Breakout Session #1

Success Metrics and Component Capabilities

October 10, 2019

Jack Lewnard, Program Director, ARPA-E
jack.lewnard@hg.doe.gov

Logistics

- Every attendee is assigned to a breakout group
- Each breakout group will include a representative mix of workshop participants and address the exact same topics/questions
- An ARPA-E PD will lead/moderate the discussion
- A BAH tech SETA will take summary notes (not verbatim)
- Tech SETA notetaker will readout summary during feedback session and forward summary notes to ruffin_sade@bah.com

Critical Questions To Answer

- **Breakout Session #1: Success Metrics and Component Capabilities**
  - What will be the toughest technical challenges for the system components – robots, composite materials, integrity inspection? **(45 minutes)**
  - What are various options for component testing? Integrated system testing? Please comment on accessibility, cost, capabilities, and any gaps? **(20 minutes)**
  - What is the most important criteria for the technology to be deemed successful? (10 minutes)
  - "The envisioned program has assumed a system solution involving a robot and composite material. Are there other high-risk, high-reward system solutions or components that we would miss with this construct? **(10 minutes)**

Prompts for Session #1

- What are the current technical limitations for each component (45 min)
  - Robots – how fast; how far; how flexible; max load (esp dragging tether); need for real-time control. One single train vs multiple trains
  - Coating – adhesion, max thickness per pass, cure rate, uniformity/control of coating process; viscosity/pumping pre-preg over distance, mechanical properties
  - Inspection tools – what techniques; working with dirty surface, contact vs non-contact; scan rates, precision/reproducibility, ability to resolve data in real time, ability to control tools in real time
- Integration/Testing (20)
  - Start early, many iterations; start later, find out subsystems don't fit.
  - How to set the scope/schedule/budget for integration/testing
- Success criteria (10)
  - If we can't get everything to TRL 4-5, what gets sacrificed? What attributes (robot functionality, coating performance, integrity testing robustness) are most important/least important for convincing others to use the technology or continue funding it
- What have we missed (10)
  - Open-ended. There are many internal and external pipe repair technologies (band, wraps, liners, etc). Maybe there's better ways to dig up and replace old pipes?

Day 1 Adjourn

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Breakout Session #2

Data Management/System Level Solutions

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Critical Questions To Answer

- **Breakout Session #2: Data Management/System Level Solutions**
  - What data will be needed from each of the system components - robots, inspection tools, coating equipment – to ensure **(40 minutes):**
    - Lowest-cost alternative technology
    - Minimum life >50 years
    - Regulatory approval
  - What are the challenges for making integrity testing and coating QA/QC data available real-time? **(30 mins)**
  - How can component developers and system providers collaborate to expedite commercialization of the best innovations? **(20 mins)**

Prompts for Session #2

- Data from each of the system components - robots, inspection tools, coating equipment (40 min)
  - What data is needed for control of device, what data must be preserved
  - What data needs to be shared among system components – i.e. feedback from integrity results for operating coating robot
  - How do we create a flexible platform so new tools/developments can be incorporated?
  - Should we require a common data platform?
- Real time data (30 min)
  - What are current limits on processing information
  - How should raw data be converted into information that can be used by technicians, engineers, etc
  - Who/when/how does data analytics/visualization get addressed? Each component developer creates their own system, or done by 3rd party incorporating info from all components

- How can component organizations collaborate to integrate their developments in to systems? (20 min)
  - Do researchers prefer to be exclusive within a team, or prefer to create subsystems that could be used by anyone in the program?
  - How should researchers share results among themselves, if at all? For example, if one party develops a very good coating, what's the best way to get a robotics and inspection team interested?
  - What will inhibit communications among researchers (IP issues, unclear communication channels, don't know other researchers, etc). If more open communications is desired, what can ARAP-E do to promote it?

Day 2 Adjourn

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