Who Will Do The Work?

National Association of Regulatory Utility Commissioners (NARUC)
Summer Committee Meetings
Nashville, TN
Mark Bridgers - Continuum Capital
July 26, 2016
10:00 am – 10:30 am
Objective & Agenda

▶ Objectives
  – Introduce a solutions to the question of “Who Will Do The Work?”.

▶ Agenda
  – Some history & perspective on construction labor shortages
  – Current capacity of the combined utility and contractor workforce:
    • Natural gas
    • Electric
    • Water/Sewer
    • Telecom
  – Review a forecast indicating where and when demand will exceed industry construction capacity
  – Learn the implications of the forecasted shortage in workforce supply, for ratepayers, Public Utility Commissioners, utility firms, and contractors.
  – Appendices – Research on each market
Historic Immigration Statistics
Labor Participation vs. Unemployment

- Improving but still does not feel “healthy” in many places
  - 287,000 jobs added in June; only 11,000 added in May
  - Official Unemployment Rate = 5%
  - Labor Participation still down 4% since 2003-2007 peak
Industry Perceptions

- Overhead and underground utility survey 2012-2015
  - Hiring growth rate peaked in 2014 and remains above 4%
  - Natural growth rate of workforce is 1.5%

**Exhibit x**
What changes do you foresee in the number of fulltime direct employees in your organization for xxx? (excluding natural attrition, retirements, etc.)

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- >-10%
- -10%-5%
- -5%-0%
- 0%
- +0%-5%
- +5%-10%
- >10%

% of All Respondents

Comparison of hiring growth from 3Q 2012 to 1Q 2016

- Q3, 2012
- Q2, 2013
- Q3, 2013
- Q1, 2014
- Q3, 2014
- Q1, 2015
- Q3, 2015
- Q1, 2016

% Avg All Respondents

Willingness To Travel For Work

Overhead and underground utility survey 2015

- Two types of contractors, those who stay home and those that travel
  - Stay Home – 150 miles/2 hour drive
  - Travel – 400+ miles

Exhibit x
How far from your existing regions/areas/offices (measured in miles) will you travel with crews to do work?

Comparison of willingness to travel for work, measured in miles

Underground & Overhead Utility Infrastructure Thesis

Who Will Do The Work?

- Thesis: That growth in spending on underground & overhead utility infrastructure between 2008 and 2016 has stretched resources in a way that makes continued expansion problematic for contractors and the utilities they serve.
Agenda

- History & Perspective
- Workforce Capacity
- Demand vs. Supply – A Solution
- Appendices
Utility Construction Market Spending Overview

Utility construction market spending

- Electric & gas market experiencing the greatest growth
- Telecom, water, sewer market recovering at different rates

Workforce Need

- 38.0% of electric and natural gas employees eligible to retire in the next decade.
- The Bipartisan Policy center predicts that U.S. utilities will need to hire an additional 150,000 workers for information technology intensive roles by the year 2030.
Today: Contractor Oil & Gas Pipeline Workforce

Number of Employees
- >5000
- 2000-5000
- 1000-2000
- 300-1000
- <300

Gas Utility Construction Workforce

Number of Employees
- >5000
- 2000-5000
- 1000-2000
- 300-1000
- <300

Today: Combined Underground Workforce – 17,000 Crews

Field production staff consist of the following:
- Construction Laborers
- Operating Engineers and Other Construction Equipment Operators
- Plumbers Pipefitters and Steamfitters
- Helpers--Pipelayers Plumbers Pipefitters and Steamfitters
- Welders Cutters Solderers and Brazers

Foreman & Superintendents are classified as first-line supervisors of construction trades.

Other field support includes truck drivers, inspectors, mechanics, pavers, landscapers, etc.

Assuming 4 staff per crew on average equals 17,000 available crews.

Agenda

History & Perspective
Workforce Capacity
Demand vs. Supply – A Solution
Appendices
State Specific Drivers of Pipeline Spending

5 Hot Spots

State Rank of Drivers of Gas Distribution
- Top 10
- 11 to 20
- 21 to 30
- 31 to 40
- Bottom 10

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Future Pipeline Labor & Management Need?

