



**LIUM**  
DATA SYNTHESIS, HUMAN TOUCH

**PREDICTIVE RESEARCH**  
*for energy & industrials*

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# Lium Launch Overview

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# Lium Launch Overview



After more than a year of gathering data, we are launching coverage of the U.S. Power & Renewables sector with a positive view on utility scale solar and offshore wind and a cautious view relative to the robust expectations in residential solar and onshore wind. The U.S. is clearly moving toward a more diverse energy chain, positioning large scale development for upside, particularly in solar where the orderbook has doubled in the last 18 months. With that said, there is plenty of room for cautiousness, especially in areas like residential solar where leading edge data is already falling behind robust expectations. In this report, we've highlighted the takeaways from each of our five separate launch reports.

# Lium Launch - Renewables, Power, & Shale



## (+) Lium Data

1. Huge running room for utility scale solar
2. Offshore wind will be fantastic
3. Residential solar at critical mass
4. Natural gas demand ramping

## (-) Lium Data

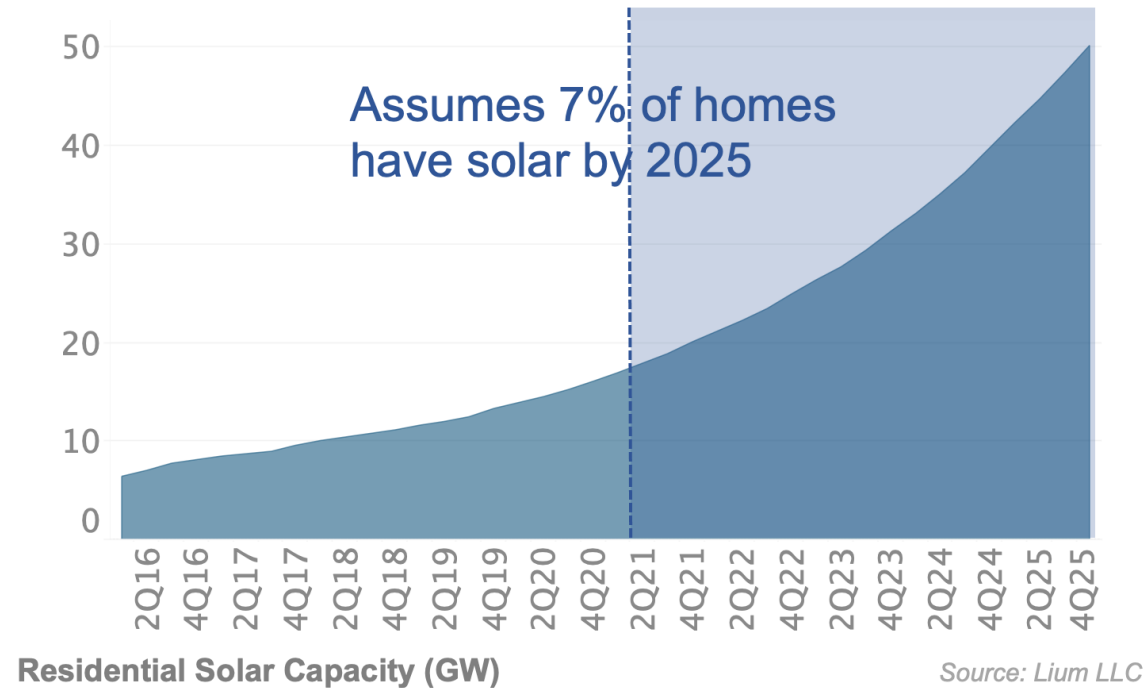
1. Recent rooftop solar permits good, not great
2. Limited onshore wind opportunities
3. Electricity use stagnant
4. Efficiency killing shale service

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# Launch I: Residential Solar

