U.S. DEPARTMENT OF ENERGY

Energy Workforce and Training Needs for the Clean Energy Economy

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Betony Jones, Director of the Office of Energy Jobs

Gene Rodrigues, Assistant Secretary for Electricity

Dr. Michael Goff, Principal Deputy Assistant Secretary of the Office of Nuclear Energy

Agenda

Overview of Energy Workforce Needs

Deep Dive: Electricity

Deep Dive: Nuclear

Discussion

U.S. DEPARTMENT OF ENERGY

Workforce Challenges and Opportunities

- Changing energy system: carbon-free, secure, resilient, equitable, geographic shifts/decentralized
- Changing DOE: R&D → +Deployment
- Increased demand for workers: from IIA Agenda
- Ability of energy sector to compete for workers
- Diversity, equity, inclusion and accessibility

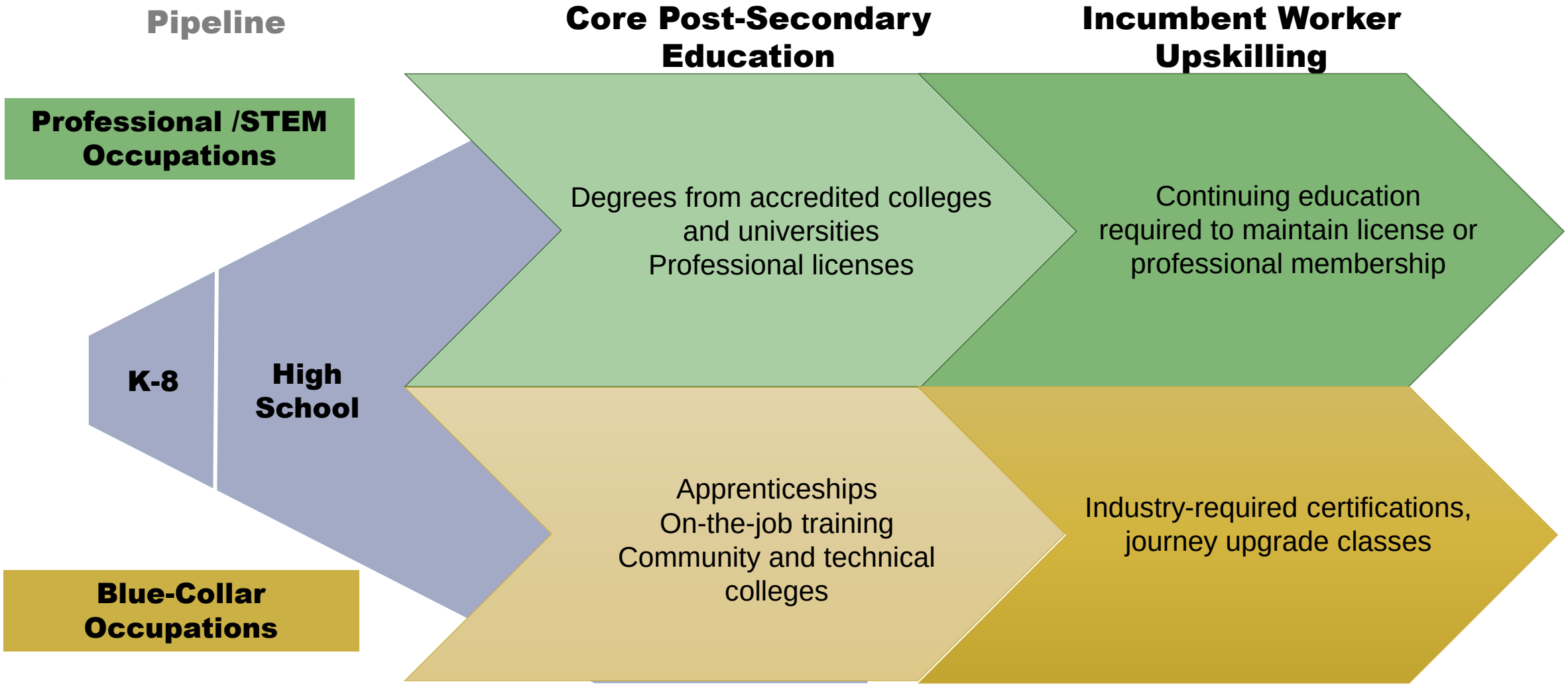
Who is the Clean Energy Workforce?

