

Alternative Energy Market Update – Q4'23

November 2023

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Alternative Energy | U.S. Landscape

Developers, Utilities & IPP's

Platform and portfolio valuations are being reset to accommodate higher financing costs

- Most of the contracted renewables subsidiaries of investor-owned utilities have been sold at this point, including AEP, Duke, and ConEd, largely to infra funds and international IPPs
- Developers and asset owners balancing growth against development challenges, higher interest rates, and upward pressure on operating costs like insurance and O&M

Brookfield
Renewable



Invenergy



Engineering, Procurement & Construction

Despite legislative tailwinds, critical challenges remain to meet demand

- Wind turbine supply continues to be challenged, as Siemens Gamesa has significantly curtailed turbine sales until it can remedy bearing issues leading to mechanical failure in popular models
- Persistent craft labor shortages exacerbated in the short-term by IRA requirements, driving up margins for those with captive labor pools and down for everyone else
- Commissioning of new domestic module manufacturing accelerates IRA enhancement adoption



GREENSPARK



SIEMENS Gamesa
RENEWABLE ENERGY

Infrastructure & Private Capital

Slow year

- Fundraising from LP's down markedly (see next page), driven by public market weakness (see page 6) and investments not meeting expectations from 2020/2021
- New deal activity is still moving forward although with lower frequency
- Investors selectively underwriting to new IRA-enabled regulatory incentives
- Interest in services businesses remains very high



greenbelt
CAPITAL PARTNERS

BlackRock

MODERN
ENERGY

LSPower

Battery Storage

2023 capacity additions have been slower than anticipated

- For an industry originally expected to double the amount of installed capacity this year, only half of that amount has actually come online
- New battery manufacturing capacity and falling prices for raw materials have reversed recent cost increases and are anticipated to accelerate new development



BROAD REACH POWER



PLUS
POWER

Renewable Fuels

Activity continues to advance despite setbacks (Navigator, Plug, etc)

- RNG practitioners face continued regulatory uncertainty and questionable project performance
- Clean H₂ announcements ramping in anticipation of more commercial traction & regulatory clarity
- CCS projects continue to gain steam with more O&G buy-in
- Project financing remains elusive for SAF developers



NOVO
HYDROGEN

Vision
RNG

MORROW
RENEWABLES



Source(s): S&P Market Intelligence, Sparksread, Infralogic, WoodMac, CARB, EPA, DOE, CCS Institute

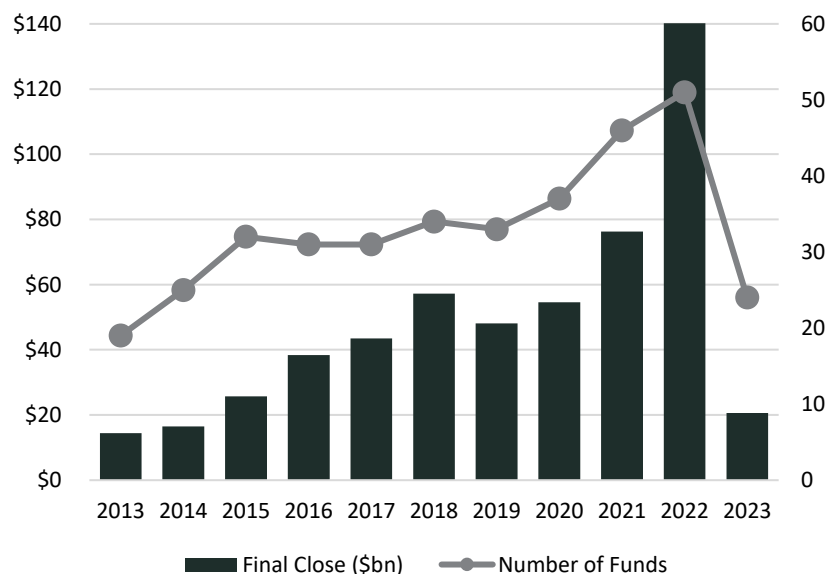
Macro Environment | 2023 Slowdown in Fundraising and Strategic Activity

Interest rates and regulatory uncertainty are causing a pause in activity

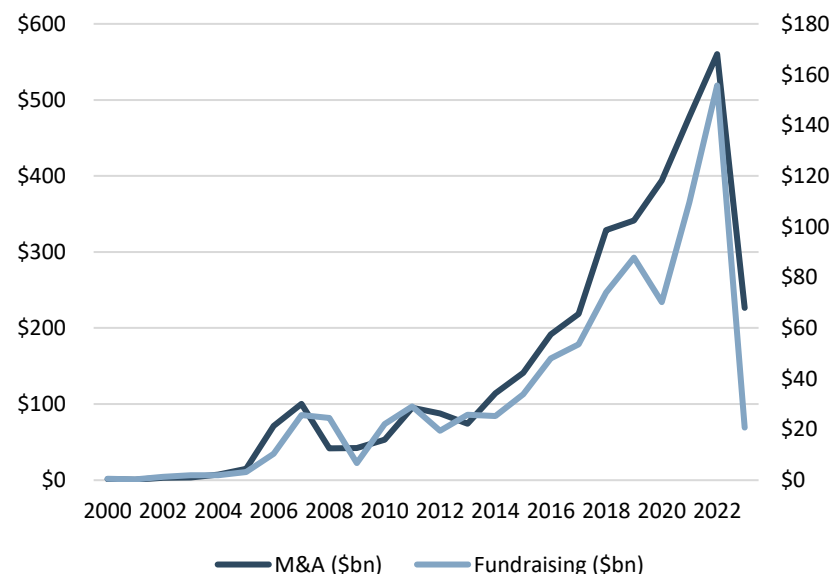
Year-to-Date Fundraising

- Global infrastructure and renewable energy fundraising in 2023 is headed for the lowest level in almost a decade, with a slight uptick in the third quarter failing to offset an 85% on-year decline for the first nine months through September
 - So far this year, 25 funds have raised \$20.8bn at final close, the least since 2014
 - Allocation to Renewables and Energy Transition is outpacing Infrastructure 60/40, a shift from the 20/80 allocation in 2022
 - Approximately 50% of capital has been raised by debt funds
- A slowdown in M&A deal value has impacted distributions, with LPs receiving less capital throughout the year to reinvest into funds
 - Additionally, the “Denominator Effect” – investors’ infrastructure holdings increase as an overall proportion of portfolios due to a decrease in public valuations – has pushed many LPs close to or above their infrastructure allocations

