PV and Storage, Spring 2022

By John Benson, April 2022

1. Introduction

I had a goal in 2022 of reporting on these PV and Storage Posts frequently enough such that I can keep each papers' length fairly short so it will only be a single post. This is a single post, albeit rather lengthy

The first part of each post (Section 2) is on any technology or business developments and the last part is on major projects.

This year I will use the following criteria for what constitutes a major project:

PV-only: at least 100 MW output

BESS-only: at least 100 MW output

Combined PV and BESS – at least 100 MW for either source

I will also be a bit flexible in the above numbers, depending how important a given project is for a state or region, or technically notable. Each major project will continue to be added to the database of major PV / BESS projects that I started in 2021 (this database also helps me avoid double-coverage).

2. Technology & Business

2.1. Solar Module Technology

I noted recently it has more than two years since I reviewed new technology behind photovoltaic (PV) modules (a.k.a. PV panels, which each include many PV cells). In this time a couple of new technologies have come to market. In the last post that dealt with PV modules is described and linked below.

Photovoltaic plus Storage Part 1 *is on new technologies for utility-scale PV, utility-scale storage, PV plus storage systems, and the evolution of their missions.*

https://www.energycentral.com/c/cp/photovoltaic-plus-storage-%E2%80%93-part-1-technology

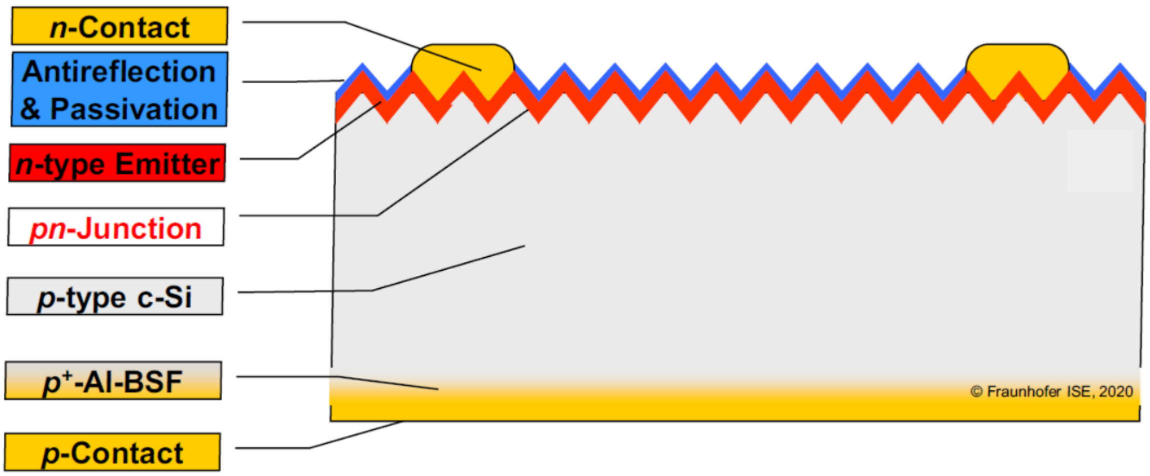
The following text and graphics is from the document referenced at the end of this paragraph. The above linked paper covered PERC and Bifacial, as will this one, but the text below puts these and newer designs in a much better historical context and includes descriptions of emerging designs.[1]

The exponential growth of photovoltaics from small manufacturers to today's fully automated 150 GW industry was mainly driven by crystalline silicon solar cells. The rapid development of silicon photovoltaics in terms of efficiency improvement and production cost reduction enabled a strong reduction of module prices…

After switching from n-type to p-type wafers in the 1960 s, the introduction of the aluminium back surface field (Al-BSF) by alloying the rear contact into the base resulting in n+pp+ structure allowed for a reduced recombination at the rear side. This rather

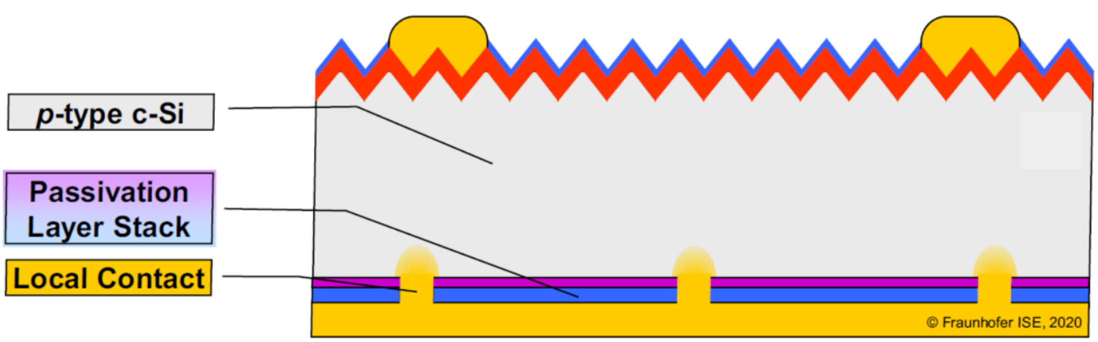
[1] National Renewable Energy Laboratory (NREL), "The 2020 photovoltaic technologies roadmap," Chapter 2, "Trends in crystalline silicon photovoltaics", Stefan W Glunz (Fraunhofer Institute for Solar Energy Systems) and Pierre Verlinden (Amrock Pty Ltd), June 2020, https://www.nrel.gov/docs/fy20osti/76570.pdf

simple structure with screen-printed contacts (see figure below) has maintained a leading position with 70%–90% market share over many of the last decades. The source of its success was a stable device, a robust process sequence and a constant increase of efficiency that is mainly due to evolutionary changes…



