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Smart Manufacturing Resiliency Tech Hub

Response to CHIPS and Science Act

Notice of Funding Opportunity (NOFO)

Executive Summary

The City of Haverhill is developing a new Advanced Manufacturing Business Park, a new Life Sciences/Food Tech Innovation Center downtown and expanding its Ward Hill Business Park, already home to many manufacturers. To jumpstart these developments and to catalyze innovation in the Merrimack Valley Region, Haverhill is developing a regional Smart Manufacturing Resiliency (SMR) Tech Hub spearheaded by a model smart factory. The Tech Hub will apply leading edge technologies for automation and supply-chain resilience, such as artificial intelligence, big data analytics, Internet of Things (IoT,) robotics, 3D printing, cloud and edge computing, etc. for research, commercialization, new product and service development, and workforce training by a consortium of industry, colleges, and government partners. The Advanced Manufacturing (ex. Semiconductor), Life Sciences and emerging Climate Technology industries are the key targets for economic development. These inter-related industries are projected to be key to local, regional, and national economic development in the next decade.

A broad public, private partnership (PPP,) or consortium, is being organized to co-develop, operate, and maintain the Tech Hub capability. A steering committee has been established. The region has the startup, industry, academic institutions, and government agencies to support the Tech Hub, in addition to potential national and global partners. The CHIPS and Science Act's Tech Hub NOFO is the first funding opportunity for the Tech Hub. This Executive Summary is in preparation for response to the NOFO.

The Merrimack Valley region is comprised of many underserved Gateway cities, including Haverhill, Methuen, Lawrence and Lowell in need of equity for workforce training and jobs, which is a major driver for the SMR Tech Hub proposal.

This SMR Tech Hub initiative is the key topic for the "Summit on Smart Manufacturing Resiliency" on June 16th at Northern Essex Community College: <https://whav.net/2023/05/11/smart-manufacturing-resiliency-summit-next-month-sets-stage-for-future-haverhill-tech-hub/>. Expansion and organization of partnerships for the SMR Tech Hub proposal are major objectives for the Summit.

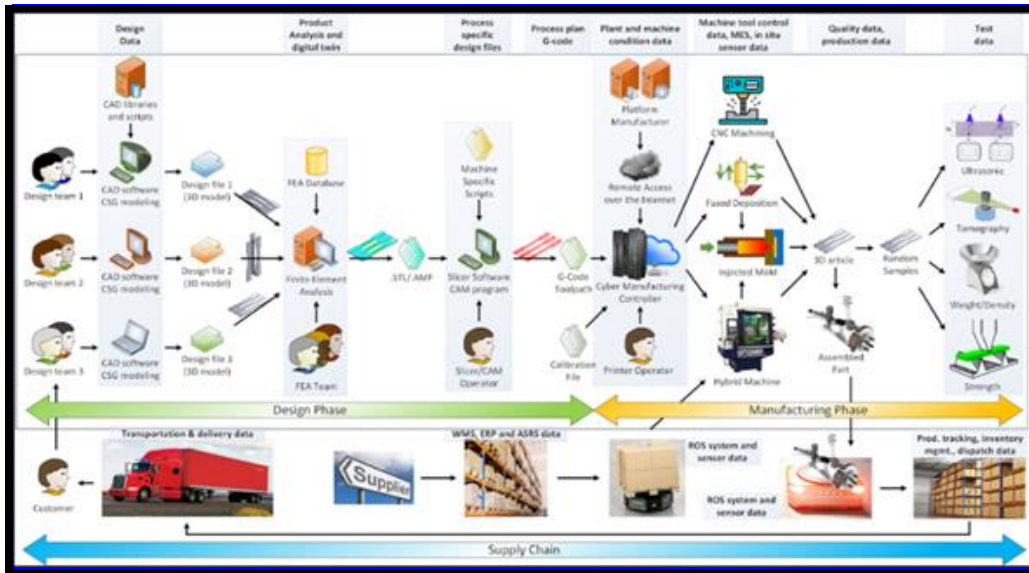
Three key elements of the SMR Tech Hub are summarized below that together create a national reference model for regional economic development, national security, and education:

- Technology Basis for SMR Tech Hub (For Techies!)
- Scalable Model Smart Factory
- Equitable Advanced Manufacturing Workforce Development Feeder System.