From Today:
2020 = 5,750 Additional Crews
2030 = 11,000 Additional Crews


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2020: Pipeline Supply vs. Demand

5 Hot Spots Due To:
- Transmission lateral
- NGL and shale oil transmission
- Distribution replacement
- Housing starts accelerating

2020 Labor Need - Balanced Market

LEGEND:
- > 100%
- 70%-100%
- 20%-70%
- 0%-20%
- < 0%
2030: Pipeline Supply vs. Demand

3 Hot Spots Due to:
- Interstate transmission replacement
- DIMP activity
- Early plastics replaced

2030 Labor Need - Balanced Market
A Solution
Utility Example

Vision:
- Where the industry speaks with one voice for a single purpose – Companies adequately staffed with a diverse workforce with the right skills to safely keep the energy flowing.

Mission:
- Build the alliances, processes, and tools to develop tomorrow's energy workforce.

Goals:
- Career Awareness - Build awareness of high skilled positions in the energy industry.
- Workforce Development/Education - Implement short and long term education solutions to build a pipeline of skilled workers.
- Workforce Planning - Identify critical workforce needs and measure the success of workforce development initiatives.
- Member Value and Support - Support the needs of CEWD members

For more information: www.cewd.org
Seed An Industry Solution (1 of 4)

Underground Construction Workforce Alliance (UCWA)

► Long-Term Objective:
  – Solve underground workforce and field leadership availability over a 10-year time horizon covering 2015-2025.

► Short-Term Objective:
  – Build a coalition made up of Industry Associations, Unions, Material / Equipment Suppliers, Engineers, Contractors, and Utility / Pipeline firms that develop the strategy and tactics necessary to achieve the long-term objective.

For more information: Contact Mark Bridgers, (919) 345-0403, Mbridgers@ContinuumCapital.net
Seed An Industry Solution (2 of 4)

UCWA Leadership Team

- Doug Banning – CEO - Miller Pipeline
- Robert G. Darden - Executive Vice President - Distribution Contractors Association (DCA)
- Peter Fojtik - General Manager - Gas Distribution - Michels Corporation
- Chuck Shafer - Vice President – Engineering & Construction - NiSource Inc. - NiSource Gas Distribution
- Kyle Slaughter - Director Operations Support - Atmos Energy Corporation
- Dave Wisniewski - Senior Director, Underground Installations - Vermeer Corporation
- Eben Wyman – President - Wyman Associates
Pilot Local Implementation Team:

- Central Ohio in coordination with CEWD
- Confirmed shortage of workforce and continued growth in spending over 10 year horizon
- Touches 4 large LDCs
- Touches 5 large contractors and as many as 10 medium to small contractors
Free Trial
Continuum has negotiated a free trial for companies interested in both participating in and utilizing this resource.

Contact Mark Bridgers for information.

The CLMA® is an online application that helps owners, contractors, labor providers and the construction industry overall understand the skilled labor market and manage labor risk.

- More than 4M projects
- Value of projects ≈ $4.2T
- About 77% of U.S. non-residential construction
  - About 79% Industrial construction
  - About 76% Non-Industrial construction
- Tracks 49 craft disciplines
- Now tracking 14 professional positions

www.myCLMA.com
Practical Training Examples

State Technical College of Missouri (www.statetechmo.edu)
- Collaboration Opportunity
  - Networking Systems Technology
  - Electrical Distribution Systems
  - Heavy Equipment Operations
  - Welding Technology
- Program Objectives
  - Cause future employees to self-select out during education rather than after employment
  - Build clarity on graduate skill level and experience

Northeast Wisconsin Technical College (www.nwtc.edu)
- Leverage Opportunity
  - Gas Utility Construction & Service
- Program Objectives
  - Train individuals to become gas distribution worker, gas service person, gas meter and regulation mechanic, gas clerk-estimator, gas inspector, gas appliance repair mechanic, underground facilities locator, pipeline welder, pipe layer, PE pipe fusion, and equipment operator.
# Training Structure

