Cybersecurity on US Manufacturing and Supply Chains

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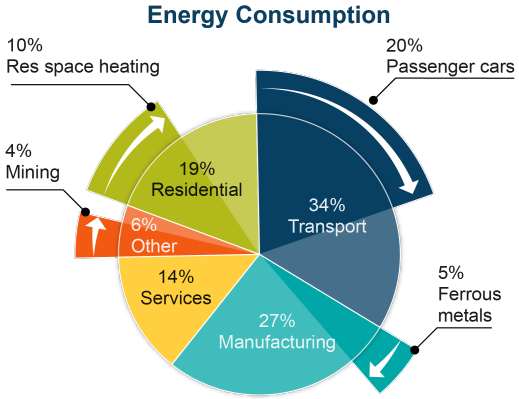
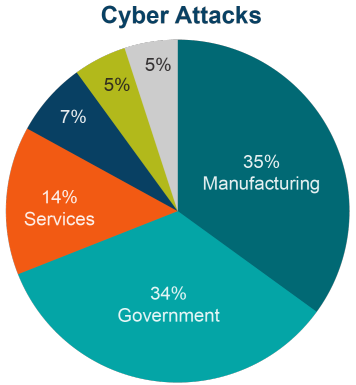
VOLGENAU SCHOOL MASON ENGINEERING

