Future Opportunities in Infrastructure Sensing Research:

Collaboration is Key to Innovation

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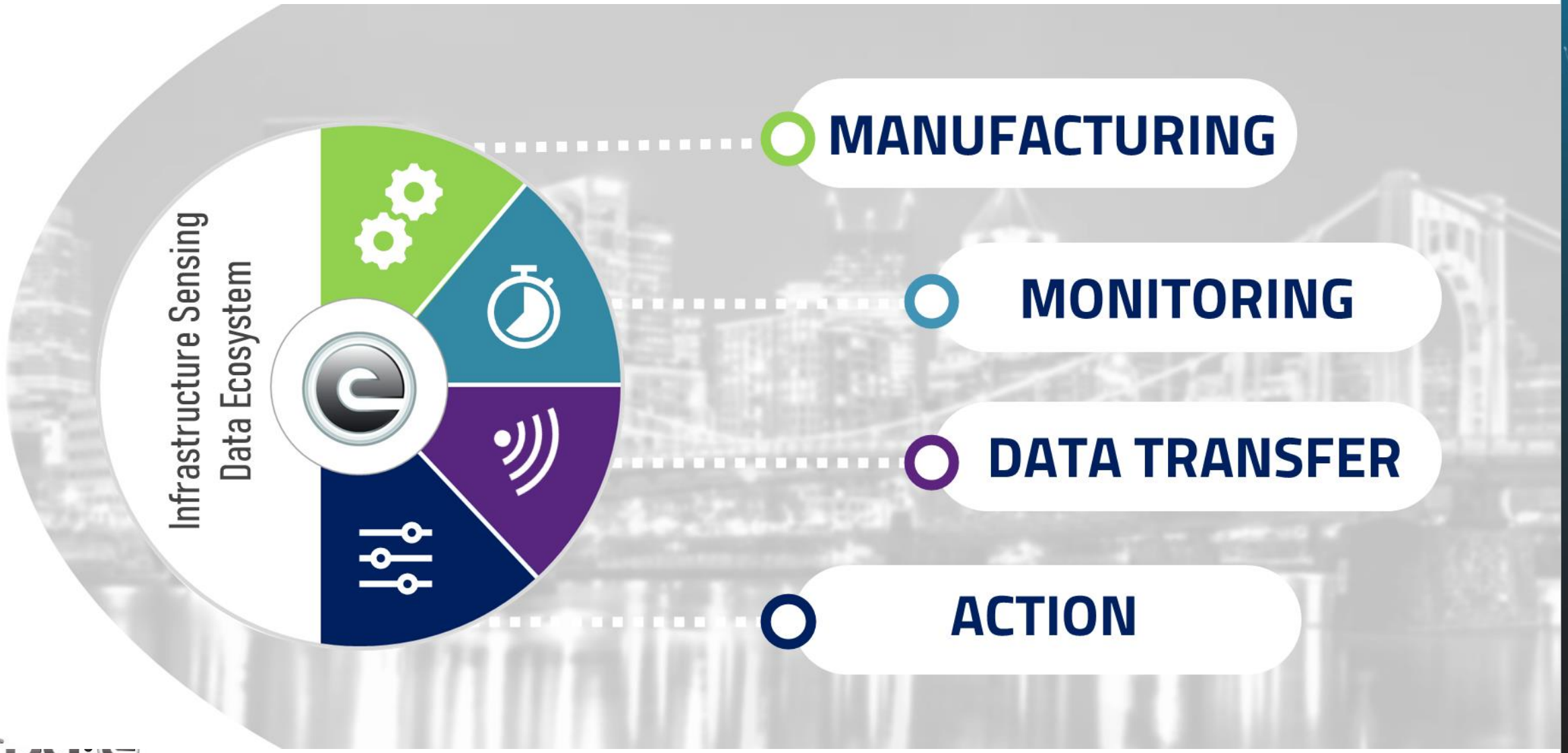
Program Director