Aluminum back surface field (Al-BSF)

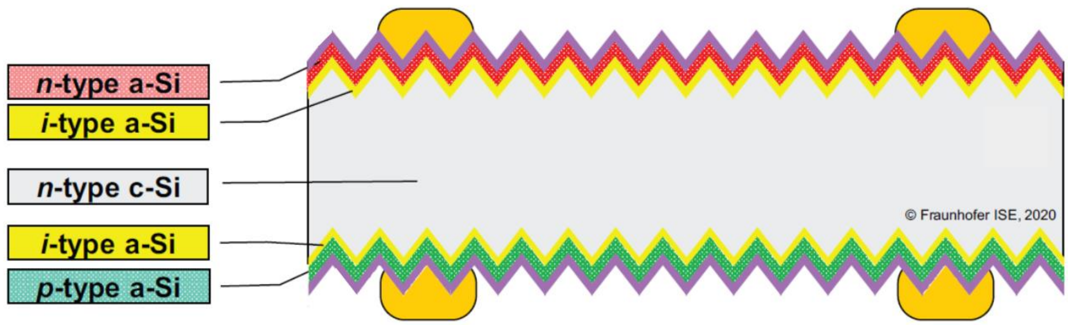
However, around 2013 the efficiency of industrial Al-BSF cell plateaued around 20%. This made it attractive to substitute the fully contacted Al-BSF cell by the Passivated Emitter and Rear Cell (PERC) cell structure with local rear contacts (see figure below), resulting in better electrical and optical properties. The potential of this cell structure was already proven in 1980 s but was limited to laboratory processes due to the high cost compared to the efficiency gain. The transfer of the PERC technology to industrial mass production theoretically had a relatively low threshold for the industry since only two process steps had to be added to the Al-BSF process flow, i.e. the rear surface passivation layer and the fine patterning of the local rear contacts. However, it took several decades to finalize a cost-effective PERC process…



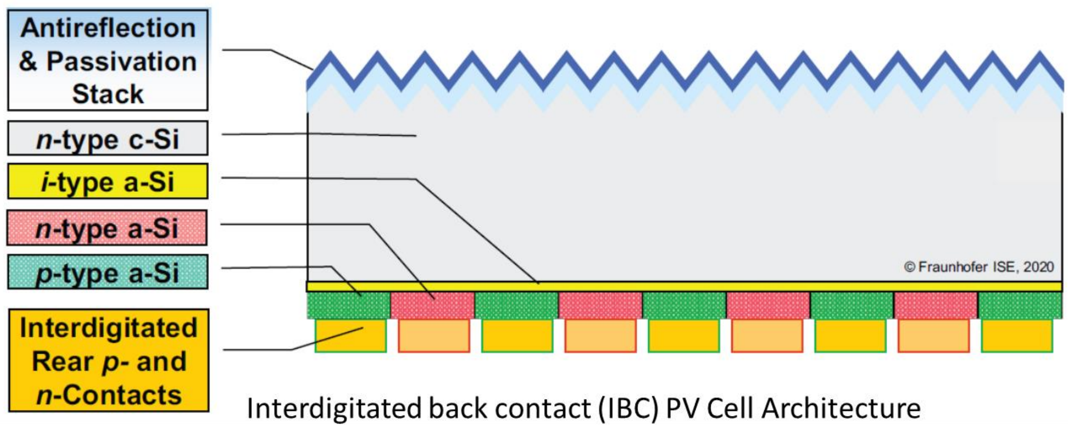
Passivated emitter and rear cell (PERC) architecture

In parallel with the PERC cell, other high-efficiency cell structures were transferred to mass production, such as the interdigitated back contact (IBC) solar cell or heterojunction solar cells (SHJ) (see figures below). Despite their high efficiency potential, their market share is still limited. This is probably due to the standardization of technology in mass production... However, since the market demands a continuous increase in module efficiency, these and other technologies might play an important role in the future.

Author's note: Passivating uses a thin films that simultaneously suppresses recombination and promotes charge-carrier selectivity.