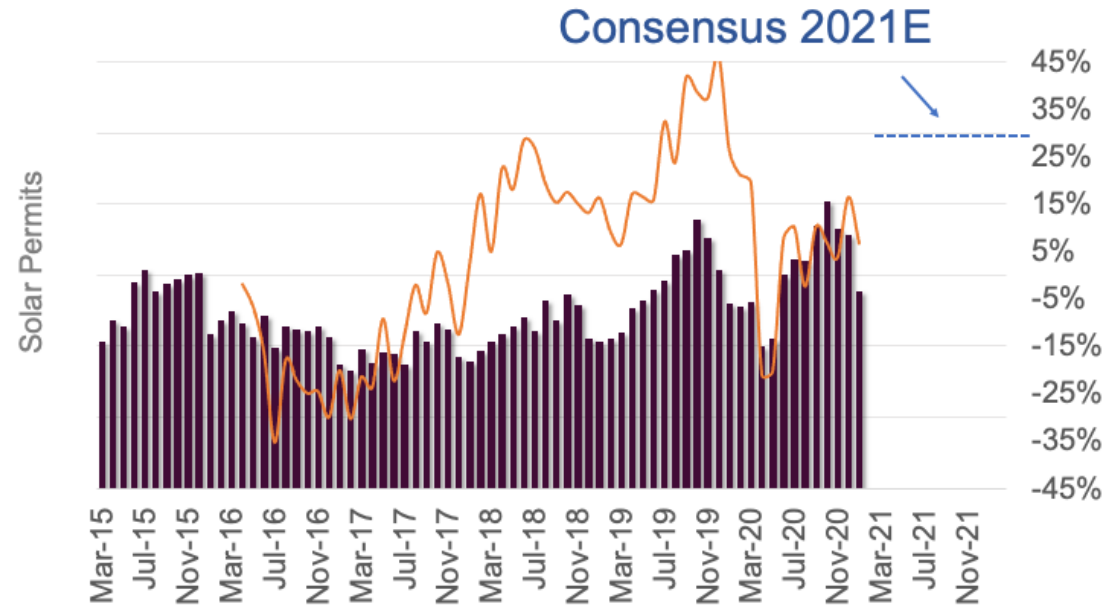
Fresh Eyes On New Data

# Rooftop Power Is A Needle Mover



After another 450,000 installations in 2020, over 15GW of residential solar has been installed in the U.S. In California, the percentage is much higher (8-10%). Going forward, our sensitivity model assumes 5%, 7%, or 8% of U.S. homes will have solar by 2025.

# Expectations Looking For A Lot



Visible solar permits vs Y/Y Growth (%)

Source: Lium LLC

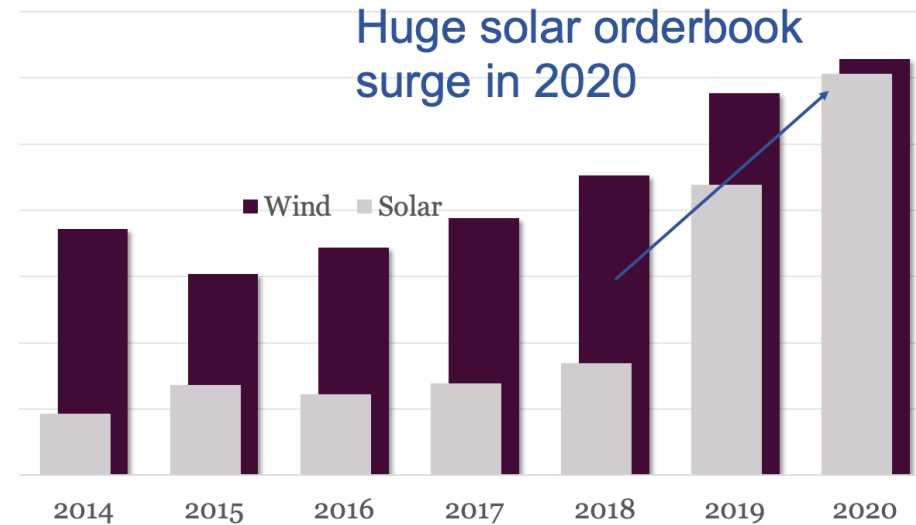
Based on residential solar permits filed in the top U.S. cities, activity is tracking up ~10-15% y/y. While this is constructive, we believe consensus for residential solar companies is anticipating much higher growth in 2021E.

