



Perovskite Accelerator for Commercializing Technologies (PACT) **Bankability Webinar**

Dr. Joshua S Stein
Director, PACT Center, Sandia National Laboratory

Dr. Ralph Romero
Senior Managing Director, Black & Veatch

Rob Foree
Consultant, Black & Veatch

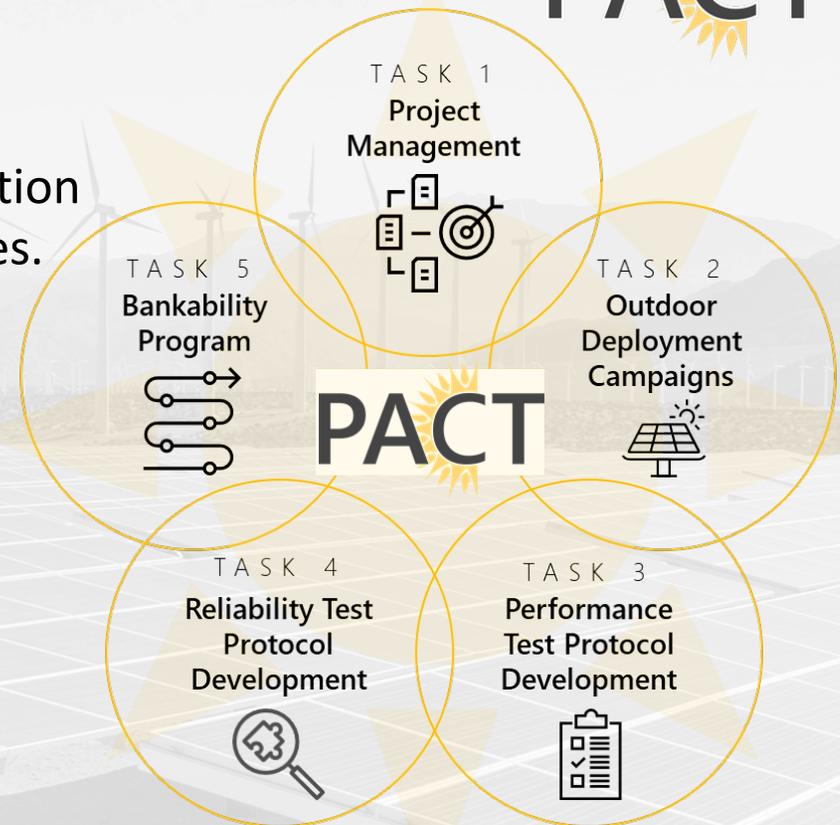
Dr. Akshay Ashirgade
Manager, Black & Veatch



Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525. SAND2022-4094 PE

PACT Overview

- PACT is a DOE-funded independent validation center for perovskite photovoltaic modules.
- Performance and reliability test protocol development
- Outdoor testing
- Accelerated stress testing of modules
- Bankability support for companies



Center Structure and Leadership team



Joshua Stein
Director, Sandia



Bruce King
*Performance Lead
Sandia*



Laura Schelhas
*Deputy Director,
Reliability Lead, NREL*



Ralph Romero
*Bankability Lead
Black & Veatch*



Kailey Wulfert
*Business Development
Sandia*

PACT Task Structure

1. Project Management
2. Outdoor Deployment
3. Performance test protocols
4. Reliability test protocols
5. Bankability program



Los Alamos National Lab



Wanyi Nie

Team Members by institution

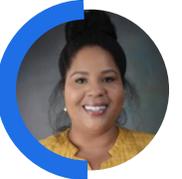
Sandia National Labs



Jennifer Braid



Marios Theristis



Angelique Montgomery



Christa Torrence (now at LANL)

National Renewable Energy Lab



Kirsten Perry



Michael Owen-Bellini



Robert White



Joe Berry



Tim Silverman



Ingrid Repins



Dana Kern



Michael Deceglie



Paul Ndione



Nutifafa Doumon



Jack Schall





Team Members by Institution

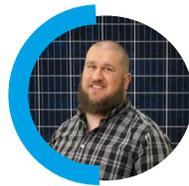
Black and Veatch



Rob Foree



Akshay Ashirgade



Daniel Zirzow

CFV Labs



Jim Crimmins



James Richards



Colin Sillerud

EPRI



Cara Libby



Wayne Li

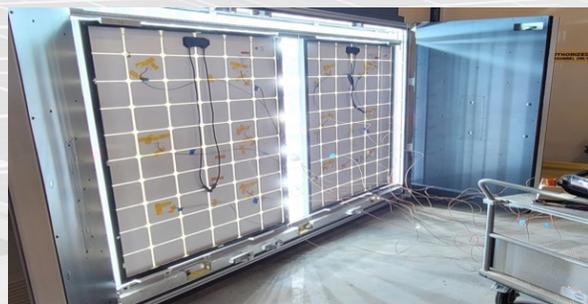
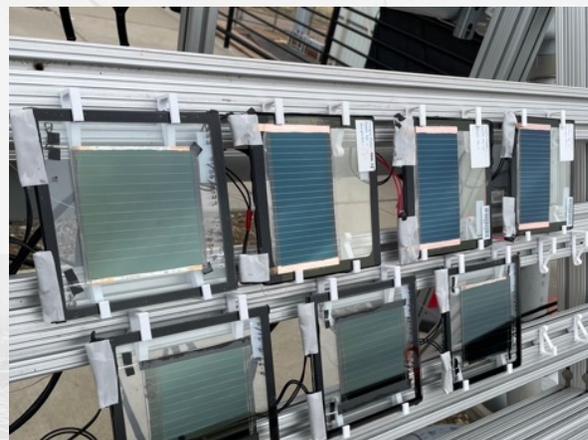