Heterojunction solar cells (SHJ) PV Cell Architecture



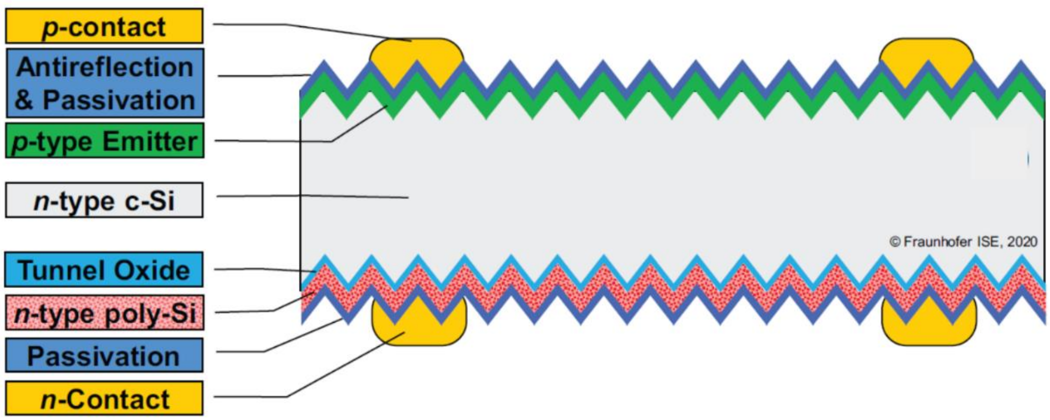
Interdigitated back contact (IBC) PV Cell Architecture

During the period 2010 to 2020, the silicon PV industry went through a period of significant changes, including a rapid decrease in manufacturing cost (more than−15% per year in average) and a continued increased in efficiency (+2% relative per year) and module power (typically+5 W per year at the beginning of the decade, increasing much faster nowadays due to larger wafer sizes).

***The PERC cell** being the actual 'workhorse' of the PV industry, the key challenge is to maintain its major role by continuous performance improvement and cost reduction. In terms of cost reduction, the production of PERC cells has the advantage that the entire supply chain is aligned and standardized to this technology. Increasing the throughput of the tools and automation are the main avenue toward lower cost of manufacturing. One of the most recent approaches is to increase the wafer size up to 210 mm which poses enormous challenges not only in cell manufacturing but also in module design and assembly, and potentially module reliability. In terms of efficiency improvement, the task is starting to be very difficult, as the efficiency in production has reached 23.3% and the practical efficiency limit of this structure is about 24.5%.*

*Although **Bifacial modules** have been commercially introduced more than three decades ago but did not receive the expected consideration because of cost, bifacial PV modules have done a remarkable come-back since 2018. Bifacial modules are now considered as one of the standard technologies for ground-mounted applications, with a fixed tilt structure, on a tracker or even in a vertical North-South orientation. By reducing* *the metal coverage on the rear side, n-type PERT (Passivated Emitter Rear Totally diffused, no figure) or TOPCon (Tunnel oxide passivating contact, figure below) solar cells can reach 80%–95% bifaciality, while PERC solar cells made on p-type substrates have typically a 65%–75% bifaciality, lower than for n-type because of greater metal coverage to form the local Al-BSF and shorter effective carrier lifetime. The additional annual energy provided by the bifacial modules is highly dependent on the reflectivity of the ground creating the albedo, a measure of the diffuse reflection of solar radiation, and bifaciality. It varies from a few percent's, typically 6% for PERC and 9% for TOPCon or SHJ cells, up to about 25% in the best cases (ground with very high reflectivity, like white gravel).*

Author's comment: Bifacial modules collect light on both the front and rear side of the panel. Also, "bifaciality" is the ratio of rear power to front power.



Tunnel oxide passivating contact (TOPCon) architecture

Silicon heterojunction solar cells (SHJ)—Heterojunction solar cells also known as HIT cells make use of passivating contacts based on a layer stack of intrinsic and doped amorphous silicon (see third figure above), SHJ in rear junction configuration). Due to their superior surface passivation quality, SHJ cells hold the record for open-circuit voltage at one sun of 750 mV. In recent years, the fill factor was strongly improved due to a better understanding of carrier transport and interface carrier recombination. The main challenge of amorphous silicon passivating contacts is the parasitic absorption in the front layer stack resulting in a somewhat lower short-circuit current compared to cells with a diffused emitter. This can be overcome by using IBC cell structures (see below) or using SHJ structures as the bottom cell in silicon-based tandem cells where parasitic absorption of blue light is no issue.

Author's comment: The "fill factor" is typically a measure of the efficiency of a solar PV module. Fill factor is the ratio of actual maximum module power to the product of open circuit voltage & short circuit current (highest achievable power).

