

Jim Crimmins  
CFV Labs  
Albuquerque, NM

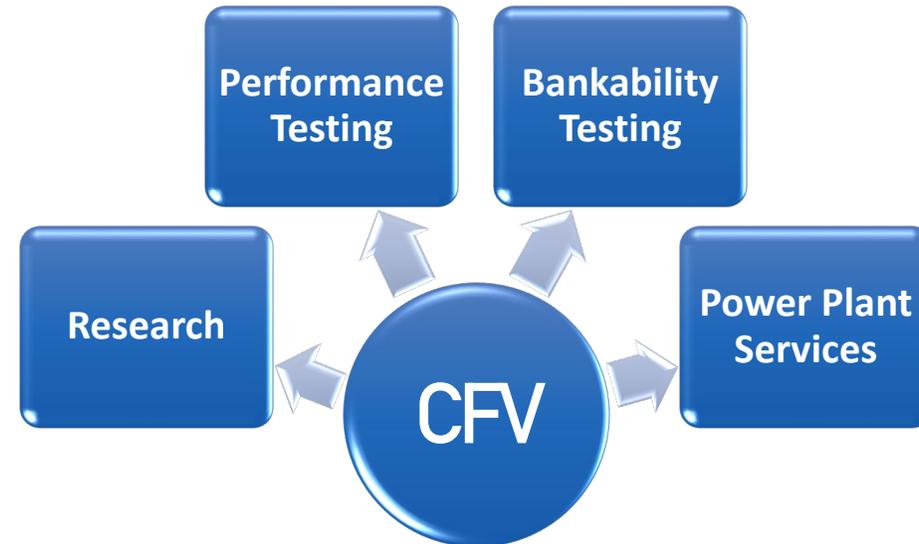
# CFV Labs Introduction

CFV Labs

CFV Labs is a Premier PV  
Research and Test Facility in  
Albuquerque, NM.

“Powering Renewable Innovation”

CFV Labs



CFV Labs has been ISO 17025 accredited by A2LA since 2011.

Our scope of accreditation can be found here:

[www.a2la.org](http://www.a2la.org)

CFV Labs



## Accredited Laboratory

A2LA has accredited

**CFV SOLAR TEST LABORATORY, INC.**

Albuquerque, NM

for technical competence in the field of

**Sustainable Energy**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 5<sup>th</sup> day of June 2018.

A handwritten signature in blue ink, appearing to be 'A. ...', written over a horizontal line.

Senior Director, Accreditation Services  
For the Accreditation Council  
Certificate Number 3301.01  
Valid to June 30, 2020  
Revised January 16, 2019

*For the tests to which this accreditation applies, please refer to the laboratory's Sustainable Energy Scope of Accreditation.*

A Selection of CFV's  
Customers, Collaborators  
and Partners.

We work with both  
manufacturers and  
developers.

CFV Labs



CFV Labs was started by Fraunhofer, CSA Group and VDE in 2010.

The current principals acquired CFV in 2020 and have been with the company for 3-7 years.

We are committed to making CFV Labs the premier full-service PV test lab in North America.

