R&D needs & opportunities: 3 framing questions

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1. What should R&D seek to accomplish?

• More and more-diversified production
  • Better geoscience
  • Better mining, mineral processing and extractive metallurgy (lower cost, less polluting, less energy intensive)

• Less waste
  • Increased manufacturing efficiency
  • Enhanced recycling and re-use

• Development of substitute materials
  • . . . that take advantage of materials that are less prone to supply-chain risks
2. What are the big challenges?

- Overarching
  - Anticipating which materials may go critical
  - Increasing the speed of discovery, innovation & deployment
- More specific
  - Unlocking unconventional resources
  - Selective separations
  - More-direct processing paths for converting ore and intermediate products into high-value forms that are closer to final-application use
3. What stages of R&D should government fund?

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   • Less waste
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2. What are the big challenges?
   • Unlocking unconventional resources
   • Selective separations
   • More-direct processing paths for converting ore and intermediate products into high-value forms that are closer to final-application use

3. What stages of R&D should government fund?
   • A key question – pilot/demonstration plants, mid-TRL work?