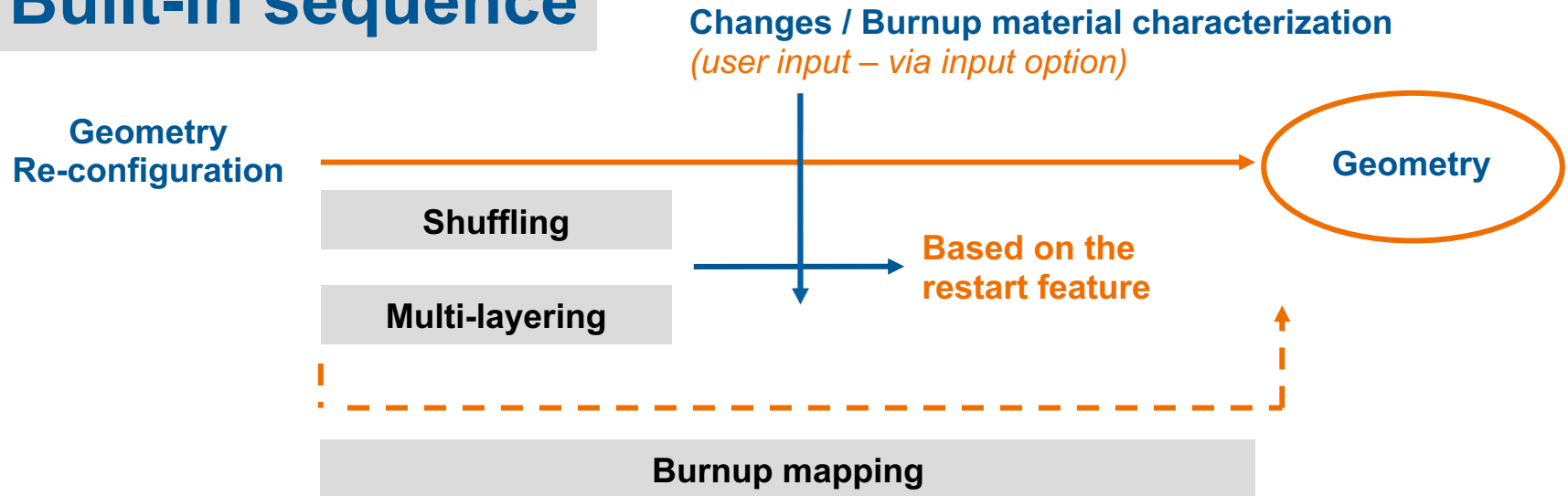
** If there is material division*

- 2 **Where are you?**
 - Location
 - (x,y,z) centre of each element.
 - Indexing within mesh

- 3 **What do you got?**
 - Data mesh handles in the information

Burnup Framework

Step 3: Built-in sequence



A large, intricate geometric pattern of triangles in various shades of blue and green covers the left side of the slide. The pattern is composed of many small triangles that form larger, more complex shapes, creating a textured, mosaic-like effect.

Feedback Questions [...]

Thank you!

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