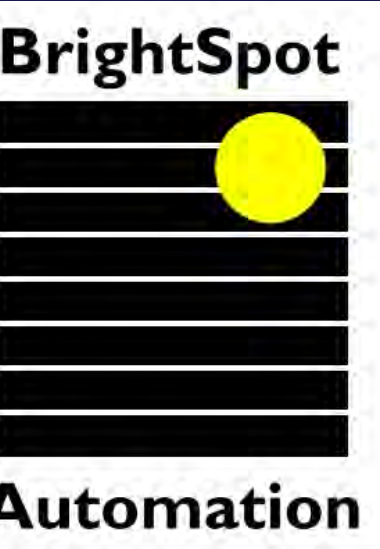


The LoadSpot: a mechanical load tester to enable development of advanced materials and designs for solar panel durability

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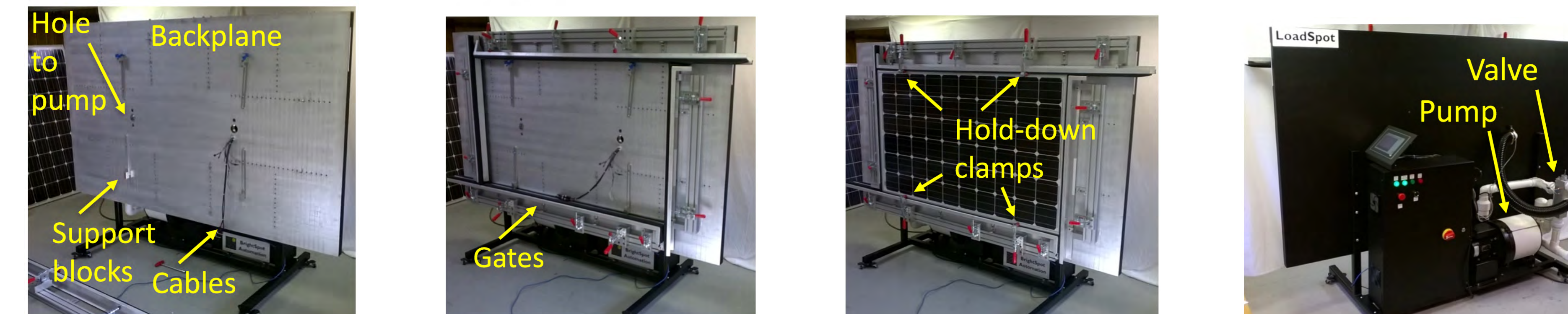
