

Case Studies of Distributed Wind Certification Projects

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DW26 – Day 2, Case Studies Panel

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 **INNOVATIONS**

References

Detailed information regarding the certification process covered in the case studies can be found online in the [Distributed Wind Certification Best Practices Guideline](#) as well as <https://www.reinnovationsllc.com/>!

Topics and Case Study Examples

Full Certification Case Study: ACP 101-1 (30-65kW) and Electrical (Non-entry)

Three Case Study Comparisons: Two 1-30kW non-entry & one 65-150kW entry permitted

2026 Standards Update



 **INNOVATIONS**

DWT “Type” Certifications in the US

ACP 101-1 Certification Requirements

1. Certification Application
2. Test Site Assessment and Inspection
3. Design Evaluation
4. Type Testing
5. Certification Review
6. Factory Inspection and Labeling

Electrical Certification Requirements

1. NEC, NFPA 70
2. Interconnection
3. Component Approvals (PMG, inverter, etc.)

		↓ CS 2 & 4 ↓	↓ CS 1 ↓	↓ CS 3 ↓
	Micro turbines < 1 kW Peak Power	1-30 kW Peak Power	30-65 kW Peak Power	65-150 kW Peak Power
STRUCTURAL DESIGN				
Simplified load model	Not required	Not recommended for turbines > 10 kW	Not allowed	Not allowed
Simulation model	Not required	Allowed	Required	Required
Structural Analysis	Not required	Required	Required	Required
TYPE TESTING				
Duration	Required	Required	Required	Required
Power Performance	Required	Required	Required	Required
Loads Validation	Not required	Required. Power, RPM, and weights	Required. ← + blade 1st flap	Required. ← + tower loads
Acoustics Noise	Not required	Required	Required	Required
Safety and Function	Required	Required	Required	Required

Category	UL 6142	UL 6141
	Non-entry	Entry permitted
Intended application	Micro and small wind turbines	Medium and large wind turbines
Personnel entry	Not permitted or intended	Permitted for operation and maintenance.
Primary safety focus	Equipment electrical safety	Personnel + equipment safety
Voltage scope	≤ 1500 VAC (often < 600 VAC)	< 690 VAC (+1000 VAC and 1500 VDC)
Installation codes	NEC (NFPA 70)	NFPA 70 + NESC + NFPA 79
Component differences	LV components and subsystems	MV/HV equipment, drives, elevators, auxiliaries
Safety Related Control Systems (SRCS)	IEC 61400-2 based	IEC 61400-1 based with FMEA
Service personnel safety	Not addressed	Explicitly addressed
Utility grid interaction	IEEE 1547 and IEEE 1547.1	Not in scope
Typical use case	Distributed / residential / small commercial	Large commercial and utility scale wind turbines



CASE STUDY 1:

ACP101-1 (30-65kW)

Customer site

Electrical Certification (Non-entry)

- **REI Scope of Work**

- ACP Design (Northwind Eng)
 - Aeroelastic model
 - Component structural reports
- ACP Type Testing
- ACP Certification PM
- Electrical Certification Evaluation
- Electrical Certification Agent

