



# WSP

**WSP**

**The Leader in**  
*Underground Storage and Disposal*

*October 15, 2019*

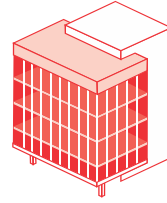


# WSP

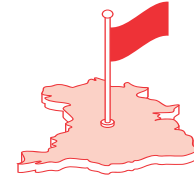
GLOBAL  
PRESENCE



**48,000**  
Employees



**550**  
Offices

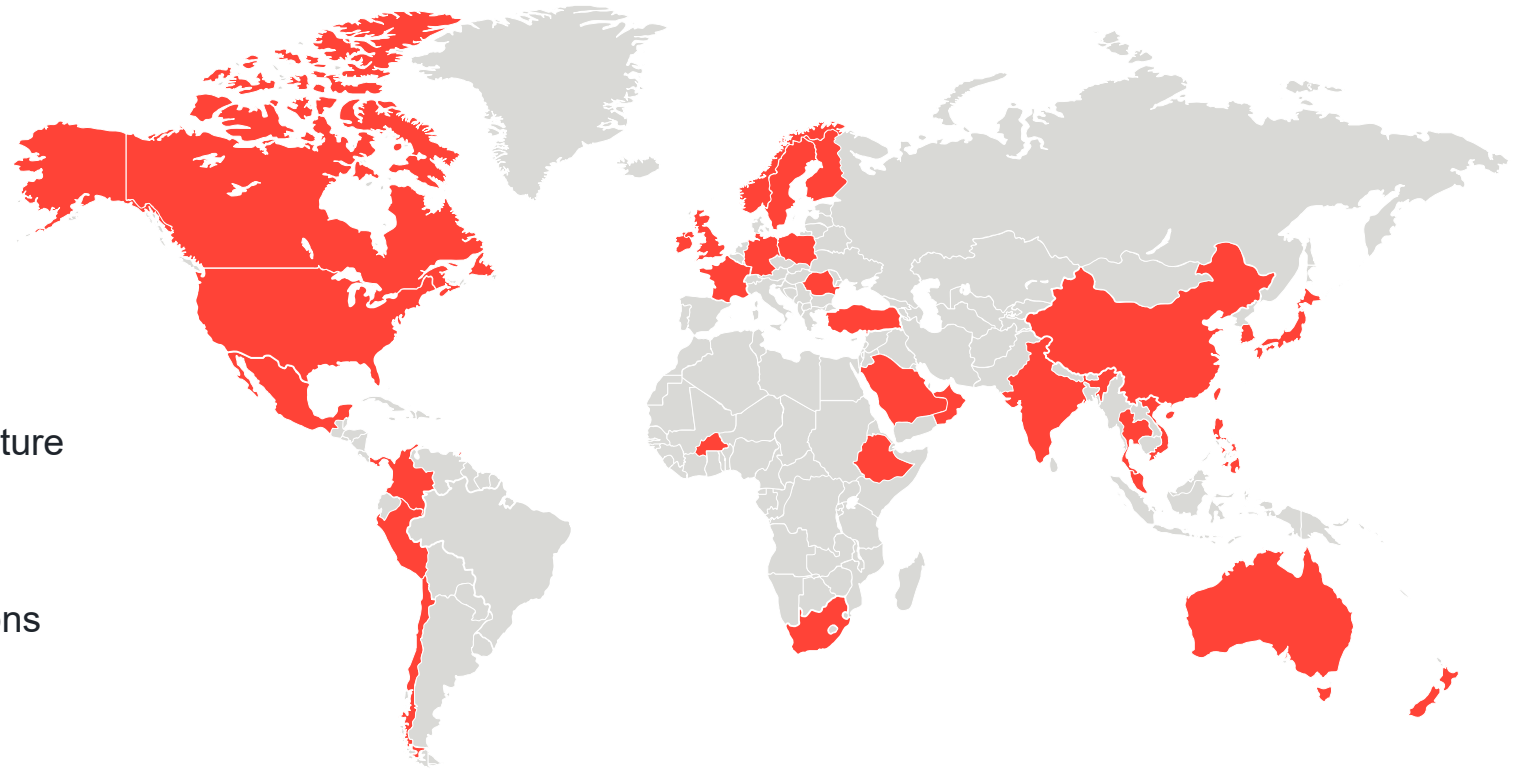


**40**  
Countries

One of the world's leading  
engineering and professional  
services firms

Active in every major infrastructure  
market

Creative, comprehensive, and  
sustainable engineering solutions



WSP's main contribution to a sustainable economy is through the services we offer and the projects we deliver.

