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CEC Staff Workshop Next Generation Wind Energy Technologies and their Environmental Implications

October 25, 2018

Jason Cotrell, RCAM Technologies



Two panel questions on taller wind turbines

Question 1: There are neither new nor existing wind turbine manufacturing facilities located to California. How critical is it and are there opportunities for advanced manufacturing technology in California? How can next generation wind energy technologies change this landscape in California?

Question 2: What are the **research needs** to enable on-site manufacturing or hybrid solutions for wind energy technologies? What are the main on-site manufacturing challenges in California and what are needed to address those challenges?

A state of the art large turbine and logistical challenges

78-m two-piece blades

200 t, 5-MW nacelle

160-m concrete tower





Photo from Windpower Engineering

https://www.windpowerengineering.com/business-news-projects/uncategorized/liebherr-tower-crane-lifts-afully-pre-assembled-rotor-for-turbine-installation/

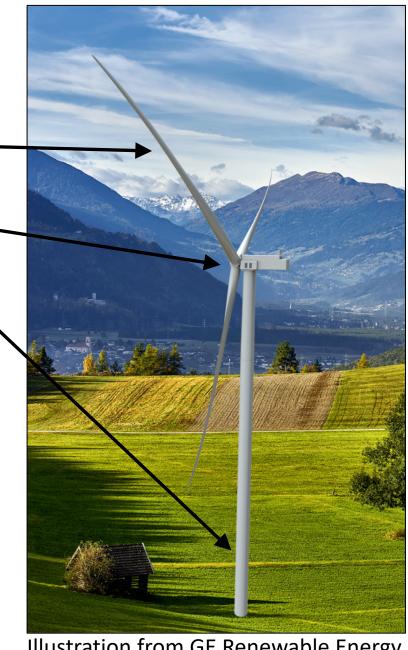


Illustration from GE Renewable Energy https://www.ge.com/renewableenergy/windenergy/turbines/cypress-platform

California has a substantial large turbine deployment and jobs opportunities:



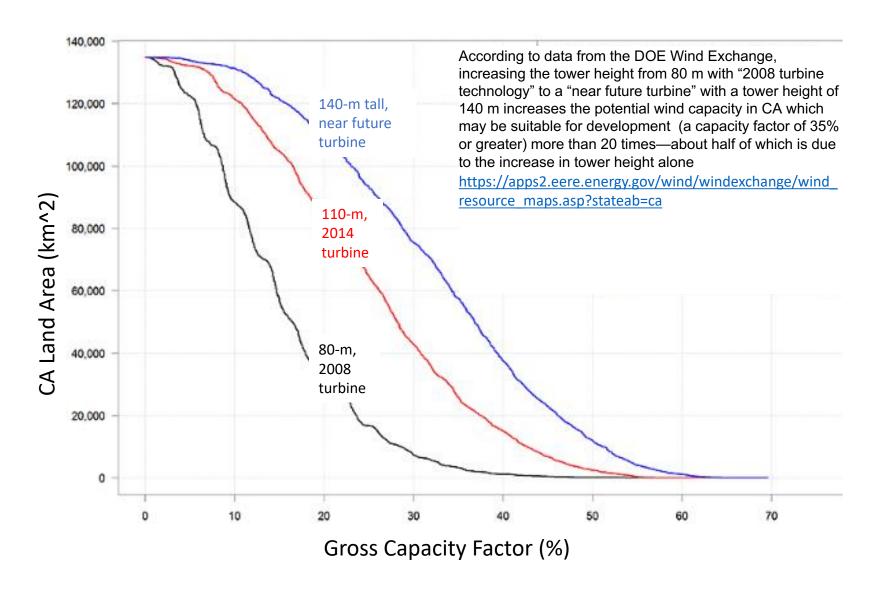




Photo from Greentechlead https://www.greentechlead.com/wind/global-wind-farm-om-market-hit-usd-9-84-bn-2016-19421



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Responses from my informal survey of wind experts



We need to better understand the potential benefits and challenges of large land-based wind technologies and on-site manufacturing:

- 1. What is the actual deployment potential for large-wind turbines in California?
- 2. How much would large-wind turbine deployments really cost?
- 3. What are the actual wind shears in different California regions?
- 4. How well do large-wind turbines integrate with other generation technologies (offshore wind, solar, etc....)?
- 5. What are the public acceptance, zoning, wildlife and military constraints?
- 6. What benefits could on-site manufacturing and assembly bring to California?
- 7. How does large wind compare with offshore wind costs?

My suggestion: California-focused studies or projects that help quantify the benefits and challenges of large turbines



Subcontractor Report

WindPACT Turbine Design **Scaling Studies** Technical Area 2: Turbine, Rotor, and Blade Logistics

March 27, 2000 to December 31, 2000

Kevin Smith Global Energy Concepts LLC Kirkland, Washington



Golden, Colorado 80401-3393

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https://www.nrel.gov/docs/fy01osti/29439.pdf

Industrializing Offshore Wind Power with Serial Assembly and Lower-cost Deployment

Final Report, 11 December 2017

Lead Institution:

University of Delaware Principal Investigator: Willett Kempton UD Project Managers: Andrew Levitt, Richard Bowers

Participating Contractors and Companies:

Mammoet, Weeks Marine, SPT Offshore, Moffatt & Nichol, Atlantic Grid Development, EEW Steel, CG Power Solutions, Clipper Marine, Saipem Group, Signal International, Steel Suppliers Erectors, Inc., Universal Foundation/Aalborg University, XKP Visual Engineers

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https://www.ceoe.udel.edu/research/affiliatedprograms/wind-power-program/researchprojects/industrializing-offshore-wind

Scope Examples:

- Wind resource assessment
- Tall tower conference or workshop
- "Open-source" reference turbines, towers, and site
- Logistics and assembly modeling and tools
- LCOE modeling
- **Economic impact assessment**
- Grid integration impacts
- Public acceptance survey
- Repowering potential
- Market survey or comparison to other markets that have deployed tall wind (i.e. Germany)
- Advanced technology studies and projects
- Explore the synergies of tall-wind and future offshore wind deployments