## General Utility Construction & Maintenance Training Program

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Training Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Computer</td>
<td>OSHA 10</td>
</tr>
<tr>
<td>Class A CDL (with tanker endorsement)</td>
<td>Plan &amp; Blueprint Reading</td>
</tr>
<tr>
<td>Basic Power</td>
<td>Work Zone Safety</td>
</tr>
<tr>
<td>Awareness</td>
<td>Utility Locating</td>
</tr>
<tr>
<td></td>
<td>One Call</td>
</tr>
<tr>
<td>Basic Permit Requirements</td>
<td>Construction Math</td>
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<tr>
<td></td>
<td>Basic Power Tools</td>
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<td></td>
<td>Basic Rigging</td>
</tr>
<tr>
<td></td>
<td>Basic Electric (AC/DC Theory)</td>
</tr>
</tbody>
</table>

## Underground Utility Training Program

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Training Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Fusion</td>
<td>Shoring &amp; Trench Safety</td>
</tr>
<tr>
<td></td>
<td>Asset Separation</td>
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<tr>
<td></td>
<td>Environmental Impact</td>
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<tr>
<td></td>
<td>Pole Climbing</td>
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<tr>
<td></td>
<td>Basic Aerial</td>
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<tr>
<td></td>
<td>Bucket &amp; Digger Derrick Operation</td>
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<tr>
<td></td>
<td>Advance Power Awareness</td>
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<tr>
<td>Trenching Techniques</td>
<td>Direction Boring Operation</td>
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<td></td>
<td>Cross Bore Risk Management</td>
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<tr>
<td></td>
<td>Enclosed/Confined Space</td>
</tr>
<tr>
<td></td>
<td>Pole Attachment Points</td>
</tr>
<tr>
<td></td>
<td>Pole Setting &amp; Replacement</td>
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</tbody>
</table>

## Overhead Utility Training Program

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Training Area</th>
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<tbody>
<tr>
<td>Water/Sewer</td>
<td>Broadband</td>
</tr>
<tr>
<td></td>
<td>Electric</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
</tr>
<tr>
<td></td>
<td>Broadband</td>
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<tr>
<td></td>
<td>Electric Dist.</td>
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<tr>
<td></td>
<td>Electric Trans.</td>
</tr>
<tr>
<td>Other Overhead</td>
<td>Other Overhead</td>
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<tr>
<td></td>
<td>Light Equipment Operation</td>
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<tr>
<td></td>
<td>Cable Stringing</td>
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<tr>
<td></td>
<td>Cable Splicing</td>
</tr>
<tr>
<td></td>
<td>Cable Pulling</td>
</tr>
<tr>
<td></td>
<td>Steel &amp; Alloy Welding</td>
</tr>
<tr>
<td></td>
<td>Fiber Splicing</td>
</tr>
<tr>
<td></td>
<td>Energized vs. Non-Energized</td>
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<td></td>
<td>Pressure Testing</td>
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<td></td>
<td>Line Splicing</td>
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</tbody>
</table>
What Should Regulators and Utilities Do Today?
What Should Regulators and Utilities Do Today?

Regulators

- **Awareness**: Use today as a starting point for understanding workforce dynamics in the states and regions you regulate and more specifically the unique circumstances of your state and region.
- **Vision**: Much of the underground construction activity pulls from the same local workforce and developing this workforce over a decade is necessary.
- **Strategy vs. Cash**: Pouring cash or increased rates onto this challenge in and of itself is not the solution; encouragement of mitigating strategies, similar to the below, especially when paired with innovative rate making schemes is a solution.