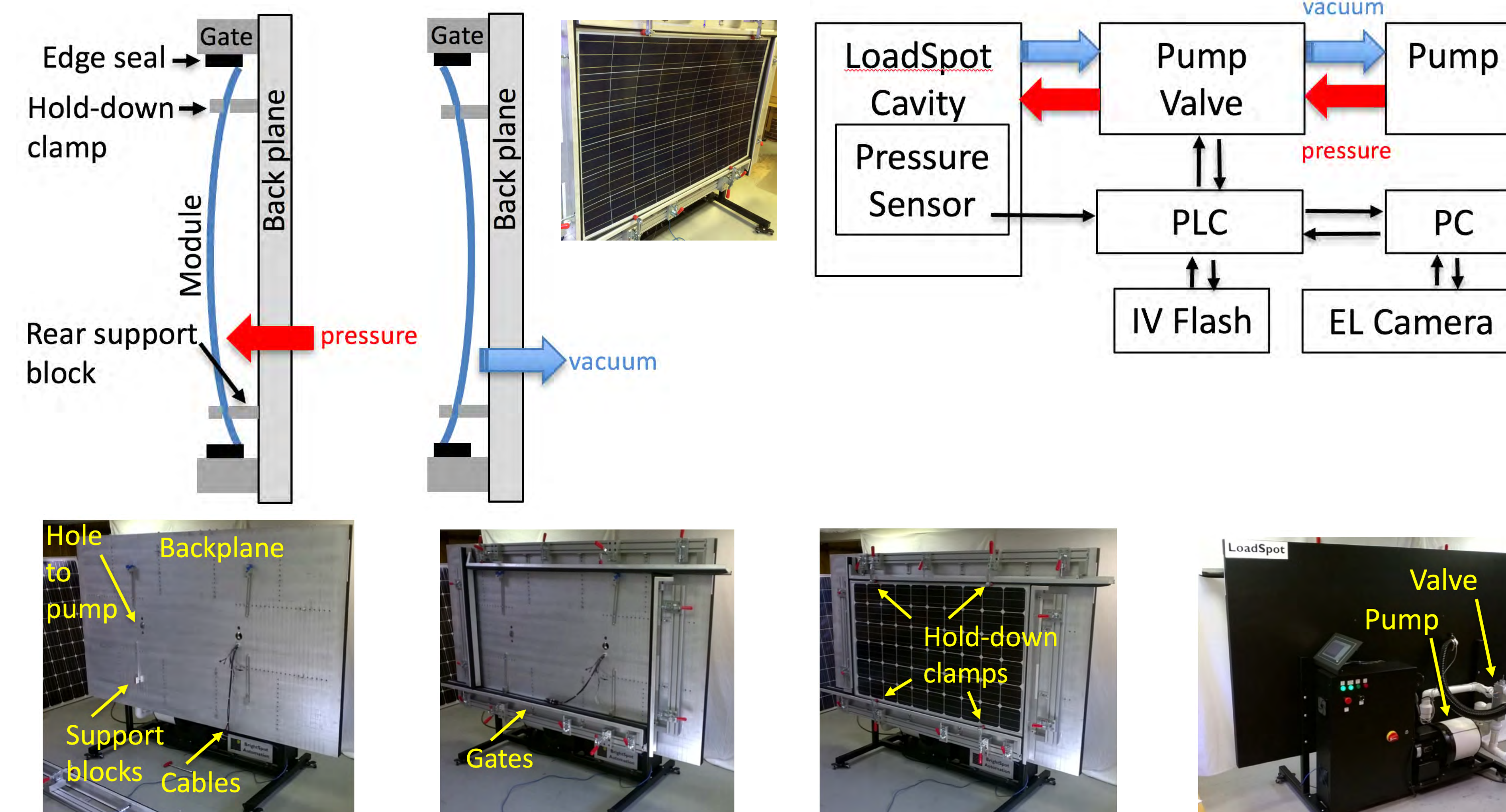
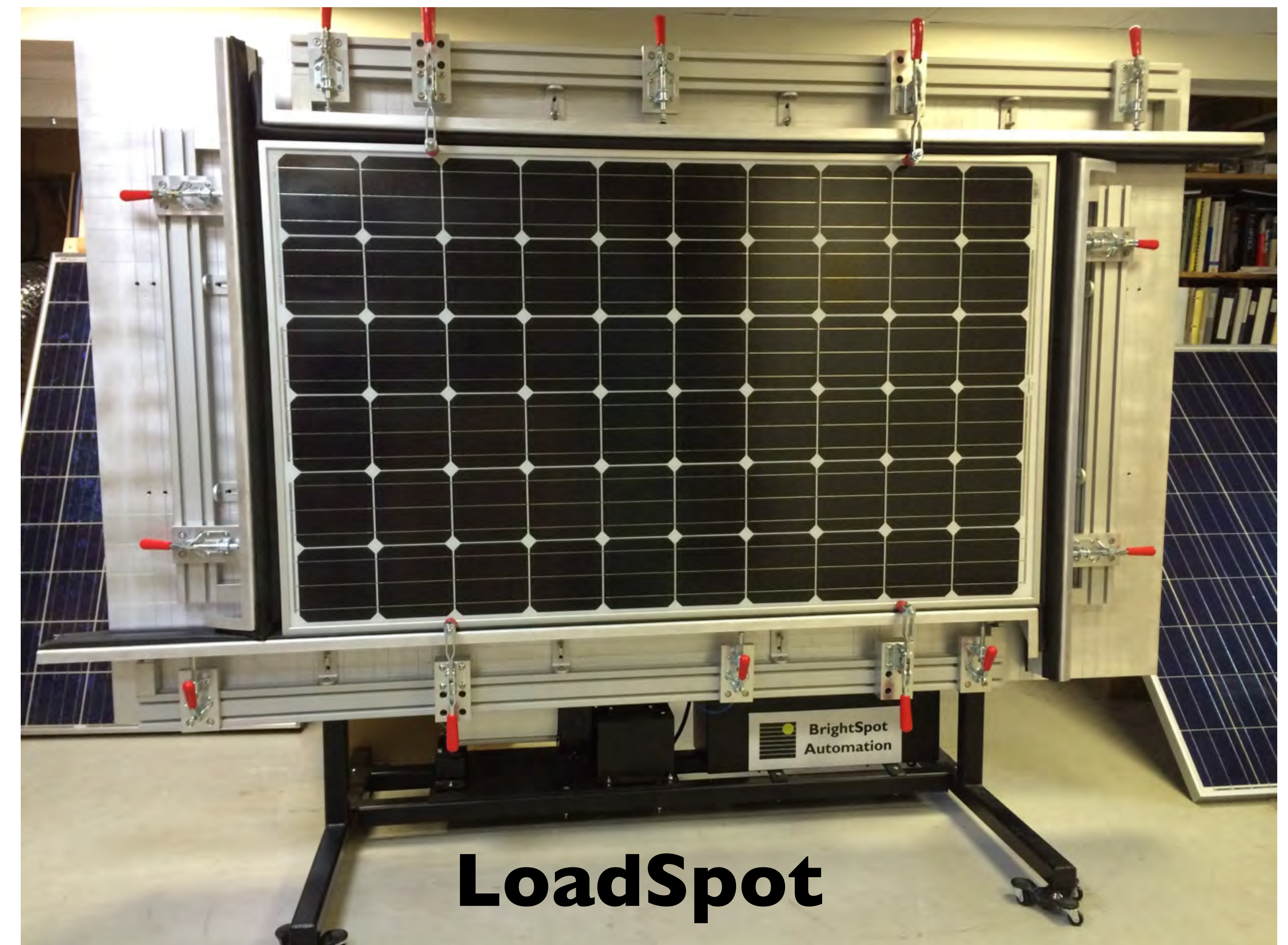
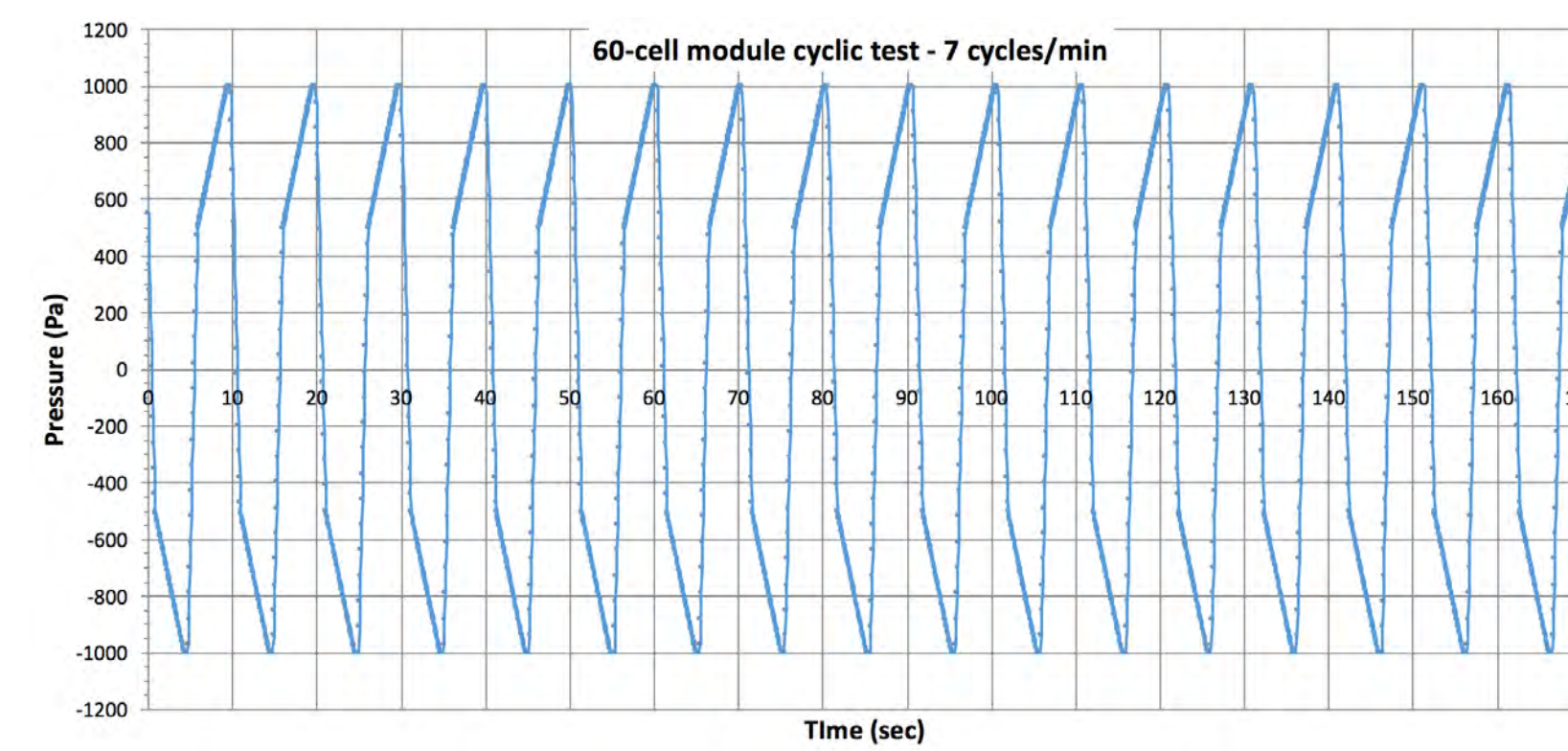


