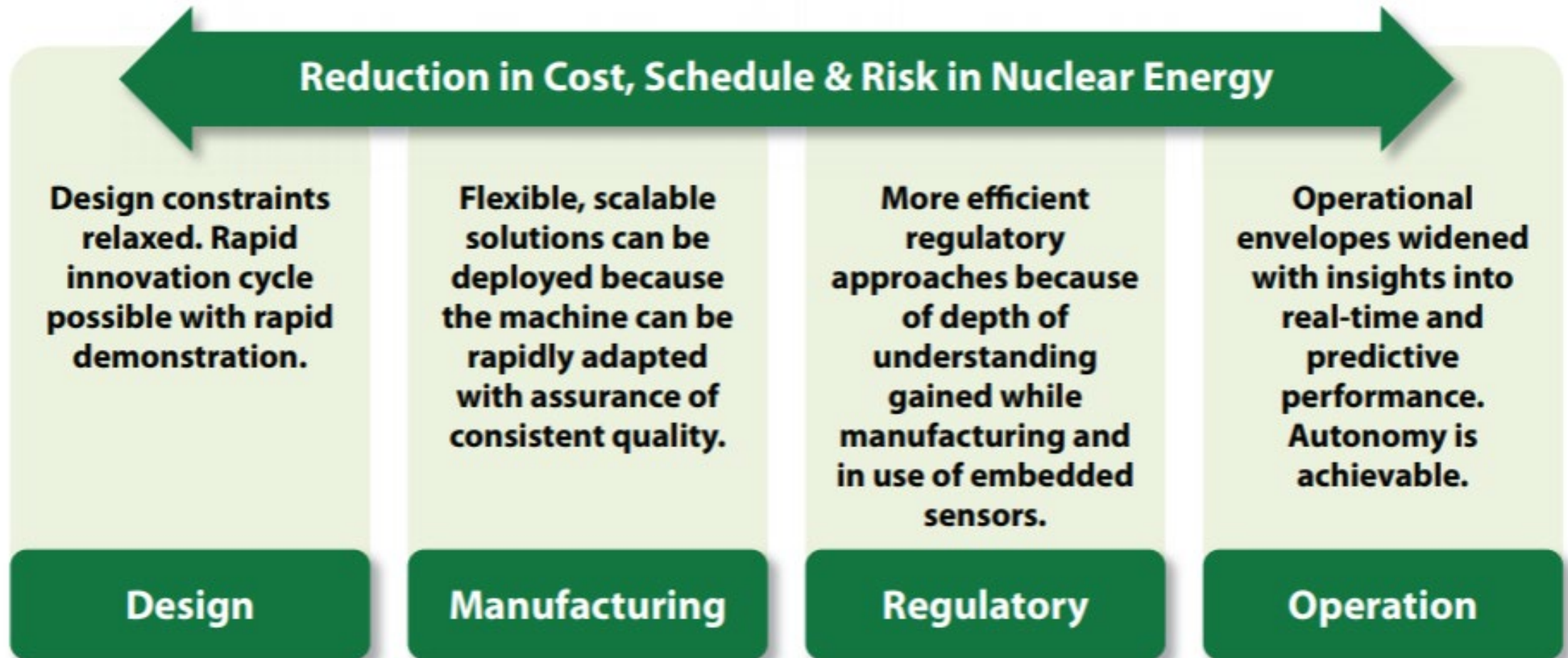


Transformational Challenge Reactor Program

Laying the Foundation for Using Additive Manufacturing for Nuclear Energy Systems



Materials Properties in Additive Manufacturing

Data to acquire:

Uniaxial tensile tests
Thermal creep
Plasticity (true stress-strain)
Fracture
Environmental compatibility
Thermal-physical & physical properties
Radiation hardening
Radiation swelling
Radiation induced creep
Creep fatigue
Component testing
Surface roughness
Thermal aging
High-throughput EBSD
Large area TEM
Residual stress
Phase/precipitation evaluation
Post-weld/post-processed HT
Post-fab TMT verification
CT scan/defect determination
Maximum allowable defect sizes
Sensor-component interface wetting