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# Launch II: Utility Scale Solar

Fresh Eyes On New Data

# Unprecedented Growth In Orderbook



Orderbook - Utility Scale Solar vs Wind

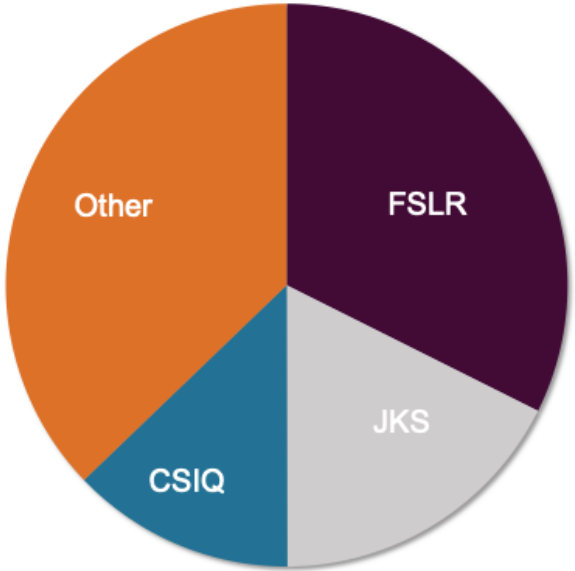
Source: EIA, Lium LLC

As shown in the graph above, the amount of utility scale projects in backlog has soared in recent quarters. Unlike some sectors, this growth is fairly widespread with a lot of running room in many regions. Texas and Midcontinent are notable standouts.



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# Consolidated Market With Running Room



Utility Scale U.S. Share (%)

Source: Lium LLC

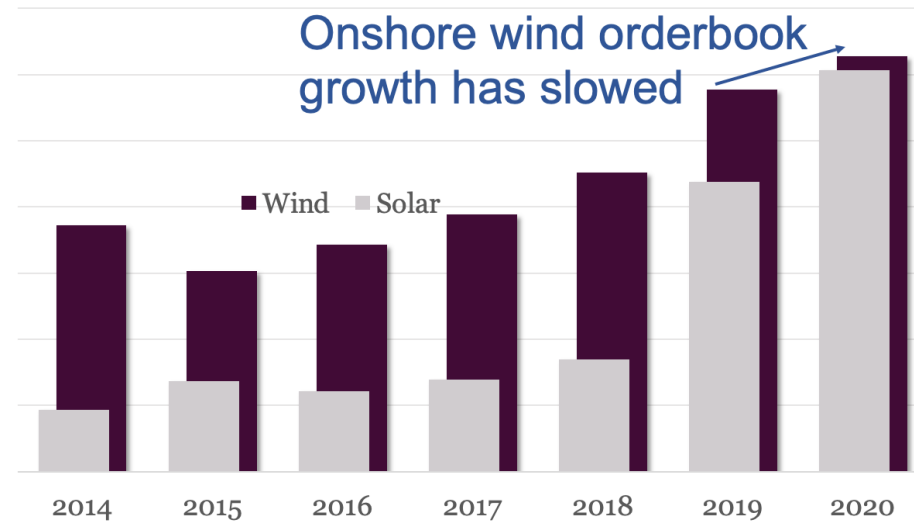
In addition to a big and growing market, the U.S. utility scale market is fairly consolidated. In fact, we believe three large public companies have roughly 60% share.

