Nuclear Fabrication Supply Chain

The American Nuclear Energy Revival Briefing Series

- Building the Supply Chain and Workforce for the New Generation

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2010 AWS Data

- Average age of the US welder: 55
- 2010 AWS study projects >170k welders before 2020
- Greater growth anticipated in emerging countries
- Training Organizations
  - Over 3000 welder training schools in U.S.
  - Many manufacturers/fabricators have their own training programs
  - Other institutions (military, prisons) also train welders

2008 EWI Survey Data

- What technical advancements would have the greatest impact on your business
  - 800 Responses from US fabricators
    1. Better NDE
    2. Technology for joining dissimilar materials
    3. Technology for joining high performance materials
    4. Real-time weld monitoring and control
    5. Improved welder training methods
    6. Integrated weld monitoring and inspection
    7. High productivity welding processes
    8. On-line access to welding data
    9. Fully automated NDE

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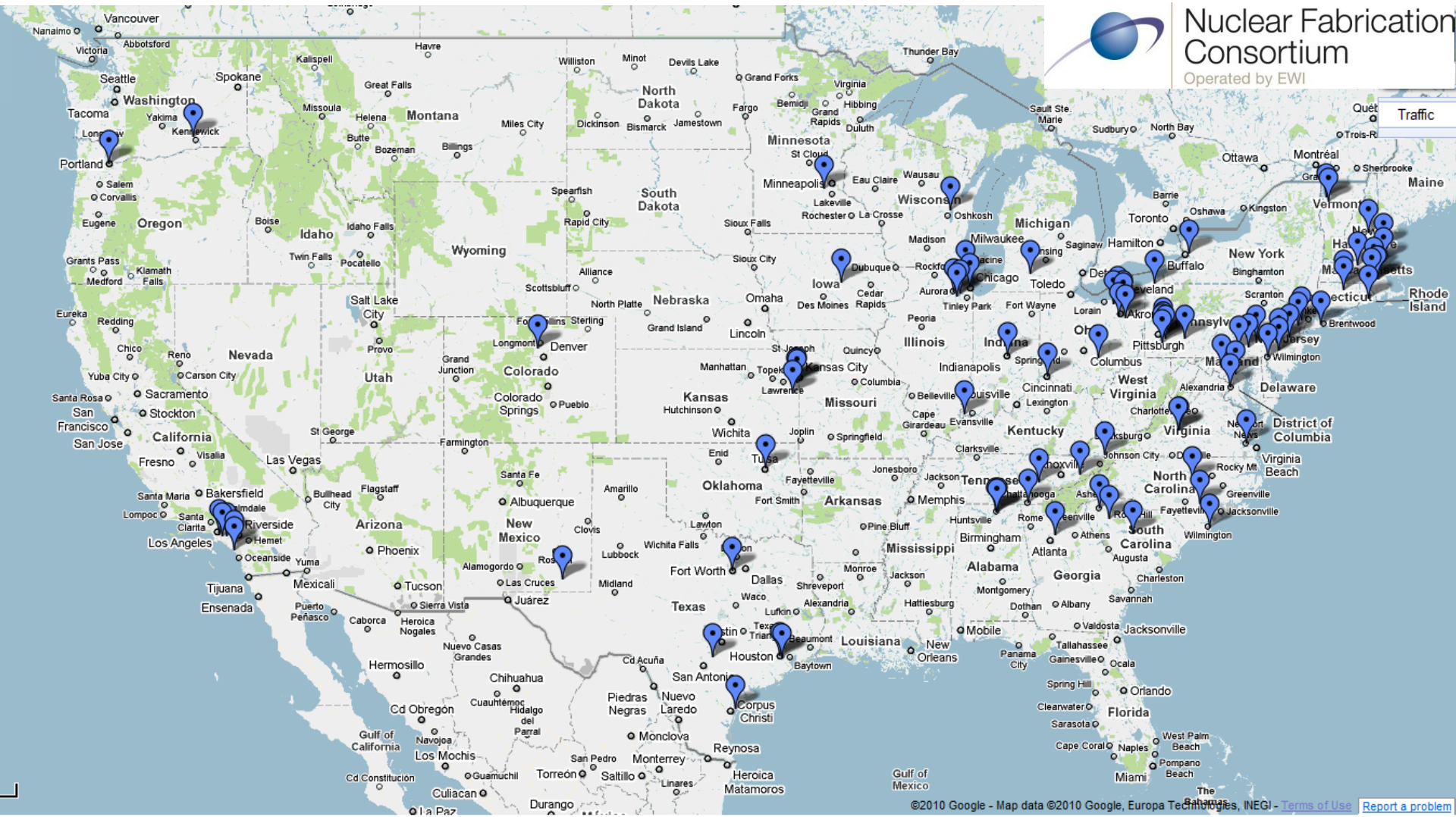
What Does Improved Welder Training Methods Mean

