



PREDICTIVE RESEARCH
for energy investors

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Executive Summary

LAUNCHING SATELLITE DATA... The Inflation Reduction Act (IRA) to be passed later this week will drastically change the solar landscape in the U.S. Coinciding with this revolutionary government action, we are launching a new intelligence product to track in real-time the development of every large scale solar project through satellite imagery.

...BECAUSE. As the IRA accelerates solar development, investors will need more actionable data rather than relying on anecdotes, industry groups, media, and lobbyists, as they do now. A recent example was in April 2022 when misleading surveys related to tariffs exaggerated fear and misallocated investor capital – alternatively tracking data with satellite imagery would have painted a very different (less draconian) and more accurate picture of what was actually happening on the ground. As utility scale solar enters the next boom cycle, driven by the passing of the IRA, we are introducing this alternative for solar investors and corporate managements.

NEW WAY TO TRACK SOLAR DATA. As an alternative to anecdotes, imperfect surveys, and guesswork, we have created a tool called **Lium solarSAT™** to better inform the market with real-time solar satellite monitoring. With this product, investors and corporate management can monitor the status of all U.S. large scale solar projects, including the day each project broke ground (firstDIRT™), timing of panel deliveries, and final completions.

HOW IT WORKS

Satellites trained on ~350 potential U.S. solar projects

Daily changes monitored to track ground breaking (firstDIRT™), panel delivery, and installation

Data aggregated into various datasets and monthly summary products

WHO USES IT

Buyside Investors - Leading indicator for tracker / panel installations; Solar supply / demand; Market share assessments

Private Equity - Independent company benchmarking; Geomarket analysis; Project specific timing & details

Corporate Management - Customer tracking; Competitor analysis

RECENT TRENDS IN SATELLITE DATA

- ❑ **firstDIRT™ Much Better Than Feared....** As part of our solarSAT™ product, we have built specific capabilities to track exactly when each project begins construction or 'turns dirt', which we call firstDIRT. Based on this data, new activity has been much stronger than generally thought among the industry. In fact, as shown in the graph on slide 16, 2Q was the second highest quarter for new project starts at almost 4 GWac.
- ❑ **...But Panel Installations Still Dragging.** Tracking actual panel deliveries, our satellite data is consistent with anecdotes and panel import suggesting lower installation activity. In our data, roughly 30% fewer panels were installed versus a year ago
- ❑ **July Projects Under Construction > 19 GWac.** According to our data, we count 19-20 GWac of projects that are currently under construction at the end of July, up 25% from a year ago. Of this, 10 GW has yet to receive any panels

AVAILABLE DATA: **SAT-1:** solarSAT™ Summary Data; **SAT-2:** solarSAT™ Status Detail; **SAT-3:** firstDIRT™ Monthly Update

Lium Solar Satellite Data

- ☐ What is it?
- ☐ How does it work?
- ☐ Who uses this?
- ☐ Can I see examples?
- ☐ What has satellite data shown us lately?

What is it?

- ❑ Satellites trained on 350 potential U.S. solar projects
- ❑ All projects 50 MW or greater
- ❑ Complete U.S. lower-48 coverage
- ❑ Data analyzed at both project and company level

How does it work?

- ❑ Lium uses satellite imagery / data science to assess daily changes in large scale solar developments
- ❑ Daily changes are monitored to track:
 - ❑ firstDIRT™ when the project has broken ground
 - ❑ Panel delivery & installation
- ❑ Data is aggregated into various datasets and summary products

Who uses this?

- ☐ **Buyside Investors**
- ☐ **Private Equity Investors**
- ☐ **Corporate Management**

Buyside Investors

- ❑ **firstDIRT™ leading indicator to utility scale solar**
- ❑ **Real-time monitoring of panel delivery & installation**
- ❑ **Non-consensus trends using proprietary data**
- ❑ **Market share assessments**