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# Launch III: Wind Power

Fresh Eyes On New Data

# Onshore Wind Opportunities Harder To Find

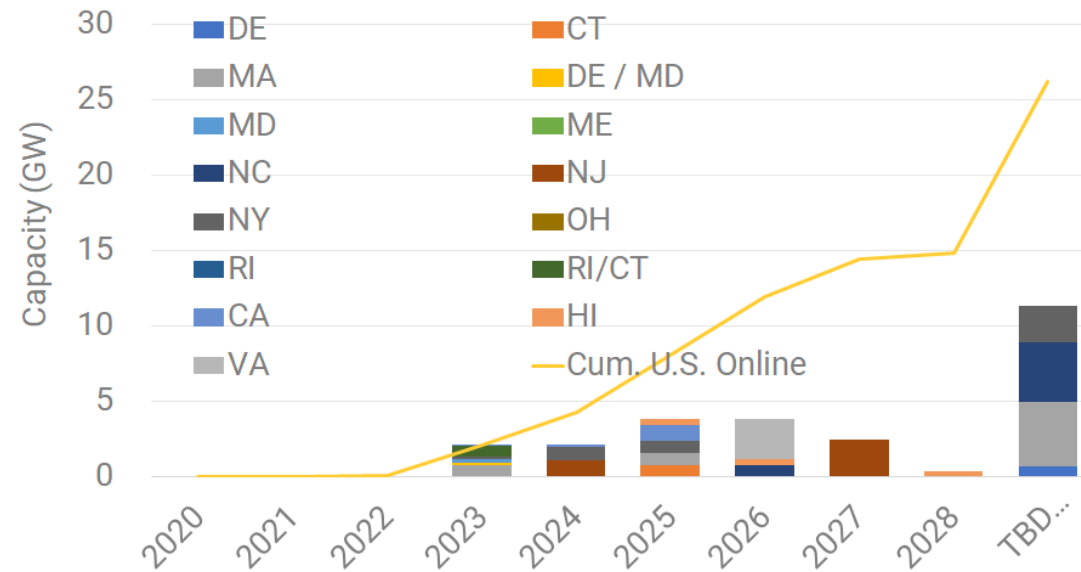


Orderbook - Utility Scale Solar vs Wind

Source: EIA, Lium LLC

With the wind resource limited to certain parts of the country, orderbook growth for onshore wind has slowed somewhat in recent quarters. Additional transmission and offshore wind will be needed to push the sector forward in the U.S.

# Massive Offshore Potential...Long Development Cycle



First Power For U.S. Offshore Wind Pipeline

Source: Lium LLC

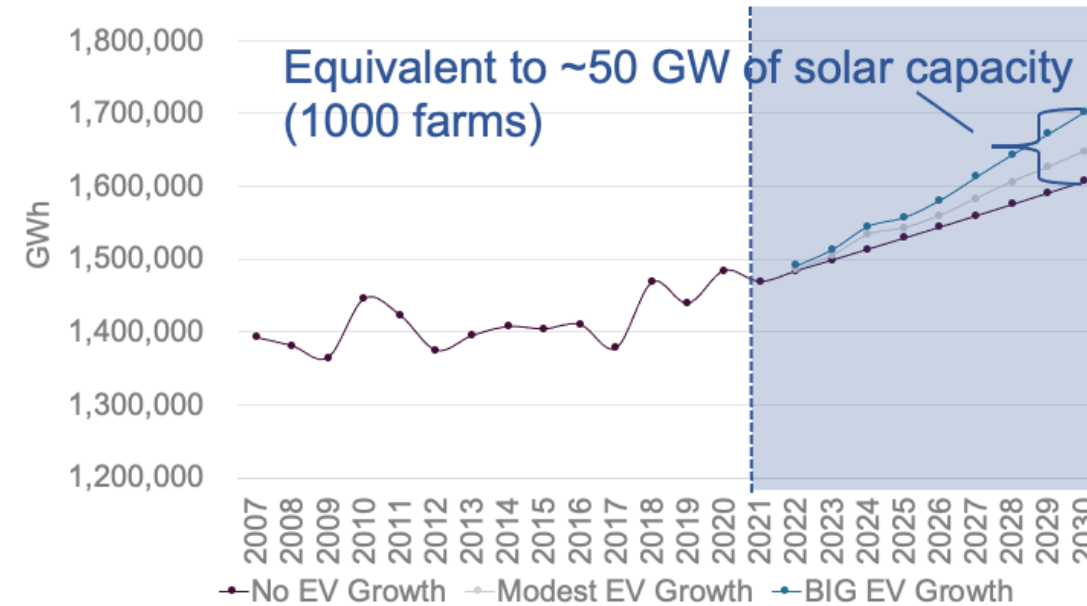
Lium is monitoring current and future (emphasis on future) U.S. offshore wind capacity of >26GW. This is a giant future power source, but projects can take many years to develop.