Activity Heads for Decade Low



Fundraising Tracks M&A Decline



Source(s): Infralogic 3Q Fundraising Report

Alternative Energy | Public Market Overview

Renewable Energy Sector Analysis - Q3 2023										
Company	Ticker	Price 11/28/2023	Market Cap (\$mm)	Enterprise Value (\$mm)	YTD Total Returns (%)	Valuation		Debt / Total Cap (%)	Credit	S&P Credit Rating
						2023E EV / EBITDA (x)	2024E EV / EBITDA (x)		2023 Net Debt / EBITDA (x)	
Alternative Energy										
Array Technologies	ARRY	\$14.91	\$2,255	\$3,144	(22.9%)	11.1x	8.9x	54.1%	1.9x	B+
Brookfield Renewable Corporation	BEPC	26.74	9,873	34,126	0.7%	14.4x	13.2x	43.7%	5.6x	BBB+
First Solar	FSLR	155.02	16,563	15,284	3.5%	13.2x	7.8x	7.9%	NA	NA
Hannon Armstrong	HASI	24.06	4,635	8,190	(12.4%)	38.4x	29.0x	63.6%	16.5x	BB+
Ormat Technologies	ORA	67.32	4,063	6,141	(21.7%)	12.7x	11.4x	45.5%	4.0x	NA
Sunnova Energy International	NOVA	11.00	1,347	8,716	(38.9%)	39.1x	25.1x	76.6%	30.2x	NA
SunPower Corporation	SPWR	4.06	711	950	(77.5%)	NA	15.0x	44.1%	NA	NA
Sunrun	RUN	11.92	2,597	13,993	(50.4%)	NA	NA	60.1%	NA	NA
Cleantech										
Bloom Energy Corporation	BE	\$13.55	\$3,036	\$3,942	(29.1%)	38.3x	19.0x	74.1%	8.6x	NA
Enphase Energy	ENPH	99.10	13,491	13,023	(62.6%)	17.1x	18.4x	56.5%	NA	NA
FuelCell Energy	FCEL	1.21	545	347	(56.5%)	NA	NA	13.0%	2.7x	NA
Plug Power	PLUG	3.84	2,325	2,731	(69.0%)	NA	NA	21.7%	NA	NA
SolarEdge Technologies	SEDG	76.97	4,373	4,078	(72.8%)	11.7x	17.1x	22.8%	NA	NA
Tesla	TSLA	246.72	784,303	767,442	100.3%	46.4x	36.8x	13.1%	NA	BBB
Solar / Wind IPP										
Clearway Energy	CWEN.A	\$24.24	\$2,836	\$12,498	(15.4%)	11.4x	10.6x	64.9%	6.8x	BB
EDP Renováveis	EDPR	17.69	18,115	27,382	(20.7%)	12.5x	10.7x	39.6%	3.4x	BBB
NextEra Energy Partners	NEP	22.98	2,147	19,185	(64.7%)	10.1x	9.3x	31.1%	3.2x	BB
Ørsted	ORSTED	44.86	18,849	25,351	(50.7%)	8.5x	6.4x	53.3%	2.1x	BBB+
Alternative Fuels / RNG										
Ameresco	AMRC	\$28.57	\$1,492	\$3,438	(50.0%)	20.9x	14.4x	67.6%	11.4x	NA
Clean Energy Fuels Corp.	CLNE	3.42	763	820	(34.2%)	19.0x	8.5x	24.5%	1.2x	NA
Darling Ingredients	DAR	41.55	6,629	11,215	(33.6%)	6.8x	6.6x	50.8%	2.7x	BB+
Montauk Renewables	MNTK	9.08	1,289	1,285	(17.7%)	24.7x	15.4x	22.4%	NA	NA
Neste	NESTE	37.50	28,809	31,161	(19.6%)	8.4x	8.0x	31.1%	0.6x	NA
OPAL Fuels	OPAL	5.45	927	2,374	(25.1%)	34.9x	16.7x	30.3%	2.3x	NA
Electric Vehicle Infrastructure										
ChargePoint Holdings	CHPT	\$1.93	\$695	\$781	(79.7%)	NA	NA	53.7%	NA	NA
Evgo, Inc	EVGO	2.91	301	791	(34.9%)	NA	NA	9.0%	2.8x	NA
Blink Charging Co.	BLNK	3.46	233	183	(68.5%)	NA	NA	6.8%	0.7x	NA
Battery Storage										
Enovix Corporation	ENVX	\$10.92	\$1,832	\$1,636	(12.2%)	NA	NA	41.0%	2.5x	NA
Eos Energy Enterprises	EOSE	1.02	161	315	(31.1%)	NA	NA	253.1%	NA	NA
Fluence	FLNC	20.27	2,402	2,310	18.2%	NA	33.5x	8.9%	1.3x	NA
Li-Cycle	LICY	0.70	126	338	(85.2%)	NA	NA	53.6%	NA	NA
QuantumScape Corporation	QS	5.73	2,805	1,782	1.1%	NA	NA	6.8%	3.7x	NA
Stem Inc.	STEM	2.60	405	886	(70.9%)	NA	50.2x	57.2%	NA	NA

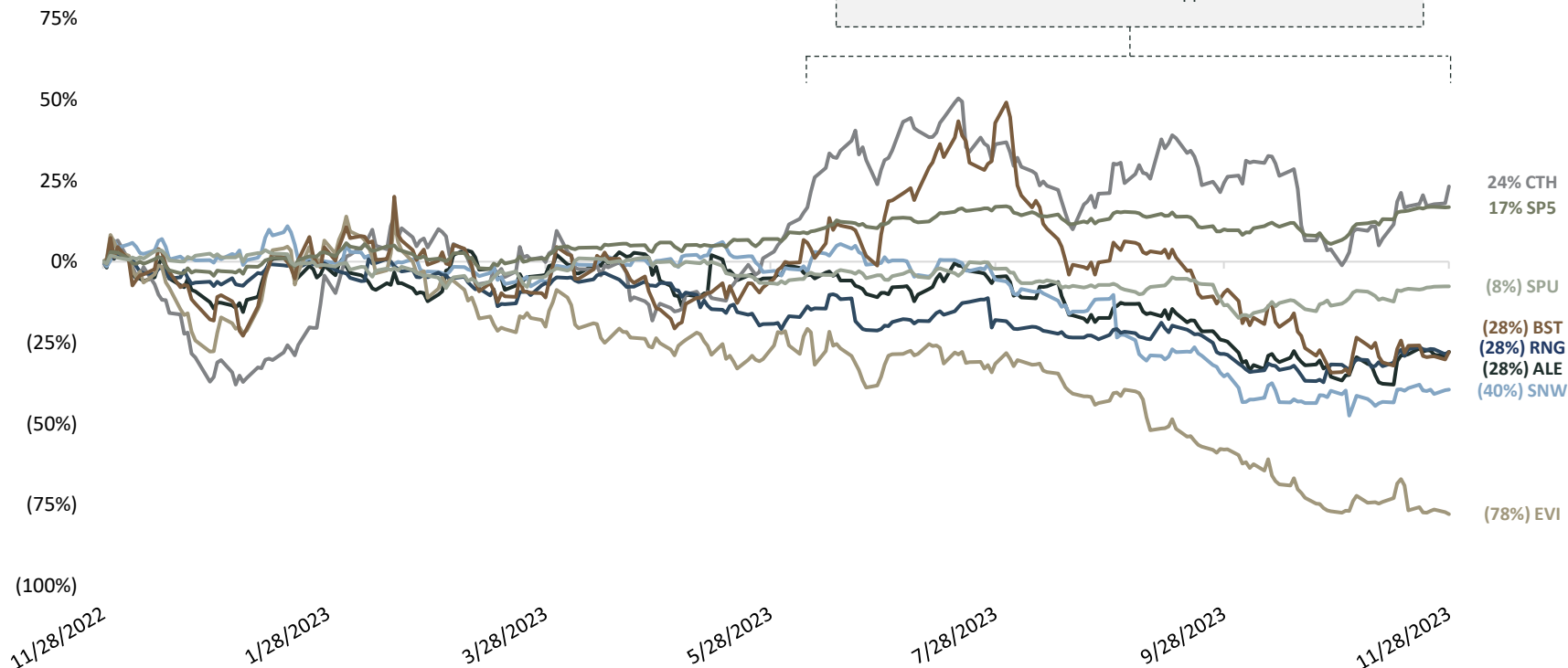
Source(s): S&P CapIQ Pro. Note: Prices as of 11/28/2023

