

MARKET REVIEW

DECARBONIZING CORPORATE VALUE CHAINS

How Upstream, Downstream & Midstream Companies
are Advancing Renewable Energy Purchasing

November 2018



ACKNOWLEDGEMENTS

We would like to extend our special thanks to the following companies for their extensive contributions to this paper.

APEX CLEAN ENERGY

MARS

FIRST SOLAR

THE DOW CHEMICAL COMPANY

IBM

WILSON SONSINI GOODRICH & ROSATI, P.C.

ACORE

The American Council on Renewable Energy (ACORE) is a national non-profit organization that unites finance, policy and technology to accelerate the transition to a renewable energy economy. Founded in 2001, ACORE is the focal point for collaborative advocacy across the renewable energy sector, supported by hundreds of members spanning renewable energy technologies and constituencies. Every year, ACORE convenes top business leaders and policymakers at its annual forums on finance, policy and grid technology in New York, Washington, D.C. and San Francisco. For more information, please visit www.acore.org.

Corporate Renewable Energy Procurement

The growing purchase of renewable energy by corporate and industrial (C&I) end users is fundamentally remaking the model for electric power sales in the U.S. To accelerate this trend, ACORE taps our extensive network of leading renewable financiers, developers, power generators and corporate consumers. This work includes:

- Hosting roundtables with members, end-users, and relevant sustainability, finance and energy stakeholders to seek pathways for addressing common challenges for corporate renewable energy use.
- Promoting strategically important federal and state policies that facilitate corporate procurement including, for example, efforts to reverse state policies that bar third-party sales or purchase of electric power.
- Producing reports that address established and innovative financing structures for renewable energy procurement and current market dynamics. Prior reports include *Corporate Renewable Energy Procurement Industry Insights*, June 2016 and the *Renewable Energy PPA Guidebook for Corporate and Industrial Customers*, October 2016

The *Decarbonizing Corporate Value Chains* market review is a product of ACORE's Renewable Value Chain Working Group, which launched in March 2018 to identify replicable tools that companies can deploy to decarbonize their value chains, mitigate climate risk and more efficiently participate in the renewable energy economy.

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EXECUTIVE SUMMARY

Aggressive corporate and industrial (C&I) sector sustainability commitments are fueling the expansion of a decarbonized, American renewable energy economy. Recently, large corporate adopters have begun to implement business-to-business market incentives that encourage renewable energy procurement throughout their value chains (i.e., *Renewable Value Chain Initiatives*). This paper analyzes replicable tools that corporations can use to both adopt renewable energy and to help spread its use throughout the C&I sector, including through supplier engagement programs, internal practices, contracting structures, and policy advocacy.

To date, more than two-thirds of Fortune 100 companies have committed to purchasing renewable electricity to power their operations. As of September 2018, C & I buyers have procured over 5.3 gigawatts (GW) of renewable energy nationally, shattering the previous record of 2.9 GW in 2017, with months remaining in the year.¹ At the forefront of this transition are multinational corporations that are doubling down on sustainability and renewable energy procurement strategies. In recognizing the intrinsic value of sustainable and climate resilient assets, these leading companies are reducing carbon emissions throughout their global operations and creating platforms and incentives as models for others to follow.

Despite this momentum, renewable energy procurement in the broader C&I sector remains challenging. Top reasons include the complexities associated with traditional power purchase agreements (PPAs) – the standard method to contract for renewable electricity – and the absence of adequate market incentives. Traditional PPAs can also pose barriers for some corporations including creditworthiness, project size, tenor and other risks. Encouragingly, companies are overcoming these barriers by signing PPA deals with other buyers (i.e., aggregated PPAs) and negotiating for more flexible terms.

Additionally, large multinational companies are beginning to adopt new business-to-business market incentives, or Renewable Value Chain Initiatives, that encourage upstream companies and midstream suppliers to produce products and services that are made by renewable energy. In doing so, these corporations are sending a powerful message to suppliers that have historically lacked the appropriate market incentives to decarbonize and are challenged by existing contracting structures.

The goal of the report is to illuminate and elevate approaches for Renewable Value Chain Initiatives. While there is no single model, this report provides unique insights and best practices from The Dow Chemical Company, IBM, Mars, Apex Clean Energy, First Solar and Wilson Sonsini. Their entries impart how companies are successfully adopting value chain initiatives, overcoming contracting challenges and expanding the renewable energy economy.

EXAMPLE OF A RENEWABLE VALUE CHAIN INITIATIVE

In 2017, Walmart launched its Gigaton Initiative which aims to reduce one gigaton of CO₂ from its value chain by 2030. Since the beginning of the program, Walmart has engaged with 400 suppliers who are actively seeking to lower their carbon emissions. If accomplished, the carbon reductions associated with this initiative would be the equivalent of the annual emissions of Brazil.

The case studies and market analyses that follow highlight five key areas of focus for Renewable Value Chain Initiatives:

- 1. Downstream Companies:** How leading downstream adopters of renewable energy procurement can leverage Renewable Value Chain Initiatives and better engage their suppliers.
- 2. Upstream Companies:** How upstream companies can gain a competitive advantage by producing less carbon-intensive products and services.
- 3. Midstream Supplier Compliance:** How midstream suppliers can adapt and procure renewable energy to comply with Renewable Value Chain Initiatives.
- 4. Policy Objectives:** How leading companies and their suppliers can help to change energy markets in support of a renewably powered economy.
- 5. PPA Evolution & Value Chain Tracking:** How companies can pursue flexible PPA contracts and track their scope 3 emissions to implement Renewable Value Chain Initiatives successfully.