## CFV Labs Management Team



**Jim Crimmins**  
CEO



**Daniel Zirzow**  
CTO

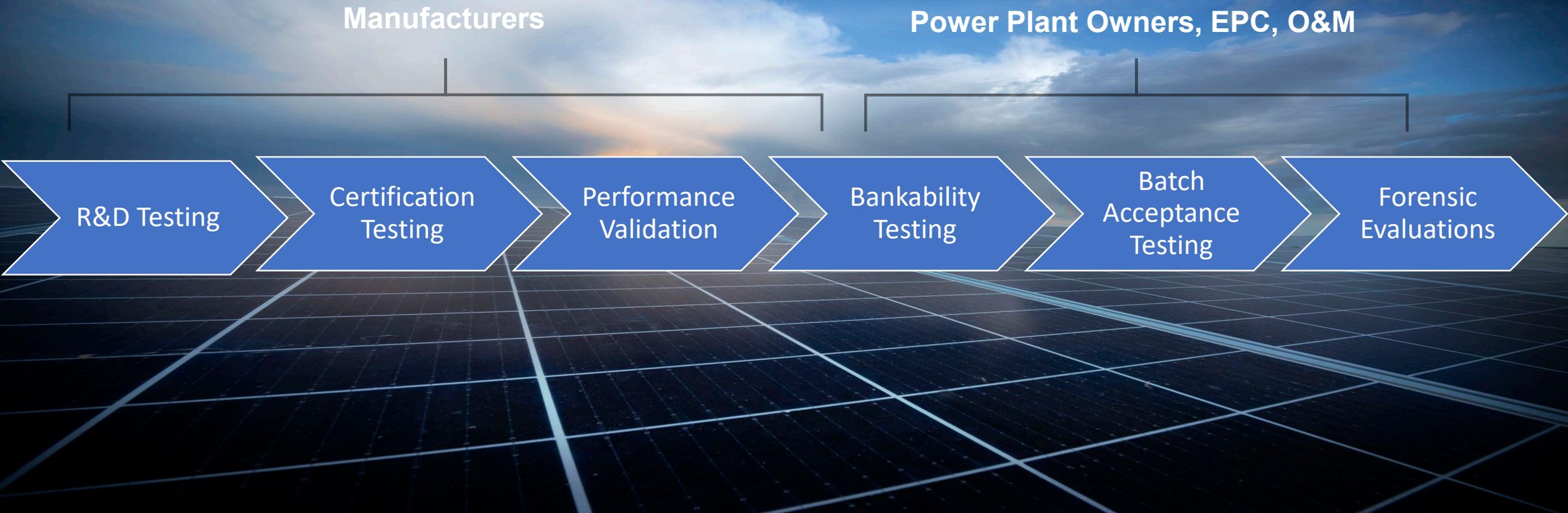


**Colin Sillerud**  
VP Engineering



**James Richards**  
VP Engineering

# CFV Labs provides testing services throughout the product lifecycle...



R&D testing can isolate product issues early in the development cycle before they become embedded in the design.

CFV Labs offers a wide range of performance, safety and reliability testing services to enable manufacturers to optimize their new designs.

Early-stage testing can also enable manufacturers to start certification projects with additional confidence.

**CFV Labs**

**We partner with start-ups and manufacturers on early-stage R&D and product design.**



CFV Labs is accredited to perform PV module, racking and tracker certification testing.