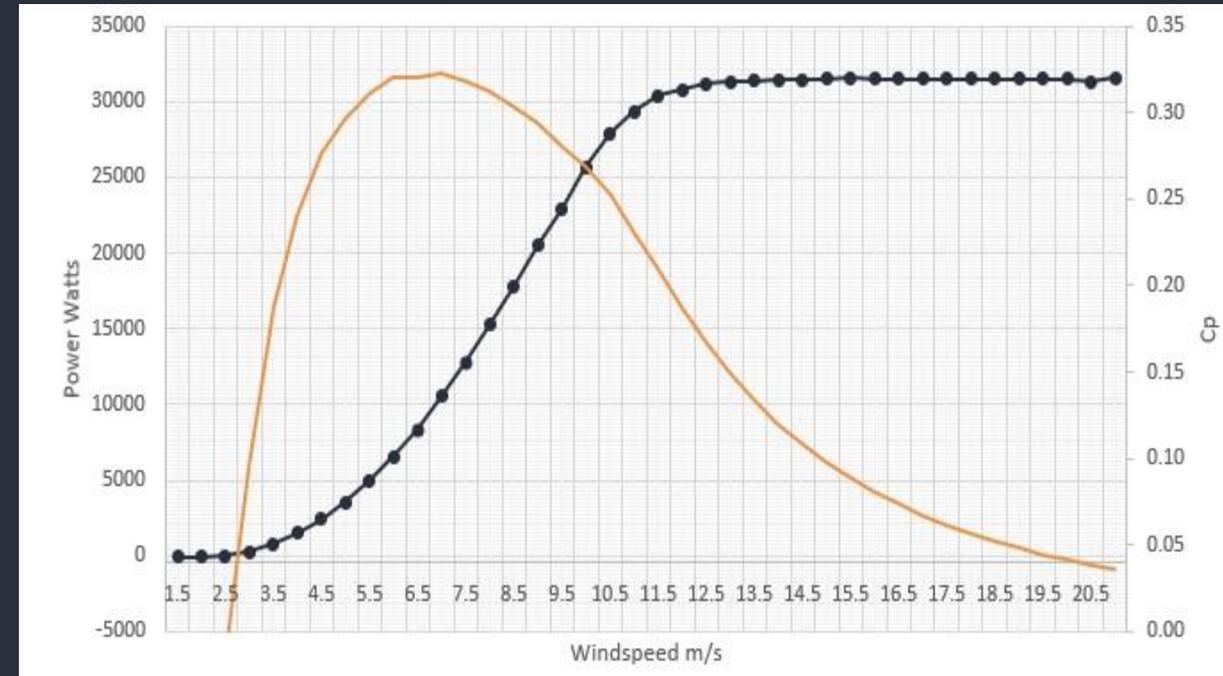
CASE STUDY 1: Challenges to Overcome

REI SCOPE	CHALLENGES	APPROACH	SOLUTION
Design	<ul style="list-style-type: none">• New design → Unknowns• Simplified load model• Material data / characterizations	<ul style="list-style-type: none">• Assess the components• Assess turbine design envelope• Define compliant design conditions• Define material properties	<ul style="list-style-type: none">• Develop compliant aero-elastic simulation model• Develop component structural reports
Type Testing	<ul style="list-style-type: none">• New / unused test site• Customer site → distance• Multiple turbines to be tested• Various components / configurations	<ul style="list-style-type: none">• Assess the proposed site• Define test setup and equipment• Define tests to be performed• Define roles / responsibilities	<ul style="list-style-type: none">• Develop site layout• Execute compliant tests• Analyze and filter databases
Electrical	<ul style="list-style-type: none">• Strict market requirements• Components lacking approvals• No NRTL partner	<ul style="list-style-type: none">• Assess market requirements• Assess system & component designs• Define applicable codes and standards	<ul style="list-style-type: none">• Provide REI agent services• Perform design reviews• Develop certification scope with NRTL

Certification Results

Completed ACP 101-1 Type Testing

- ACP 101-1 Power Performance
- ACP 101-1 Duration
- ACP 101-1 Safety & Function
- ACP 101-1 Acoustic Noise



Overall Cost / Time

- 15 months
- \$252,500

Total Power Production Hours
Complete
Total Normal Operation Hours with Primary Windspeed >= 15 m/s
Complete

Electrical Product Safety Certification Time and Cost (UL 6142)