1. Why is load testing important for DuraMat activities?

- Load testing replicates real-world stress factors from wind and snow
- Static loading testing is required for module certification
- Cyclic load testing is requested by many module buyers, and will likely be required in the near future
- New materials and designs can influence the behavior and stress/strain characteristics of the module under load
- Many degradation modes are revealed by load testing
 - Cell cracking
 - Interconnect wire fatigue
 - Solar bond integrity
 - Edge seal integrity
 - Adhesion of layers at various interfaces

2. Why is special about the LoadSpot?

- Uses vacuum and air pressure from the rear side to apply the loads
 - More uniform than other loading methods
 - Leaves the front side unobscured for IV & EL testing during load
 - Can explore how cracks form as a function of load
- Can perform the standard static and cyclic loading tests and accelerated versions of these tests
- Can monitor series resistance during loading (note wire fatigue events)
- Can perform a predictive crack opening test by applying a small load to the front side and comparing IV and EL in the unloaded and loaded states
 - The small load can open up pre-existing closed cracks and provide a quick prediction of future module power loss once these cracks gradually open up in the field (in contrast to slow chamber testing)



3. Where can I do LoadSpot testing on my modules?

- The Florida Solar Energy Center (FSEC) has a LoadSpot tool that can perform IV and Electroluminescence measurements during loading
- FSEC intends to participate in the DuraMat program and has a variety of other services and tools to offer including FEM modeling of stresses vs load

4. What if I have some unusual module/mounting configurations or I want to do some unusual tests?

- As part of BrightSpot Automation's contribution to the DuraMat program, we can upon request:
 - Design/construct customized clamping and mounting hardware
 - Customize software, data output/analysis, and interfacing with other tools
 - Add new functions/features to the tool (e.g. - temperature control, multipoint deflection maps, variable shading, expanded I/V ranges)

