



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy** SAND2015-6337PE

# **Deep Borehole Field Test Emplacement Cost Estimates**

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**Contract Kickoff**

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- **Overview**
- **Assumptions**
- **Cost Drivers**
- **Operational Alternatives**
- **Cost Uncertainties**
- **Summary**



# Overview

- **Comparison of emplacement costs for DBFT based on Handling and Emplacement Options Report**
- **Costs based on actual case histories and communication with vendors**
- **Actual costs may vary significantly depending on final designs and operating conditions**



# Assumptions

- Wellbore completion activities complete
- Does not include waste package and instrumentation costs
- Emplacement costs are based on rental prices
- No “trouble time”
- Cost differences between wireline and drill string emplacement
- 400 consecutive days of operation



# Cost Drivers

## ■ Time

- Daily charges for rig
- Canister delivery time

## ■ Geography

- Location of disposal site
- Mobilization charges (e.g. CT cementing)

## ■ Temperature

- Cementing costs (retarders)

## ■ Market

- Availability of rigs and specialty services depends on oil & gas market
- Lead times for casing and tubular goods



# Operational Alternatives

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- **Rent or Buy?**

- Dictated by frequency of operation

- **Single emplacement with drill pipe?**

- **Cellar for wireline option**

- CT cementing may require a level pad for mobilization



# Cost Uncertainties

## ■ Time-dependence

- Actual duration of project?

## ■ Location selection and disposal method

- Drives periodic operation costs (plugging, cementing)

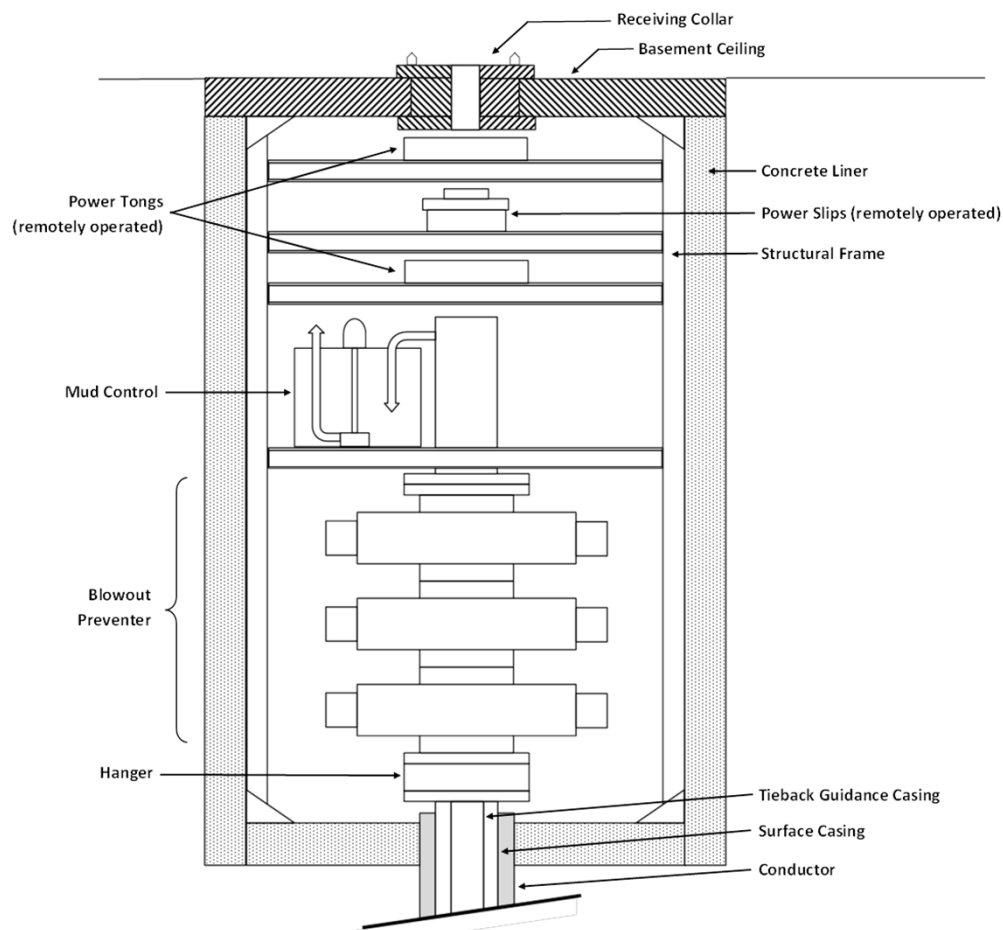
## ■ Site preparation and construction

- Limited design details
- Order of magnitude estimates



# Drill String Handling & Emplacement Required Components

- **Basement construction**
- **Surface pad installation**
- **Transfer carrier installation**
- **Workover rig**
- **Control room**