Private Equity Investors

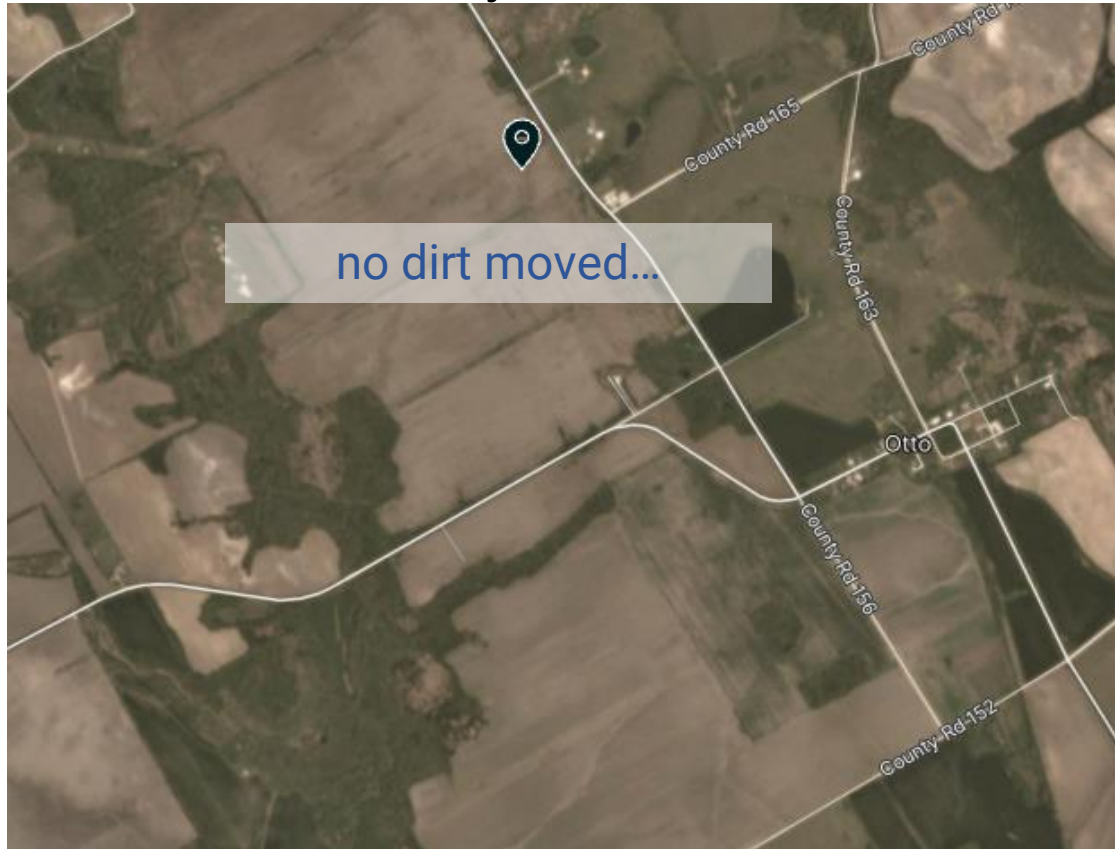
- ❑ **Company level monitoring**
- ❑ **Project specific details and tracking**
- ❑ **Real-time industry trends and analysis**
- ❑ **Market share assessments**

Corporate Management

- ❑ Customer tracking with FirstDIRT™
- ❑ Flag key geomarkets
- ❑ Real-time industry trends and analysis
- ❑ Competitor analysis

Can I See *FirstDIRT*TM Examples?