Alternative Energy | Stock Market Performance

Alternative Energy (ALE)		Cleantech (CTH)		Solar/Wind (SNW)		Renewable Fuels/ RNG (RNG)		EV Infrastructure (EVI)		Battery Storage (BST)		S&P Utilities Index (SPU)	S&P 500 (SP5)
ARRY	ORA	BE	PLUG	CWEN.A	NEP	AMRC	MNTK	CHPT	BLNK	ENVX	LICY		
BEPC	NOVA	ENPH	SEDG	EDPR	ORSTED	CLNE	NESTE	EVGO		EOSE	QS		
FSLR	SPWR	FCEL	TSLA			DAR	OPAL			FLNC	STEM		
HASI	RUN												

Indices Total Return (LTM)

Lack of regulatory clarity and rising interest rates cause investors to take a wait-and-see approach



Source(s): S&P CapIQ Pro. Note: Prices as of 11/28/2023

Alternative Energy | Legislative Update

Treasury and IRS continue rolling out guidance to the enhanced tax credit features of the IRA

Draft IRS Guidance on ITC and PTC Application¹

- Guidance released on 11/17/23, the first meaningful refresh to ITCs since the 80's
- Multiple nuanced details regarding various ITC qualification requirements and intersection with other provisions within the IRA, including (non-exhaustive):
 - Confirmation that PTC and ITC assets can be co-located, i.e. solar + storage
 - ITC eligibility for most transmission assets related to offshore wind
 - RNG qualifying equipment defined for the first time, which includes conditioning & cleaning facilities, but not upgrading equipment
 - ITC for upgrades restricted primarily to 80/20 rules typical of repowering; likely eliminates BESS augmentation ITC
 - Certain situations, like H₂ storage and H₂ production, can stack ITC and PTC

Takeaways:

- Much of this information was broadly anticipated, but this guidance will allow many financings to move into execution
- Stacking of ITC and PTC is a constructive outcome, but the market may require more detail, or a private letter ruling(s), before transacting on the concept

Prevailing Wage and Apprenticeship Requirements²

- Guidance released on 10/29/22
- Prevailing wage and apprenticeship is now required to receive most of the baseline historical ITC and PTC value, making it a de facto imperative on all new construction
- Requirements in-line with published General Service Administration (GSA) determinations
- "Good Faith" exemption from apprenticeship requirement if usual and customary business practices are utilized
- "Sufficient Records" to be maintained for work performed by contractors and subs
- Prevailing wage requirement extends to O&M during the 5-year recapture period

Takeaways:

- Request process for GSA determinations is viewed by the market as inadequately resourced and meaningful delays are expected
- Administrative burden of documentation and current profile or workforce are expected to create major challenges, especially for smaller EPCs and ones without self-performance capabilities

Domestic Content Requirements³

- Guidance released on 5/12/2023
- Qualifying ITC moves from 30% to 40% and PTC value receives a 1.1x multiplier
- Structural steel and iron must be manufactured in the U.S., though raw materials can be imported
- Non-structural steel and iron components (e.g., fasteners or buckets) are exempt
- Manufactured Product requirements follow Buy American standards with deviation
- Direct labor and materials costs of a product must be at least 40% domestic through 2024, increasing thereafter

Takeaways:

- Steel and iron qualifications appear relatively straightforward and have reasonably accommodative exemptions
- An increased level of cost accounting transparency, including profit margin in some cases, will be required on manufactured products
- Complicated calculations for manufactured products risk some project qualification















Source(s): ¹Department of the Treasury, Norton Rose Fulbright, ²Department of Labor, ³Akin Gump Strauss Hauer & Feld (see [here](#))

Traditional Renewables | Utility-Scale Solar Transactions

Date	Investor(s)	Target	Commentary
Oct'23	 KYUSHU ELECTRIC POWER CO., INC.		Enfinity Global agreed to a minority sale of its 400 MW operating portfolio to Kyushu Electric Power. Kyushu will hold a 40% equity interest, and Enfinity will retain a 60% equity interest and will be the long-term asset manager of the portfolio. In January 2023, Enfinity acquired the portfolio, consisting of 28 facilities, from Capital Dynamics
Oct'23	 ULTRA CAPITAL		Palladium Energy, a Florida-based utility-scale solar and storage developer, closed on a \$10mm corporate equity investment from Ultra Capital. Founded in 2019, Palladium will use the investment to accelerate growth of the team and development pipeline
Oct'23	 SUNRAYCER		Samsung C&T announced it will sell its portfolio of 6 solar and 9 energy storage systems to Sunraycer. The 15 assets are under construction in Texas and will have a combined capacity of 3 GW. The financial details of the sale were not disclosed. Samsung will continue its involvement in the projects until they reach COD in 2025-2026
Oct'23	 Sumitomo Corporation  ADVANTAGE CAPITAL		Sumitomo has partnered with Advantage Capital to establish Perennial Renewables, a new U.S. solar development company. Perennial Renewables will focus on developing Advantage's existing portfolio of more than 2 GW of projects located across 6 states, predominately in the Midwest and Northeast. Sumitomo and Advantage will each hold a 50% stake
Oct'23	 REPSOL		Repsol agreed to acquire ConnectGen from Quantum Capital Group for \$768mm. ConnectGen is a Houston-based developer with a pipeline that includes 20,000 MW of onshore wind, solar, and energy storage projects. The transaction builds on Repsol's U.S. renewables exposure, having taken a 40% stake in Hecate Energy in 2021
Aug'23	 Invenergy  Blackstone 		A partnership between Invenergy, CDPQ, and Blackstone, closed the acquisition of AEP's 1,365 MW unregulated, contracted renewables portfolio for \$1.5bn. The portfolio includes 14 operational projects in 11 states and is comprised of 1,200 MW of wind and 165 MW of solar. The transaction included a first-of-its-kind \$580mm PTC transfer
Jul'23			Duke Energy announced the sale of its unregulated utility-scale renewables business to Brookfield Renewable for \$2.8bn; the deal is expected to close by the end of 2023. Brookfield will acquire 5.9 GW of operating and under construction wind, utility-scale solar, and storage assets, and a 6.1 GW pipeline
Jul'23	 OMNES	 Hawthorne Renewables	Hawthorne Renewables, a newly established solar development company backed by Omnes Capital, announced it will pledge \$250mm in solar projects across the U.S. The Hawthorne team is targeting 2 GW of operational solar assets over the next five to seven years







