

	Description	Defining activities	TRL achieved when
TRL 1	Basic principles observed and reported: Transition from scientific research to applied research.	Basic scientific principles observed. Research Hypothesis formulated. Scientific background and rationale for the research. Fundamental scientific investigation within an academic environment.	Potential outcomes and use of research is defined (e.g. clear elevator pitch).
TRL 2	Technology concept and/or application formulated: Applied research. Theory and scientific principles are focused on specific application area to define the concept.	Applied scientific investigation within an academic environment. Preparation for technology needs (market dependant). Analytical techniques to test reproducibility of research. Practical concepts or applications are formulated, markets identified. Patent applications filed to protect invention. Basic process/product specifications drawn up.	The relevance of the research to an application has been proven. The value of the technology to a customer is defined.
TRL 3	Analytical and experimental critical function and/or characteristic proof-of concept: Proof of concept and demonstration of technical feasibility	Technology development within an academic environment.. Demonstrate reproducibility of technique and or technology Analytical studies to predict the performance of separate elements of the technology in appropriate context. Patent applications filed to protect invention. Preliminary techno-economic modelling. Explore commercial partnerships or collaboration opportunities. Data collection in line with industry expectations e.g. electronic lab books, analytical equipment records.	The technology concept has been proven but process components have not been integrated. The value of the technology to a customer is confirmed (e.g. market need and opportunity).
TRL 4	Component/subsystem validation in laboratory environment	Technology development within an industrial (or industry simulated) environment Bench scale validation. Basic technological components are integrated to provide evidence that the concept will work. Build data on reproducibility of process. Implementation of GLP processes. Understand the impact of the regulatory impact on the process. Scale up issues understood and mitigation plans developed. Initial techno-economic analysis using process data. Market analysis performed.	The technology concept has been proven with basic component integration. An investment case to attract private investment has been developed.
TRL 5	System/subsystem/component validation in relevant environment:	Technology development within an industrial environment (technology transferred to commercial partner and undertaken by their staff to test robustness of science and process). Basic technological components are integrated with reasonably realistic supporting elements. End to end process validation to provide evidence that the concept will work. Pilot scale experimentation. Detailed techno-economic analysis. Detailed market analysis performed.	The technology transferred to an industrial environment. An refined investment case to attract private investment has been developed.