Michael Bolen

University Partnerships



PACT Update



Initial testing protocols are available on our website: <https://pvpact.sandia.gov>

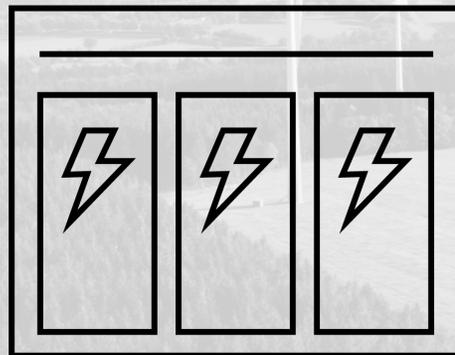
Perovskite PV modules from university partners are being tested outdoors and in accelerated stress tests.

PACT is developing an industry and academic engagement process to accept modules for testing.



What is a Bankability Study?

A bankability study is an assessment of technology risk.



Will the technology perform as expected?

Why is a bankability study important?

Helps:



- a startup company raise capital.
- finance projects using new technologies.



Is a component in a financial institution's risk assessment process.



Provides an honest evaluation and representation of the manufacturer and technology to the outside world.



Helps stakeholders get comfortable with the technology.

How Do We Assess Technology Risk?



Technology Design



Manufacturing



Company

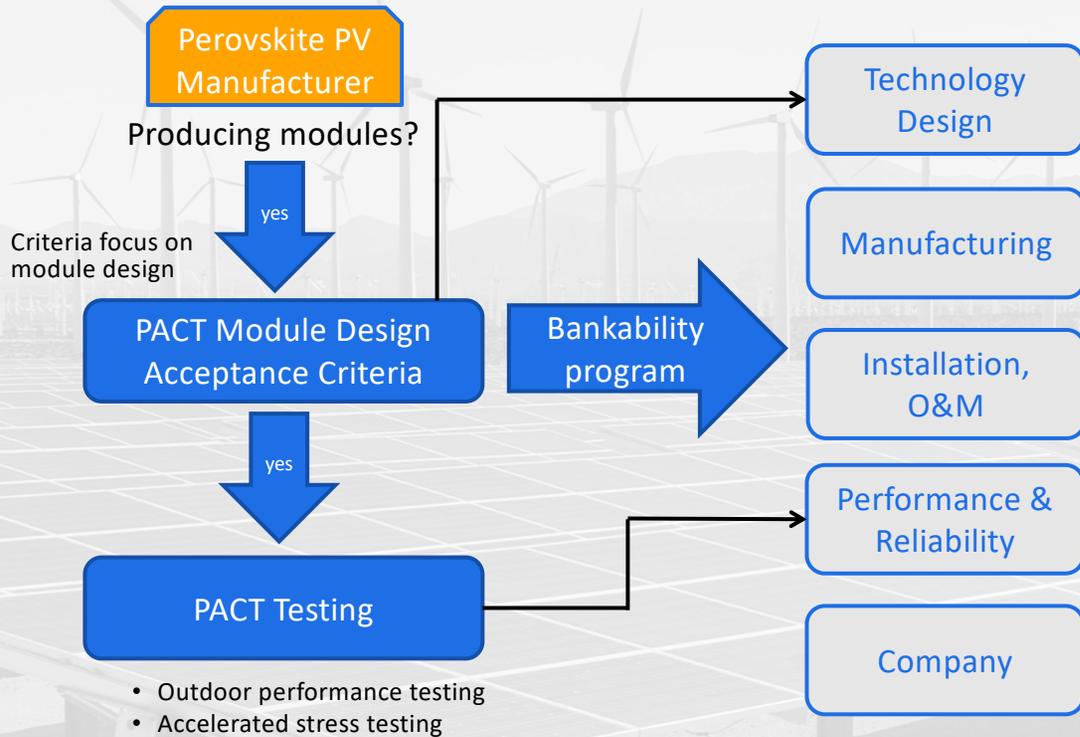


Performance and Reliability



Installation, Operation and Maintenance

PACT Bankability Program



PACT testing and bankability program aims to provide qualified companies access to free services.

What will PACT provide?



Free bankability and testing services to qualified companies.

- The typical cost of a bankability study is around \$100,000.



Based on Black & Veatch's bankability study approach.

- Validated by over 180 PV bankability assessments.
- Accepted throughout the financial community worldwide.
- Highly confidential treatment of company information.