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Technology Basis for SMR Tech Hub (For Techies!)

The key technology basis for the SMR Tech Hub is to mature and scale the end-to-end digital thread for design, production, and supply chain, as shown below, for research, commercialization, and workforce training by establishing a Model Smart Factory.



Notional Digital Thread (Source: NYU Center for Cyber Security)

<https://amm.mitre.org/wp-content/uploads/2022/10/Ramesh-KarriMITRETalkOctober2022-1.pdf>

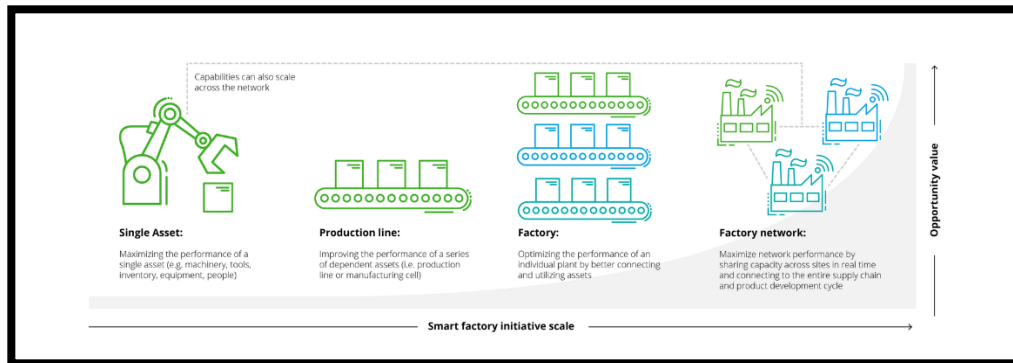
Three example strategies will be addressed:

- Optimize and scale end-to-end design, production and supply chain virtualization including maintenance automation to support timely replacement of parts for manufacturing machinery <https://www.nasdaq.com/articles/how-3d-printing-can-help-relieve-the-semiconductor-chip-shortage>.
- Address and mature Advanced Manufacturing (AM) trust factors for the end-to-end digital thread, which are key barriers to AM adoption for small and medium-sized manufacturers (SMMs), including end-to-end production process, standards, cyber security, test and certification, workforce development, and streamlined contracting <https://amm.mitre.org>.
- Leverage President Biden's Additive Manufacturing Forward Initiative; <https://amm.mitre.org/wp-content/uploads/2022/10/Orringer-ASTROA-AM-TRUST-SHOWCASE.pdf> to help advance hybrid and additive manufacturing for SMMs to produce parts and provide parts/replacements for production machinery.

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Scalable Model Smart Factory

A Model Smart Factory, as illustrated below, will be iteratively developed, and applied for startups and vendors to develop and test new products and services to advance and scale the digital thread, as well as facilitate workforce training for the Advanced Manufacturing, Life Sciences and Climate Technology industries.



Scalable Model Smart Factory Concept (Deloitte)

<https://www2.deloitte.com/us/en/pages/consulting/solutions/the-smart-factory.html>

Equitable Advanced Manufacturing Workforce Development Feeder System

The Model Smart Factory will also be used for equitable hands-on training for leading edge technologies for Advanced Manufacturing. Haverhill is in the process of developing an end-to-end Advanced Manufacturing Workforce Feeder System as shown below. It is envisioned that the Model Smart Factory will be iteratively developed to always be on the leading edge for workforce training for SMR Tech Hub consortium members and the broader community.