We know from our experience throughout the world that current codes and standards don't necessarily account for the future we are anticipating.

That is why we believe so much in *Future Ready*, our global program designed to bring clarity and vision to complex challenges.



**Can we plan infrastructure to cope with climate changes?**

Rainfall will become more extreme but less reliable, leading to increased flooding, with extreme rainfall events to double by 2050 in Canada.



**Can we build communities to respond to isolation?**

One-person households are the largest area of growth in the UK. As we become more connected, the future is likely to be increasingly lonely.



**Can we design roads and communities to be ready for electric, self-driving cars?**

Parking typically uses 15-30% of an urban area. New mobility offers the possibility to revitalize streets and to plan now for how electric cars of the future will be charged.

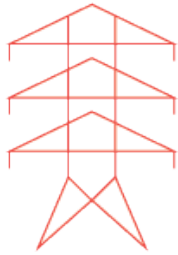


**Can we think with end-of-life deconstruction and reuse in mind?**

Buildings and infrastructure will be seen as assets and not as waste in a circular economy model.

BROAD  
U.S.  
PRESENCE

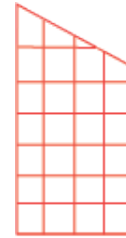
## Core Business Lines



Energy



Transportation  
and Infrastructure



Property and  
Buildings



Water and  
Environment



**Advisory Services:** strategic, planning, and environmental planning solutions across sectors at the enterprise & program levels



**Program & Construction Management:** cross-sector range of delivery services across all project lifecycle phases



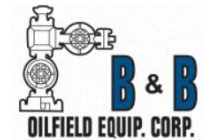
**Federal Programs & Logistics:** bringing all of WSP to the Federal market

UNRIVALLED  
EXPERIENCE

## Broad Client Base



## Broad Vendor Base





# Technical Capabilities

## *WSP USA Inc.*

### — *Subsurface*

- *EPA permitting and regulatory consulting*
- *Well design, drilling, and completion (including procurement)*
- *Well testing and maintenance*
- *Plume dispersion (reservoir) simulations*

### — *Surface*

- *Groundwater modeling (LBG, Louis Berger)*
- *Environmental investigation and remediation, compliance, and due diligence services*
- *PM/CM services for large projects*
- *Ensure compliance with RCRA administrative orders in EPA Region 7*

### — *Power*

- *Facility Energy Audits and Condition Assessments*
- *Distributed Generation/Cogeneration/Combined Heat & Power*
- *Energy Storage System Design and Optimization*
- *Owner's Engineer including Specification Development, RFP Process Management and Contracting Support*



# Technical Capabilities

## *WSP Global (UK)*

- *Full scale, full chain program management from initial development through operations*
- *Advisory support to investment groups and/or governmental agencies across the CCUS chain*
- *Engineering design of CO2 drying, compression and liquefaction plants in preparation for transportation*
- *Engineering design of above-ground infrastructure for CO2 sequestration sites*
- *Greenhouse gas emissions accounting including climate change adaptation strategies and forecasting*
- *Industry benchmarked project cost estimations*

## Previous Projects and Clients (U.S. based)

### Industrial Hazardous Wastewater Disposal Wells and Related Regulatory Support

AK Steel Air Products & Chemicals BASF BP Chevron Conoco Phillips DOW Du Pont Parke-Davis Monsanto  
Lyondell/Equistar Holly Refining Shell Chemical Company Solutia Total UOP ISP UEC Ineos

### CO2 Sequestration Evaluation and Related Well Applications

Duke Energy (Gibson, IN) Duke Energy (Edwardsport, IN) CarbonNet Foundation (Australia)  
Tenaska (Sweetwater, TX) American Electric Power (Columbus OH) Reliant (PA) Blue Source  
Duke Energy (Moscow, OH)

### Acid Gas Injection

DCP Midstream (New Mexico) Regency Gas Partners (Texas) Targa (New Mexico) Enterprise Products (Texas)  
AKA Energy (New Mexico) Atlas Pipeline (Texas) Canyon Midstream (Texas) Halcon Resources (Texas)

### Underground Gas Storage Wells and Related Operations

Sempra ATMOS Energy Energy South Midstream Freeport LNG Enbridge Bobcat Storage  
Reliant Energy Center Point Energy Williams Crosstex Cardinal Gas Storage Kinder Morgan Oneok



## Previous Projects and Clients (International)

### **CarbonNet Project, Victoria Gov DSDBI**

The Australian government engaged WSP to undertake a transport study for the CarbonNet project in Australia. WSP (UK) looked at onshore and offshore aspects of transporting CO<sub>2</sub>. WSP (USA) looked at wellbore dynamics of injecting up to 5 Mtpa (7.6MMm<sup>3</sup>/d).