- Welder training programs at 2-yr colleges and vocational schools taught the same as 50 years ago
  - Holes in your shoes approach
    - Many schools operate under the premise that;
      - the only way to become a better welder is to make more welds
      - if you can stick weld, you can use any process
- Conventional programs have limited feed back and virtually no quantitative feedback
  - Results in welders that can pass the booth based qualification test
- Nuclear and similar critical shops, spend 6 to 18 months training welders after they exit a welding school

NFC & INL – June 2010

- INL and NFC set out to determine where the Nuclear Industry lands in terms of fabrication readiness
- Opted to use N-Stamp holders as the representative benchmark
- 6 Types of N-Stamps offered
  - 91 US N-Stamp holders as of July 2010
    - 75 Companies
      - NV – Pressure Relief Values (4)
      - N3 – Spent fuel & Rad waste containment (8)
      - NA – Field and shop assembly (27)
      - NS – Nuclear support (34)
      - NPT – Fabrication (82)
      - N – Piping pumps and containment (61)

Map of US N-Stamp Holders

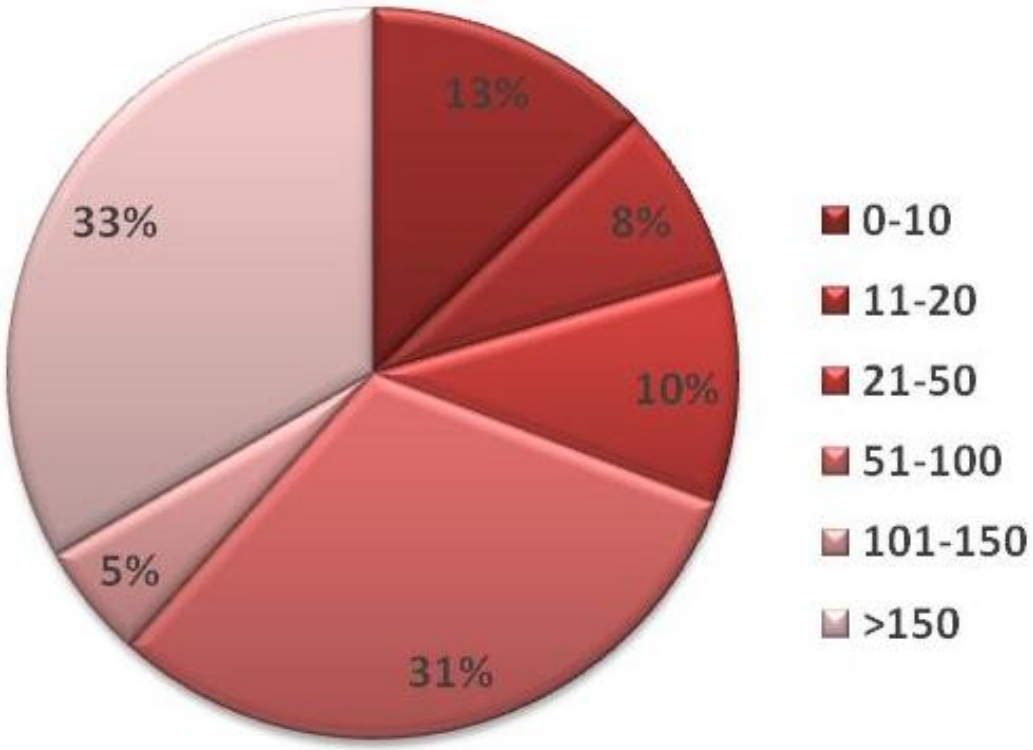


Survey of N-Stamp Holders

- Completed between July and October
  - Combination of online form with phone interviews for follow-up questions
    - Company size, certifications, needs, gaps, etc
  - Goal was to determine what the nuclear supplier base felt was important for fabrication related training

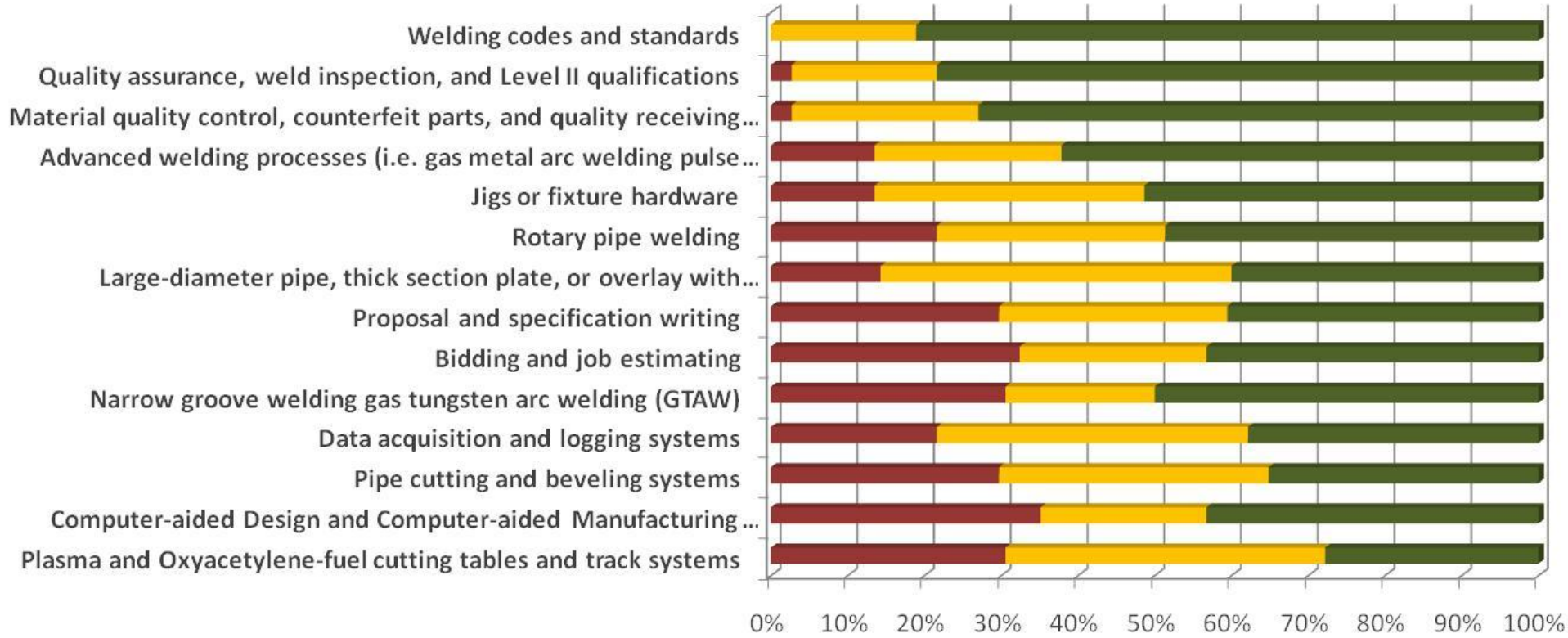
Selected Survey Responses

- How many welders and related personnel (inspection, quality, etc) does your company employ?



