

Backsheet: Correlation of Long-Term Field Reliability with Accelerated Laboratory Testing

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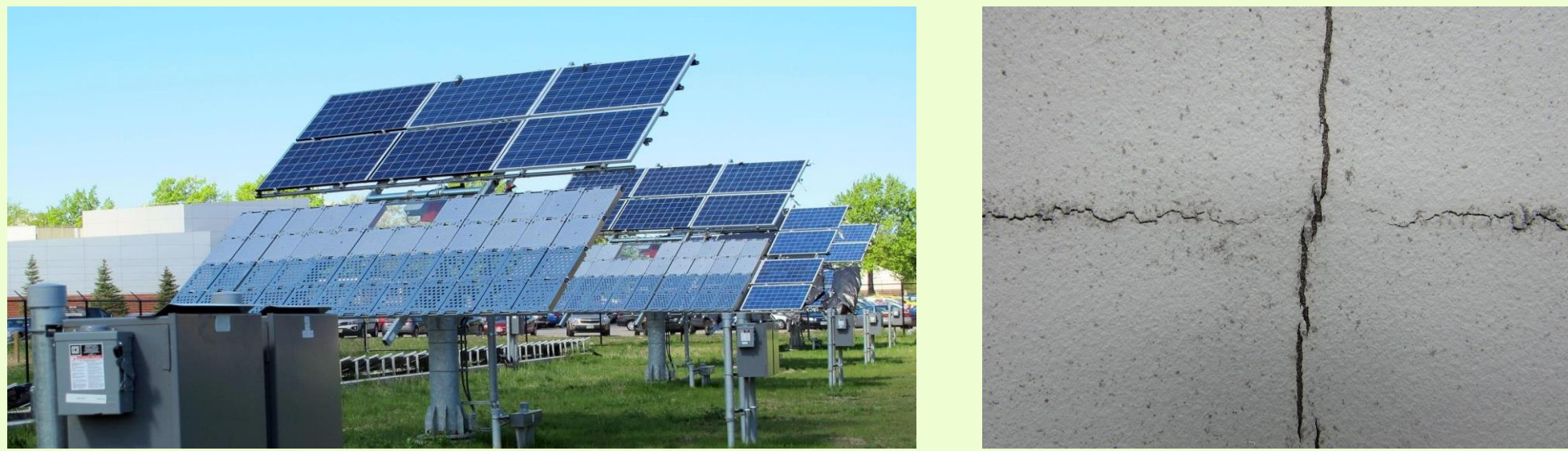
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Introduction

- PV modules are required to service in different types of environment
- Backsheet works as weathering barrier and protects human being from electric shock
- Polymeric backsheet is venerable of UV light, moisture, thermal cycle and other degradation factors
- Study the degradation mechanisms of kinds of commonly used backsheet
- Develop the degradation predictive model
- Based on both real-world and lab exposure and characterization
- Cross-correlation of outdoor and indoor degradation behavior and mechanisms
- Using indoor degradation model to predict backsheet exposed to outdoor conditions



Experiment design

Team Members:

- UL, NREL, NIST, Arkema, NEU, CWRU

Experiment:

- Identify the population of candidate PV modules brands/models, ages and climatic zones for outdoor and indoor exposures, evaluations and analytics.
- Evaluation of Outdoor exposed Field and Retrieved Modules
- Accelerated laboratory Weathering Exposure and Non-destructive and destructive evaluation of comparable backsheet material coupons
- Develop predictive tests and models based on outdoor field and retrieved module evaluations and evaluations using Stress/Mechanism/Response network modeling of training dataset with candidate module selection and validation using testing datasets.