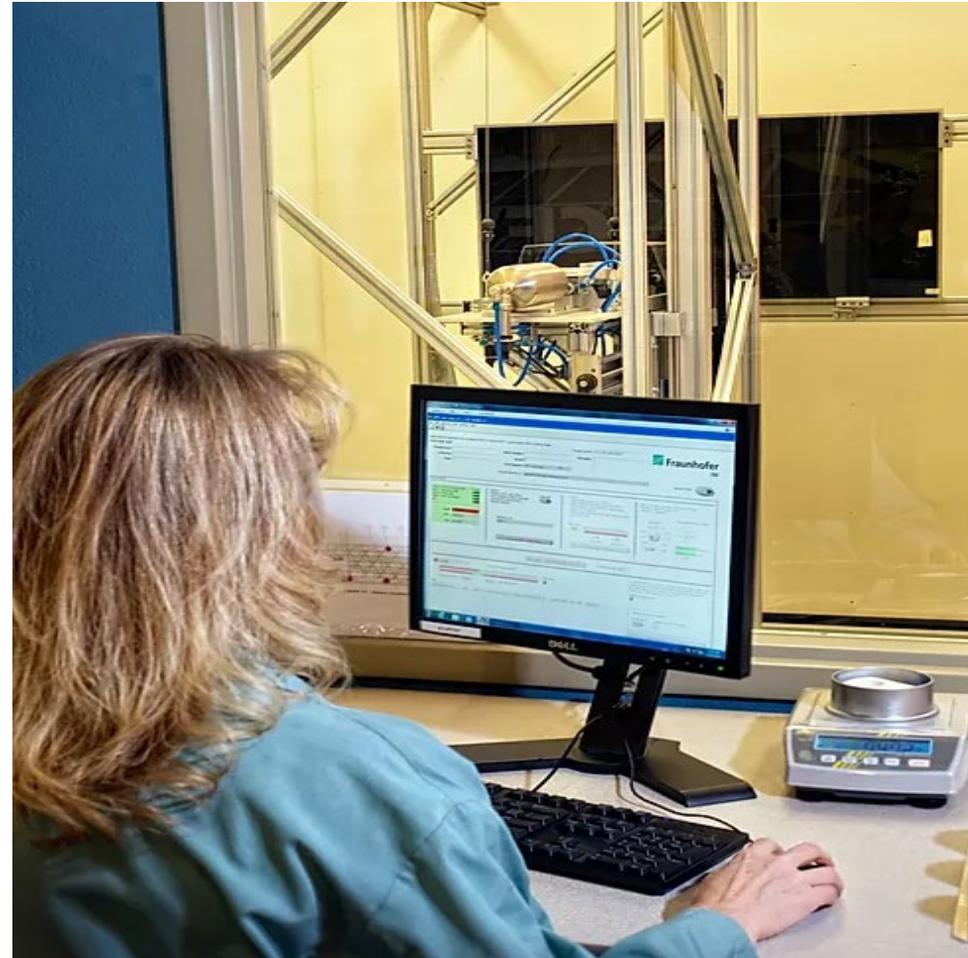
We partner with NRTLs and Notified Bodies to provide ANSI/UL and IEC certifications for our clients.

We test to the newly harmonized 61730 and 61215 PV module standards.

We perform CEC testing and are known for our fast turn-arounds due to the consistently high irradiance conditions in our outdoor test-yard.

**CFV Labs**

**We assist with UL/IEC certification and CEC testing to get products to market quickly.**



**We have a large outdoor test yard for performance validation of all PV technologies including bifacial modules and trackers.**

Large outdoor test yard attached to lab. CFV can test several hundred modules at a time.

Single axis trackers with 30 modules per row create a realistic simulated utility scale bifacial test environment.

CFV can evaluate module performance, tracker performance, synthetic albedos, torque-tube shading and other key performance drivers.



Validating the field performance of new technologies requires a new generation of instrumentation as well.

CFV Labs has created a family of very accurate module and string monitors to precisely evaluate new technologies.

These monitoring devices come in different voltage and current ranges and in both wired and wireless versions.

**CFV Labs**

**We build custom ultra-high precision instrumentation for ourselves and our clients.**



A+/A+/A+ h.a.l.m.  
flasher.

Integrated temperature  
chamber for accurate  
61853-1 matrix  
measurements.

Round-robins with  
Fraunhofer ISE, NREL,  
SERIS to validate  
measurement accuracy.

**CFV Labs**

**We have a world class flasher program for  
indoor performance validation.**



# We do bankability testing with test sequences based on published standards.

CFV Labs use standards as the base for bankability testing protocols.

CFV Labs was instrumental in the development of IEC 63209 - an emerging bankability testing standard in draft format.

IEC standards are developed by technical committees representing a broad array of stakeholders in the PV industry.