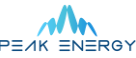






Source(s): Company Press Releases

Traditional Renewables | Distributed Generation Solar Transactions

Date	Investor(s)	Target	Commentary
Nov'23	Pending		American Electric Power announced their intent to sell their Retail and Distributed Resources businesses. As of 9/30/2023, AEP's book value of the businesses were \$244mm for Retail and \$353mm for Distributed Resources. Management expects a sale agreement to be announced in 1Q24 and transaction close in 1H24
Nov'23			Summit Ridge closed a \$275mm expansion of its existing financing with MUFG. Summit will use the proceeds to build up to 15 solar projects in Illinois and for the construction and permanent financing of up to 15 solar projects in Virginia
Nov'23	BlackRock		BlackRock's Evergreen Infrastructure fund, an open-ended fund with close to \$1bn in client commitments, made its first investment in U.S.-based Lighthouse Solar. Lighthouse, a C&I solar and battery storage platform, has an operating portfolio spanning 6 states
Nov'23			DSD Renewables received a \$250mm investment from Cox Enterprises to support DSD's growth. The investment is Cox's largest renewable energy investment to date. BlackRock's Climate Infrastructure business will remain the majority stakeholder in DSD
Nov'23			Madison Energy Infrastructure acquired Pro-Tech Energy Solutions. Formed in 2009 and based in New Jersey, Pro-Tech has built hundreds of DG projects and has developed substantial front-of-the-meter assets across the Northeast and Mid-Atlantic
Oct'23			Hull Street Energy completed an investment in Greenskies Clean Focus, a developer and operator of DG projects in New England, New Jersey, and California. Greenskies offers decarbonization solutions, including onsite and offsite solar, battery storage, and microgrids
Oct'23			REC Solar received an undisclosed investment from ArcLight. REC Solar has a portfolio of solar, battery storage, and microgrid projects for hundreds of U.S. commercial enterprises, including manufacturers, retailers, schools, universities, and municipalities
Oct'23			Cultivate Power secured a corporate equity investment of \$10mm from Generate Capital. Cultivate is headquartered in Chicago, IL, with local development teams in the Midwest and California. The company is focused on developing 10 – 50-acre projects on farmland and infill

Source(s): Company Press Releases

Traditional Renewables | Battery Storage Activity

Date	Category	Involved Parties	Commentary
Nov'23	Financing	 MIDDLE RIVER POWER	Middle River Power secured \$250mm in financing for a portfolio of 327 MW, 1hr duration battery storage projects being developed in California. The portfolio of three battery storage projects will be paired with existing gas-fired peaking generation
Nov'23	Financing	 esVOLTA	esVolta, a Generate Capital company, closed on a \$170mm credit facility. The facility supports the completion of the esVolta's esFaraday portfolio, which consists of two operational projects and two construction projects collectively totaling 370 MWh
Nov'23	Financing	 aypa	Aypa Power, a Blackstone portfolio company, closed a \$550mm portfolio debt and tax equity financing for two battery storage projects. The financing supports the 100 MW / 400 MWh Cald project, in Los Angeles, CA, which secured a long-term tolling agreement with San Diego Gas & Electric, and the Borden County project, a 150 MW / 300 MWh project in TX. Both projects are expected to COD in 2024
Oct'23	Financing	 GREENPRINT CAPITAL  spearmint energy	Greenprint Capital Management invested \$92mm in tax equity into SpearMint Energy's Revolution battery storage project. Revolution, which reached mechanical completion this summer and is scheduled to COD in 2H23, is a 150 MW / 300 MWh energy storage project in West Texas
Oct'23	Financing	 PLUS POWER	Plus Power closed on \$1.8bn in new financing. The funding includes \$707mm for the 250 MW Sierra Estrella Energy Storage project in Arizona. Additionally, the proceeds will also support construction of 700 MW of batteries on the ERCOT grid in Texas. The financing commitments cover five projects totaling 1,040 MW of capacity / 2,760 MWh
Oct'23	Investment	 PEAK ENERGY  ECLIPSE  TDK TDK VENTURES	Energy storage technology developer Peak Energy has started operations after receiving a \$10mm financing round. The funding round was led by technology investor Eclipse, with significant participation from strategic partner TDK Ventures. Peak Energy's goal is to provide sodium-ion battery technology to reduce the cost of battery storage by 50%
Aug'23	Financing	 [A B] CARVAL  PEREGRINE ENERGY	Peregrine Energy, a clean energy platform focused on utility-scale energy storage, announced an agreement with AB CarVal to raise over \$700mm of credit, equity, and debt to fund Peregrine's pipeline of over 7 GW of standalone battery, solar, and wind projects. Peregrine's project portfolio spans five ISOs and 10 states
Aug'23	Acquisition	 ENGIE  BROAD REACH POWER	Engie agreed to acquire Broad Reach's battery storage business for \$1bn, which includes 350 MW of operational assets and 880 MW under construction, primarily in the ERCOT market. The acquisition also includes a 1.7 GW pipeline of projects in advanced stages of development and a significant pipeline of early-stage projects

Source(s): Company Press Releases

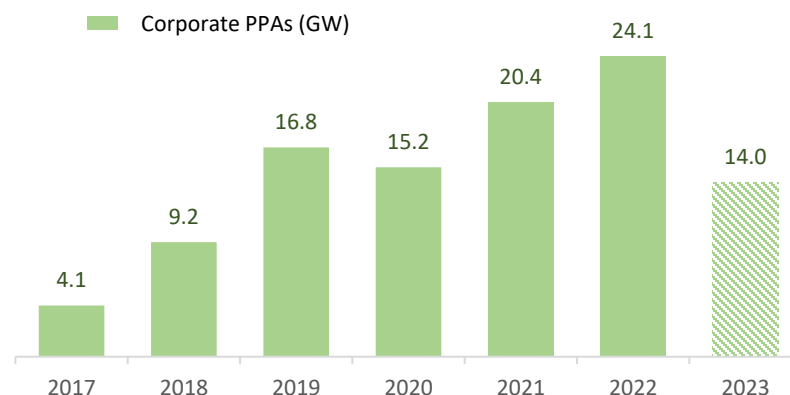
Corporate Sustainability | Corporate PPA Market Overview

PPA price escalation diminishes, developmental issues ease (slightly), and announcements slow