RESULTS

Retrieved Module

ModuleID	sa30146	sa30162	sa30169	sa30172	sa30181	sa30183	sa30185	sa30187	sa30189	sa30191	sa30193	sa30195	sa30197	sa30199	sa30201	sa30203	sa30205	sa30207	sa30209	sa30211	sa30213	sa30215	sa30217	sa30219	sa30221	sa30223	sa30225	sa30227	sa30229	sa30231	sa30233	sa30235	sa30237	sa30239	sa30241	sa30243	sa30245	sa30247	sa30249	sa30251	sa30253	sa30255	sa30257	sa30259	sa30261	sa30263	sa30265	sa30267	sa30269	sa30271	sa30273	sa30275	sa30277	sa30279	sa30281	sa30283	sa30285	sa30287	sa30289	sa30291	sa30293	sa30295	sa30297	sa30299	sa30301	sa30303	sa30305	sa30307	sa30309	sa30311	sa30313	sa30315	sa30317	sa30319	sa30321	sa30323	sa30325	sa30327	sa30329	sa30331	sa30333	sa30335	sa30337	sa30339	sa30341	sa30343	sa30345	sa30347	sa30349	sa30351	sa30353	sa30355	sa30357	sa30359	sa30361	sa30363	sa30365	sa30367	sa30369	sa30371	sa30373	sa30375	sa30377	sa30379	sa30381	sa30383	sa30385	sa30387	sa30389	sa30391	sa30393	sa30395	sa30397	sa30399	sa30401	sa30403	sa30405	sa30407	sa30409	sa30411	sa30413	sa30415	sa30417	sa30419	sa30421	sa30423	sa30425	sa30427	sa30429	sa30431	sa30433	sa30435	sa30437	sa30439	sa30441	sa30443	sa30445	sa30447	sa30449	sa30451	sa30453	sa30455	sa30457	sa30459	sa30461	sa30463	sa30465	sa30467	sa30469	sa30471	sa30473	sa30475	sa30477	sa30479	sa30481	sa30483	sa30485	sa30487	sa30489	sa30491	sa30493	sa30495	sa30497	sa30499	sa30501	sa30503	sa30505	sa30507	sa30509	sa30511	sa30513	sa30515	sa30517	sa30519	sa30521	sa30523	sa30525	sa30527	sa30529	sa30531	sa30533	sa30535	sa30537	sa30539	sa30541	sa30543	sa30545	sa30547	sa30549	sa30551	sa30553	sa30555	sa30557	sa30559	sa30561	sa30563	sa30565	sa30567	sa30569	sa30571	sa30573	sa30575	sa30577	sa30579	sa30581	sa30583	sa30585	sa30587	sa30589	sa30591	sa30593	sa30595	sa30597	sa30599	sa30601	sa30603	sa30605	sa30607	sa30609	sa30611	sa30613	sa30615	sa30617	sa30619	sa30621	sa30623	sa30625	sa30627	sa30629	sa30631	sa30633	sa30635	sa30637	sa30639	sa30641	sa30643	sa30645	sa30647	sa30649	sa30651	sa30653	sa30655	sa30657	sa30659	sa30661	sa30663	sa30665	sa30667	sa30669	sa30671	sa30673	sa30675	sa30677	sa30679	sa30681	sa30683	sa30685	sa30687	sa30689	sa30691	sa30693	sa30695	sa30697	sa30699	sa30701	sa30703	sa30705	sa30707	sa30709	sa30711	sa30713	sa30715	sa30717	sa30719	sa30721	sa30723	sa30725	sa30727	sa30729	sa30731	sa30733	sa30735	sa30737	sa30739	sa30741	sa30743	sa30745	sa30747	sa30749	sa30751	sa30753	sa30755	sa30757	sa30759	sa30761	sa30763	sa30765	sa30767	sa30769	sa30771	sa30773	sa30775	sa30777	sa30779	sa30781	sa30783	sa30785	sa30787	sa30789	sa30791	sa30793	sa30795	sa30797	sa30799	sa30801	sa30803	sa30805	sa30807	sa30809	sa30811	sa30813	sa30815	sa30817	sa30819	sa30821	sa30823	sa30825	sa30827	sa30829	sa30831	sa30833	sa30835	sa30837	sa30839	sa30841	sa30843	sa30845	sa30847	sa30849	sa30851	sa30853	sa30855	sa30857	sa30859	sa30861	sa30863	sa30865	sa30867	sa30869	sa30871	sa30873	sa30875	sa30877	sa30879	sa30881	sa30883	sa30885	sa30887	sa30889	sa30891	sa30893	sa30895	sa30897	sa30899	sa30901	sa30903	sa30905	sa30907	sa30909	sa30911	sa30913	sa30915	sa30917	sa30919	sa30921	sa30923	sa30925	sa30927	sa30929	sa30931	sa30933	sa30935	sa30937	sa30939	sa30941	sa30943	sa30945	sa30947	sa30949	sa30951	sa30953	sa30955	sa30957	sa30959	sa30961	sa30963	sa30965	sa30967	sa30969	sa30971	sa30973	sa30975	sa30977	sa30979	sa30981	sa30983	sa30985	sa30987	sa30989	sa30991	sa30993	sa30995	sa30997	sa30999	sa31001	sa31003	sa31005	sa31007	sa31009	sa31011	sa31013	sa31015	sa31017	sa31019	sa31021	sa31023	sa31025	sa31027	sa31029	sa31031	sa31033	sa31035	sa31037	sa31039	sa31041	sa31043	sa31045	sa31047	sa31049	sa31051	sa31053	sa31055	sa31057	sa31059	sa31061	sa31063	sa31065	sa31067	sa31069	sa31071	sa31073	sa31075	sa31077	sa31079	sa31081	sa31083	sa31085	sa31087	sa31089	sa31091	sa31093	sa31095	sa31097	sa31099	sa31101	sa31103	sa31105	sa31107	sa31109	sa31111	sa31113	sa31115	sa31117	sa31119	sa31121	sa31123	sa31125	sa31127	sa31129	sa31131	sa31133	sa31135	sa31137	sa31139	sa31141	sa31143	sa31145	sa31147	sa31149	sa31151	sa31153	sa31155	sa31157	sa31159	sa31161	sa31163	sa31165	sa31167	sa31169	sa31171	sa31173	sa31175	sa31177	sa31179	sa31181	sa31183	sa31185	sa31187	sa31189	sa31191	sa31193	sa31195	sa31197	sa31199	sa31201	sa31203	sa31205	sa31207	sa31209	sa31211	sa31213	sa31215	sa31217	sa31219	sa31221	sa31223	sa31225	sa31227	sa31229	sa31231	sa31233	sa31235	sa31237	sa31239	sa31241	sa31243	sa31245	sa31247	sa31249	sa31251	sa31253	sa31255	sa31257	sa31259	sa31261	sa31263	sa31265	sa31267	sa31269	sa31271	sa31273	sa31275	sa31277	sa31279	sa31281	sa31283	sa31285	sa31287	sa31289	sa31291	sa31293	sa31295	sa31297	sa31299	sa31301	sa31303	sa31305	sa31307	sa31309	sa31311	sa31313	sa31315	sa31317	sa31319	sa31321	sa31323	sa31325	sa31327	sa31329	sa31331	sa31333	sa31335	sa31337	sa31339	sa31341	sa31343	sa31345	sa31347	sa31349	sa31351	sa31353	sa31355	sa31357	sa31359	sa31361	sa31363	sa31365	sa31367	sa31369	sa31371	sa31373	sa31375	sa31377	sa31379	sa31381	sa31383	sa31385	sa31387	sa31389	sa31391	sa31393	sa31395	sa31397	sa31399	sa31401	sa31403	sa31405	sa31407	sa31409	sa31411	sa31413	sa31415	sa31417	sa31419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