### **CCS on gas fired power plants, IEAGHG**

WSP (UK) supported the International Energy Agency (IEAGHG) in studying the impacts of CCS technologies on the performance of a range of different types of gas fired power plants.

### **Calix (Europe) Ltd, TSB**

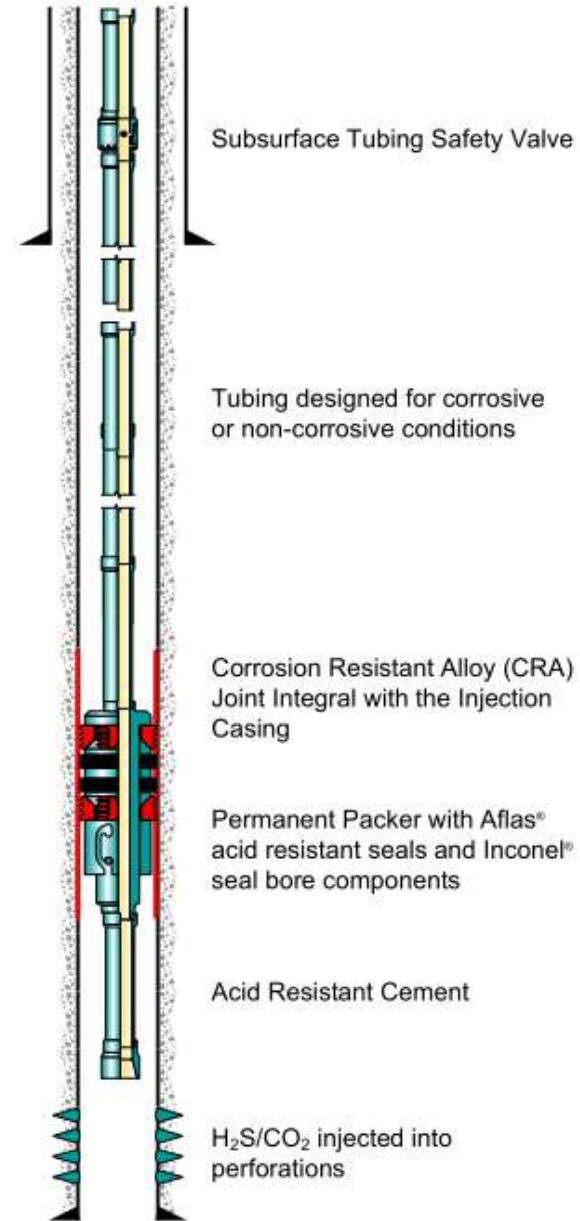
Calix (Europe) Ltd needed an independent review of its developing calcium looping carbon capture technology. WSP (UK) worked with Calix to develop a successful tender for grant support.

### **EU NER300, European Investment Bank**

WSP (UK) supported the European Union and the European Investment Bank in implementing the New Entrant Reserve competition for new and innovative renewable and CCUS projects.

# Well Design Fundamentals

## Integrity Comes First!



## General Integrity Issues

- Reservoir Integrity
  - Will the reservoir store CO<sub>2</sub> for “thousands of years”?
  - Are there any current penetrations? Future?
  - Are there concerns about storage geomechanics?
  - Seismicity issues?
- Borehole Integrity
  - How is the well completed?
  - Redundant safety features? SSSV, Check valves, packer, etc.
  - Casing selection. Use of CRA material?
- Surface Integrity
  - Properly designed wellhead. CRA components.
  - Located near any existing (or planned) infrastructure?

The WSP logo is located in the top left corner of the image. It consists of the lowercase letters 'w', 's', and 'p' in a red, sans-serif font, with the 'w' and 's' connected.

Questions?

The WSP logo is located in the bottom left corner of the image. It consists of the lowercase letters 'w', 's', and 'p' in a red, sans-serif font, with the 'w' and 's' connected.

# Standing for Society

2018 — Global Sustainability Report