PPA Market Dynamics

- While mega PPA signings by the tech titans are down in 2023, the PPA market is seeing a flurry of activity that crosses a broad swath of industries, including packaging, consumer products, heavy industrials, pharmaceuticals, and more
- Q3 PPA signings were heavily concentrated in ERCOT, likely a result of finally getting some regulatory clarity on market reforms in the region from the state legislature. Implementation of these reforms will play-out over the coming quarters and years, but the general consensus is that the more Draconian of outcomes for renewables were avoided
- Absent a big Q4 from PPA bellwethers, full-year PPA volume is anticipated to be down year-over-year. This pullback in buying activity, when paired with a thawing of some major supply chain issues, has caused PPA prices to moderate slightly in most parts of the country
 - PJM is a notable exception to this price moderation, with development hurdles pushing prices up slightly and extending a multi-year trend of project scarcity. Corporate buyers in many parts of PJM are faced with the choice of electing for clearly uneconomic transactions or enhancing economics by partially monetizing valuable PJM RECs through REC swap arrangements
- As we move into the 2024, most new renewable projects being marketed by developers will be for 2026-2028 delivery, which means the wave of new domestic module manufacturing capacity coming online will begin to impact markets. As developers and financiers establish more transaction precedent around IRA tax enhancements like domestic content, solar PTC, and storage ITC, among others, we anticipate these benefits to materialize through marginally lower PPA prices for offtakers

Americas Corporate PPA Volume (2017 – 2023)¹



Noteworthy Recent PPA Announcements





















Corporate	Seller	Size (MW)	Fuel Source	Location
		209	Solar	ERCOT
		282	Solar	ERCOT
		100	Solar	ERCOT
		21	Solar/Storage	ERCOT
		80	Solar	SERC
		125	Solar	ERCOT

Source(s): American Clean Power, Infralogic, S&P Clean Energy Procurement, BNEF, ¹2023 is GFEP projection

Energy Transition Service Providers | Noteworthy Transactions

Despite a downturn for many sectors within Energy Transition and slow-down in related M&A activity, the Services sub-sector has remained strong

Energy Transition Consulting M&A

Date	Involved Parties		Commentary
Aug '23	 MORROW SODALI	 HXE Partners	Morrow Sodali acquired HXE Partners, an ESG strategy and implementation advisory firm. HXE will work closely with Morrow subsidiary FrameworkESG, a specialty advisory firm that provides analysis to help clients reduce ESG risk
Jun '23	 SLR	 Carnstone	Ares-backed SLR acquired Carnstone, an England-based sustainability consultancy to large corporates and institutions. Carnstone has a team of 45 professionals located across the UK, France, China, and Singapore
Jun '23	 THE CARLYLE GROUP	 Anthesis	Carlyle announced it has agreed to acquire a majority stake in Anthesis, a global pure-play sustainability advisory and solutions firm
Jun '23	 TRC	 GLADSTEIN, NEANDROSS & ASSOCIATES CLEAN TRANSPORTATION & ENERGY CONSULTANTS	TRC announced the acquisition of Gladstein, Neandross & Associates, a North American consulting firm specializing in low- and zero-emission transportation, infrastructure, and ultra-low carbon fuels for commercial transportation
Mar '23	 PARSONS	 IPKEYS POWER PARTNERS	Parsons acquired IPKeys Power Partners, a company founded in 2014 that provides enterprise software platform solutions to electric, water, and gas utilities in North America
Feb '23	 EY	 Attalea PARTNERS	EY acquired Attalea Partners, a Spanish ESG consulting firm that provides services to private equity and investee firms. With the incorporation of 11 professionals, EY aims to broaden their ESG and sustainability service offerings
Feb '23	 ERM	 COHO	ERM acquired Coho. Services offered by Coho include market insights, strategy development, procure renewable energy, EV transition, fuel switching, supply chain improvements, and water resiliency
Jul '22	 LEGENCE	 BLACK BEAR ENERGY	Legence acquired Black Bear Energy, a technology-enabled, commercial buyer's representative specializing in onsite renewable energy and cleantech services
Jul '22	 intertek	 CEA	Intertek acquired Clean Energy Associates, an independent provider of quality assurance, technical services, supply chain traceability and downstream engineering support for the solar energy and energy storage industries
Jan '22	 LIME ROCK NEW ENERGY	 EPE ELECTRIC POWER ENGINEERS	Lime Rock New Energy acquired a controlling interest in Austin-based Electric Power Engineers, a consulting engineer firm focused on the power, renewable energy, grid modernization, and energy storage industries

Diversified Consulting M&A

Date	Involved Parties		Commentary
Nov '23	 BainCapital	 Guidehouse	Bain Capital announced it would acquire Guidehouse, a consulting firm that advises government organizations and businesses, in a deal valuing it at \$5.3 billion including debt
May '23	 VMG HEALTH	 BSM Consulting	VMG Health acquired BSM Consulting, a specialist healthcare consulting firm, founded in 1978, with offices in Reno, Nevada and Phoenix, Arizona
Mar '23	 accenture	 optimind.	Accenture acquired Optimind, a Paris-based consulting firm specializing in financial services, insurance, and compliance management for insurance firms, banks, and corporates
Nov '22	 cognizant	 austincsi	Cognizant acquired AustinCSI, a digital transformation consultancy specializing in enterprise cloud and data analytic advisory services

Source(s): Company Press Releases

Renewable Fuels | US RNG

November deal announcement suggests favored status for Landfill Gas, while recent Treasury guidance creates significant market uncertainty

Enbridge/Morrow – Transaction Overview



November 3, 2023: Enbridge announced the acquisition of seven operating facilities from Morrow Renewables

- Morrow Renewables, a Texas-based LFG-to-RNG developer, agreed to sell seven operating facilities to Enbridge (TSX: ENB) for **\$1.2bn**
 - The Morrow facilities deliver RNG from municipal landfills in six Texas locations (Edinburg, Hinton, Tyler, Melissa, Longview, and Alvarado) and one Arkansas location (Fort Smith)
- The transaction is expected to close in 2024, with approximately 60% of the consideration to be staggered over the following two years. Deferred consideration schedule:
 - 2024 = \$0.5bn, 2025 = \$0.5bn, and 2026 = \$0.2bn
- Enbridge Commentary (CEO Greg Ebel):
 - “RNG fundamentals are strong in the United States and indicate continued growth in demand over the long-term as gas utilities increasingly continue to set RNG blending targets.”

7

Operational LFG
Facilities

**5 million
MMBtu**

RNG Produced per
Year

86 FTEs

Plant and Field Ops.
Workers Acquired

Recent Treasury Guidance

November 17, 2023: The Department of the Treasury and the Internal Revenue Service issued proposed regulations regarding the definition of “energy property” and related rules applicable to the energy credit available under section 48

- In a departure from previous conventional wisdom, the proposed regulations take the position that qualified biogas property does NOT include any gas upgrading equipment necessary to concentrate the gas into the appropriate mixture for injection into a pipeline through the removal of other gases
- Treasury’s position on this issue frustrates taxpayers and developers, and we expect that Treasury will receive significant pushback from stakeholders during the comment period (BP, Waste Management, Republic Services, Ameresco, etc.)
- Negative impacts from the proposed regulations are widespread:
 - Value: much less of the capital stack in biogas projects is absorbed by the ITC
 - Timing: the proposed regulations complicate decision making due to the 2023 ITC sunset provision
 - Deal flow: transactions are paused due to the uncertainty caused
 - It is unclear whether the run-on effects from the proposed regulations are the result of a knowledge gap within Treasury, or if the changes are more deliberate and intentional

