UPISC UNIVERSITY OF PITTSBURGH INFRASTRUCTURE SENSING
COLLABORATION WORKSHOP

NATIONAL ENERGY TECHNOLOGY LABORATORY

Workshop Summary and Closeout Report

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UPitt Infrastructure Sensor Collaboration (UPISC)
2023 Workshop
November 8, 2023

City of Pittsburgh Infrastructure Sensing Needs and Road mapping

- ***Interconnected network for smart city, monitoring, and modeling***
- ***Dark fiber for sensing***
- ***Exemplary demonstration of sensor technologies***
  - Dig Once policy, as many technologies as possible
  - Sweet spot for demonstration
  - AI, Digital Twin
  - Cost analysis
  - Leverage existing best technologies for demonstration.
- ***Sensor strategy for city infrastructure to avoid high impact disruption, for example landslide***
- ***Predictive monitoring and warning of catastrophic failures***

City of Pittsburgh Infrastructure Sensing Needs and Road mapping

- ***Collaboration between the city, university, national labs, and private company.***
- ***Prioritize sensing parameters***
- ***Transformer and power grid monitoring***
- ***Engagement with stakeholders.***
- ***Data baseline collection and build the big picture.***
- ***Communication and networking, public education and knowledge***

Full-day Workshop Summary

- **National Academies Perspective on Infrastructure Sensing**
  - Need for National Academy study on Infrastructure Sensing. No existing one yet.
  - Routes to National Academy studies
- **Standardization of Sensing, Data and Analytics Across Infrastructure Segments**
  - The purpose of IEEE standards is to clarify definitions so that ambiguity in specifications can be eliminated to facilitate broad usage in a multiplicity of applications
  - Examples of IEEE standards on FBG fiber and DAS
- **Sensor technologies progress update from NETL and UPitt**
  - Significant progress made and capabilities are expanded.
  - R&D 100 award and new awarded projects

Full-day Workshop Summary

- **Hydrogen Infrastructure Sensing**
  - Broad range from hydrogen production, transportation, storage, to end users.
  - Opportunities exist in sensing for safety, environmental impact, and hydrogen product loss
  - Challenges in hydrogen emission quantification.
- **Digital Twins Applied to Infrastructure Sensing**
  - The digital twin needs to be uniquely defined and implemented for specific problems we're trying to solve.
  - Integrated digital twins allow us to know the efficacy and health of a process and of the machine. Sensors and digital twins will benefit us throughout – identifying mechanical anomalies, monitoring thermal capacity usage, status updates.

Full-day Workshop Summary

- **Electric Power Grid Sensing, Analytics, and Digital Twins**
  - Move from one-way power, communications with high latency, low bandwidth and predictable customer needs to two-way power and data with millions of connected devices, moderate latency and bandwidth, and evolving and unpredictable customer needs.
  - Distributed energy resources (DER) interconnection.
  - Integration with edge devices
- **Open Standards in Wireless Sensors**
  - Provide an overview of open standard wireless communication ecosystems
  - Discuss the differences between mesh, star, and tree networks
  - How to select the best network based on their characteristics

Full-day Workshop Summary

- **Transportation/Civil Infrastructure Sensing**
  - Safety is top priority
  - Synergy in sensor technologies between Energy and Transportation Sectors
  - Joint Office of DOE and DOT, focusing EV infrastructure
  - Collaboration and communication are key for technology demonstration and transfer
  - Smart Cities