Utilities

- **Upgrade Service Providers**: Lock in effective and efficient service provider resources with 5-7 year contracts.
- **Project Delivery**: Develop a structured project delivery system selection for type, geography, and pace of work.
- **Upgrade Skills**: Improve talent acquisition and retention for the replacement of baby boom generation.
- **LEAN Construction**: Develop partnering, collaboration, and integration skills with service providers to drive out waste.
- **Scarcity Environment**: Identify strategies, processes, & technologies to operate in a “scarcity” environment - labor constraints, equipment constraints, etc.
- **Asset Management**: Mitigate long-term economic, regulatory and technological developments with the potential to lower demand and strand long lived assets.
Thank You

MARK BRIDGERS

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LinkedIn: www.linkedin.com/pub/mark-bridgers/12/9b4/81
Mark founded and leads a Utility Vertical Market team at Continuum Capital. He works with gas/electric utilities, power generators, pipeline companies, and energy companies. As a recognized expert in capital construction and operational challenges, Mark was recently honored with membership in the Society of Gas Operators (SOGO).

Mark helps firms prepare for and successfully navigate “strategic transitions.” His passion is helping organizations achieve breakthrough innovations through collaborative or integrated relationships. He is the architect of an approach for integrated service provider management referred to as the “Extended Enterprise” among construction industry participants.

Mark is an avid educator, trainer, and writer with more than 20 years of industry expertise including financial performance analysis; development and implementation of tools to reduce construction cost, life-cycle cost, and operational friction; restructuring of processes and procedures - often times using LEAN Construction techniques; and leader development. He is a recognized expert in capital construction and operational challenges. Mark is also author of over 150 articles and research papers published internationally in industry journals, including ENR, PE – The Magazine for Professional Engineers, Pipeline & Gas Journal, Utility Contractor (NUCA), Underground Contractor, Electric Energy (RMEL) and Electric Perspectives (EEI).

Mark holds a master’s degree in business administration from the University of Virginia’s Darden school of Business and a bachelor’s degree in financial management from Clemson University. In addition, he earned the designation of Chartered Property and Casualty Underwriter (CPCU) and Associate in Reinsurance (ARe).
Agenda

- History & Perspective
- Workforce Capacity
- Demand vs. Supply

Appendices
- Appendix I – Electric T&D
- Appendix II – Telecom
- Appendix III – Pipeline
- Appendix IV – Water & Sewer
- Appendix V – Power Generation
Appendix I – Electric T&D

Workforce Availability Perspectives & Information
Electric Construction Market Drivers

- **Replacement Funding** – Driven by legislative action in New England, Mid-Atlantic and Mid-West
- **New Housing** – Acceleration spotty around the country but all markets improving
- **Reliability Expectations** – Asset replacement, hardening, reinforcement activity
- **“Smart Grid”** – Transformation of the grid; “real” construction activity just beginning and will accelerate in the future – today is mostly technology and meter installation
- **Distributed Generation** – just beginning and will accelerate in the future
U.S. Electric T&D Spending Overview

**US Electric Transmission & Distribution**
- Spending forecast through 2019

Electric workforce is 3.5x larger than gas workforce

Field production staff consist of the following
- Linemen
- Operating Engineers and Other Construction Equipment Operators
- Helpers

Foreman & Superintendents are classified as first-line supervisors of construction trades

Other field support includes truck drivers, inspectors, mechanics, electricians, etc.

Assuming 4 staff per crew on average equals 63,000 available crews

Today: Electric T&D Workforce

Electric Transmission & Distribution

Today vs. 2018

Long-term, this market may need 50,000 new field and supervisory entrants.

Telecom Construction Market Drivers

- **Competition** - Google, AT&T, Verizon, and CenturyLink among others to bring fiber and high speed service to major cities in the U.S.

- **Federal Funding** – Increasing availability of federal funding (Connect America Fund (CAF), etc.)

- **Data Management** – Continued expansion of data bandwidth need

- **Wireless Infrastructure** – Increasing need for fiber backhaul to support wireless infrastructure

- **New Housing** – Acceleration spotty around the country but all markets improving
U.S. Telecom Spending Overview

US Telecom Construction Market

Telecom Workforce

The traditional telecommunication line installer workforce internal to the telecommunication firms is forecast to decline by 10% through 2022. In raw numbers this workforce will decline from 76,300 in 2012 to 68,300 in 2022.