Source(s): Company Press Releases, RNG Coalition, V&E

Renewable Fuels | Clean Hydrogen Activity

Clean H₂ activity has accelerated in 2H'23



ACES DELTA

Chevron acquired a majority interest in **ACES Delta**, a JV between Mitsubishi Power Americas and Magnum Development. The project plans to produce green hydrogen and use salt caverns for seasonable, dispatchable storage of the energy



NovoHydrogen received a \$20mm equity commitment from Modern Energy. NovoHydrogen, a Denver-based pure-play green hydrogen developer, pursues onsite and near-site projects for customers across a variety of sectors



Electric Hydrogen announced a \$380mm Series C. The funding round was led by Fortescue, Fifth Wall, and Energy Impact Partners. Electric Hydrogen, a developer of PEM electrolyzers, has raised \$600mm since it was founded in 2020



Duke Energy will add two 1 MW electrolyzers to an existing solar plant in FL. The resulting green H₂ will be stored. In times of high demand, H₂ will be dispatched to a combustion turbine to run on a natural gas/H₂ blend or up to 100% H₂



Copenhagen Infra. and **Tenaska** announced they will develop greenfield GW-scale green hydrogen projects with the intent to serve local and global demand for green hydrogen, ammonia, methanol, SAF, and other clean fuels in the U.S.



Monarch, a CA-based green H₂ developer, secured a \$25mm preferred equity investment from LS Power. LS Power plans to invest up to \$400mm into projects developed by Monarch as part of a newly formed platform, Clean Hydrogen Fuels

Other Noteworthy Themes

1 IRS Guidance on Hydrogen PTC

- Treasury guidance on what standards must be met for the production of hydrogen to qualify for the 45V PTC
 - Additionality
 - Deliverability
 - Time matching
- Stakeholders anticipate these clarifications in December 2023, which should unlock a number of development projects that are currently paused until the guidance is provided

2 Electrolyzer manufacturers targeting the U.S. market

- The construction of numerous electrolyzer manufacturing facilities is advancing
 - 10/25/23: **John Cockerill Hydrogen** announced the acquisition of manufacturing space in Baytown, TX for a 1 GW/yr facility
 - 5/19/23: **Cummins** started operations for electrolyzer production in Minnesota
 - 5/3/23: **Nel** plans to build a gigawatt electrolyzer manufacturing facility in Michigan
 - 3/20/23: **HydrogenPro** to build a new 500 MW facility in Texas

Source(s): Company Press Releases, S&P Market Intelligence, Inframation, Green Hydrogen Coalition

Renewable Fuels | DOE Regional Clean Hydrogen Hubs

Program Overview

- In September 2022, the DOE issued a funding opportunity announcement soliciting proposals for the development of clean hydrogen hubs across America
- The funding includes up to \$7bn to establish 6 – 10 regional clean hydrogen hubs, with an additional \$1 – 2bn reserved for future clean hydrogen hub launches or other supporting activities
- To the “maximum extent practicable,” at least two projects must be sited in prevalent natural gas-producing regions
- The final selected project list must include at least one hub producing hydrogen from fossil fuels, one from renewable energy, and one from nuclear energy

Program Update¹

- On October 13, 2023, it was announced that the hydrogen hub awardees were as follows:

Project Name	States	Federal Cost Share	Targeted Feedstock				Targeted End-Uses				Emissions Reduction	Midstream Considerations			
			Renewable Electrolysis	Biomass + CCUS	Fossil + CCUS	Nuclear Electrolysis	Industry	Transport.	Power	CHP/Space Heating		Pipelines	Fueling Stations	CO ₂ Storage	H ₂ Storage
Appalachian Hydrogen Hub (ARCH2)	WV, OH, PA	\$925mm	—	—	●	—	?	?	?	?	9 MT	●	●	●	?
California Hydrogen Hub (ARCHES)	CA	\$1.2bn	●	●	—	—	●	●	●	—	2 MT	—	●	—	—
Gulf Coast Hydrogen Hub (HyVelocity)	TX	\$1.2bn	●	—	●	—	●	●	—	—	7 MT	●	●	—	●
Heartland Hydrogen Hub (HH2H)	MN, ND, SD	\$925mm	●	—	—	●	●	●	—	●	1 MT	●	—	—	—
Mid-Atlantic Hydrogen Hub (MACH2)	PA, DE, NJ	\$750mm	●	—	—	●	●	●	—	●	1 MT	●	●	—	—
Midwest Hydrogen Hub (MachH2)	IL, IN, MI	\$1bn	●	—	●	●	●	●	●	—	3.9 MT	?	?	?	?
Pacific Northwest Hydrogen Hub (PNWH2)	WA, OR, MT	\$1bn	●	—	—	—	●	●	—	—	1 MT	—	●	—	—

Source(s): ¹Center for Strategic & International Studies; as of October 20, 2023.

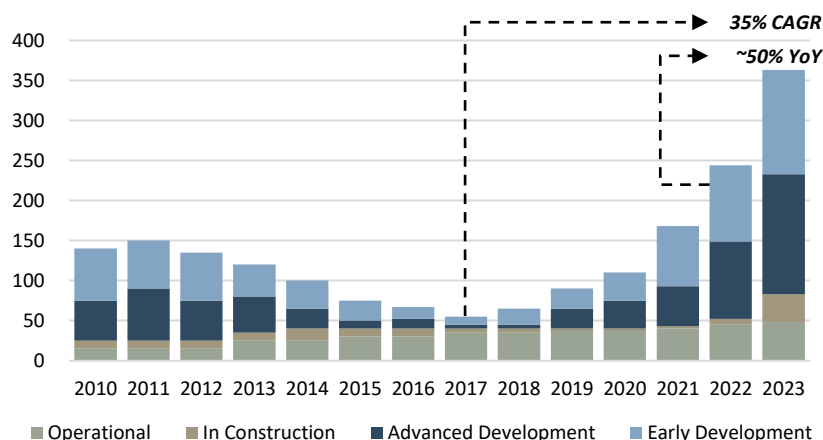
CCS Market | Macro Level Trends

Government policies have created an advantageous environment for the build-out of CCS projects