Where Innovation Is Tradition

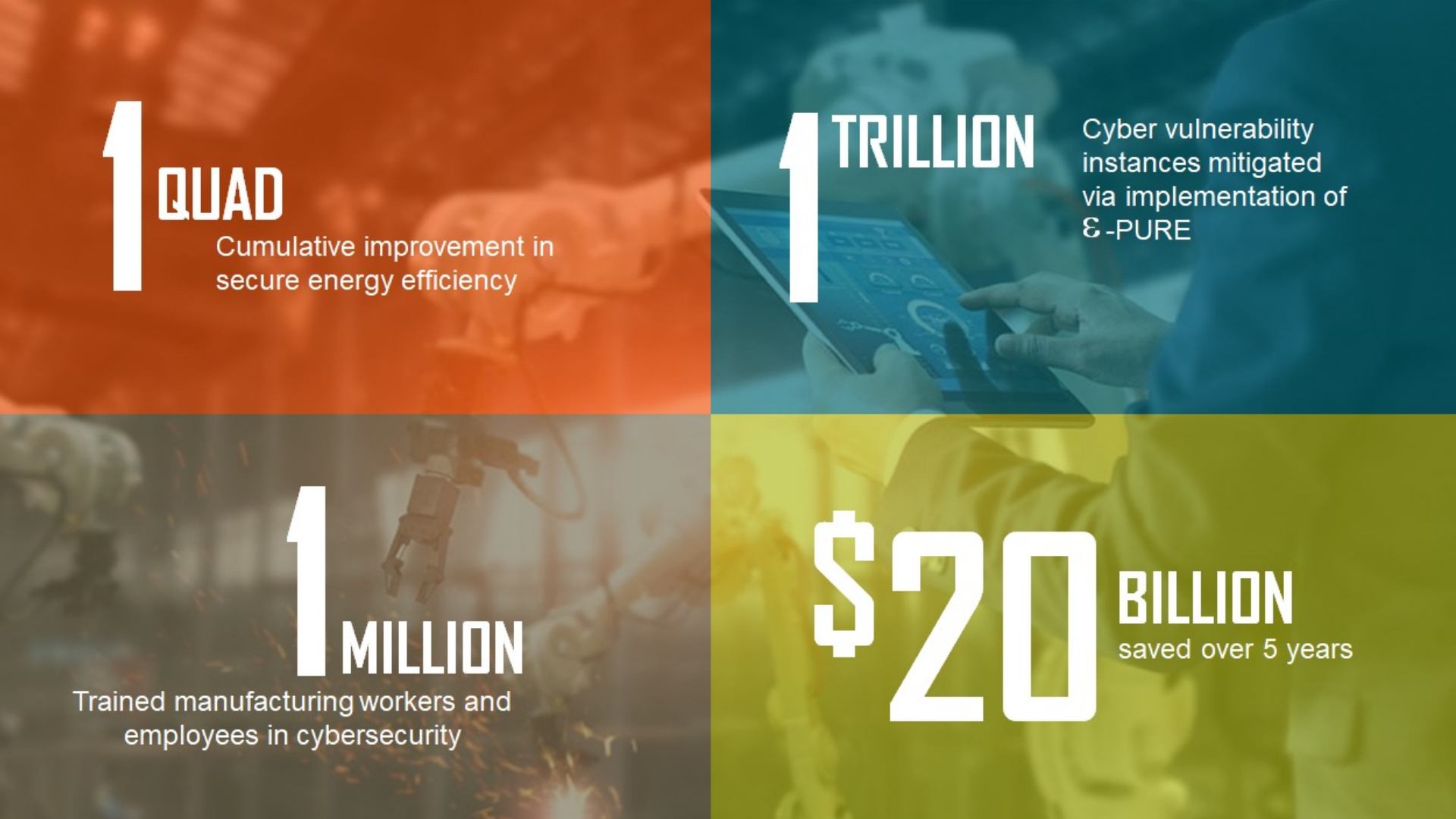
The Challenge

- Digital Transformation is here, and it must be secured
  - We create new, and enlarge existing, cyber attack surfaces
- Energy use is a major factor in manufacturing!
  - Case study: aluminum engine block production
  - 7.5M kW-hr/year (machining alone)
  - Digitalizing this machining process saves
    - Path optimization: 0.75M kW-hr/year
    - Vibration minimization: 1.875M kW-hr/year