# Launch IV: Power

Fresh Eyes On New Data

# EV Power Demand



Residential Power Demand

Source: Liium LLC

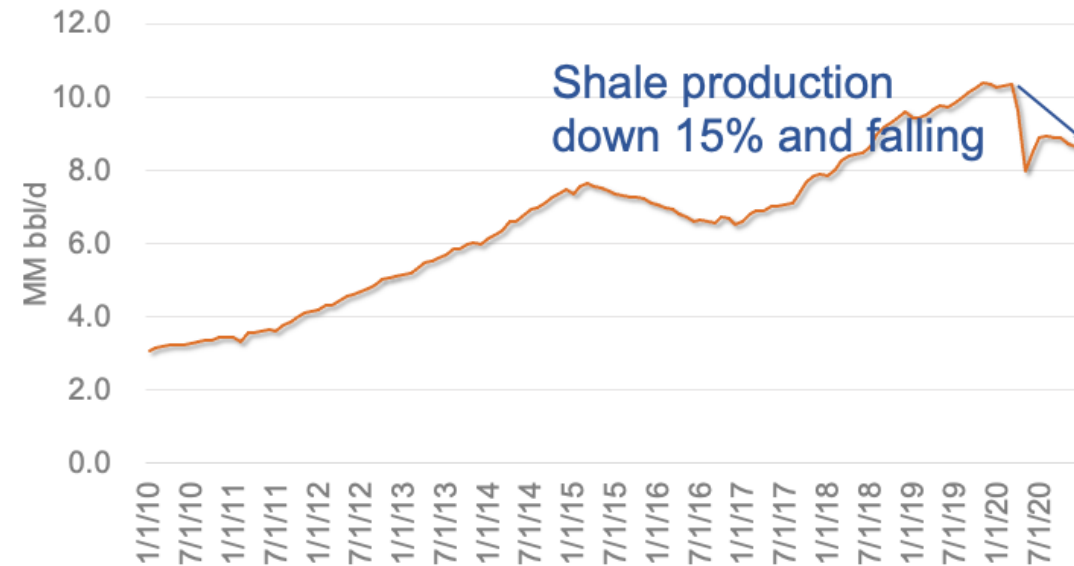
Despite stagnant electricity demand, EV adoption could help move this along later in the decade. Using our sensitivity model, we believe an additional 100 TWh of annual generation could be needed if electric vehicles become 15% of the U.S. car market by 2030.

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# Launch V: Shale Production & Services

