

PRECAST WIND & U.S. ELECTRIC MARKET

SAND 2014

PT

Google Warren Buffett

C&I Gradation

75% Less Concrete

NATGAS = \$5

PElla

EI

Introduction

Precast Wind Tower Foundations
Mobile Precast as the Foundation of Wind Power

RUTE FOUNDATION SYSTEMS

Doug Krause, PE



RUTE wind

2018 GE 2.5 > Ø116m 90mHH



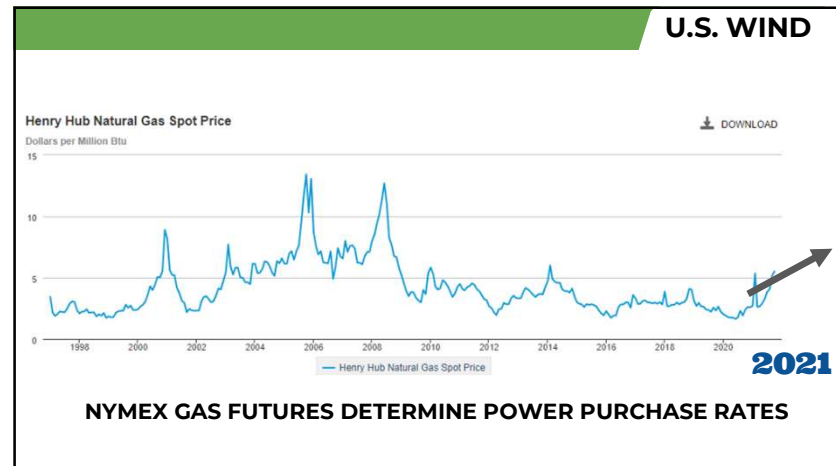
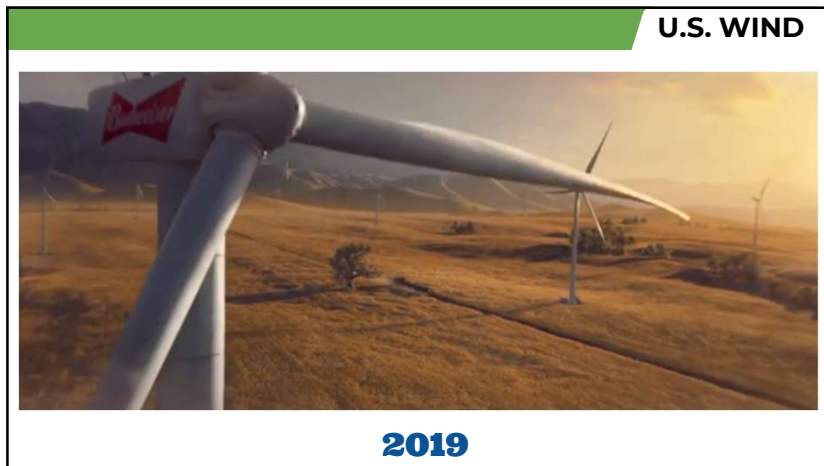
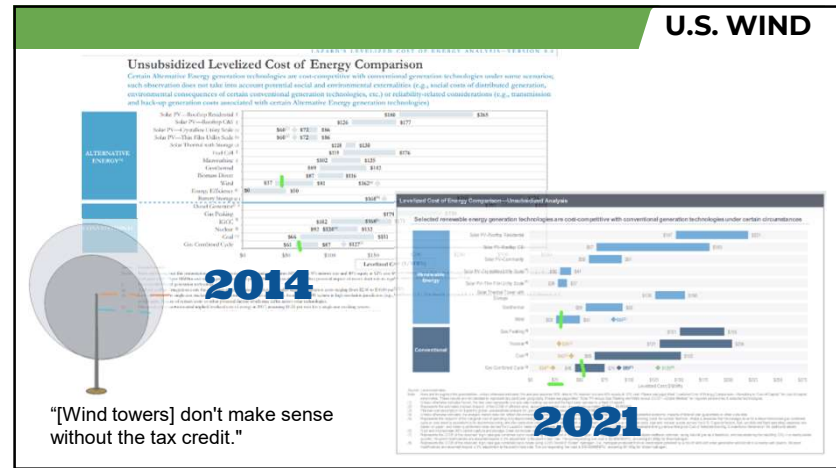
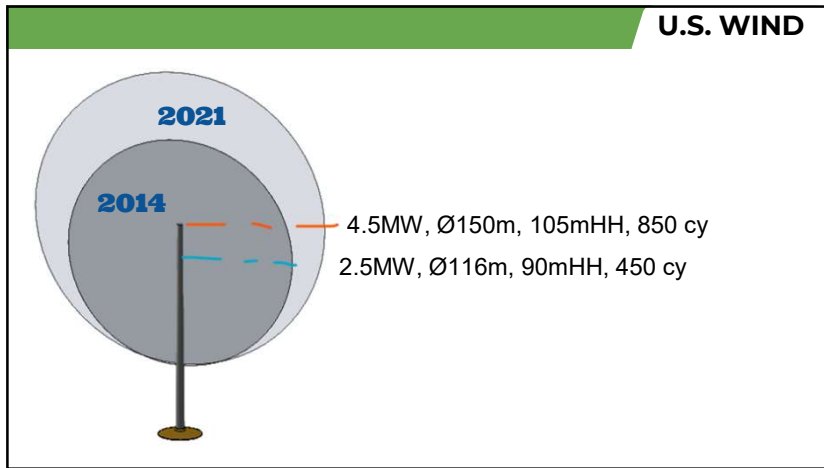