Interdigitated back contact (IBC) solar cells were always regarded as the cell architecture with the highest efficiency potential by avoiding shading losses (see second figure above). The company SunPower is the pioneer of developing a mass-production IBC cell. Indeed the first industrial solar cell with efficiencies clearly above 20% was based on this concept. The biggest challenge for this cell structure compared to a conventional cell structure is the higher process complexity, with doping and contacts of both polarities on one side, requiring a relatively fine patterning of at least three levels with a precise alignment between them. Therefore, to be cost-competitive, it is a major requirement that its efficiency should be significantly higher than the one of PERC-type cells. SunPower has reached a major boost in efficiency above 25% by applying passivating contacts. The current efficiency record for silicon solar cell of 26.7% combines an IBC structure with heterojunction passivating contacts. IBC cells with polysilicon-based passivating contacts have also reached excellent efficiencies (26.1%). Recently, new rear patterning process approaches, e.g. using tunnel structures, have been presented which might help to reduce process complexity.

TOPCon (Tunnel oxide passivating contact, figure above) structure is an alternative to SHJ for passivating contacts, but it is a much newer technology in industrial production. It consists in adding a thin tunnelling silicon dioxide (about 1.5 nm) and a doped polysilicon layer between the silicon substrate and the rear metal contact. In the case of an n-type substrate, a phosphorus-doped polysilicon layer is used as the rear contact structure. Efficiencies of 25.8% (dedicated area, in laboratory) and 24.6% (total area, in the industry) have been demonstrated with this structure and n-type substrates. The TOPCon technology is fundamentally compatible with the conventional silicon solar cell process. It just adds two to four steps in the normal cell process. It does not have the advantage of 30 years of production history like SHJ but might be easier to integrate with existing production lines. Currently, the main current challenge is to adopt a well-accepted standard process sequence for the industry that would enable a cost-reduction roadmap.

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2.2. The Revival of CSP?

As I've said before, when we are starting to develop advanced technologies, we should start with the materials and their interactions. This is exactly what NREL is doing. The National Renewable Energy Lab was selected by the Department of Energy to design, construct and operate a small pilot molten salt concentrating solar power plant.

Today's most advanced CSP plants are power towers integrated with two-tank, molten-salt thermal energy storage. These systems deliver thermal energy at 565°C (1,050°F) for integration with conventional steam-Rankine power cycles. Key to decreasing system costs and fulfilling Gen3 CSP goals is increasing plant efficiency by raising the temperature of the heat delivered to the power cycle to over 700°C (1,292°F).[2]

NREL supported the Department of Energy by developing a CSP Gen3 Demonstration Roadmap that identified three potential pathways to raise temperatures to over 700°C, based on the form of the thermal carrier in the receiver: molten salts (the "molten-salt" pathway), gas-phase heat-transfer fluids such as carbon dioxide or air (the "gas-phase" pathway), or falling curtains of tiny solid particles (the "particle" pathway).

The following are excerpts from recent report of this NREL Project.

This report documents the progress and potential of the "Liquid Pathway" to meet these objectives. The Liquid Pathway proposes the use of low-cost molten chloride salts for energy storage, mated with an operationally flexible solar receiver that employs liquid-metal sodium for heat capture and transfer to the storage salt. This approach leverages

[2] National Renewable Energy Lab (NREL), "Concentrating Solar Power," https://www.nrel.gov/csp/generation-3-concentrating-solar-power-systems.html

molten-salt technology from the current state-of-the-art CSP power towers embodied by plants such as Gemasolar, Crescent Dunes, Noor III, and the DEWA 700 CSP project. Furthermore, the design builds on the knowledge gained over decades of use of liquid-metal sodium as a high-temperature heat transfer fluid (HTF) in solar tests and nuclear-power applications.[3]

The commercial representation of the proposed Gen3 design incorporates a high-efficiency sodium receiver operating at ~740°C (1,364°F) with a liquid-liquid heat exchanger feeding a two-tank, molten-chloride salt storage system (see Figure 1). Chloride salt is dispatched to a Rankine power cycle to provide electric power to the grid. The design integration is a conceptual match for the current sodium receiver → solar salt storage → steam-Rankine power cycle promoted by Vast Solar, which may facilitate commercial acceptance and development.