Deliverables to Company

Bankability roadmap

- Familiarize company with requirements of a successful bankability study.
- Perform initial technology assessment.
- Identify technology strengths and weaknesses.
- Develop, with the company, the path to success.

Bankability assessment

- In-depth review of each of the five bankability “pillars”.
- Bankability report for company.

Community Outreach (Year 1)



GOALS

Introduce perovskite PV bankability services to PACT community members.

Engage with module manufacturers.



Activities include:

- Webinar
- PACT workshop
- Bulletins

Bankability Roadmap

(Years 2-3)



GOAL

Develop bankability roadmap with module manufacturers.



Activities Include

- Module manufacturer workshop
- On-Site visit
- Roadmap development
- Progress review

Bankability Study

(Years 3-4)



GOAL

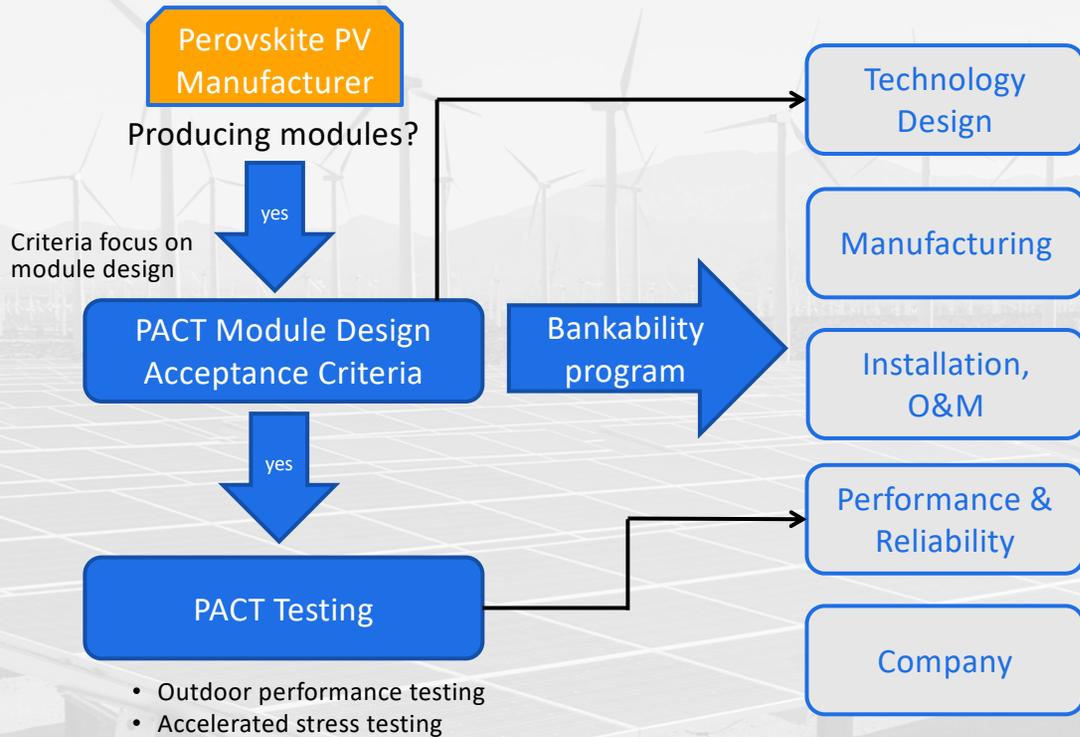
Complete full bankability assessment and deliver reports to module manufacturers



Activities Include:

- On-site visits with module manufacturers
- Perform full design, performance, manufacturing and company review

PACT Bankability Program



PACT testing and bankability program aims to provide qualified companies access to free services.

Acceptance Criteria (available at <https://pv pact.sandia.gov/services/>)



Purpose

- Ensure safety, quality and scalability
- Define minimum design requirements of perovskite PV modules
- Ensure technology compatibility with PACT technical facilities and test equipment.



Criteria

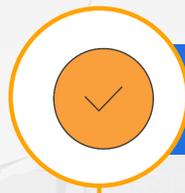
- Design details: architecture, chemical composition, batches
- Mechanical requirements: shape and size, active area, junction box, wires
- Electrical requirements: short circuit current, open circuit voltage, efficiency, safety

Technology Evaluation



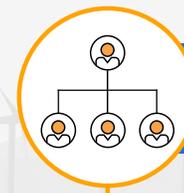
Design

- PACT Module Design Acceptance criteria feeds preliminary information
- Product design: module electrical, mechanical specifications and components specification



Performance & Reliability

- Module performance specification and test results (from PACT or other independent labs)
- Safety, degradation testing



Manufacturing and Company Information

- Manufacturing: technology, process, quality assurance
- Company information: organization, intellectual property, supply chain

How Can Manufacturers Participate in PACT?

- In order to qualify for PACT services companies will need to complete the application included in the PACT Module Design Acceptance Criteria document (<https://pvpact.sandia.gov/services/>)
- Non-disclosure and material transfer agreements will be executed to protect company proprietary information.



Q&A.



**Building
a World of
Difference.®**



Contact Us

Building a World of Difference

+1 913 458 2000

info@bv.com