Historic Focus
Research & Innovation

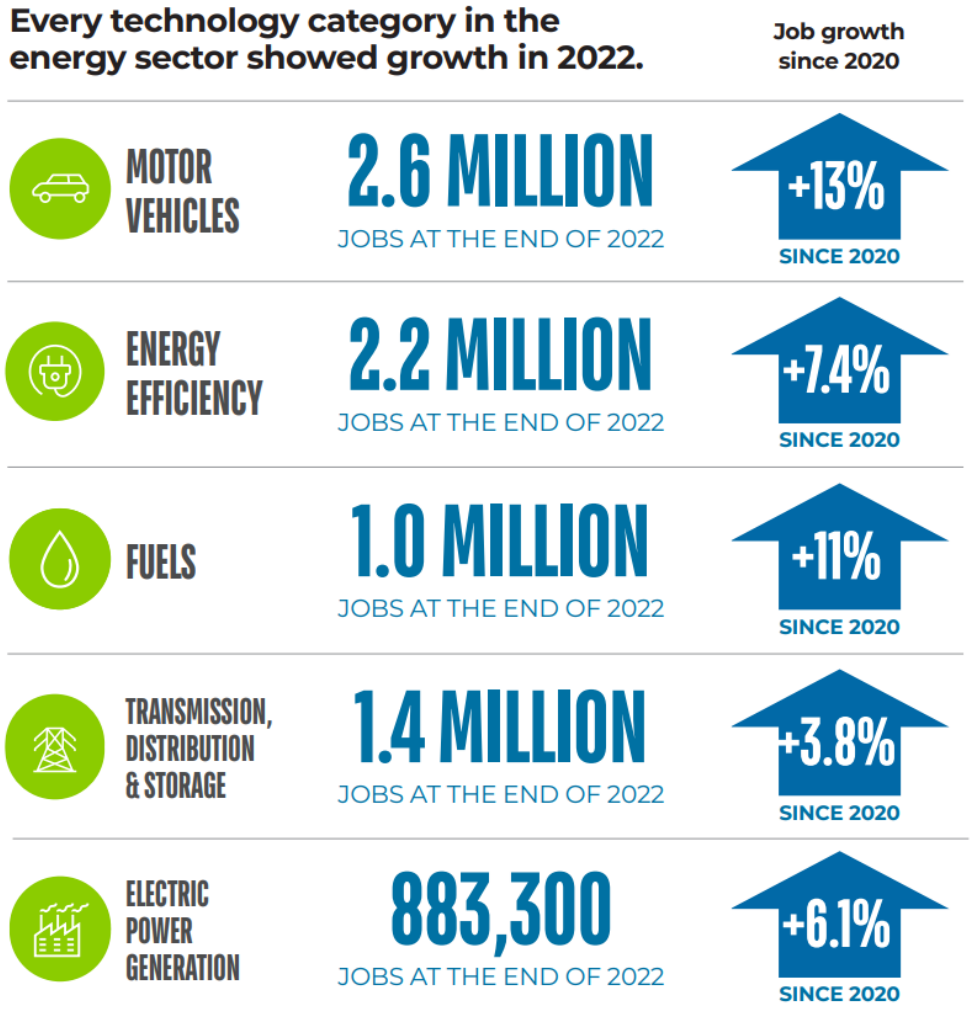
BIL + IRA
Demonstration & Deployment

Occupations	Research & Development	Design & Engineering	Construction, Installation & Repairs, Operations & Maintenance, Manufacturing	Sales, Service, Program Administration, Finance, Marketing, Education
				
Training	4-year or advanced degree, professional license		Technical degree, Apprenticeship, Certification	4-year or advanced degree, professional license

Energy Workforce Training Pathways



2023 USEER: 8.1 M Workers and growing



Other Workforce Trends

- Employers anticipate continued growth and report difficulty hiring.
- Unionized firms report lower difficulty hiring, particularly in construction where their investments in apprenticeship training provide a steady pipeline of skilled workers
- Women and Black/African America workers are under-represented
- Unionized firms are much more likely to have formal DEIA plans

