Reducing Market Barriers and Soft Costs with New Smart Standards Specifically for Distributed Wind Systems

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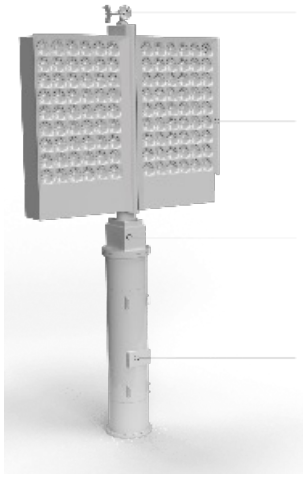
Warning
Extremely Esoteric and Dull Material Ahead

Truant's, Sleepers and Multi-Taskers will be excused

Certification is a Necessity

- For wind turbines under ~50 kW there is a persistent “Bozos and Scammers” problem
- IEC, AWEA (ACP), DWEA, and many stakeholders have worked to create and refine wind standards.
- DWEA has successfully worked to institutionalize certification requirements (e.g., Sec. 48 ITC)



Small Wind Standards Landscape

Manufacturing:

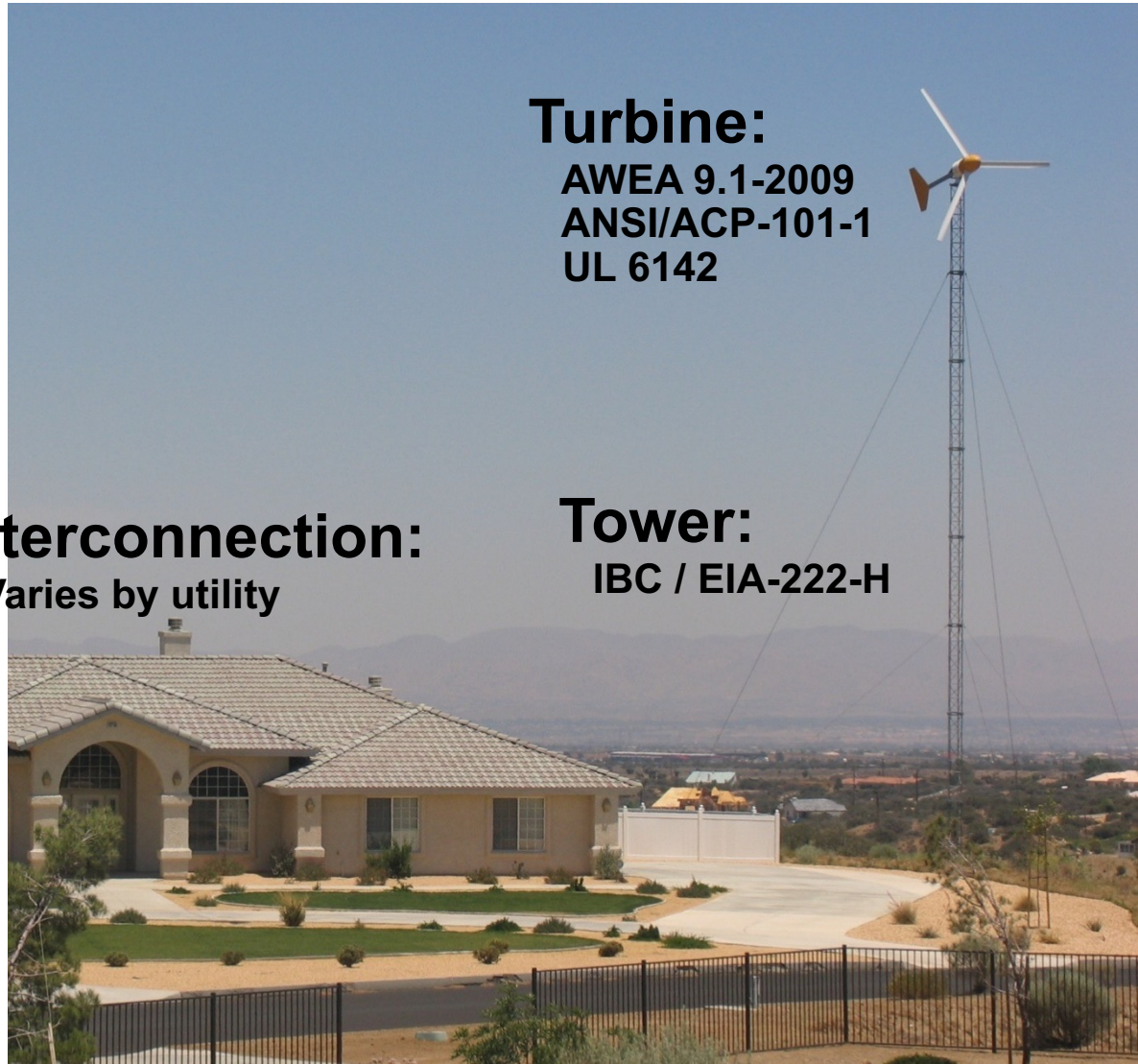
Factory Audits
ISO 9001

Wiring:

NEC - All
NEC 694

Inverter or Controller:

IEEE 1547
UL 1741, -SA, -SB



Turbine:

AWEA 9.1-2009
ANSI/ACP-101-1
UL 6142

Tower:

IBC / EIA-222-H

Interconnection:

Varies by utility

SWT Codes/Standards & Costs

	Standard	Required By	Certified By	Provided By	Typical $/Unit
Turbine	AWEA + UL	IRS & Consumers	SWCC, NRTL's	Manufacturer	$2,500-$10,000*
Tower & Foundation	IBC	City or County	State PE	Manufacturer & Installer	$0 - $4,000
Wiring	NEC	City or County	City or County	Installer	$200
Electronics	IEEE	Utility	NRTL	Manufacturer	$800-$2,000*
Interconnect	Varies by Utility	Utility	Utility	Installer	$0 - $2,500

*** - Assumes applied over 100 units**

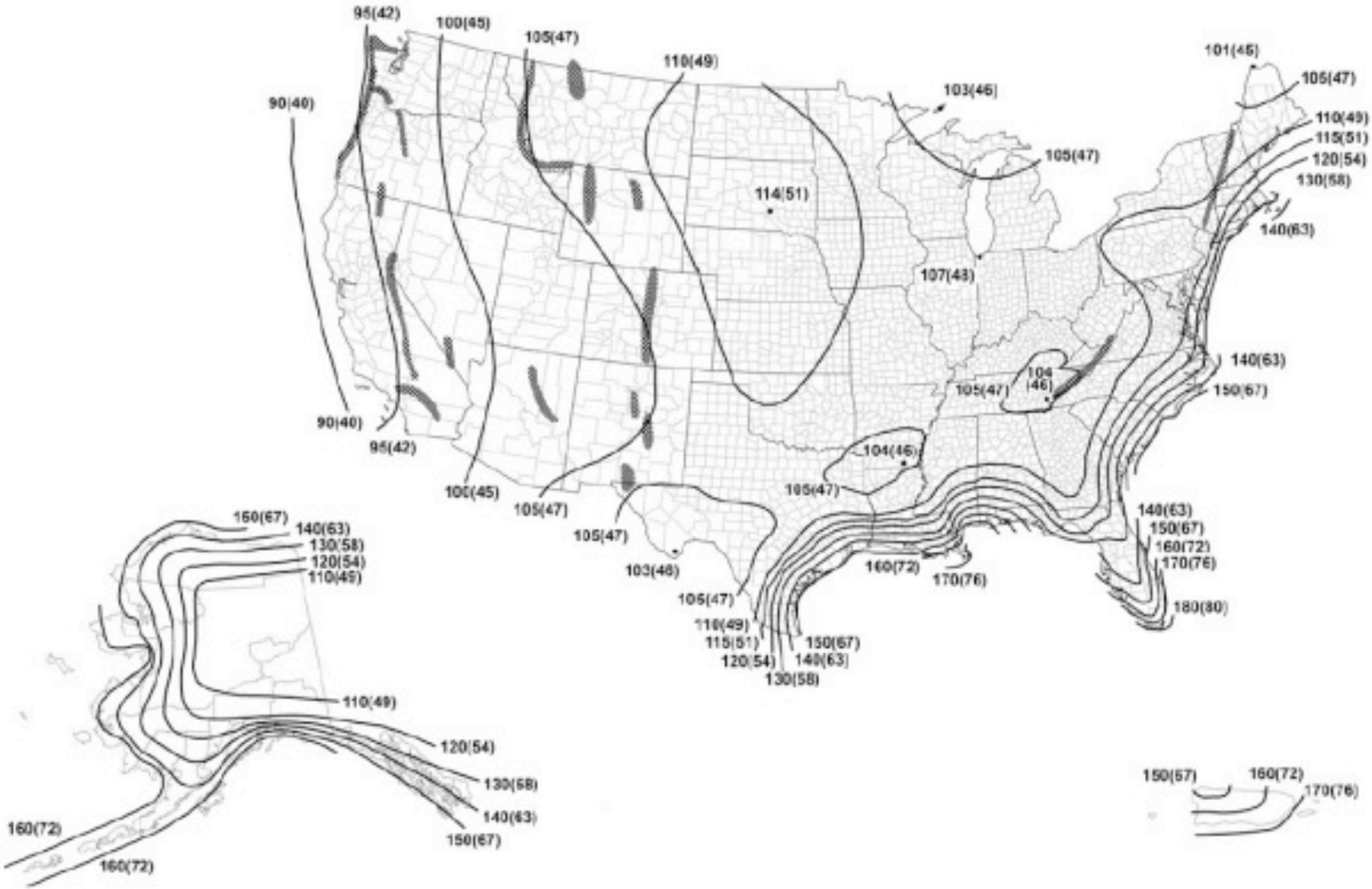
Wind Turbine Standards & Certification

- All current small wind certifications are to the original AWEA 9.1-2009
- New version, ACPA-101-2021, less burdensome in cost and time
- National Electric Code requires listing of turbine (However, NEC adoption varies by jurisdiction)
- For larger turbines, financing requires elaborate IEC certifications: Type Approval
- US-DOE and NREL have been very generous in supporting certifications through the CIP

Towers and Foundations

- City's follow the International Building Code (IBC) which references EIA 222-H for towers
- Sets wind zones, 80 – 140 mph, with terrain, risk and other factors
- In-state PE "Wet Stamp" required on analyses
- Soil strength & water level complications

ASCE-7 Wind Zones used in EIA-222-H Calculations



New FAA Requirements

Previous: No review if under 200 ft. and away from airport

New: All wind turbines need to apply, and most will require FAA and military reviews for “No Hazard” – rule resulted from ag aircraft fatalities from met. towers

Wiring

- Cities follow National Electric Code (NEC)
- Wind systems have a separate chapter – requires turbine be listed for electrical safety (UL 6142, costing ~$50,000++)
- NEC limits breaker panel loading to 80% of rated amps; problematic for larger “whole house” wind or solar systems
  - Can require breaker panel & service entrance upgrades ($$$)