27% OF US ENERGY COMSUMPTION – 34% OF ALL CYBER ATTACKS

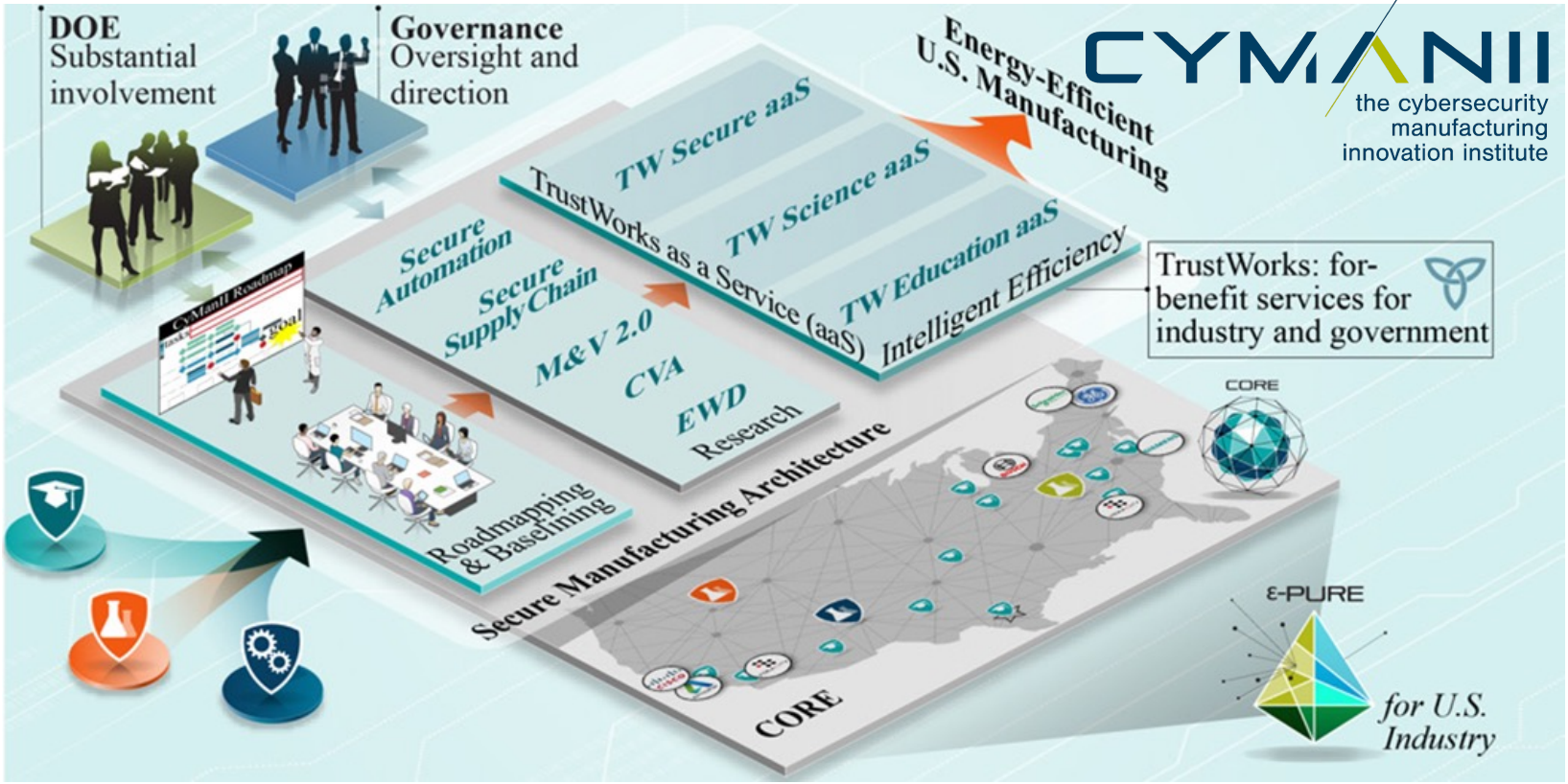

1 QUAD
Cumulative improvement in secure energy efficiency
1 TRILLION
Cyber vulnerability instances mitigated via implementation of ε-PURE
1 MILLION
Trained manufacturing workers and employees in cybersecurity
$20 BILLION
saved over 5 years

The CyManII partnership ecosystem is currently comprised of 59 proposed members including three Department of Energy National Laboratories (Idaho National Laboratory, Oak Ridge National Laboratory, and Sandia National Laboratories), four Manufacturing Innovation Institutes, 24 powerhouse universities, 18 industry leaders, and 10 nonprofits.

- We are a managing partner, responsible for the ***CyManII East Coast Headquarters*** *providing access to 4000 SF new lab space*, and a permanent member of the Governing Board
- Mason's significant track record and expertise in cybersecurity positioned us for a leadership role
- Opportunity to build our facilities and research in Advanced Manufacturing
- CyManII places Mason on the map of the DOE research ecosystem

UTSA's National Security Collaboration Center is home to CyManII headquarters with 5,000 ft^2 of office space

Concept of Operations



Measuring Impact

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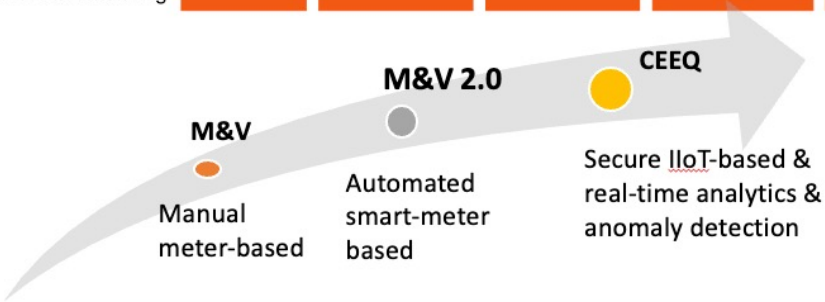
1 QUAD ■ $20 BILLION ■ 1 TRILLION ■ 1 MILLION

Sectors →	Clean Energy	Semi-Conductor	Equipment Manufacturing	Petroleum Refining	Iron/Steel	Forest Products	Ag. Food	Cement	Total	
Energy Consumption	1Q	0.09Q	0.17Q	4.17Q	1.21Q	2.47Q	1.15Q	0.30Q	10.56Q/yr	
EE Improvement from Secure SM	0.25Q	0.02Q	0.04Q	1.04Q	0.30Q	0.62Q	0.29Q	0.08Q	2.64Q/yr	*25% EE Imp.[1] 15% SA[2] 10% SCN
% Market Penetration	15%	10%	15%	8%	10%	5%	5%	3%	9% avg.	
Intelligent Efficiency from Secure Manufacturing	0.038Q	0.002Q	0.006Q	0.083Q	0.030Q	0.031Q	0.015Q	0.002Q	0.21Q/yr	X 5 yrs = 1Q



Intelligent Efficiency is the additional energy efficiency that is possible through cyber tools coupled with IIoT devices.

ε-PURE

SECURE SMART MANUFACTURING LEADING TO 1Q IN INTELLIGENT EFFICIENCY

[1]ACEEE Report IE1701. Rogers & Junga (2017) *Intelligent Efficiency Technology and Market Assessment*.
[2] Granderson, J. and Fernandes, S, 2017. State of the Advanced Measurement and Verification Technology and Industry Application. The Electricity Journal, 30, 8-16

Cyber-Informed ROI

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Transform from cyber "cost center" to enabling-ROI

- Production, Quality, Profit margin, Differentiating US advantage
- Directly relates to Energy & Emissions challenges (future ROI)