Fresh Eyes On New Data

# Shale Production Needs More Investment



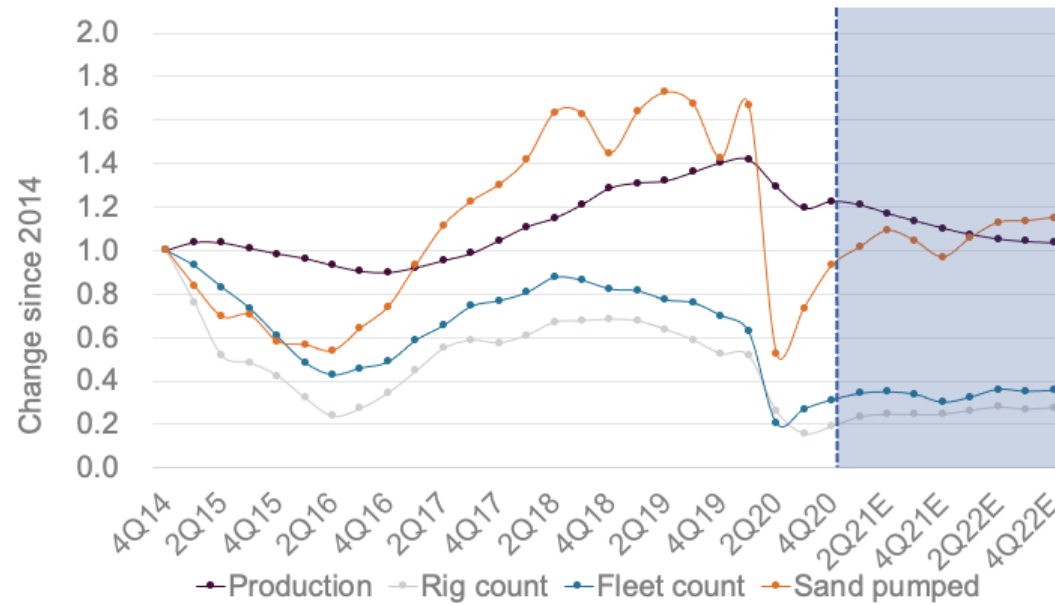
U.S. Shale Oil Production

Source: EIA, Lium LLC

We estimate the industry will need to complete 35,000 stages per month (which will require roughly 200 active frac fleets) to keep production flat. Against our estimated 170 active fleets today, this implies a 25% activity increase just to "stay on the production treadmill."



# Sand Pumped Drives Shale Production

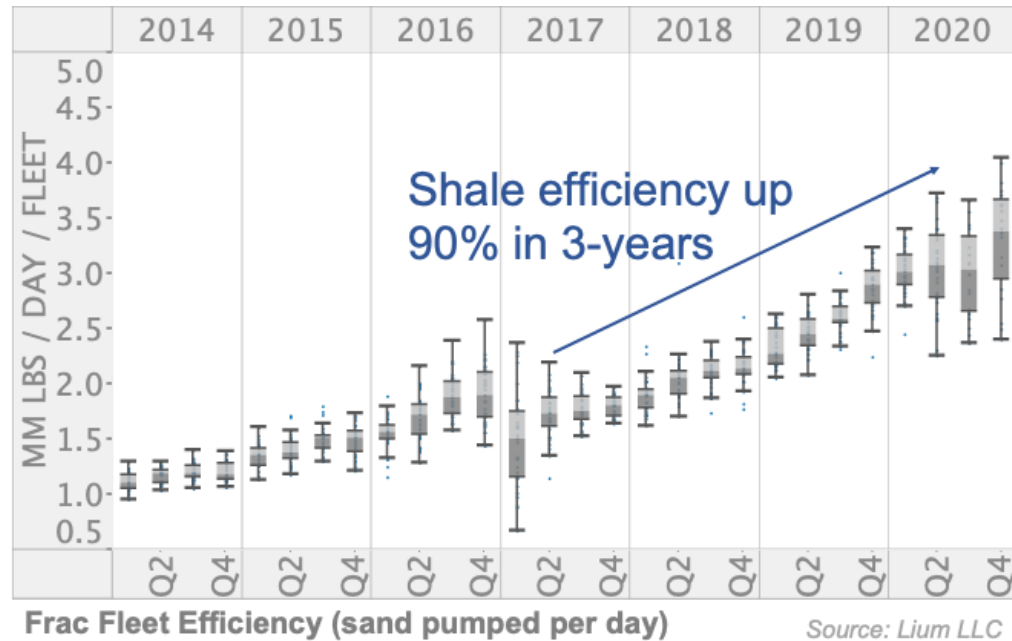


Shale Production vs Sand Pumped

Source: Lium LLC

Frac sand volumes are the single biggest factor in tight oil production changes now. Even though we expect sand pumped to increase 5-10% y/y in 2021, our base case sand rebound won't be enough to stave off further production declines after proppant volumes fell 40% in 2020.

# Shale Efficiency Still Accelerating



US frac fleets continue to harvest seemingly never-ending efficiency gains. This year, watch the adoption of simulfracs to raise the bar again. In the field, last mile contacts tell us they are delivering 75% more sand per day to simulfracs vs. normal wells and they are talking to operators about deploying to more simulfracs throughout 2021.



# Related Predictive Data

Residential Solar  
Utility Scale Solar  
Power  
Shale