July 27, 2021



August 14, 2021

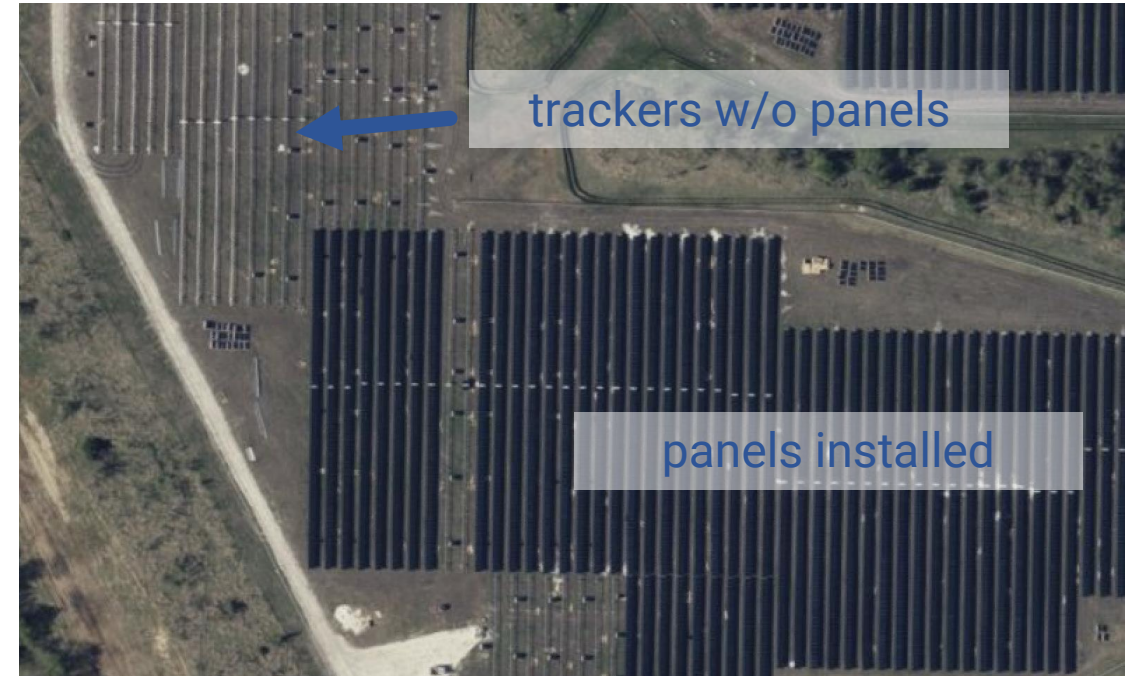


Can I See *Tracker & Panel* Examples?

August 7, 2021



November 12, 2021




LIUM SHEET SAT-1: solarSAT™ Summary ([download](#))

Utility Solar Projects	New Activity (m/m)			IN-PROCESS		
Jun-22	FirstDirt	Panel delivery started	Panel install completed	FirstDirt w/o panels	Panels being installed	Awaiting connection
Projects	7	6	3	68	36	12
Capacity (MW)	1,382	891	345	9,128	6,822	1,412
California	400	240	0	1,570	3,433	587
Texas	0	496	195	681	1,515	195
Florida	75	0	0	1,416	75	150
Nevada	690	0	0	690	300	0
Ohio	50	0	0	1,465	0	0
Colorado	0	0	0	279	200	0
New York	0	0	0	0	0	0
Wisconsin	0	0	150	525	0	200
Virginia	118	0	0	239	0	0
Georgia	0	0	0	235	106	0
Other	50	155	0	2,028	1,194	280

Source: Lium, LLC

*Includes only U.S. projects with stated nameplate capacity > 49.5 GWac


LIUM SHEET SAT-2: solarSAT™ Status Detail ([download](#))



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status as of:								Jun-22
LiumID	Project Names	State	County	Capacity (MW)	FirstDirt™	Panel delivery started	Panels installed	Online
20145	{Black Bear Solar 1}{Blackbear Sola	AL	Montgomery	100	Y	Y	N	N
20157	{High Point Solar LLC}	IL	Stephenson	100	Y	N	N	N
20163	{Gunsight Solar, LLC}	SC	Lexington	75	Y	Y	N	N
20164	{Iris Solar LLC}	LA	Washington	50	Y	Y	Y	N
20175	{Allora Solar, LLC}	SC	Lexington	75	Y	Y	N	N
20177	{7V Solar Ranch}	TX	Fayette	240	Y	N	N	N
20178	{Bluegrass Solar}	MD	Queen Annes	80	Y	Y	N	N
20188	{OCI SunRay}	TX	Uvalde	200	Y	N	N	N
20191	{Big Star Solar, LLC}{Big Star Solar	TX	Bastrop	200	Y	Y	N	N

LIUM SHEET SAT-3: firstDIRT™ Monthly Update (download)