RUTE wind

pti POST-TENSIONING INSTITUTE
Strength in Concrete

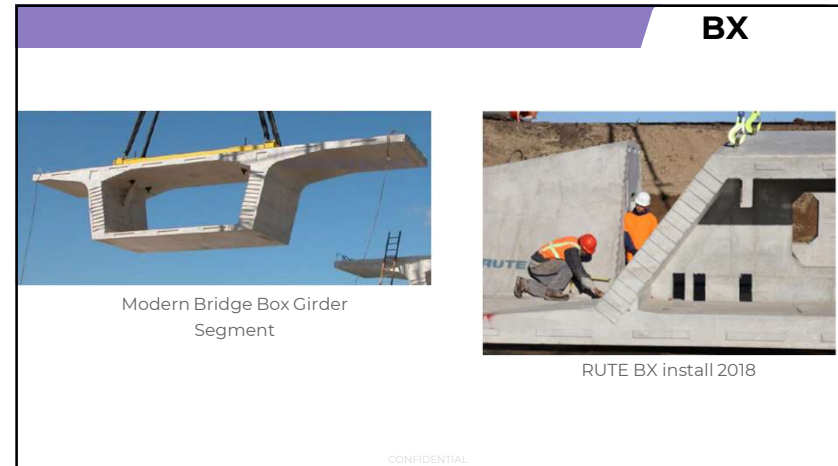
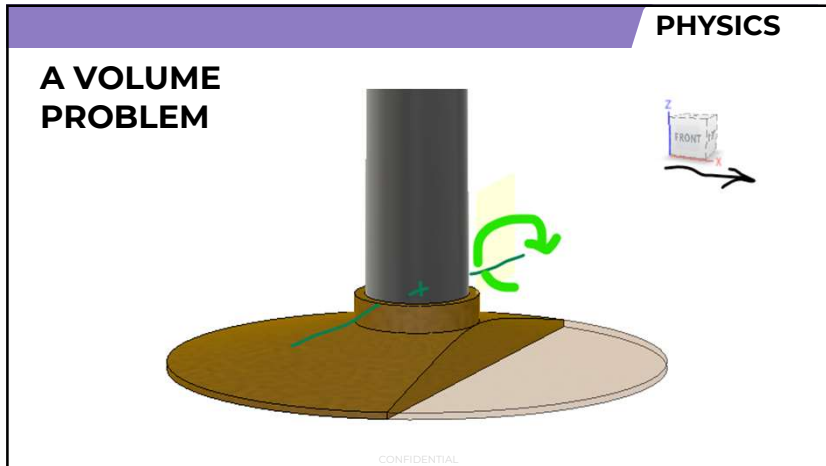
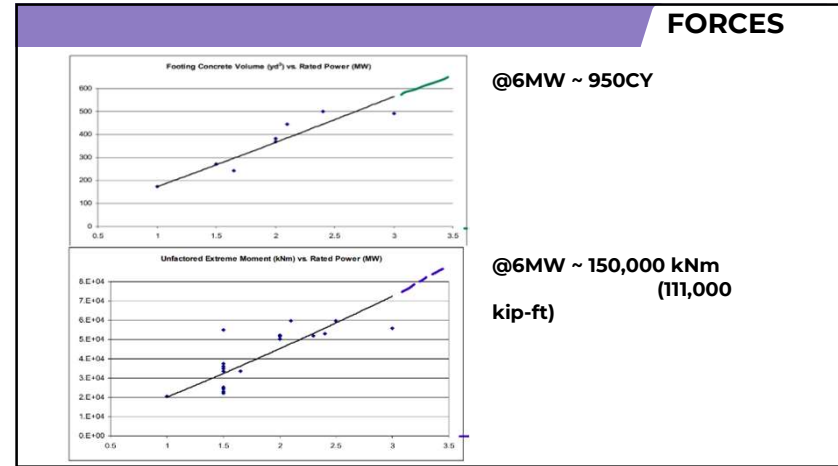
AASHIO

