

# **Generating Virtual and Synthetic Ultrasonic Data Sets to Improve Training, Reliability, and Qualifications in NDE**

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The modern nondestructive evaluation (NDE) workforce depends upon ongoing training and qualification opportunities to maintain effectiveness and proficiency for safe operation of the nuclear power plant fleet. Currently, the industry invests heavily in procuring and developing a library of physical mockups containing realistic implanted defects, but such specimens are expensive and so relatively few are fabricated. The EPRI synthetic and virtual mockup project was established in 2013 to support the energy industry by providing a means to electronically generate an array of mockup datasets by modification of existing datasets and synthesis of new datasets. This capability can allow for a diverse library of virtual mockups to be configured and designed for training and demonstration purposes, at a potentially great saving of cost and time. This project has already served six international partners and collaborators for EPRI. We present an overview of the current state of this research activity with some examples of the modification process and its capabilities and potential, involving both virtual flaws and synthetic flaws. In partnership with Trueflaw from Finland, we will present on the state-of-the-art technologies being applied to synthetic data generation using advanced AI / ML models. It is envisioned that through this research, tools and services will be available to industry to generate datasets with virtual flaws in certain configurations to be used in various training, testing, and qualification-based scenarios.