# Drill String Emplacement

## ■ Time-Dependent Costs

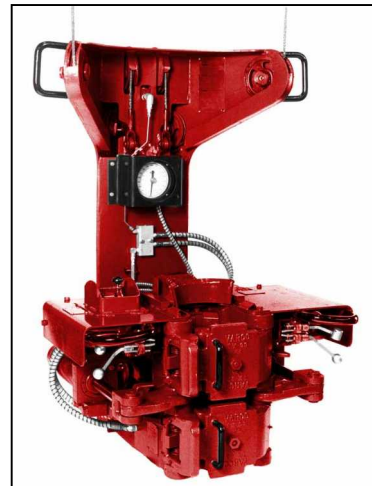
- Drill rig
- Iron roughneck
- Power tongs
- Power slips
- BOP stack

## ■ Intermediate Plugging Costs

- Bridge plugs
- Cementing

## ■ One-Time Costs

- Build pad and cellar
- Build structural frame
- Build transfer track system
- Final sealing and rig-down



NOV power tongs



NOV power slip



Wrangler Roughneck 120™



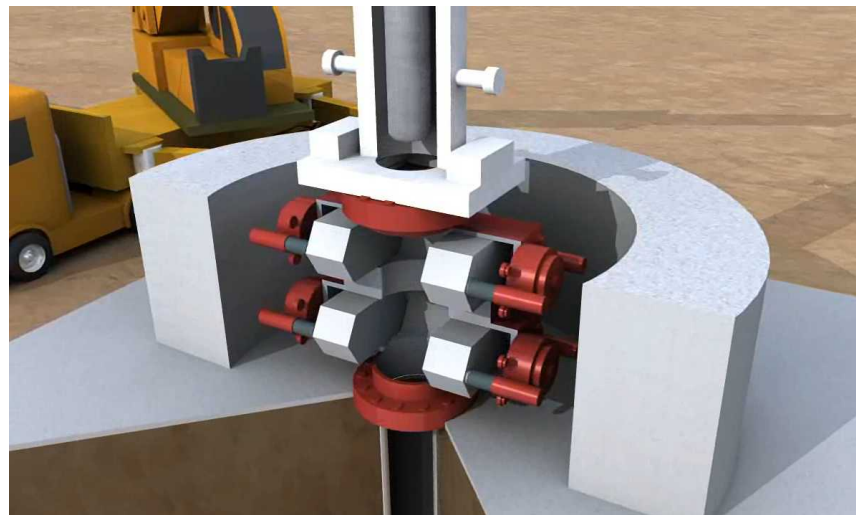
# Drill String Emplacement Costs

	Component	Daily Cost	Total
Time Dependent Costs	Drill rig	\$75,000	\$30,000,000
	Iron roughneck	\$3,000	\$1,200,000
	Power tongs	\$1,000	\$400,000
	Power slips	\$3,000	\$1,200,000
	BOP stack	\$2,500	\$1,000,000
	Sub-total		\$33,800,000
Intermediate plugging costs	Bridge plug	\$10,000	\$90,000
	Cementing	\$40,000	\$360,000
	Sub-total		\$450,000
One-time costs	Build pad and cellar		\$500,000
	Build structural frame		\$100,000
	Build transfer track system		\$300,000
	Final sealing and rig-down		\$1,000,000
	Misc. costs		\$200,000
	Contingency		\$500,000
	Sub-total		\$2,600,000
Total Project Cost			\$36,850,000



# Wireline Handling & Emplacement Required Components

- **Surface pad**
- **BOP shield**
- **Hoist and wireline**
- **Cable head**
- **Crane**
- **Ancillary equipment**
- **Workover rig**
- **Control room**





# Wireline Emplacement

## ■ Time-Dependent Costs

- Wireline unit
- Crane
- BOP stack

## ■ Intermediate Plugging Costs

- Bridge plugs
- Coiled tubing unit and cementing

## ■ One-Time Costs

- Build pad and control room
- Build radiation shield enclosure
- Final sealing and rig-down





# Wireline Emplacement Costs

	Component	Daily Cost	Total
Time Dependent Costs	Wireline unit	\$37,000	\$14,800,000
	Crane	\$15,000	\$6,000,000
	BOP stack	\$2,500	\$1,000,000
	Sub-total		\$21,800,000
Intermediate plugging costs	Bridge plug	\$10,000	\$90,000
	Coiled tubing unit and cementing	\$200,000	\$1,800,000
	Sub-total		\$1,890,000
One-time costs	Build pad and control room		\$350,000
	Build radiation shield enclosure		\$50,000
	Final sealing and rig-down		\$1,000,000
	Misc. costs		\$200,000
	Contingency		\$500,000
	Sub-total		\$2,100,000
Total Project Cost			\$25,790,000



# Summary

- **Costs depend on location and other factors as well as method**
- **Uncertainty in estimates**
- **Wireline is potentially less costly**