Working Principles

- Job quality is key: workers migrate to good jobs
- Need to support business models that value skilled workers
- Need to calibrate workforce education and training to demand for workers
- Need to develop training responsive to the skill requirements of the industry.
- Need to target DOE's workforce efforts and work strategically with broader workforce development system
- An engaged skilled workforce is fundamental to success

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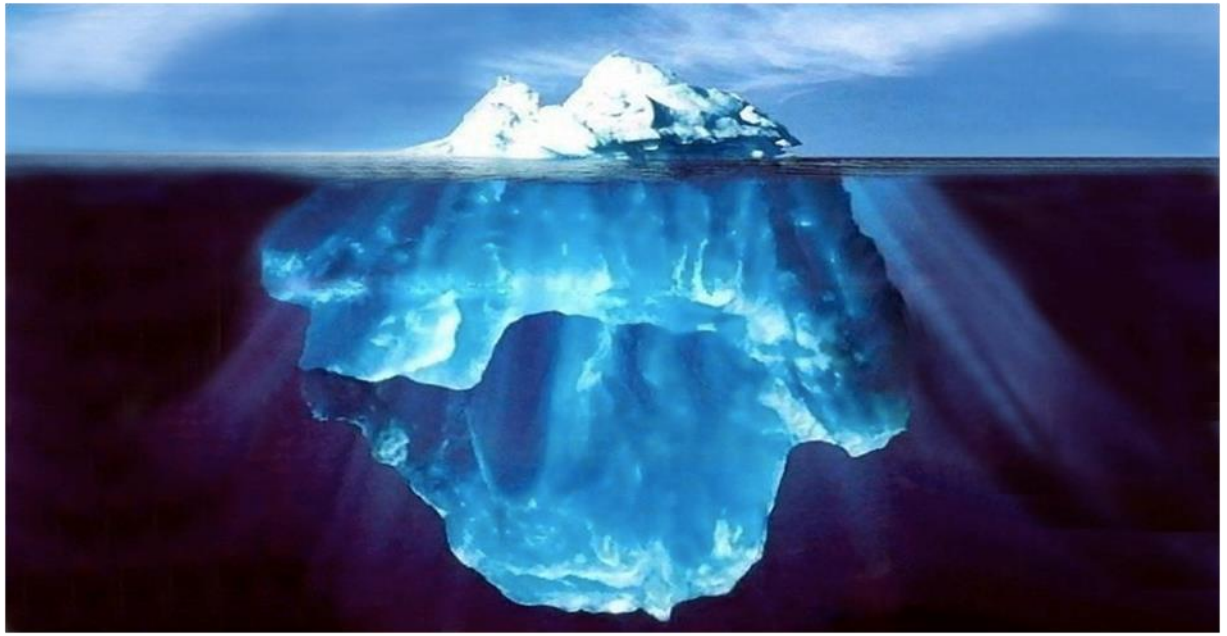
Tip of the Iceberg

- The labor challenges and opportunities we are experiencing today are early effects of a global transition to a clean energy economy



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What We are Seeing

- Distribution Transformers: Availability of skilled labor not keeping pace with increase in demand
- Transmission Build-Out and Reconductoring: Gaps in technical expertise and experience slowing the pace of adoption
- Energy Storage & Microgrid Development/Operation: New technologies and practices require the development of new skill sets

What We are Doing

- Convening Public/Private Sector Stakeholders
  - Example: USG Power Sector-Manufacturing Sector Convening/Sub-group on Transformer Standardization
- Providing Multidisciplinary Technical Assistance that Meets the Moment
  - Example: LANL's Grid Science Winter School
- Developing Local Expertise and Capacity
  - Example: Microgrids for Rural, Remote, and Indigenous Communities / Energy Storage for Social Equity

Office of Nuclear Energy

Nuclear Energy Workforce Facts/Figures

- ~ 100,000 direct employment by nuclear industry, highly paid and unionized
- 500-800 permanent jobs per nuclear power plant
- **Skilled trades**: carpenters, electricians, heavy equipment operators, pipefitter, sheet metal workers, welders, mechanics, project managers
- **Professional**: accountants, cybersecurity specialist, communications, health physicist, legal, policy analyst, financial managers
- **Engineering and technicians**: chemist, engineers (all disciplines), radiation protection specialist, safety and environmental specialist, security