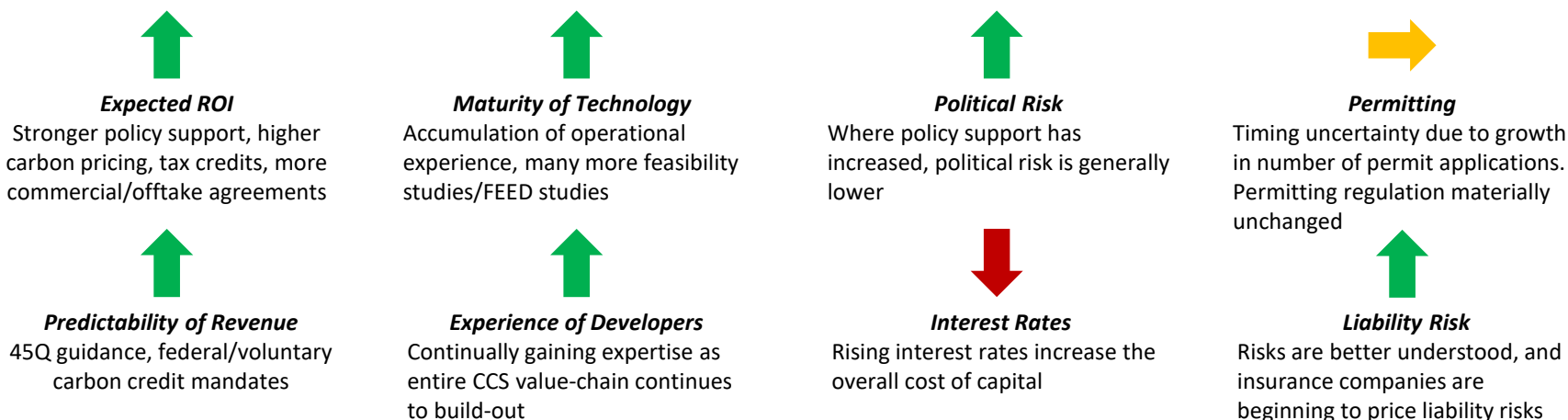
Post-IRA Commentary

- There has been an increase in equity financing, project financing, and M&A activity
- CCS is becoming a more prominent feature in public policy
 - In Nov. 2023, the EU passed the Net-Zero Industry Act, which aims to have 50 Mtpa of CO₂ storage developed by 2030
 - The UK's CCUS Net Zero Investment Roadmap anticipates 20 – 30 Mtpa of CCS capacity installed by 2030
- Recent growth has been concentrated in North American and Europe where supportive policy and/or carbon pricing is strong
- Historically, a CCS facility was vertically integrated – a single CO₂ capture plant with dedicated compression, pipeline, and storage systems. However, despite the recent **cancellation of Navigator CO₂**, CCS networks are rising in popularity – plants utilizing shared transport and storage facilities

Capacity of Commercial Facility Pipeline since 2010 (Mtpa)¹



Status of CCS Financing







Source(s): Global Status of CCS 2023; as of July 2023. ¹Does not include CO₂ transport and/or storage facilities that do not have their own CO₂ capture source.


CCS Market | Select Transactions

Positive tailwinds have spurred a flurry of financial activity throughout the CCS value-chain



M&A

Date	Acquired	Investor	Investor Type	\$mm	Commentary
Aug. 2023	 Carbon Engineering	 OXY Occidental	Oil and Gas	1,100	Occidental has agreed to acquire Carbon Engineering (CE) for \$1.1bn. The transaction, consisting of three annual cash payments by Occidental, is expected to close by the end of 2023. Following the close of the transaction, CE will become a subsidiary of Occidental's Oxy Low Carbon Ventures
Jul. 2023	 Denbury	 Exxon	Oil and Gas	4,900	Exxon agreed to acquire Denbury for \$4.9bn. The all-stock transaction is valued at \$89.45 per share. Exxon management highlighted Denbury's 1,300-mile CO ₂ pipeline network and 10 onshore CO ₂ carbon sequestration sites as motivating factors

Equity Investments

Date	Target	Investor	Investor Type	\$mm	Commentary
Sep. 2023	 SPIRITUS	 khosla ventures	Venture Capital	11	Spiritus, a company developing direct-air-capture technology, announced \$11mm in a funding round led by Khosla Ventures and other investors, including Page One Ventures, to develop and scale the technology
Jul. 2023	 CARBON CURE	 BlueEarth CAPITAL	Growth Capital	80	CarbonCure Technologies secured \$80mm from an investment round led by Blue Earth Capital, and a consortium highlighted by Breakthrough Energy Ventures, Amazon, and Microsoft. The proceeds will be used by CarbonCure to expand operations and accelerate its product roadmap

Project Financing

Date	Target	Investor	Investor Type	\$mm	Commentary
Nov. 2023	 OXY Occidental	 BlackRock	Hedge Fund	550	Occidental announced that BlackRock will form a JV with Occidental subsidiary, 1PointFive, and invest \$550mm in the development of STRATOS. STRATOS is a DAC facility being developed in Ector County, TX that intends to sequester 500,000 tonnes of CO ₂ per year. Construction for STRATOS is approximately 30% complete and the facility is expected to COD in mid-2025

Source(s): Company Press Releases

CCS Market | Proposed North American CO₂ Transport and Storage Projects

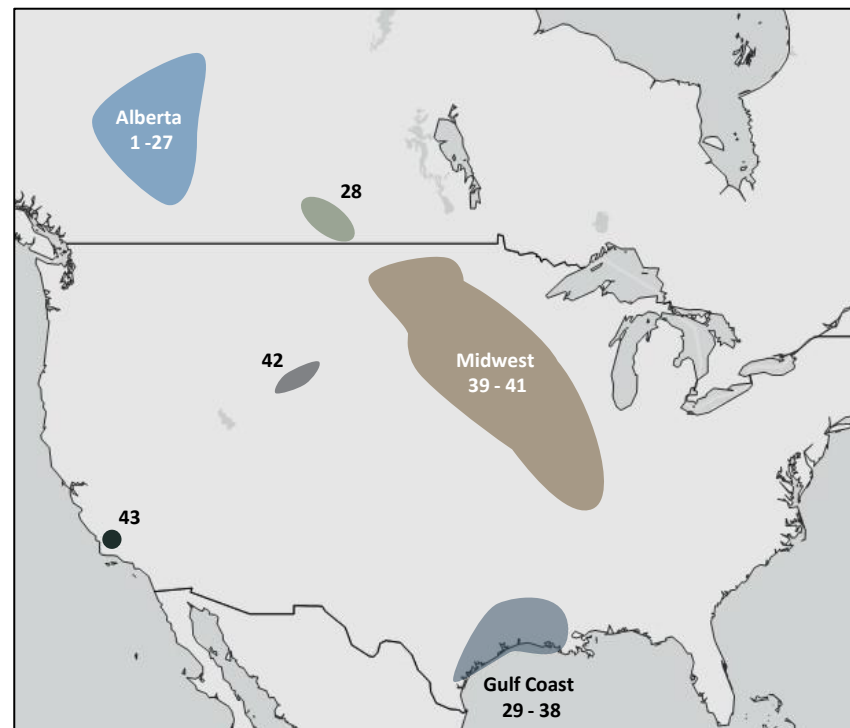
Developer activity is concentrated in three areas: Alberta, the Gulf Coast, and the Midwest

