Focus question #1: VISION AND GOALS

- **Recovery Recycle**: Separate additive manufacturing parts & component metals to 98% purity
- **Collection**: Collect 100% of EOL products in a cost effective way
- **Design for End of Life**: Design products to achieve 100% disassembly
- **Strategic Guidance**: The impact of reuse/recycling considered in the manufacturing of 80% of all technology based products
- **Upcycling**: Develop efficient and effective systems to up-cycle 25% more waste
- **Remanufacturing**: Increase remanufacturing via advancement of technologies (e.g., estimation of remaining life of components) and processes (end of life design & material salvages)
Breakout Session 4: End of Life Product Management

Focus question #2: Challenges and Barriers

**Business Model: Cost**

- Cost of material is not the total cost of material
- Recycling cost is not included in the initial product price to consumers

**Workforce**

- Lack of an educated workforce to execute the work at all levels

**Incentives and Motivation**

- Design of end of life is absent. There is lack of incentives and drivers

**Product Design**

- Product design requirements are conflicted: Size/format vs. environmental survivability vs. cost vs. EOL

**Metrics**

- Lack of methodology to quantify environmental & social cost and benefits
- Required improvements of metrics and indicators to measure recycling efficiency

**Technology- Separation**

- Lack of rapid separation / ID of materials
- Lack of infrastructure & efficient technology to collect, separate and recover materials & mix metals

**Knowledge**

- Lack of awareness and information about product attributes, such as composition, remanufacturability, recyclability, markets, etc
- Lack of infrastructure for collection and separation

**Ecosystem**

- Immature ecosystem of engagement between EOL products and remanufacturers/recyclers
- Lack of information sharing mechanism between manufactures and EOL management companies
Breakout Session 4: End of Life Product Management

Focus question: R&D Needs & Focus area

**Business Model / Incentives and Motivation**

- **R&D Needs:** Conduct analysis / assessment of end-of-life value
- **R&D Focus Area:** Valuing the fully burdened cost/recycling costs into the product cost

**Product Design**

- **R&D Needs:** Develop design tools that integrate EOL considerations
- **R&D Focus Area:** Integrated design tools addressing EOL options

**Metrics**

- **R&D Needs:** A recycling metric that measure the environmental benefits of recycling different materials
- **R&D Focus Area:** Simple & accepted metrics for the recycling of complex products

**Technology-Separation**

- **R&D Needs:** Ability to separate heterogeneous / multi-component materials? Identify requirements for cost, energy usage, etc
- **R&D Focus Area:** Identification and Separation of EOL Products for Recycling

**Knowledge**

- **R&D Needs:** Additional awareness and information about product attributes, such as composition, remanufacturability, recyclability, markets, etc
- **R&D Focus Area:** Forum to facilitate stakeholder discussion and improve flow of information between stakeholder
Focus question #2: Challenges and Barriers

**Business Model: Cost**
- Cost of material is not the total cost of material
- Recycling cost if not included in the initial product price to consumers

**Workforce**
- Having an educated workforce to execute the work at all levels

**Incentives and Motivation**
- Design of end of life is absent. There is lack of incentives and drivers

**Product Design**
- Design conflict. Size/format vs. environmental survivability vs. cost vs. EOL

**Metrics**
- Lack of methodology to quantify environmental & social cost and benefits
- Improved metrics and indicators to measure recycling efficiency

**Technology- Separation**
- Rapid separation / ID of materials
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**Knowledge**
- Lack of awareness and information about product attributes, such as composition, manufacturability, recyclability, markets, etc
- Lack of infrastructure for collection and separation

**Ecosystem**
- Immature ecosystem of engagement between EOL products and remanufacturers/recyclers
- Lack of information sharing mechanism between manufactures and EOL management companies

**Funding**
- Lack of funding for developing recycling /processes. Current mode of offshore recycling is motivating foreign countries to increase R&D on recycling /processes