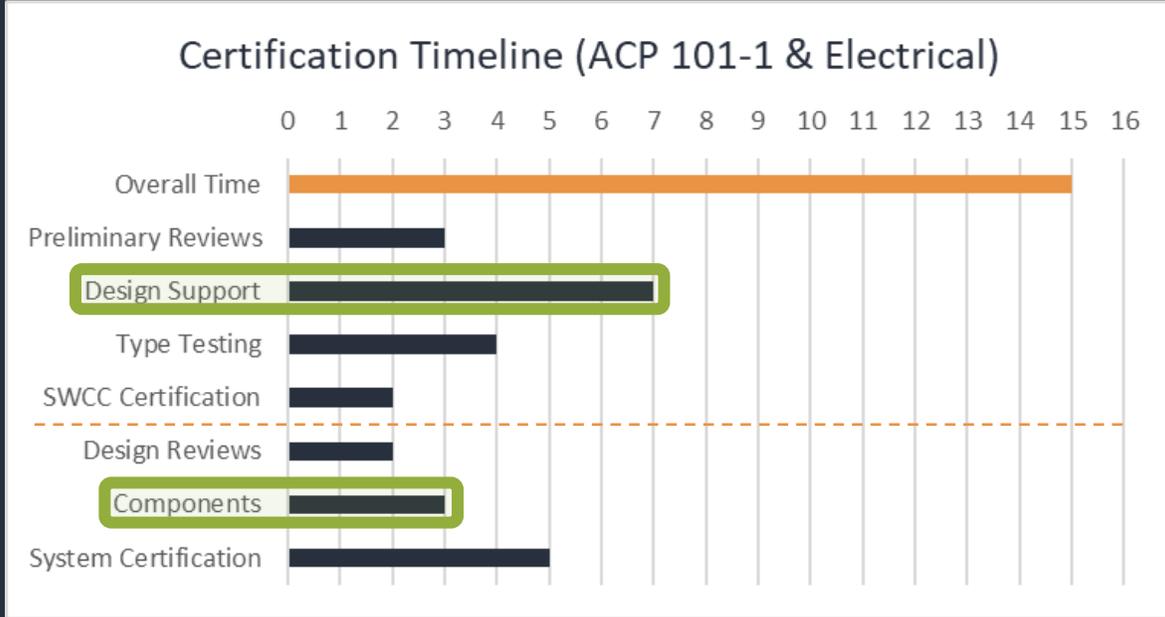
Product/System	Total Cost	Total Time
-	USD \$	Months
Turbine System NRTL Classification	32,000	6
PM Generator NRTL approval	22,000	3
Control System Equipment NRTL approval	20,000	3
REI Advisory	8,000	NA
TOTAL COST / TIME	82,000	6

Type Test & Certification Time and Cost (ACP 101-1)

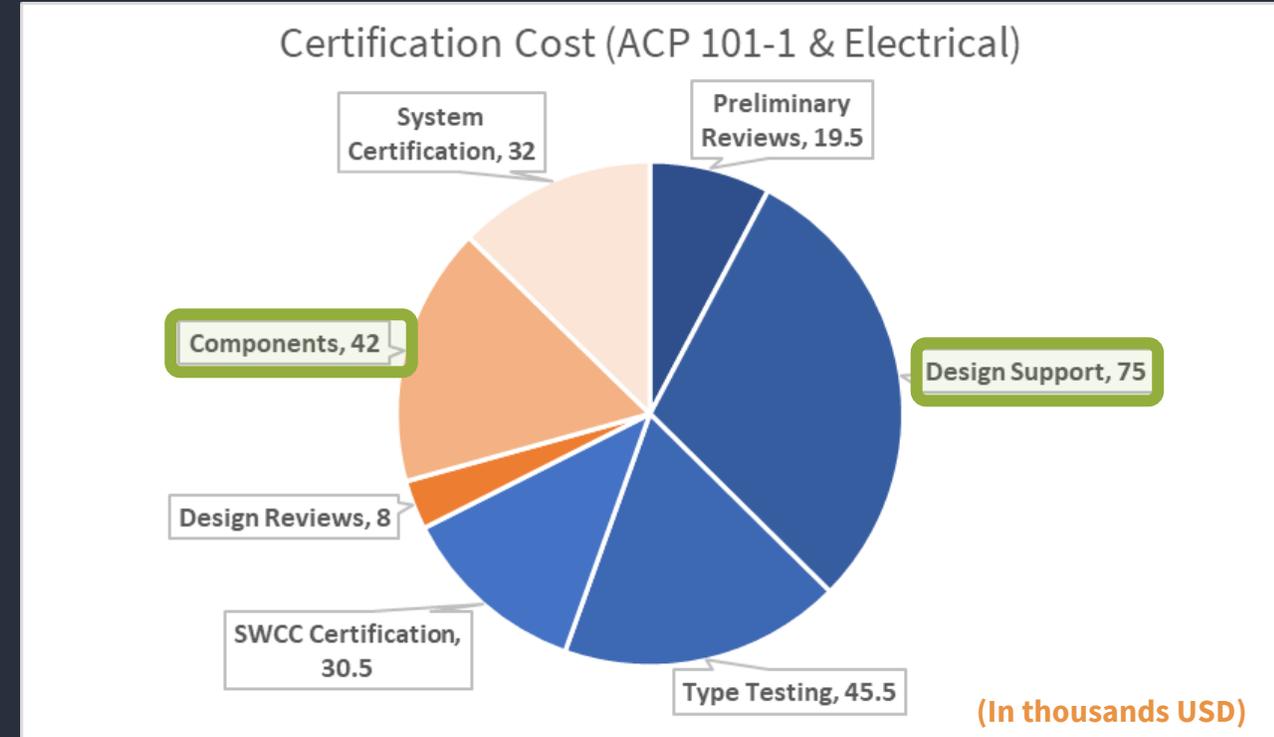
Certification Element	Total Cost	Total Time
-	USD \$	Months
Preliminary Certification Review	7,500	1
Aero Model Development	45,000	4
Structural Analysis / Reports	30,000	3
Type Testing – Site and Equipment	12,000	3
Type Testing – Power	12,000	3
Type Testing – Noise (external)	20,000	2
Type Testing – Duration	4,000	3
Type Testing – S&F (remote)	6,000	2
Type Testing – Design Validation	3,500	1
Certification Review	27,000	1
Factory Inspection	3,500	1
TOTAL COST / TIME	170,500	9