ARPA-E

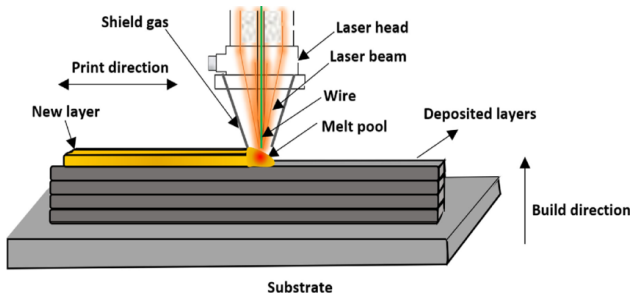
Opportunities for Infrastructure Sensing Research:



MANUFACTURING

In Situ Fabrication

Real-Time Inspection & Rework for Improved Quality Control



Re-Manufacturing

Nondestructive Inspection to Enable Reuse & Rework

Design For Inspection

Sensor Integration to Extend Infrastructure Lifetime

Source: Mbodji et al, *Welding in the World,* Dec. 2022

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MONITORING

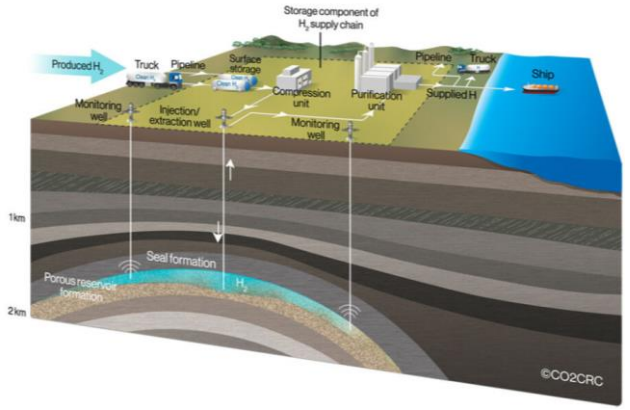
Extreme Environments

Reliability is Essential to Enable New Energy Modes:

Hydrogen Transport & Storage, Nuclear, Thermal Storage, Geothermal, Geological Hydrogen, Etc.

Remote Monitoring

Robust Sensing Strategies for Subterranean & Isolated Areas



Macro-Scale Integration

Multiple Data Sources to Enable System-Level Monitoring

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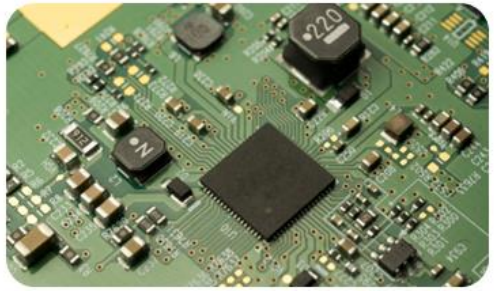
DATA TRANSFER

Extreme Environments

Materials Innovations Required to Enable Reliable Data Transfer



Data Security

Critical for Nuclear, Electrical Grid, Transportation, Etc.

Energy Efficiency

Considerations for Power Supply and Power Consumption

ACTION

Adaptive Control

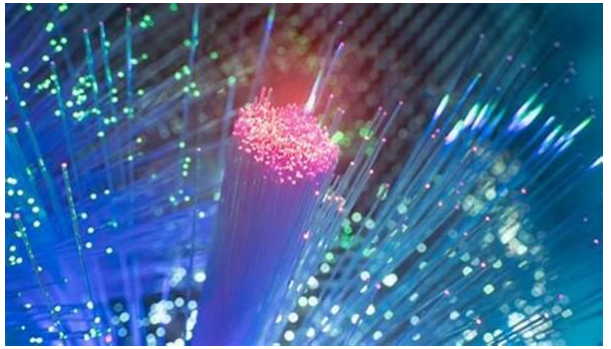
Real-Time Adjustment of Process Control & Measurement Strategy

System-Level Analysis

Data to Inform Machine Learning & Modeling Tools

Integrated Computing

Optical Sensing + Optical Computing for Improved Response



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