The contractor line installer workforce is expected to increase from 15,800 to 22,500.

The communication industry is moving gradually towards more of an outsourced construction workforce model.

- In 2012 17% of the line installers were external. By 2022 25% of this workforce will be external.

<table>
<thead>
<tr>
<th>Forecast Change by Occupation Through 2022 – Communications Workers</th>
<th>Utility</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications equipment installers and repairers, except line installers</td>
<td>-4%</td>
<td>10%</td>
</tr>
<tr>
<td>Telecommunications line installers and repairers</td>
<td>-10%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Appendix III – Pipeline

Workforce Availability Perspectives & Information
State Specific Drivers of Pipeline Spending

5 Hot Spots

State Rank of Drivers of Gas Distribution
- Top 10
- 11 to 20
- 21 to 30
- 31 to 40
- Bottom 10

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## US Pipeline Spending Overview

### US Gas & Liquid, Transmission & Distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>Spending (in $)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>9,175</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>11,085</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>16,265</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>24,612</td>
<td>51.3%</td>
</tr>
<tr>
<td>2008</td>
<td>32,389</td>
<td>31.6%</td>
</tr>
<tr>
<td>2009</td>
<td>35,122</td>
<td>8.4%</td>
</tr>
<tr>
<td>2010</td>
<td>33,259</td>
<td>-5.3%</td>
</tr>
<tr>
<td>2011</td>
<td>32,741</td>
<td>-1.6%</td>
</tr>
<tr>
<td>2012</td>
<td>37,738</td>
<td>15.3%</td>
</tr>
<tr>
<td>2013</td>
<td>40,759</td>
<td>8.0%</td>
</tr>
<tr>
<td>2014</td>
<td>44,137</td>
<td>8.3%</td>
</tr>
<tr>
<td>2015</td>
<td>43,775</td>
<td>4.8%</td>
</tr>
<tr>
<td>2016</td>
<td>40,251</td>
<td>-13.0%</td>
</tr>
<tr>
<td>2017</td>
<td>51,404</td>
<td>17.4%</td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td>14.3%</td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td>-20%</td>
</tr>
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## US Gas & Oil Pipeline Wave Drivers

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>$32 to $43 billion (+34%)</td>
<td>$43 to $65 billion (+49%)</td>
<td>$65 to $80 billion (+23%)</td>
<td>$80 to $45 billion (-44%)</td>
</tr>
<tr>
<td>Shale gas and oil exploration expansion</td>
<td>Transmission and high pressure distribution lateral construction</td>
<td>Interstate transmission replacement programs accelerating</td>
<td>Transmission replacement activity slows</td>
</tr>
<tr>
<td>Interstate transmission network expansion</td>
<td>NGL and shale oil transmission system build out – Replacement for rail transport</td>
<td>DIMP acceleration of activity</td>
<td>100 years of distribution infrastructure replaced in 20 years</td>
</tr>
<tr>
<td>TIMP acceleration of activity</td>
<td>Distribution replacement programs start</td>
<td>Early distribution plastics replaced</td>
<td>Industrial/Power/Export infrastructure complete – modest to no growth</td>
</tr>
<tr>
<td>Distribution replacement programs start</td>
<td>DIMP plan preparation</td>
<td>Rising natural gas prices increase domestic gas production</td>
<td>Housing starts tempered by low population growth</td>
</tr>
</tbody>
</table>

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**The Cliff**

- Transmission replacement activity slows
- 100 years of distribution infrastructure replaced in 20 years
- Industrial/Power/Export infrastructure complete – modest to no growth
- Housing starts tempered by low population growth
Today:
Contractor Oil & Gas Pipeline Workforce

Number of Employees
- >5000
- 2000-5000
- 1000-2000
- 300-1000
- <300

Today:
Gas Utility Construction Workforce

Number of Employees
- >5000
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- 1000-2000
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Field production staff consist of the following:
- Construction Laborers
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Other field support includes truck drivers, inspectors, mechanics, pavers, landscapers, etc.