(Note: Test equipment costs are not included)

Certification Timeline & Cost (for Comparison)

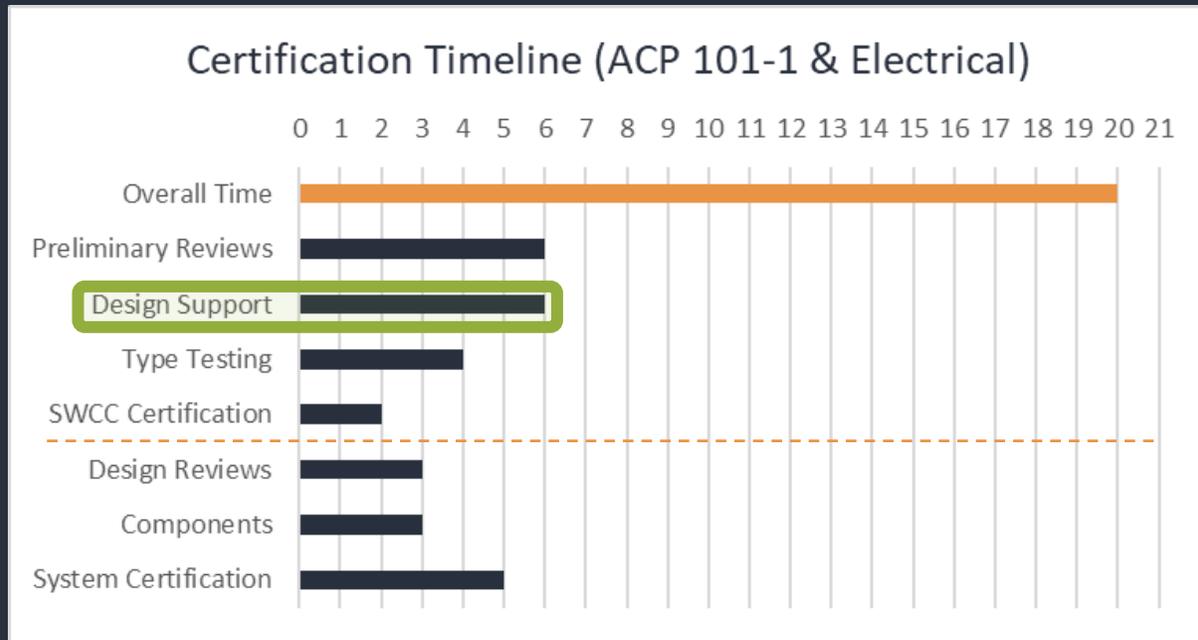


Total Time: 15 Months

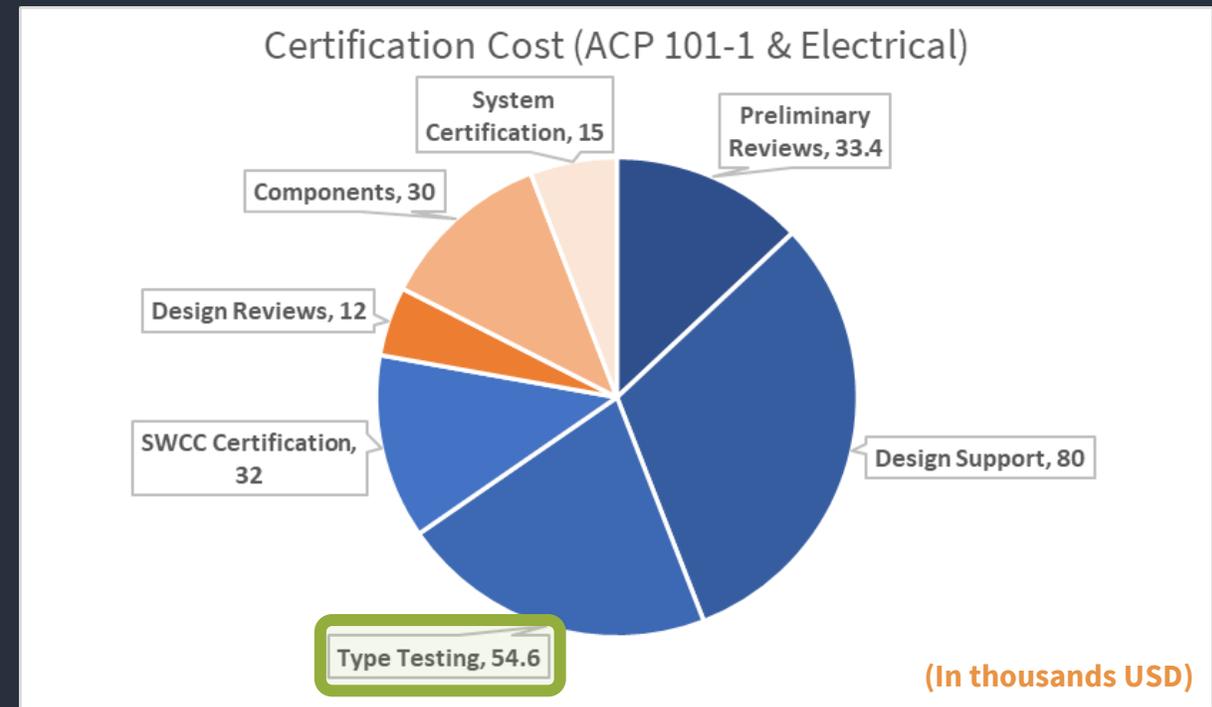


**Total Cost:
\$252,500**

CASE STUDY 2 SUMMARY: ACP101-1 (1-30kW) - Partner Test Site Electrical Certification (Non-entry)