Detailed Overview

Identifier	Project Name	Target COD	Capacity (Mtpa CO ₂)
1	Alberta Carbon Trunk Line	2020	14.60
2	ARC Resources Greenview Region	Under Eval.	Under Eval.
3	Bison Meadowbrook Storage Hub	2025	3.00
4	Bison North Brumheller Hub	Under Eval.	Under Eval.
5	City of Medicine Hat Project Clear Horizon	Under Eval.	Under Eval.
6	Enhance Grand Prairie Hub	Under Eval.	Under Eval.
7	Entropy Bow River Hub	Under Eval.	5.00
8	Grand Prairie Net Zero Gateway Storage Hub	Under Eval.	Under Eval.
9	Heartland Generation Battle River Carbon Hub	Under Eval.	Under Eval.
10	IPL Alberta Hub	Under Eval.	6.00
11	Kiwetinohek Maska Swan Hills Hub	Under Eval.	Under Eval.
12	Kiwetinohek Opal Carbon Hub	Under Eval.	Under Eval.
13	Oil Sands Pathway to Net Zero Alliance	2030	12.00
14	Enbridge Open Access Wabau Carbon Hub	2026	4.00
15	Enhance Energy Origins Project Carbon Storage Hub	2026	20.00
16	Pembina Alberta Carbon Grid	2025	20.00
17	RETI East Calgary Region Carbon Sequestration Hub	Under Eval.	Under Eval.
18	Shell Atlas Carbon Storage Hub	2025	Under Eval.
19	Tidewater Brazeau Carbon Sequestration Hub	Under Eval.	Under Eval.
20	Tidewater Ram River Carbon Sequestration Hub	Under Eval.	Under Eval.
21	Tourmaline Clearwater	Under Eval.	10.00
22	Vault 44.01 Rocky Mountain Carbon Vault	Under Eval.	Under Eval.
23	Vault 44.01 Athabasca Banks	Under Eval.	Under Eval.
24	West Lake Pincher Creek Carbon Sequestration Hub	Under Eval.	2.70
25	Whitcap Resources Rolling Hills Hub	2024	2.50
26	Wolf Central Alberta Hub	2024	Under Eval.
27	Wolf Fort Saskatchewan Carbon Hub	2024	2.50
28	Southeast Saskatchewan CCUS Hub	2024	0.95
29	Talos Coastal Bend	2026	1.50
30	Denbury Gulf Coast ¹	2025/2026	20.00
31	Exxon Houston Shipping Lane	2030	50.00
32	Chevron Bayou Bend	2026	20.00
33	Central Louisiana Regional Carbon Storage Hub	2027	10.00
34	Talos Harvest Bend Louisiana Transport and Storage	2026	5.00
35	Gulf Coast Sequestration Storage Hub	2024	10.00
36	Crescent Midstream Louisiana Offshore Hub	Under Eval.	Under Eval.
37	Liberty CCUS Hub	2025	Under Eval.
38	1PointFive Bluebonnet Hub	2026	8.00
39	Mid West Express ²	2024	36.00
40	Wolf Mt. Simon CCS Hub	2025	12.00
41	Navigator Heartland Greenway ³	2025	15.00
42	Denbury Rocky Mountains	Under Eval.	40.00
43	CRC Carbon Terravault 1	2025	1.24

Commentary and Geographic Overview

- Legacy O&G infrastructure and density of emitters has enabled the Alberta and Gulf Coast regions to be first-movers for sequestration
- In the Midwest, the ethanol industry's concentration has prompted select developers to pursue constructing multi-state CO₂ pipelines paired with permanent geological storage
- Elsewhere, other developers, such as Denbury in the Rocky Mountains, or consortiums, such as Carbon Terravault in California, are opportunistically evaluating sequestration where it is economical



Source(s): Global Status of CCS 2023; as of July 2023. ¹Orion and Leo sites; ²Storage and Trunk Pipeline only; ³In October 2023, Navigator cancelled their pipeline.

GreenFront Energy Partners - Overview



GreenFront Energy Partners | Founding Partners and Service Offering

Track record of execution for developers, investors, and corporate clients

GreenFront Founding Partners



Robert Birdsey – Managing Director

- Head of GFEP renewable fuels
- Head of BB&T Energy IB 2013-2020
- J.P. Morgan Energy IB 2007-2013
- MBA, University of Virginia; BA, Sewanee
- Board Member, Virginia Solar Energy Development & Battery Storage Authority



Adam Hahn – Managing Director

- Head of corporate renewable advisory
- Led BB&T's Utility Investment Banking coverage 2015-2020
- Prior to BB&T, worked in the CFO's group at Dominion Energy
- MBA, University of Richmond; BBA, James Madison University



Whit Wall – Managing Director

- Head of GFEP traditional renewables
- Led BB&T's Infrastructure Investment Banking coverage 2015-2020
- Environmental consultant for JJ Blake & Associates prior to BB&T
- MBA, University of Virginia; BS, James Madison University

Service Offering – Exclusively Focused on Renewable Energy



Capital Formation

Raising capital for projects and platform growth initiatives



M&A Advisory

Advising on purchase/sale of alternative energy assets + equity



Corporate Renewable Advisory

Representing corporates in renewable energy procurement efforts

GreenFront Energy Partners | Coverage Universe

GreenFront's go-to market strategy enables significant synergies

Closely-Linked Coverage Universe



Traditional Renewables

Solar, Wind, Storage



Renewable Fuels

Renewable Natural Gas, Carbon Capture, Hydrogen



Corporate Renewable Advisory

Corporate procurement of renewable energy & products

GreenFront Differentiation

- Regional Market Intelligence: Our experience negotiating PPAs gives us on-the-ground information specific to different RTO/ISOs across the country
- Corporate Finance: As solar/wind/storage move from alternatives to incumbent resources, financing structures are evolving. GreenFront's deep experience in traditional corporate finance helps our clients evolve beyond project financing strategies

GreenFront Differentiation

- Experience: Prior O&G background has enabled GreenFront to already transact in very early-stage markets (RNG, CCUS, H₂, LFG, GTL)
- Environmental Attributes: Deep knowledge around revenue pathways for LCFS, 45Q, voluntary CO₂ credits
- Corporate Network: PPA advisory assignments keep us in regular dialogue with corporate sustainability decision-makers

GreenFront Differentiation

- Risk Management: GreenFront provides clients with proprietary analytics around correlation/covariance between weather, resource production, and market pricing
- Negotiating Edge: GreenFront builds project models to understand seller economics, identifying leverage points that benefit our corporate clients. We know where developers can bend on certain terms and where they can't

GreenFront Energy Partners | Credentials

Deal execution spanning multiple segments across the Alternative Energy value chain

GREENSPARK SOLAR

Has received development and growth capital from



Placement Agent
2023



Has closed on a private placement to advance its green H2 dev portfolio



Financial Advisor
2023



Has signed an exclusive solar PPA totaling 250 MW of procurement with



PPA Advisor
2023



Has closed on a private placement to advance its biogas monitoring technology

Undisclosed

Financial Advisor
2022



Has closed an equity investment to support its low-carbon hydrogen production technology

Undisclosed

Financial Advisor
2022



Has closed on a JV and funding commitment from



Financial Advisor
2022



ENERGY ASSURANCE

Has been acquired by



Sell-side M&A Advisor
2022



Has secured a structured equity private placement from



Greenbacker
CAPITAL

Financial Advisor
2021



Has secured a \$50 million equity commitment from

Hartz Capital

Financial Advisor
2021



Has signed a wind PPA totaling 100 MW of procurement with



PPA Advisor
2021



Has secured a private placement for development capital with



Placement Agent
2021



Has signed an exclusive solar PPA totaling 250 MW of procurement with



PPA Advisor
2020