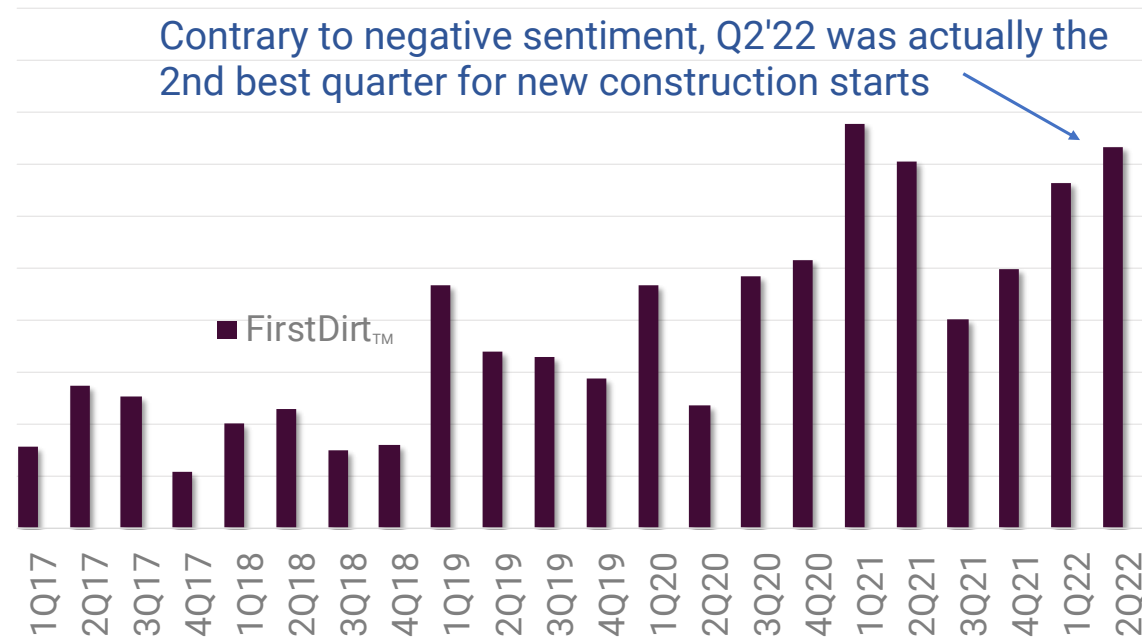
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FirstDIRT Month:					Jul-22
LiumID	Project Names	State	County	Capacity (MW)	FirstDIRT
20170	{SunEast Tabletop Solar	NY	Montgomery	80	Y
20203	{Otter Creek Solar}	VA	Mecklenburg	60	Y
27966	{High Springs Solar Pow	FL	Alachua	75	Y
27852	{Cassville Solar}	WI	Grant	50	Y
27853	{Springfield Solar (WI)}	WI	Dodge	100	Y
20116	{Piney Creek Solar}	VA	Halifax	80	Y

What has satellite data shown us lately?

- ❑ **firtDIRT_{TM} Much Better Than Feared...**
- ❑ **...But Panel Installations Still Dragging**
- ❑ **July Under Construction > 19GW (up 25% y/y)**

firstDIRT™ Much Better Than Feared

As part of our solarSAT™ product, we have built specific capabilities to track exactly when each project begins construction or 'turns dirt' (firstDIRT™). Based on this data, new activity has been much stronger than generally thought among the industry. In fact, as shown in the graph below, 2Q was the second highest quarter for new project starts at almost 4 GWac.