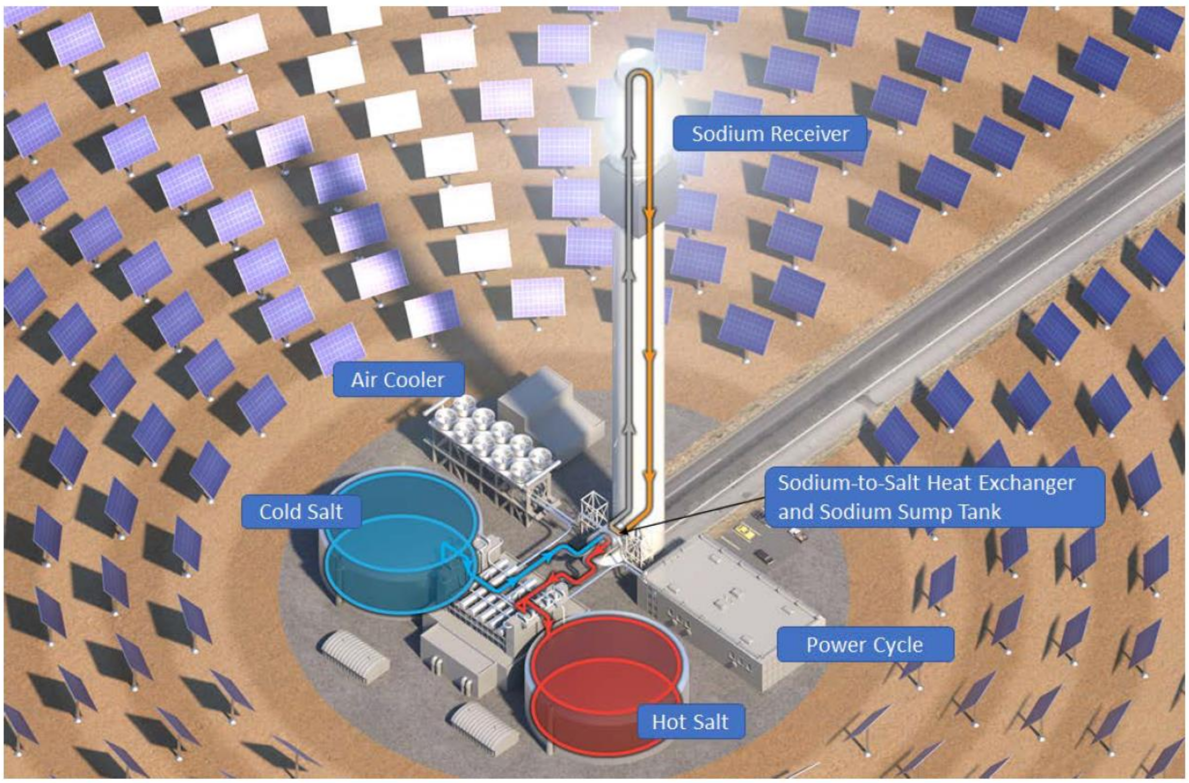

Figure 1. Sodium/Salt Gen3 system showing on-sun charging of the salt storage system

For Vast Solar, referenced above, go through the link below. Also note that the above design (except for the solar heat source) is very similar to the design of the nuclear plant in the second link below, leading to a concept of a hybrid solar-nuclear-storage design.

https://vastsolar.com/

https://energycentral.com/c/gn/nukes-%E2%80%93-part-6

[3] Craig Turchi, et al, NREL, "CSP Gen3: Liquid-Phase Pathway to SunShot," July 2021, https://www.nrel.gov/docs/fy21osti/79323.pdf

2.3. 50-Year PV Lifetime?

What makes for a good solar module? A few things are obvious: high energy yield, low cost, and reliable in the field.[4]

Reliability plays a huge role in the lifetime costs and performance of solar modules and systems. These high-tech semiconductor devices must continue generating electricity for 30 to 40 years of sun, wind, hail, snow, and heat.

We expect modules to slowly degrade and produce slightly less electricity over time as they are exposed to outdoor conditions over the years. A major question in the solar energy industry is exactly how much we should expect solar modules to degrade each year (generally 0.5%–1%) and when they will eventually degrade so much that they no longer produce adequate power (often about 20% loss from their original output) or become unsafe.

For modules built today, it is probably 30 years. Each additional year makes the cost of electricity from that module cheaper and means we will need to mine or recycle fewer raw materials to reach our clean energy goals. Could research push that age of retirement to 50 years?

Launched in November 2016 with funding from the Department of Energy's (DOE's) Solar Energy Technologies Office (SETO), the Durable Module Materials (DuraMAT) Consortium is a multi-laboratory consortium led by the National Renewable Energy Laboratory (NREL), with Sandia National Laboratories and Lawrence Berkeley National Laboratory as core research labs…

After five years of researching solar module reliability and awarding $30 million in high-impact projects, DuraMAT was awarded an additional $36 million by SETO for six more years of funding starting in 2021, as the consortium continues its focus on five core objectives…

To better understand how modules fail, DuraMAT has developed accelerated stress tests based on the environmental conditions seen in different climates. These tests are paired with powerful materials science forensics (think CSI but for degraded PV modules) and detailed physics modeling of those failures to better understand what causes module degradation, with the ultimate goal of predicting when they will fail. To top it all off, DuraMAT collects the resulting data in a central, shared data repository and applies its insights to develop new, creative approaches to improve module durability.

The ultimate goal is to better predict how new materials and module designs will perform, building confidence that they will last for more than 30 years in the field, despite our lack of long-term field data for new technologies. Field data shows that older PV technologies are durable. DuraMAT is applying that knowledge to make more accurate predictions about newer technologies…

[4] Kassidy Gamble, National Renewable Energy Lab (NREL), "Aging Gracefully: How NREL Is Extending the Lifetime of Solar Modules," March 15, 2022, https://www.nrel.gov/news/features/2022/aging-gracefully-how-nrel-is-extending-the-lifetime-of-solar-modules.html

3. Projects

I normally don't cover expansions of either existing PV and/or BESS projects, but when the already largest BESS Project in the world, adds another massive expansion, I think it's news-worthy.