Assuming 4 staff per crew on average equals 17,000 available crews

Today: Pipeline Supply vs. Demand

3 Hot Spots

Labor supply versus today’s regional spending:
- New England – Critical
- Pacific – Critical
- Middle Atlantic – Challenging
- East North Central – Challenging
- South Atlantic – Challenging
- West North Central - Challenging
- East South Central – Challenging
- Mountain – Manageable
- West South Central – Manageable

Future Pipeline Labor & Management Need?

From Today:
2020 = 5,750 Additional Crews
2030 = 11,000 Additional Crews


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2020: Pipeline Supply vs. Demand

5 Hot Spots Due To:
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- Distribution replacement
- Housing starts accelerating

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2030: Pipeline Supply vs. Demand

3 Hot Spots
Due to:
- Interstate transmission replacement
- DIMP activity
- Early plastics replaced

2030 Labor Need - Balanced Market

LEGEND
- > 100%
- 70%-100%
- 20%-70%
- 0%-20%
- < 0%
Appendix IV – Water & Sewer

Workforce Availability Perspectives & Information
Water & Sewer Market Drivers

- **Aging Infrastructure** – Water and sewer infrastructure beyond its anticipated design life
- **Water Demand** – Increasing demand for residential, commercial, and industrial usage exceeding supply
- **Unaccounted For Water** – Percentage of unaccounted for or non-metered water loss is being solved too slowly
- **Low Water & Sewer Rates** – Municipal rates and available funding mechanism in many markets are simply too low to afford a combination of system maintenance and capital spend
- **Leadership Gaps** – Agencies without farsighted leadership and courage to pursue funding increase for hiring, training, and capital asset improvement
Water & Sewer Spending Overview

US Combined Water & Sewer Spending

## Water & Sewer Wave Drivers

### Wave 1
- **2016-2019**
  - **Replacement/Limited New Infrastructure**
  - **Total Additional Expenditure**: $20-$80 billion
  - **Points**:
    - Limited financing will continue to plague the industry
    - Some small spurts of financing will follow lead concerns
    - Greatest opportunity in medium to large system operators
    - Preparing for P3 opportunities

### Wave 2
- **2020-2025**
  - **Systems Approach Integration**
  - **Total Additional Expenditure**: $50-$65 billion
  - **Points**:
    - Expansion of P3 US Market
    - Increased systems thinking across jurisdictions to watershed approach
    - Integration of wastewater, potable, non-potable systems
    - Technical assistance provider to medium to small systems

### Wave 3
- **2025-2035**
  - **Necessity versus Innovation**
  - **Total Additional Expenditure**: $45 - $100 billion
  - **Points**:
    - Deteriorating systems will begin to fail in higher numbers based on asset life expectancy
    - State and federal participation may increase through revolving loan arrangements
    - Integrated system applications will become the norm

### Wave 4
- **Beyond 2035**
  - **Points**

---

**Total Additional Expenditure**
- $20 - $80 billion
- $50 - $65 billion
- $45 - $100 billion

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Geography of Needed Capital Spend

20 Year Water/Wastewater Investment Needed by State

Source: Continuum analysis of data from American Society of Civil Engineers assessment of state water/wastewater infrastructure investment needed.
Funding Restrictions Cripple Capital Spend

- O&M is growing at twice the rate of capital spending restricting funds
- Low water and sewer rates are restricting funds
- Project delivery systems of design/bid/build are by definition the slowest and are restricting the ability to accelerate spending
Water/Wastewater Aging Workforce

- In 2008, the water/wastewater industry has the oldest workforces in the utility industry with nearly 30% of this workforce eligible to retire within five years.
- The aging workforce was the third ranked item behind only aging infrastructure and regulatory compliance.
- Years of underinvestment have not only created a need to increase spending to replace aging infrastructure but have left the utilities without the time and resources to train and develop new staff.
- Today, unlike the other major utility segments water/wastewater utilities are not forecast to shrink their workforce in coming years with the overall workforce expected to increase from 47,000 in 2012 to 55,000 in 2022 to meet expanding spending.