ASBI
American Segmental Bridge Institute





U.S. WIND					
Wind Power Concrete Market Data			Wind Farm Market Data		
U.S.	Iowa		U.S.	Iowa	
15	1	GW, of new wind per year			
123	10	GW, Today			
2,700,000	180,000	CY, Concrete Demand Annually			
810,000	54,000	tons, Cement Demand Annually			
\$162.0	\$10.8	\$m/yr, Cement Demand Annually	\$21.0	\$1.4	\$b/yr, Wind Farm CAPEX Annually
22	2	mCY, Concrete Demand Annually	\$1,167	\$78	\$m/yr, Wind Farm Foundation CAPEX Annually
3,806	309	Acres, covered by foundations Today			
180		CY, of concrete per megawatt (MW)	1.4		\$ CAPEX per MW to construct wind farm
4044		SF, Area of foundation	\$77,778		\$/MW per foundation
3		MW, Average WTC Size	5.56%		Foundation % of CAPEX
\$200		\$ per ton of cement			
600		pcy, cement portion			



Options

Esteyco

Artepref

Anker >>

<< Nabrabase

SEGMENTAL

PRECAST WIND

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FE

PRECAST

Mobile Precast Manufacturing

TYPICAL PROJECT SPECS:

- 50 foundations, customer wants 1 per day
- 3 foundation/wk output, begin operations min 2 months prior to start of WF construction
- 10 ksi concrete
- 190 cy batched and poured each day, 10 castings per day

ESTIMATED UNIT COST:

- \$1000/cy incl fixed, OH and variable costs

TECHNICAL ELEMENTS OF PLANT:

- Form system
- **Matchcast** process
- **Heat MGT** of forms to regulate temperature gradients
- Curing chamber means 2x handling
- **Integrated PT** system ~400 270 ksi 0.6 strands per foundation
- Batching consistency - **Sand & Gradation Quality**

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Mobile Precast Manufacturing

75% Less Concrete






Established mobile plant in EU for towers

RUTE Facility Design

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KEY ELEMENTS OF MOBILE PRECAST BOX GIRDER PRODUCTION

1. RELIABLE MIX FOR STRENGTH & FLOW
1. CONCRETE PLACEMENT
1. CONTROL TEMPERATURE GRADIENTS
1. EFFICIENT PT ANCHORAGE SYSTEM
1. COST EFFICIENT HANDLING SYSTEM
1. CURING
1. MATCH CAST TOLERANCE QA CAPABILITY
1. 3 PER WEEK THROUGHPUT


KEY SOLUTIONS

1. GREAT **SAND & AGGREGATE GRADATION**
1. NO PUMPS OR CONVEYORS
1. **HEATED FORMS** - PUMP SYSTEM
1. **INTEGRATED PT**
1. CUSTOM GANTRY JACKS
1. SEPARATE CURE CHAMBER BUILDING
1. TEST FIT YARD
1. 2 MONTH JUMP ON THE WIND FARM

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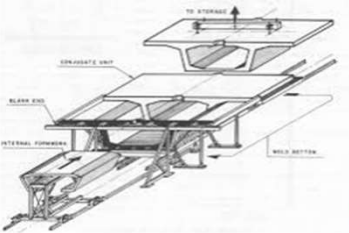
Benefits of going mobile

- Reduced Risk to Customer
 - transportation costs and associated emissions
 - Stockpiled product near job site
- Cost Advantage



PRECAST

MATCHCASTING





PRECAST

Integrated PT System


The opposite case of a bridge.

Bridge = Long tendons, few anchorages


BX = Short tendons, lots of anchorages




RUTE Team




DOUG KRAUSE, P.E.
Founder & President



VANESSA HOPKINS
Founder & Content Creator




BOB ST AUBIN
Construction Officer




EVELYN HUNSBERGER
Engineering Lead


2019 AWARD WINNER




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Head of Sales

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