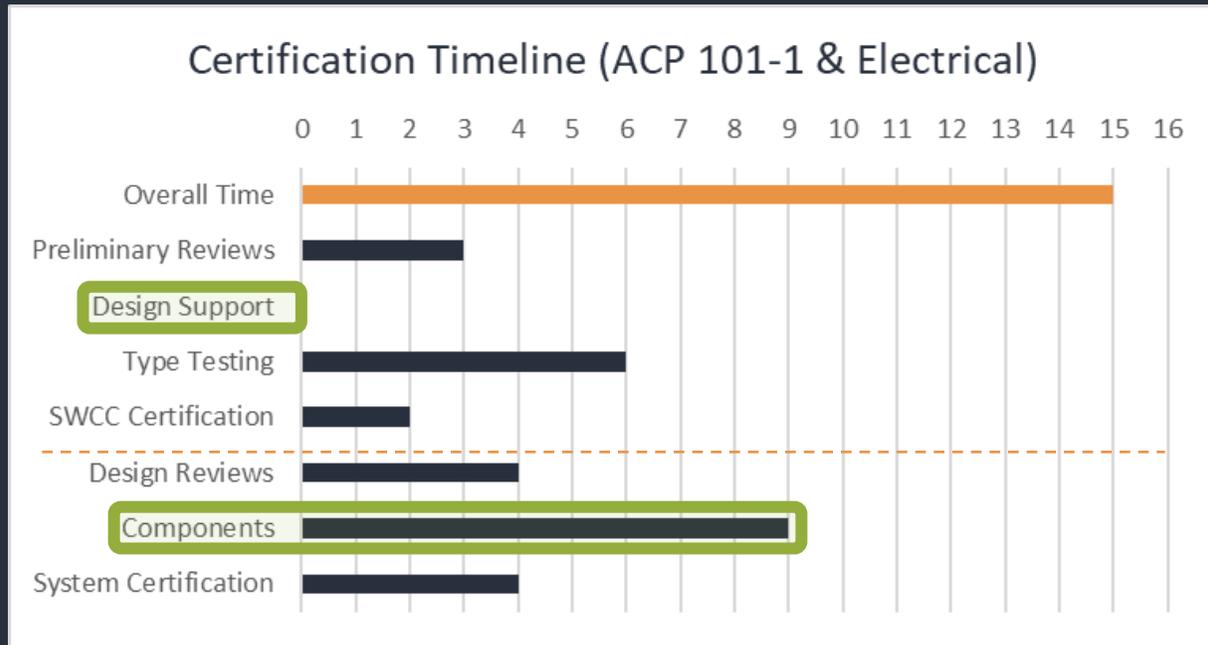
Total Time: 20 Months



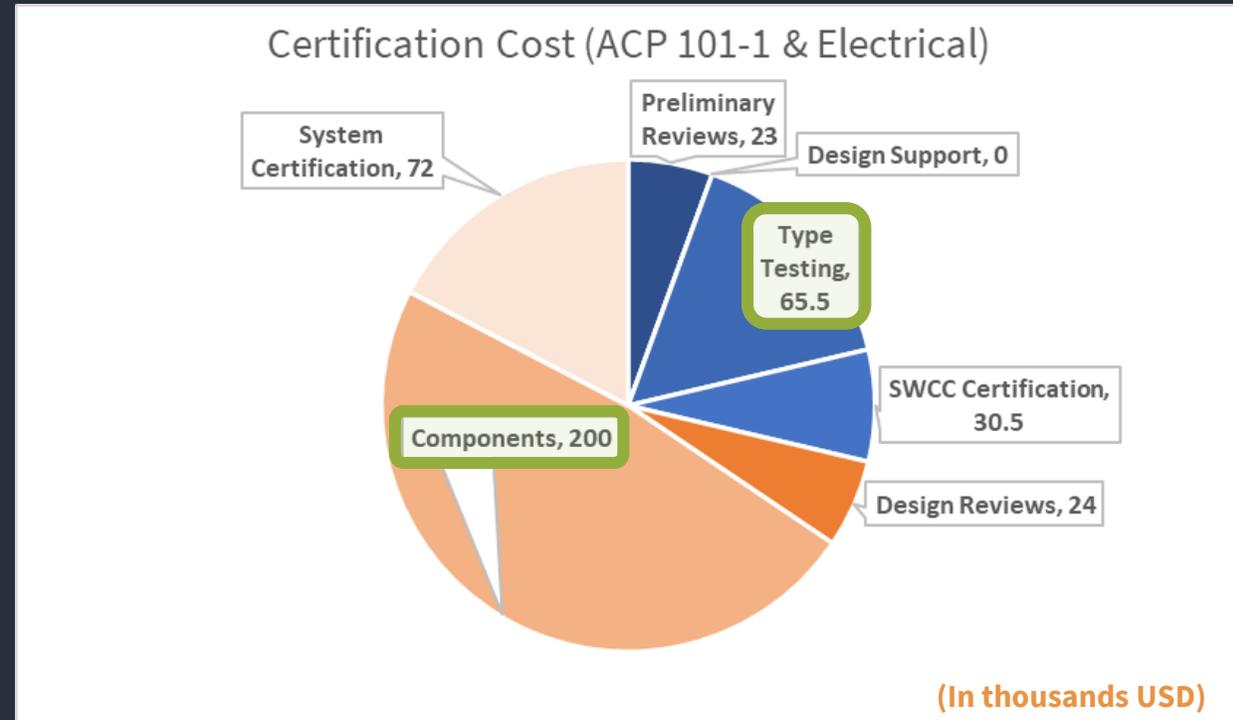
**Total Cost:
\$257,000**

CASE STUDY 3 SUMMARY:

ACP101-1 (65-150kW) - Customer site Electrical Certification (Permitted Entry)

