In the past decade, additive manufacturing (AM) has emerged as a viable method for producing metallic components used in aerospace and energy sectors. While AM’s capability to fabricate intricate geometric parts has been proven, ensuring the certification of these components for crucial applications remains challenging. This challenge stems from the distinct spatial and temporal variations in thermal, mechanical, and chemical attributes within individual components, deviating significantly from conventional manufacturing processes. Consequently, the conventional practice of certifying AM parts via coupon-based qualification may not always be feasible.

In this presentation, we will provide an overview of current qualification techniques relying on extensive testing. Furthermore, we will explore emerging methodologies incorporating in-situ monitoring, computational modeling, machine learning, and artificial intelligence. We will illustrate the application of these methodologies through case studies involving the qualification of metallic components manufactured via AM for both energy and aerospace applications.