Water/Wastewater Aging Workforce

- Percent of Water/Wastewater Workforce over 55 by State
  - Overall 23.4% of the Water/Waste Water workforce is over 55

Appendix V – Power Generation

Workforce Availability Perspectives & Information
Power Generation Market Drivers

Drivers of Spending
- Shale Oil & Gas
- Renewable Energy Requirements
- Power Demand Destruction

Source: Proprietary Continuum analysis state renewable power generation requirements and guidelines.

Power Generation Spending Overview

US Power Generation Spending


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## Power Generation Wave Drivers

<table>
<thead>
<tr>
<th>Wave 1 2002-2012</th>
<th>Wave 2 2015-2030</th>
<th>Wave 3 2030-2045</th>
<th>Wave 4 Beyond 2036</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peaking Gas &amp; Wind Power Driven</td>
<td>Coal Retirements &amp; Gas/Renewable Driven</td>
<td>Distributed Generation &amp; Storage Driven</td>
<td>The place of traditional power gen utility?</td>
</tr>
<tr>
<td>$20 to $37 billion (+85%)</td>
<td>$33 to $50 billion (+52%)</td>
<td>$50 to $35 billion (-30%)</td>
<td>Shrinking Spending</td>
</tr>
<tr>
<td>Production/investment tax credit fuels wind power construction</td>
<td>Coal retirements from age and regulation accelerate</td>
<td>Nuclear licensing not renewed</td>
<td>Power generation spending fragmented at residential, commercial, and industrial sites in addition to traditional merchant or utility sites</td>
</tr>
<tr>
<td>Low natural gas prices and energy demand fuel merchant and utility gas fired power generation construction</td>
<td>Replacement of coal is four faceted: 1) stand alone natural gas; 2) renewable augmented by natural gas; 3) energy efficiency; 4) distributed generation</td>
<td>Coal retirements continue</td>
<td>Traditional power generators punished and atrophying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wide spread distributed generation is a reality</td>
<td>Utility industry transitions to “insurance” model and focuses on grid management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utility scale storage invented and widespread augmenting both renewables and distributed generation</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Spending has peaked early in this cycle</td>
<td></td>
</tr>
</tbody>
</table>

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Mark Bridgers  
7/26/2016  
NARUC - Who Will Do The Work?  
www.ContinuumCapital.net
Thesis

Who Will Do The Work?

- **Thesis:** That growth in spending on new or renewable power generation and perhaps more importantly, the retrofit or decommissioning of existing facilities will stretch resources in a way that makes expansion problematic for contractors and the merchant or utility power generators they serve.

![Diagram showing change in workforce from 2010 to 2020](image)
Today: Combined Power Generation Construction Workforce – 20,000 Crews

Field production staff consist of the following:
- Boilermakers
- Electricians
- Ironworkers
- Laborers
- Pipayers Plumbers PIPEfitters and Steamfitters
- Welders, Cutters, Solderers, and Brazers

Foreman & Superintendents are classified as first-line supervisors of construction trades.

Other field support includes truck drivers, inspectors, mechanics, carpenters, etc.

Approximately 18% of the workforce works directly for the power producers.

Assuming 4 staff per crew on average equals 18,000 available crews.

Power Generation Workforce

Today vs. 2018

Threatened and transforming in a way that reduces the need for traditional trades (boilermakers, millwrights, ironworkers, etc.) in favor of less specialized electrical and mechanical trades.


Mark Bridgers
7/26/2016
Future: Power Generation Workforce by Region

4 Hot Spots

- Labor supply versus today’s regional spending:
  - New England – Critical
  - Pacific – Critical
  - Middle Atlantic – Challenging
  - East North Central – Challenging
  - South Atlantic – Critical
  - West North Central - Challenging
  - East South Central – Challenging
  - Mountain – Manageable
  - West South Central – Manageable