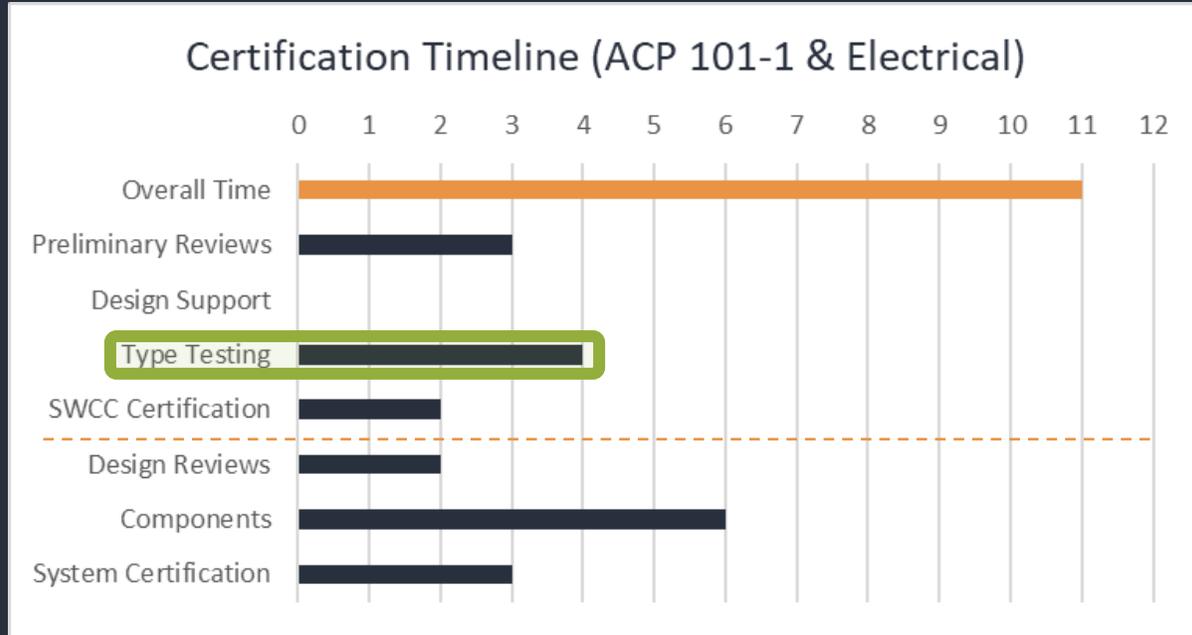


Total Time: 15 Months

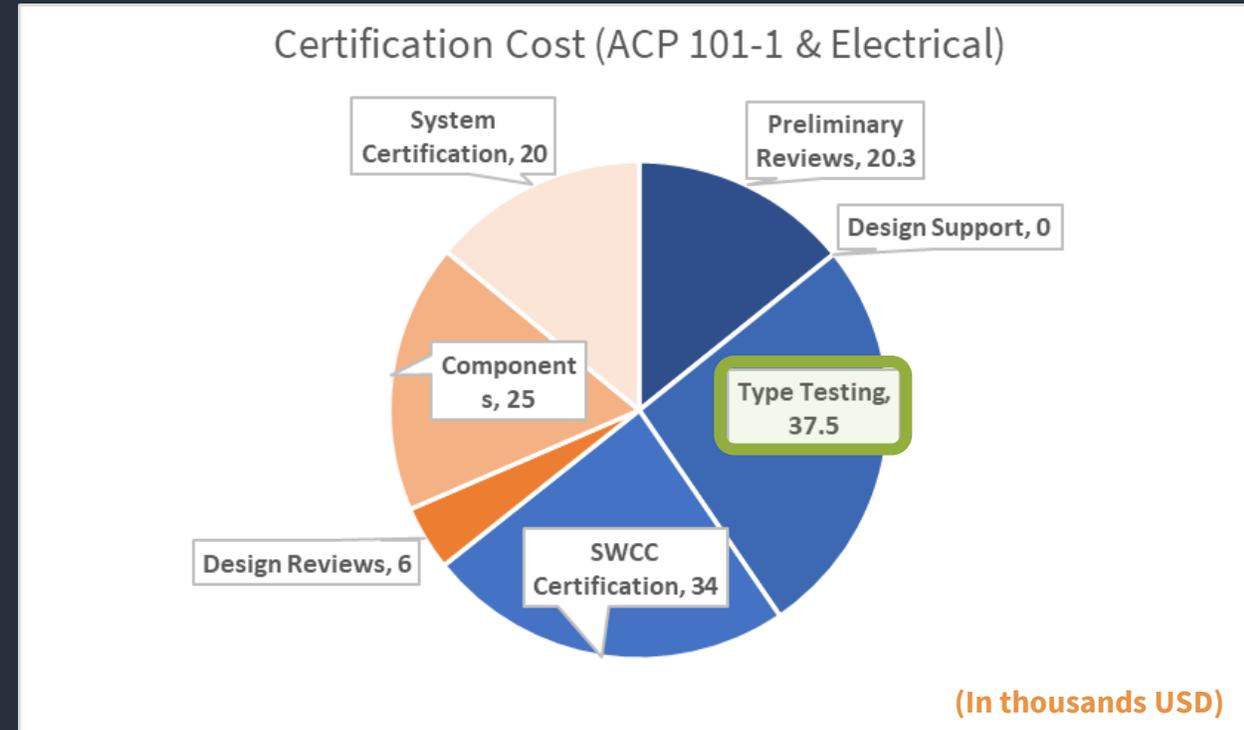


**Total Cost:
\$415,000**

CASE STUDY 4 SUMMARY: ACP101-1 (1-30kW) - Customer site Electrical Certification (Non-entry)



Total Time: 11 Months



**Total Cost:
\$142,800**

Case Study Time and Cost Comparisons

TIME COMPARISON					COST COMPARISON			
ACP 101-1					ACP 101-1			
Step	CS 1	CS 2	CS 3	CS 4	CS 1	CS 2	CS 3	CS 4
Preliminary Reviews	3 months	6 months	3 months	3 months	\$ 19,500.00	\$ 33,400.00	\$ 23,000.00	\$ 20,300.00
Design Support	7 months	6 months	NA	NA	\$ 75,000.00	\$ 80,000.00	\$ -	\$ -
Type Testing	4 months	4 months	6 months	4 months	\$ 45,500.00	\$ 54,600.00	\$ 65,500.00	\$ 37,500.00
SWCC Certification	2 months	2 months	2 months	2 months	\$ 30,500.00	\$ 32,000.00	\$ 30,500.00	\$ 34,000.00
TOTAL	9 MONTHS	14 MONTHS	11 MONTHS	11 MONTHS	\$ 170,500.00	\$ 200,000.00	\$ 119,000.00	\$ 91,800.00
Electrical Safety					Electrical Safety			
Step	CS 1	CS 2	CS 3	CS 4	CS 1	CS 2	CS 3	CS 4
Design Reviews	2 months	3 months	4 months	2 months	\$ 8,000.00	\$ 12,000.00	\$ 24,000.00	\$ 6,000.00
Components	3 months	3 months	9 months	6 months	\$ 42,000.00	\$ 30,000.00	\$ 200,000.00	\$ 25,000.00
System Certification	5 months	5 months	4 months	3 months	\$ 32,000.00	\$ 15,000.00	\$ 72,000.00	\$ 20,000.00