PAN files, LID, LeTID, MLT, PID and Hail testing are also offered on a stand-alone basis

CFV Labs

Control	Sequence A	Sequence B	Sequence C	Sequence D	Sequence E
2 Modules	3 Modules	3 Modules	2 Modules	3 Modules	2 or 4 Modules
Initial Check	Initial Check	Initial Check	Initial Check	Initial Check	Initial Check
Control Interim Check (Simultaneous with Other Interim Checks)	MQT 11 TC 200	IEC TS 62702 DMLT $\pm 1000$ Pa	MQT 13 DH 200	MQT 13 DH 1000	MST 13 Continuity Eq. Bond.
Final Check	Interim Check	Interim Check	Interim Check	Interim Check	IEC TS 62804-1
	MQT 11 TC 200	MQT 11 TC 50	Interim Check	MQT 13 DH 1000	Positive PID 85°C/85% 96 hrs
	Interim Check	Interim Check	MQT 12 HF 10	Final Check	Negative PID 85°C/85% 96 hrs
	MQT 11 TC 200	MQT 12 HF 10	Interim Check		Interim Check
	Final Check	Final Check	MST 54 UV Front 60kWh/m <sup>2</sup>		IEC TS 62804-1
			Interim Check		Positive PID 85°C/85% 96 hrs
			MQT 12 HF 10		Negative PID 85°C/85% 96 hrs
			Final Check		Final Check



## For developers and EPCs we perform forensic evaluations of underperforming modules.

Forensic evaluation of underperforming power plants and modules, with field facing partners.

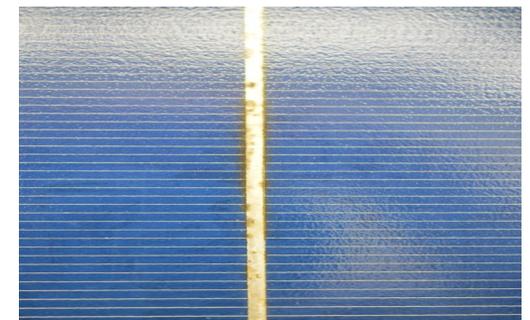
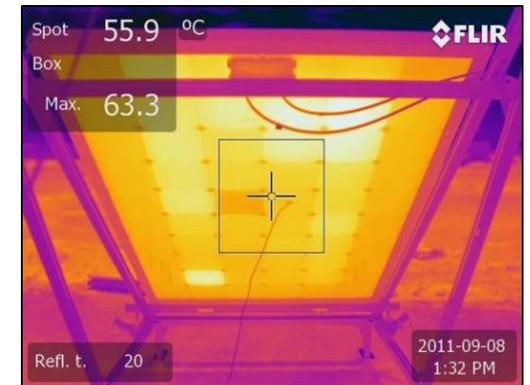
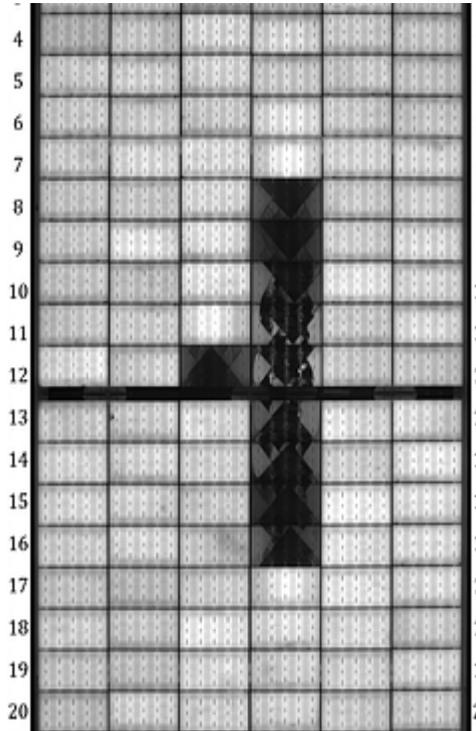
Thermographic and EL imaging for defect detection.

Backsheet spectroscopy for material identification.

Warranty claim testing.

Full-service reliability testing for go-forward testing of fielded modules with backsheet problems or other defects.

**CFV Labs**



**Thank You!**

**Questions?**

**Jim Crimmins**

**[jim.crimmins@cfvlabs.com](mailto:jim.crimmins@cfvlabs.com)**

**CFV Labs  
Albuquerque, NM**