Vistra today announced that it plans to further expand its **Moss Landing Energy Storage Facility** in Moss Landing, California. The company has entered into a 15-year resource adequacy agreement with Pacific Gas and Electric Company (PG&E) for a new 350-megawatt/1,400-megawatt-hour battery system. This would complement the existing 400 MW/1,600 MWh of energy storage capacity already at the site. On Jan. 21, 2022, PG&E filed its application with the California Public Utilities Commission (CPUC) to approve the contract, with a decision expected within 180 days.

https://ca.finance.yahoo.com/news/vistra-announces-expansion-worlds-largest-161512038.html

Bayou Galion Solar project is a 98.1MW solar PV power project. It is planned in Louisiana. The project is currently in permitting stage. It will be developed in single phase. Post completion of the construction, the project is expected to get commissioned in 2023.

The project is being developed and currently owned by Recurrent Energy. The company has a stake of 100%.

Bayou Galion Solar project is a ground-mounted solar project which is planned over 1,080 acres.

The project cost is expected to be around $105.75m.

https://www.power-technology.com/marketdata/bayou-galion-solar-project-us/

With a clear focus on creating sustainable energy solutions and value for its stakeholders, Buckeye Partners, L.P. will build a 270-megawatt solar project in central Texas. To develop this critical renewable energy project, which adds to the company's growing and diversified portfolio of lower-carbon solutions, Houston-based Buckeye has selected Black & Veatch to provide engineering, procurement and construction (EPC) services for the planned Project Parker photovoltaic solar project.

"We are committed to deploying our deep expertise in clean energy to support clients on the leading edge of the energy transition such as Buckeye partners with their decarbonization goals," said Mario Azar, President of Black & Veatch's Energy & Process Industries business.

Project Parker will be located on two adjacent sites near Waco, Texas, in Falls County. Construction of the project, which will include more than 500,000 solar panels, is to be completed in early 2023. Buckeye announced the initial project investment in August of this year…

https://www.gulfoilandgas.com/webpro1/main/mainnews.asp?id=925127

As part of its mission to build a stronger, more resilient energy grid for the hometowns it serves, **Pacific Gas and Electric Company (PG&E)** is proposing nine new battery energy storage projects totaling approximately 1,600 megawatts (MW), to further integrate renewable energy resources and improve reliability of the California electric system.

If approved by the California Public Utilities Commission (CPUC), these nine projects would bring PG&E's total battery energy storage system capacity to more than 3,330 MW by 2024…

The nine projects announced today and listed below all feature lithium-ion battery energy storage technology, each with a four-hour discharge duration. PG&E has executed 15-year Resource Adequacy agreements for each of the following projects:

Author's comment: The list included Moss Landing Phase 3, which is covered above.

Beaumont ESS I, LLC (a wholly owned subsidiary of Terra-Gen, LLC) – The Beaumont Energy Storage project is comprised of a 100 MW stand-alone, transmission-connected battery energy storage resource located in Beaumont, Calif. (Riverside County) and scheduled to be online by August 2023.

Sanborn ESS I, LLC (a wholly owned subsidiary of Terra-Gen, LLC) – The Edwards Sanborn Energy Storage project is comprised of a 169 MW stand-alone, transmission-connected battery energy storage resource located in Mojave, Calif. (Kern County) and scheduled to be online by August 2023.

Canyon Country ESS I, LLC (a wholly owned subsidiary of Terra-Gen, LLC) – The Canyon Country Energy Storage project is comprised of an 80 MW stand-alone, transmission-connected battery energy storage resource located in Santa Clarita, Calif. (Los Angeles County) and scheduled to be online by October 2023.

Poblano Energy Storage, LLC (a wholly owned subsidiary of Strata Clean Energy, LLC) – The **Inland Empire Energy Storage** project is comprised of a 100 MW stand-alone, transmission-connected battery energy storage resource located in Rialto, Calif. (San Bernardino County) and scheduled to be online by April 2024.

NextEra Energy Resources Development, LLC (a wholly owned subsidiary of NextEra Energy Inc.) – The **Corby Energy Storage project** is comprised of a 125 MW stand-alone, transmission-connected battery energy storage resource located in Vacaville, Calif. (Solano County) and scheduled to be online by June 2024.

NextEra Energy Resources Development, LLC (a wholly owned subsidiary of NextEra Energy Inc.) – The **Kola Energy Storage project** is comprised of a 275 MW stand-alone, transmission-connected battery energy storage resource located in Tracy, Calif. (Alameda County) and scheduled to be online by June 2024.

Nighthawk Energy Storage, LLC (an affiliate of Arevon Energy) – The Nighthawk Storage project is comprised of a 300 MW stand-alone, transmission-connected battery energy storage resource located in Poway, Calif. (San Diego County) and, pending required local approvals, is scheduled to be online by June 2024.