TOTAL	13 MONTHS	6 MONTHS	13 MONTHS	11 MONTHS	\$ 82,000.00	\$ 57,000.00	\$ 296,000.00	\$ 51,000.00
FULL SUMMARY	15 MONTHS	20 MONTHS	15 MONTHS	11 MONTHS	\$ 252,500.00	\$ 257,000.00	\$ 415,000.00	\$ 142,800.00

Costs: External labor costs for testing and certification related services only. No OEM internal costs included. No equipment costs included. No installation costs included.

2026 STANDARDS UPDATES

- ANSI/ACP 101-1
 - Addendum 1 approved → Clarifications only
 - Awaiting ANSI publication
- IEC TC88 MT2 UPDATE (IEC 61400-2)
 - Committee Draft expected Q2 2026
 - Notable changes
 - Design similar to 61400-1
 - Testing simplified
 - Scope now includes medium turbines 200 – 1200 m²
- UL 6142
 - New edition recently published → Minor updates only
 - Major technical improvements pending
- *Distributed Wind Certification Best Practices Guideline* → Final release expected Q1 2026



A stylized, cartoonish illustration of a wind turbine. The tower is grey with a vertical ribbed pattern. The nacelle is grey and contains a central hub with three blades. The blades are grey with a lighter grey inner section. The background is dark blue with abstract, colorful shapes in shades of orange, red, and blue, suggesting a sunset or sunrise. The entire graphic is semi-transparent, allowing the text to be overlaid.

THANK YOU FOR YOUR TIME!

QUESTIONS?

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