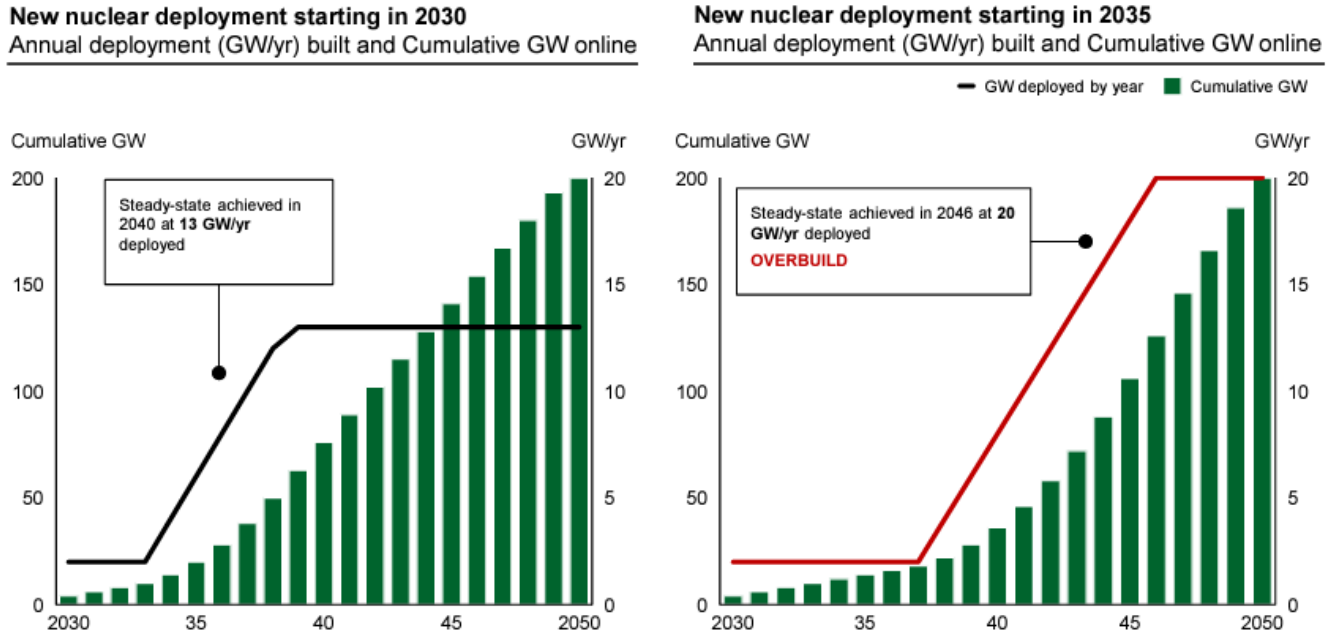
January 2021, Georgia Power

- 9,000 workers at peak construction of Units 3 and 4 at the Alvin W. Vogtle Electric Generating Plant (Waynesboro, GA)
- 800 permanent jobs once fully operational

Pathways to Commercial Liftoff: Advanced Nuclear

Key Jobs Finding: ~375,000 additional workers with technical and non-technical backgrounds needed to support the deployment and operation of 200 GW of new nuclear by 2050

- **By 2030:** ~50,000 additional workers would be required for construction and manufacturing
- **By 2050:** ~100,000 additional workers would be required for new nuclear plant operations in addition to ~275,000 required for construction and manufacturing



New nuclear build-out scenarios and implications for industrial base capacity requirements.

Near-term Nuclear Energy Workforce Needs

Workforce for BIL-funded Advanced Reactor Demonstration Projects

- **X-energy Xe-100 (Dow facility, TX):** ~1200 construction-related jobs and 96 jobs for plant operations
- **TerraPower Natrium (Kemmerer, WY**): ~ 1300 construction-related jobs and 260 jobs for plant operations

Workforce to Advance Nuclear Energy RD&D at Idaho National Laboratory (INL)

- ~2800 new employees needed in the next five years
- 600+ for engineering
- 750+ in technical and skilled trades

Supporting the expected advanced nuclear build out to meet our climate objectives will require a significant increase in all workforce areas, technical, construction, engineering, professional, and skill trades