Caballero CA Storage, LLC (a wholly owned subsidiary of Origis USA, LLC) – The Caballero Energy Storage project is comprised of a 99.7 MW stand-alone, transmission-connected battery energy storage resource located in Nipomo, Calif. (San Luis Obispo County) and scheduled to be online by June 2024.

https://www.pge.com/en_US/about-pge/media-newsroom/news-details.page?pageID=38883b6b-8597-4734-b85a-104a9f6e8af3&ts=1643130720013

California community choice aggregator MCE greenlit a 100-MW solar project that will be paired with 75 MW of battery storage. The **Golden Fields Solar project**, located in Kern County, was selected with unanimous support by MCE's Technical Committee of the Board.

Author's Comment: MCE is a CCA north of San Francisco. I believe that this was previously Marin Clean Energy, but it looks like they have expanded into Solano and Contra Costa Counties.

"Projects like Golden Fields Solar are essential to California's transition to a carbon-free power grid," said Ford Greene, board director of MCE. "Large battery storage projects that are co-located with renewable resources take us one step closer to an all-renewable electric grid, increase reliability, and create green-collar jobs."

The project is expected to come online in March 2025 for a 15-year term. Golden Fields Solar will be constructed with union labor and will include pollinator-friendly habitats throughout the project site. The project developer has pledged $100,000 and 100 hours of employee time toward community benefit initiatives in the MCE service area and communities adjacent to the project location.

https://www.solarpowerworldonline.com/2022/02/mce-approves-union-built-california-solar-storage-project/

Located in Central Ohio, the **Union Solar Farm** is an economic development opportunity being pursued by AEUG Union Solar, LLC (ACCIONA)

The project represents an estimated $320M investment that will create more than 300 local jobs at peak construction. It will create an estimated 12 to 14 full-time jobs during operation. The project will contribute millions in local tax revenue over its 30+ year lifetime.

Location: Union County, Ohio

Capacity: 325 MW PV

Technology: Solar panels affixed to solar trackers

Begin Operations: 2023

Owners: ACCIONA

https://www.unionsolarfarm.com/?_adin=01833301559

BayWa r.e. has completed the sale of the 266 MW DC (200 MW AC) **Corazon I Solar plant** and the 200 MW (400 MWh) **Guajillo storage project** to Eni New Energy US Inc.

Located in Webb County, Texas, the Corazon I Solar plant began operations in August 2021, while the Guajillo storage project is expected to reach an operational stage before the end of 2023.

https://solarindustrymag.com/eni-new-energy-us-purchases-corazon-i-and-guajillo-in-texas-from-baywa-r-e

North American renewable energy producer D. E. Shaw Renewable Investments (DESRI) and the Sacramento Municipal Utility District (SMUD) are planning the California utility's first solar + storage project, sized at 200 MWAC and 400 MWh. The **Coyote Creek Agrivoltaic Ranch** project will be the largest solar array in SMUD's territory, covering 1,200 acres on a parcel that is over 2,550 acres. It will generate enough electricity to cover 5% of the utility's electrical load.

The project is the largest combined solar + storage generation facility announced in northern California under PPA contract at this time and will be located in eastern Sacramento County. The project is expected to reach commercial operation no later than 2024 and will provide SMUD's customers with a long-term supply of local renewable energy.

https://www.solarpowerworldonline.com/2022/03/desri-developing-current-largest-solar-storage-project-in-northern-california/

Obsidian Solar Center

The Obsidian Solar Center is an approved solar photovoltaic (PV) energy generation facility with a nominal generating capacity of 400 megawatts, located within a site boundary of approximately 3,921 acres (6.1 sq. miles). The approved facility includes either a solar PV without battery storage (PV only), or a solar PV with 50 MW of battery storage [dispersed or centralized] (PV plus storage).

The Obsidian Solar Center at Fort Rock is a flexible, large-scale solar and storage project under development scheduled to begin construction in 2019, pending issuance of a site certificate from EFSC. Initial permitting milestones will be completed in 2018. The project may be completed in steps through 2022 or 2023.

https://www.obsidiansolarcenter.com/

https://www.oregon.gov/energy/facilities-safety/facilities/Pages/OSC.aspx

WEC Energy Group, a Milwaukee-based energy company, has unveiled plans for a new 310 MW solar+storage project. If approved, the **Paris Solar-Battery Park** in Kenosha County would be the largest facility of its kind in Wisconsin. The facility features 200 MW of solar generation and 110 MW of battery storage.

When completed, the 1,500-acre project is expected to feature up to 750,000 solar panels…

The company WEC Energy Group utilities We Energies and Wisconsin Public Service would own 90% of the project. Madison Gas and Electric (MGE) would own the other 10%. MGE is seeking approval from the PSCW to purchase solar energy and battery storage from the park.