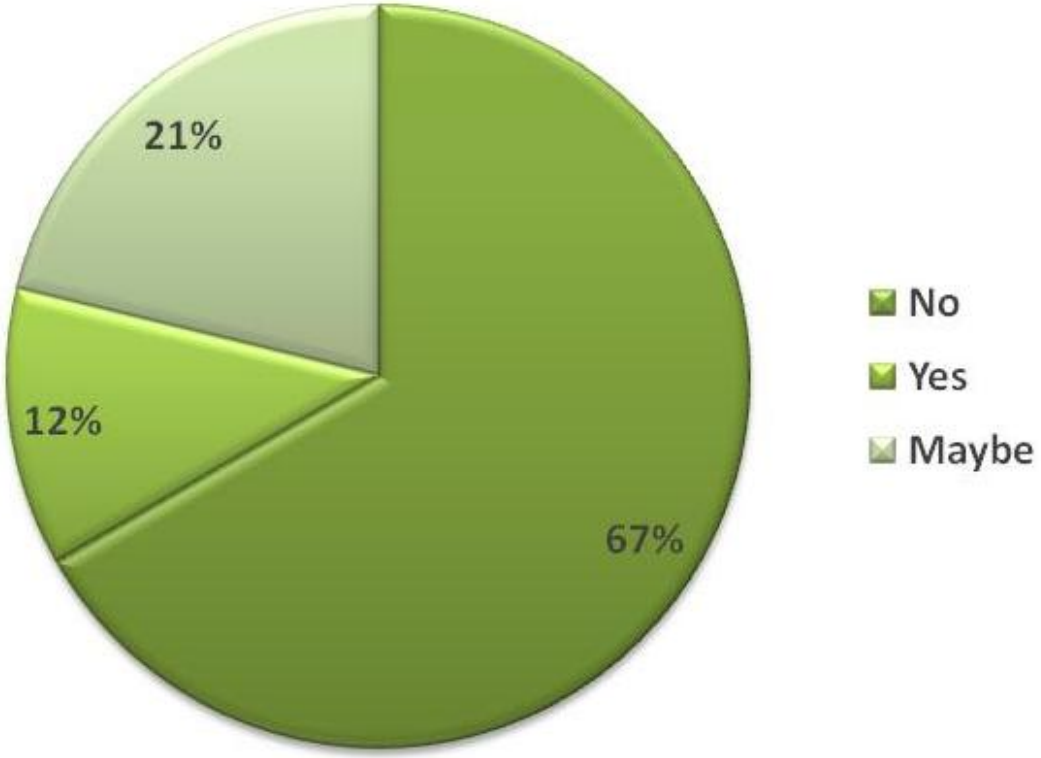
Selected Survey Responses

- How important is having welders trained in _____ to your companies success
  - Little importance→Mildly important→Critically important



Selected Survey Responses

- If the domestic nuclear renaissance were to take off, would your company have enough skilled welding related workforce?



