

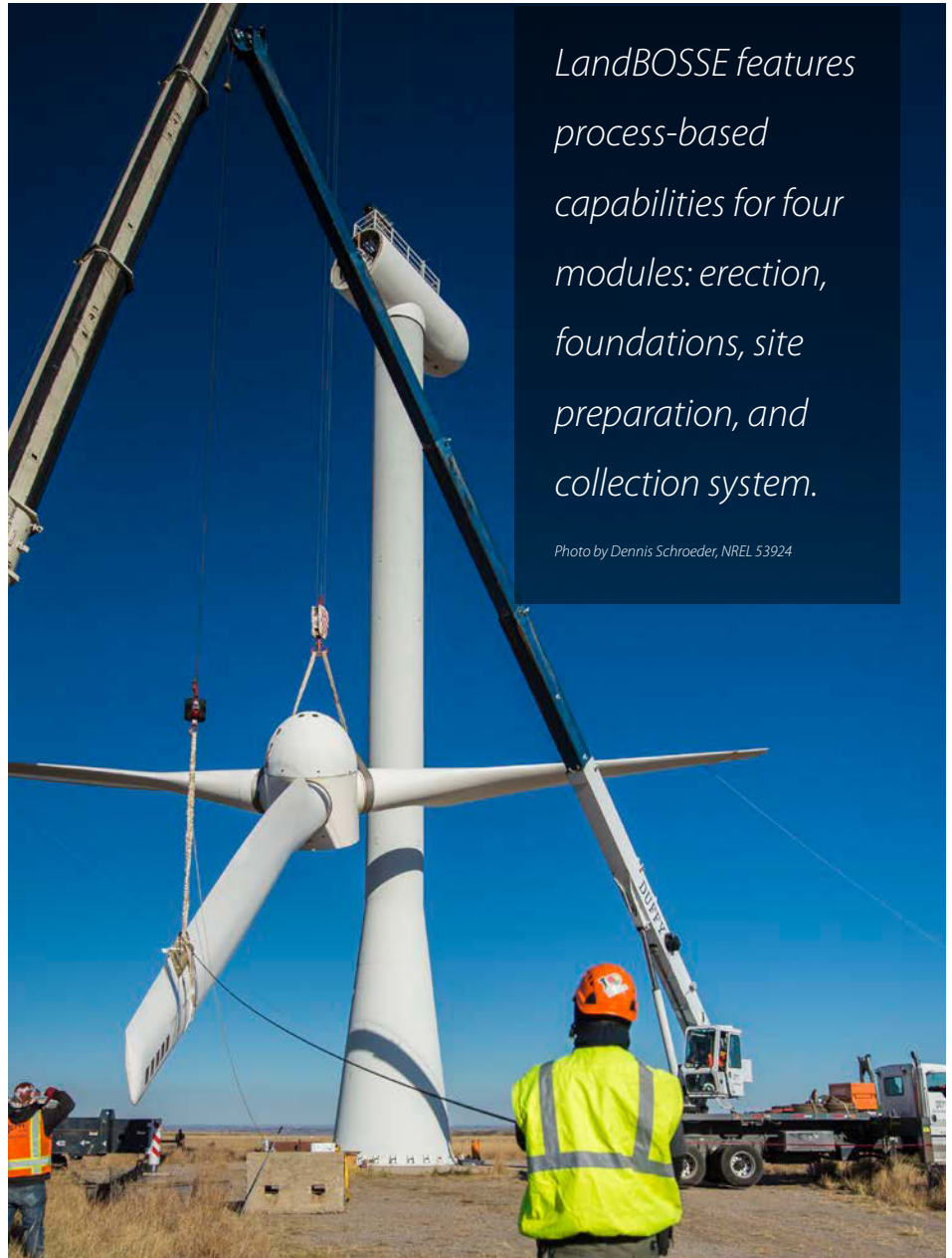
MODELING BALANCE-OF-SYSTEM COSTS FOR LAND-BASED WIND PLANTS

The National Renewable Energy Laboratory's Land-Based Balance-of-System Systems Engineering (LandBOSSE) Model Works To Improve Wind Power Plant Cost Estimation and Design

One-third of the cost to install a land-based wind power plant is currently consumed by balance-of-systems (BOS) expenses—permitting, labor, material, and equipment costs associated with site preparation, foundation construction, electrical infrastructure, and tower installation. As a result, modeling how BOS costs change with different foundation designs, tower technologies, and turbine installation methods is valuable for understanding the potential for cost reductions in a wind project's total investment costs.

LandBOSSE cost categories

1. Development
2. Management
3. Foundations
4. Site preparation
5. Erection
6. Collection system
7. Grid connection
8. Substation



LandBOSSE features process-based capabilities for four modules: erection, foundations, site preparation, and collection system.

Photo by Dennis Schroeder, NREL 53924

The National Renewable Energy Laboratory developed the Land-based BOS Systems Engineering (LandBOSSE) model to provide researchers, analysts, wind power developers, government agencies, and the public with a flexible tool that can be used to estimate the BOS costs associated with wind power plant construction.

Available at <https://github.com/WISDEM/LandBOSSE>, the open-source LandBOSSE model includes all costs associated with onsite wind plant installation. The model does not provide estimates for turbine capital expenditures, offsite transportation expenses, or operation and maintenance costs.



LandBOSSE can be used to estimate the balance-of-system costs associated with wind power plant development.

Photo by Dennis Schroeder, NREL 50696

LandBOSSE can help reduce time and labor for bidding projects or prospecting by enabling:

- More efficient iteration of customer scenarios such as types and numbers of turbines
- Scaling of foundation material and labor quantities
- Regional adjustments to working hours, crew sizes, and labor rates.

With funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Wind Energy Technologies Office, a team of NREL researchers developed LandBOSSE using a hybrid of process-based and empirically derived equations formulated from market research, industry data, pricing

“LandBOSSE is an effective tool for understanding the potential for reducing a wind project’s total investment costs.”

-Wind Tower Technologies, LLC

trends, and insights from experienced land-based wind plant developers. The research team also partnered with several industry leaders, including Mortenson, RES, Wind Tower Technologies, and Apex, who reviewed the model and supported its validation efforts.

Overall, the model is based on a bottom-up assessment of inputs and outputs associated with each BOS operation and, where needed, is supplemented by top-down estimates of costs from industry.

LandBOSSE features process-based capabilities for four modules: foundations, site preparation, erection, and collection system. The tool’s modularity allows for future expansion that could enable the exploration of a variety of plant sizes, locations, and site-specific parameters, along with different types of tower technologies, turbines, and foundation designs.

For more information, download the LandBOSSE technical report: <https://www.nrel.gov/docs/fy19osti/72201.pdf>