Invenergy LLC received approval in December 2020 from the PSCW to build the solar project. Invenergy also proposed to install a battery storage system at the site. Construction is expected to begin in 2022 and the project is scheduled to go into service in 2023.

https://psc.wi.gov/Pages/MajorCases/paris-solar-project.aspx https://solarindustrymag.com/wec-energy-group-unveils-plans-for-paris-solar-battery-park

In April 2018, Colorado Springs Utilities issued a Request for Proposals seeking renewable energy resources to meet its 2020 Energy Vision which called for 20% of the Utilities' generation to come from renewable resources. juwi proposed the **Pike Solar & Storage project** to be sited on land owned by the City of Colorado Springs.

Juwi's project was selected as the project supplier in March 2019. In September 2020, the project agreements were signed, and the project was announced publicly.

The project will be sited on approximately 1,350 acres of City of Colorado Springs-owned land in unincorporated El Paso County.

At 175 megawatts AC, it will be one of the largest solar projects in Colorado.

This Project will have potential for up to a 50 MW battery energy storage system.

Project construction could begin as early as fall of 2021 and will be complete by the end of 2023.

https://juwicolorado.com/

Blue Sky Solar Farm is a 369MW solar PV power project. It is planned in Illinois, the US. The project is currently in permitting stage. It will be developed in single phase. The project construction is likely to commence in 2023 and is expected to enter into commercial operation in 2024.

The project is being developed by Renewable Energy Systems and Scout Clean Energy. The project is currently owned by Scout Clean Energy with a stake of 100%.

Blue Sky Solar Farm is a ground-mounted solar project which is planned over 2,700 acres.

The project construction is expected to commence from 2023. Subsequent to that it will enter into commercial operation by 2024. Off-taker is Comcast.

http://bluesky-solar.net/

https://www.power-technology.com/marketdata/blue-sky-solar-farm-us/

Jupiter Power LLC ("Jupiter") today announced that its **Flower Valley** II LLC ("Flower Valley II"), a battery energy storage facility located in Reeves County, Texas, has commenced commercial operations.

Note that Jupiter Power has two other major projects scheduled to be commissioned in 2022. **Crossett Energy Storage Facility** (200 MW / 200 MWh) and **Swoose I & II Energy Storage Facility** (110 MW / 220 MWh**)**. See the link to Jupiter below. Also Flower Valley I & II have a total of 110 MW / 220 MWh.

Flower Valley II, Jupiter's first transmission connected project, is a 100-megawatt (MW) energy storage facility, consisting of 200-megawatt hours (MWh) of duration capacity. Flower Valley II is among the largest energy storage projects in commercial operation in Texas, providing power to the ERCOT grid for use by Texas consumers of all types and sizes, both through energy capacity and grid-firming ancillary services. The 100MW

Flower Valley II facility translates to enough power to meet the electricity needs of 20,000 homes at peak demand in Texas.

Flower Valley I and Flower Valley II represent a combined investment of more than $70 million in Reeves County.

Jupiter expects a total of more than 650MWh of dispatch-able energy storage capacity to be operational before the 2022 summer peak season in ERCOT

https://energycentral.com/news/jupiter-powers-largest-utility-scale-battery-storage-facility-date-flower-valley-ii-enters

https://www.jupiterpower.io/

Canadian Solar Inc: through its wholly-owned subsidiary Recurrent Energy, LLC and Matrix Renewables, the TPG Rise-backed global renewable energy platform, today announced an agreement whereby Matrix Renewables will acquire the **Gaskell West 2 and 3** project of 105 MWac solar plus 80 MWh energy storage.

The Gaskell West 2 and 3 project is located in Kern County, California, and is fully contracted holding five long term power purchase agreements with BART, cities and utilities in California. The solar plus storage project is expected to reach commercial operation in late 2022, and will generate enough clean and low-cost electricity to power approximately 16,800 California homes and displace approximately 178,500 metric tons of carbon emissions each year. This hybrid project marks the first transaction between Matrix Renewables and Recurrent.

https://www.prnewswire.com/news-releases/canadian-solar-and-matrix-renewables-announce-transaction-for-105-mwac-solar-plus-80-mwh-storage-project-in-california-301519844.html

Located in the Town of Byron in Genesee County, NY the Excelsior Energy Project is a proposed 280-megawatt photovoltaic solar energy generating facility with 20 megawatts of energy storage. This project has been approved by New York regulators.

The Excelsior Energy Project is expected to begin commercial operation in late 2022. This Project is proposed by NextEra Energy, Inc.

https://www.excelsiorenergycenter.com/

A 3,000-acre solar energy farm, **Sun Park Solar Project**, is planned on a former coal mining site in southern West Virginia, project officials said.

The estimated $320 million project will be built at the Rock Creek Development Park along the borders of Boone and Lincoln County by the newly formed SEVA WV, a unit of Kansas City, Missouri-based Savion Energy.

The park itself will be renamed Sun Park and is expected to include industrial and commercial development, educational facilities and tourism and hospitality venues, officials said at a news conference Monday. The solar panels are expected to provide 250 megawatts of power. The project is expected to be completed by 2024.

https://www.wvpublic.org/energy-environment/2022-04-05/solar-panel-farm-planned-on-former-w-va-coal-mine-site