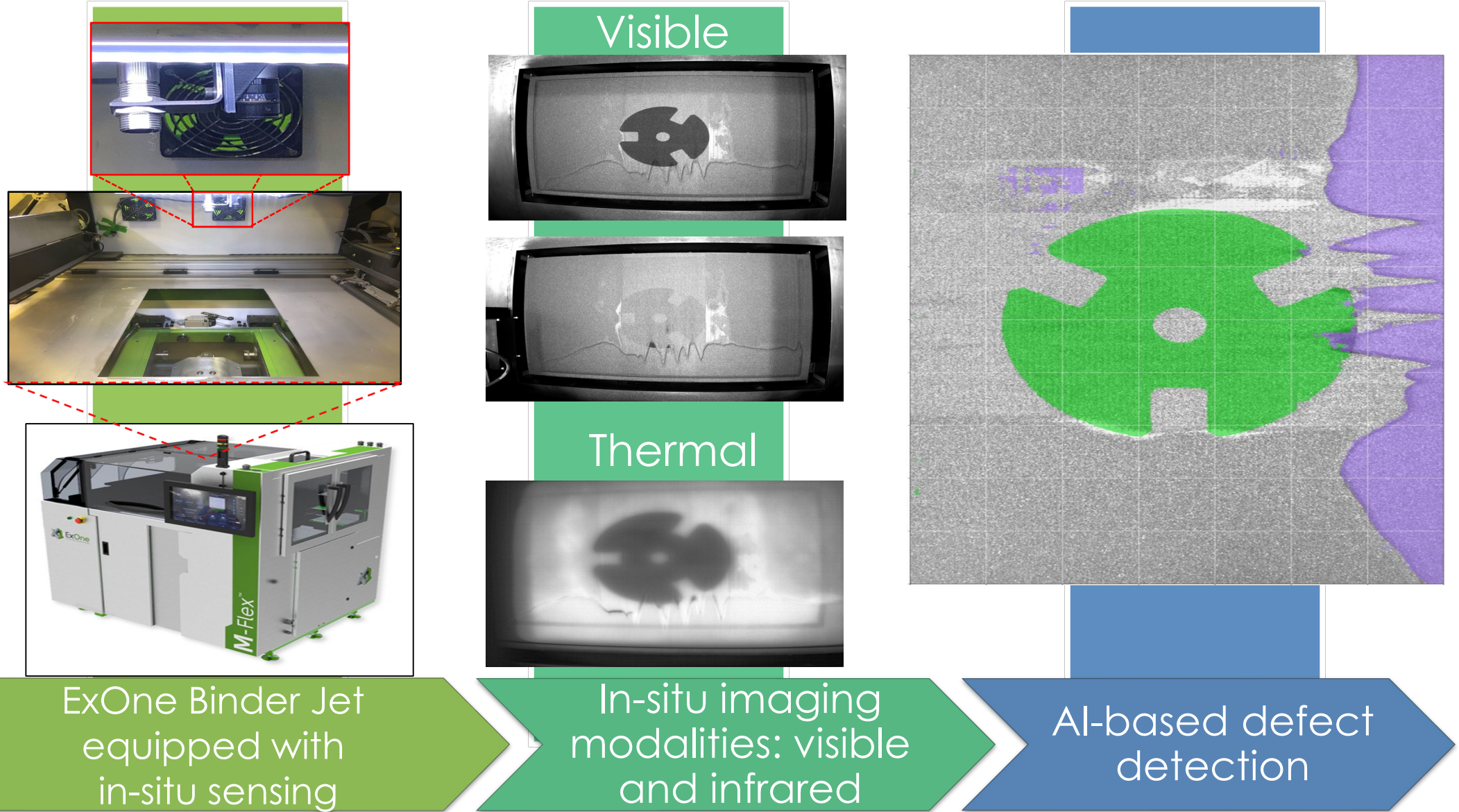
Materials Handbook

- Baseline mechanical properties
- Baseline thermophysical properties
- Baseline microstructure
- Batch-to-batch variability bounds
- Correlated NDE and destructive testing results

Example: 316L Stainless Steel

- ✓ Preliminary tests show additive data aligning well with wrought data
- ✓ Materials database growing on a weekly basis

Digital Platform for As-Built Quality Verification



Engagement to Facilitate Adoption

A Different Approach Requires Extensive Engagement