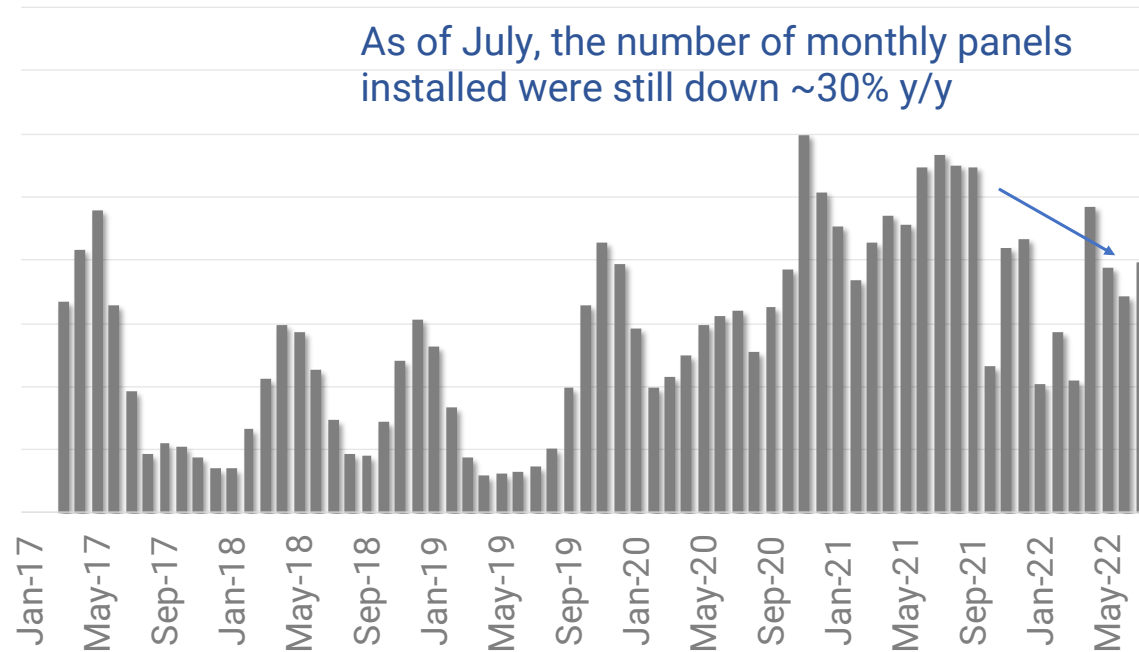


FirstDIRT Utility Solar Activity (>50 MW)

Source: Lium LLC

Panel Installations Still Dragging

Tracking actual panel deliveries, our satellite data is consistent with anecdotes and panel import suggesting lower installation activity. In our data, roughly 30% fewer panels were installed versus a year ago



Utility Solar Activity - Panels Installed (>50 MW)

Source: Lium LLC

July Under Construction

According to our data, we count 19-20 GWac of projects that are currently under construction at the end of July, up 25% from a year ago. Projects under construction have inflected higher in recent months primarily due to 1) delays in getting panels and 2) higher new construction starts in April / May / June. Of the 19 GW under construction, 10 GW has yet to receive any panels.

U.S. Large Solar - Under Construction (MWac)				
	FirstDirt w/o panels	Panels being installed	Awaiting connection	Under Construction
Jun-21	NA	NA	NA	NA
Jul-21	7,021	7,806	680	15,507
Aug-21	NA	NA	NA	NA
Sep-21	NA	NA	NA	NA
Oct-21	NA	NA	NA	NA
Nov-21	NA	NA	NA	NA
Dec-21	NA	NA	NA	NA
Jan-22	NA	NA	NA	NA
Feb-22	NA	NA	NA	16,804
Mar-22	NA	NA	NA	17,533
Apr-22	NA	NA	NA	18,517
May-22	NA	NA	NA	19,263
Jun-22	NA	NA	NA	19,955
Jul-22	NA	NA	NA	19,384

Source: Lium Research

~19 GW now under construction in the U.S.
~8 GW of that is sitting idle waiting for panels

Other Lium Data Products

Lium Data Available (U.S.)

A. Utility Solar

- ☐ Monthly satellite imagery
- ☐ Project application database
- ☐ FirstDirt™ project list
- ☐ Monthly panel delivery data
- ☐ Panel import data by country
- ☐ State by state installations
- ☐ Market share data
- ☐ Production / utilization by facility
- ☐ Realtime solar output by region
- ☐ Quarterly installation forecasts

B. Storage

- ☐ Monthly new applications list
- ☐ Storage cost model
- ☐ BESS under construction data
- ☐ Project pipeline database
- ☐ Quarterly battery storage model
- ☐ Market share data

C. Resi Solar

- ☐ Monthly permit data by city
- ☐ Installer market share
- ☐ Cost data by region
- ☐ Installation counts by state
- ☐ Quarterly forecasts by state

D. Wind

- ☐ Facility production & utilization
- ☐ Realtime wind output by region
- ☐ Project application database
- ☐ Turbine market share
- ☐ Offshore wind project pipeline
- ☐ Offshore installation vessel data
- ☐ OSW supply chain matrix
- ☐ Offshore capex & capacity
- ☐ Port investment monitor
- ☐ Vendor registry

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