Inverter

- Requirements set by utility or State PUC
- UL 1741, safety standard for solar inverters; certification cost: ~$80,000
- UL 1741-SB, many additional “grid-friendly attributes” + utility communication, allowing remote control (required in CA, HI, VT, etc.)
  - -SB was devoped by utilities for high density solar DER’s (e.g., solar suburbs)
  - Certification: 4 months and $120,000 (total inverter certification cost is ~$200,000)

DW Pain Points

- UL 1741-SB applied to Distributed Wind
  - Should allow 1741 or a new 1741-SW
- NEC listing requirement and busbar limits
  - UL-6142 should be significantly streamlined
  - Should allow larger loading with self-curtailment
- “Wet Stamp” requirements for structural and foundation analyses
  - Should allow manufacturer’s “Dry Stamp”
- FAA and military siting reviews
  - Should revert to original rules for wind turbines

MB Standards Experience

- 1979: Authored “AWEA Performance Rating Standard” – became IEC 61400-12
- 2000 – Present: Member of IEC 61400-2 “Small Turbine Safety Standard” Committee
- 2007: Authored AWEA 9.1-2009, Small Wind Certification Standard, led approval
- 2010 – Present: Member of UL 6142, Small Wind Electrical Safety Standard
- Co-Chair, ACP Small Wind Committee (ACP-101-1-2021)
- 2022: Participated with ACPA and SEIA in ICC International Building Code revision of Wind Risk Category
- Past: SWCC Board, Present: ICC-ES Advisory Committee

Modest Proposal

- Aggressively modify UL 6142 to reduce scope and burden
- Start development of UL 1741-DW inverter standard, with reduced scope and excluding grid-interactive and communications requirements (-SB elements)
- Develop DW tower standard through ACP Wind Standards Committee, to supplant EIA/TIA-222, with reduced scope and complexity
- Revise NEC to allow higher busbar loading with auto output curtailment to limit max busbar current
- Revise IBC to allow manufacturer's "Dry Stamp" on structural analyses
- Revise FAA regulations to revert to old "no hazard" rules for turbines below 200 ft.