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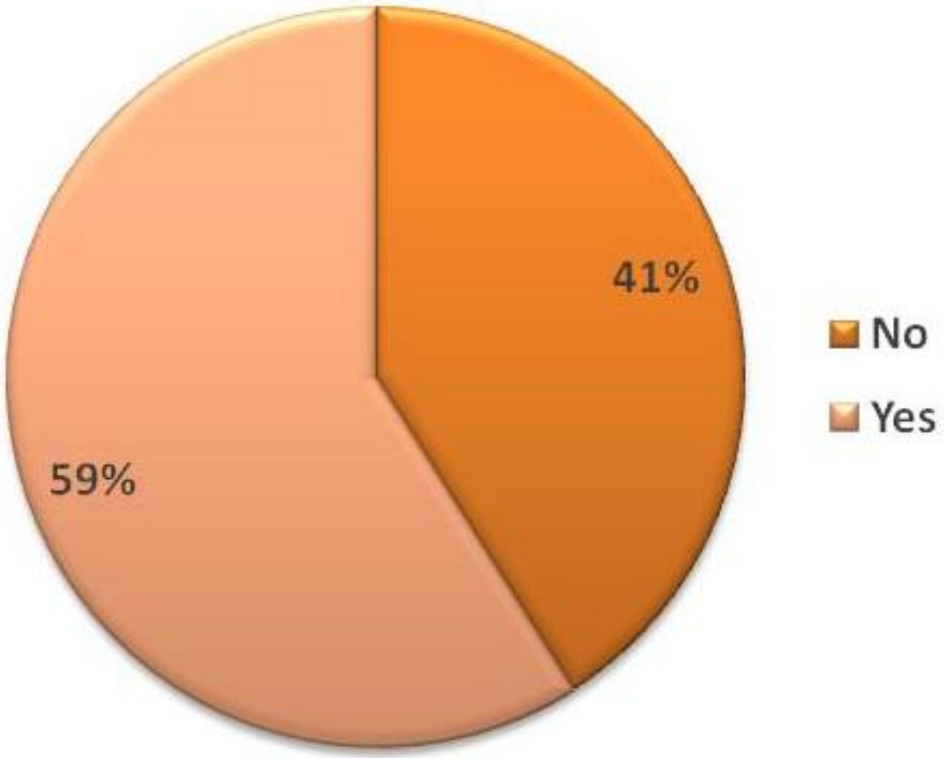
Selected Survey Responses

- Does your company currently conduct welder skill development training onsite?



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What does this mean

- It's likely not a coincidence that 59% of N-Stamp holders said they have internal, custom welder training programs and 67% said we aren't ready
  - Good companies take action to prepare for the future
- It is also our good fortune that Nuclear suppliers are suppliers to other markets
  - They have to stay competitive in other fabrication technologies for non-nuclear projects

Problem with Data

- Data collected was based on where we are today, not where we could be
  - Welders are trained mostly with SMAW and GMAW at vocational schools
  - Most AE firms require GTAW for critical nuclear components
  - GTAW is one of, if not the, slowest fusion welding processes
    - But it has 70 years of validated high quality production welds under its belt

NFC Core Studies Project
SoTA Fabrication Techniques

- Historically, the nuclear industry used joint design as it variable
- Going forward, we need to utilize technologies that are proven in other industries
  - Controlled Short Circuit GMAW
    - RMD, CSC, CMT, etc.
      - Productivity of GMAW, Quality of GTAW
  - Tandem Processes
    - Tandem GMAW, Tandem/Hybrid Laser GMAW
      - Productivity and quality of SMAW with the ability to go out of position
  - Laser
    - Single largest advancement since last new construction period
      - Quality of GTAW, productivity limited only by $$

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    - Single largest advancement since last new construction period
      - Quality of GTAW, productivity limited only by $$
      - Steam Generator Example – 1.5 man month savings
  - Tandem Processes
    - Tandem GMAW, Tandem/Hybrid Laser GMAW
      - Productivity and quality better than SAW with the ability to weld out of position

Accepted by ASME

In Process

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So Whatness

- We need more fabrication capacity, not just more of yesterdays welders and technicians
- U.S. CAN NOT COMPETE ON LABOR RATES
  - If we had an excess of skilled welders it would do us little good without the ability to make better products
- We have historically competed and won based on technology

Path forward

- Fabricators need to work together;
  - To educate the Utilities and AE firms of the benefits and history of alternative fabrication technologies
  - To continue to be innovative for their perspective product lines
  - To support new fabrication technologies and one another
    - Done through participation in CSO's
- Education system needs to improve and standardize welder training programs
  - It should not be okay that we hire the best graduates then train them for a year in order to meet the minimum welder qualification criteria

Questions

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