1. "Corporate PPA Deal Tracker," Bloomberg New Energy Finance, accessed October 24, 2018, www.bnef.com



RENEWABLE VALUE CHAIN INITIATIVES: Perspectives from Upstream, Downstream and Midstream Companies

INTERVIEW WITH MARS:

Expanding Influence in the Renewable Energy Economy

Mars has emerged as a downstream leader in supplier engagement for its corporate sustainability strategy. ACORE spoke with *Winston Chen, Global Renewable Energy Program Manager at Mars Incorporated* to discuss how the company is expanding its influence in a decarbonized economy.

As a leader in corporate sustainability, how is Mars promoting environmental stewardship without sacrificing profits?

To decarbonize the company's operations, Mars has established a \$1 billion Sustainable Generation Plan. We believe that to maintain sustainable growth over the long term, companies will need to take significant actions that appeal to consumers and protect the public from external factors such as climate change. We recognize that sustainability plays a long-term role in the profitability of our company and try to integrate sustainability into the corporate fabric of our mission. To ensure that we are receiving the most significant impact from our investments, we have developed a strict vetting system. This system allows us to find projects that will have a meaningful environmental impact while also providing a considerable return on investment.

Mars has committed to using 100 percent renewable energy by 2040 and reducing greenhouse gas emissions (GHG) by 67 percent by 2050. How have you approached implementing these aggressive targets?

We monitor our progress via science-based targets that track our scope 1-3 emissions.² Since our goals are so aggressive, we began by evaluating where we could have the most significant impact globally, and then worked our way down. Since we announced our renewable energy goal, we have signed PPA deals in the U.S., United Kingdom, Mexico and Australia. As a team, we look at where our operations have the largest GHG footprint and then find incentive-driven markets where we can participate and procure renewable energy.

Current market trends show that value chain initiatives are the next frontier for corporate renewable energy procurement. Can you please help explain why this trend is occurring and whether there is a business case for value chain initiatives? Do you see an opportunity for Mars to expand its influence in a decarbonized economy?

From Mars' standpoint, we view our total value chain as part of our operations, from the raw materials plant to large retail centers where our products are sold. We want to influence all our operations (direct and indirect) to help us decarbonize. Under the purview of sustainability, most companies still only account for their scope 1 and 2 emissions. However, on average, over 70 percent of greenhouse gas emissions come from scope 3 operations.

Mars wants to increase its global impact on reducing carbon emissions and deploying renewable energy throughout its value chain. We are partnering with suppliers to procure renewable energy and reduce our scope 3 emissions. The ability to partner with suppliers means Mars can theoretically go and bid for larger renewable energy projects. For instance, in the past, we have done deals for 100 megawatt (MW) projects, and now we are going to market for a 200 or 250 MW project by co-signing PPAs with three or four suppliers. The ability for us to engage our suppliers means we can to increase demand for renewable energy in different markets, while also benefiting from decreased prices by hitting scale.

Is there a specific set of criteria that you look for when engaging suppliers? Additionally, what should suppliers do to remain competitive in a marketplace that increasingly rewards companies who seek to lower their carbon emissions?

Every company's value chain is unique, which means our criteria for rating suppliers may be different from other companies. So far, we mostly engage large suppliers who have worked with us for several decades. The value created by these long-standing relationships has allowed us to help educate them on the importance of renewable energy and sustainability goals. Our supplier criteria primarily focus on energy footprint, corporate relationship and risk appetite. If we can align these three aspects, we will feel comfortable moving forward in connecting renewable energy developers with our suppliers.

2. Scope 1-3 Definition: See page 19

As we move forward with our own goals, Mars will seek to continue engaging other suppliers to procure renewable energy. As part of our broader company strategy, Mars has always looked for the best price and quality from our suppliers. However, sustainability is starting to become a stronger criterion that we use when rating different suppliers. For instance, if we release a request for proposal for packaging materials, and receive offers from two identical suppliers with the same price and quality, sustainability might be the differentiating factor in our decision-making process.

What are some of the obstacles Mars has faced when engaging suppliers to procure renewable energy?

The biggest problem we see is a need for a shift in corporate policy. Of course, barriers such as lack of technical knowledge, creditworthiness and risk profile remain challenging. However, c-suite level buy-in needs to happen before those other conversations can occur. There needs to be a philosophical adjustment in the way companies think about renewable energy procurement. Mars is trying to change this by better understanding how renewable energy procurement can lead to long-term growth, instead of just considering it as a short-term cost.

However, this does not mean that flexible and innovative PPA structures are not necessary. Some of our suppliers' energy loads are small, and they can only commit to short contract tenors. Luckily, markets are already beginning to move in this direction. Renewable energy developers and financiers are providing new options for PPA contracts that make them financially viable for smaller commercial and industrial clients.

Do you see renewable energy and scope 3 emissions playing a more prominent role in Environmental Social and Governance (ESG) scores?

There is a possibility that renewable energy will play a more significant role in ESG scores in the years to come. Our ESG team is monitoring how markets are evolving to reflect our value chain initiatives better. As part of our 100 percent renewable energy goal, we want to make sure every product and service we provide is powered by renewable energy. In our science-based targets, Mars has created a carbon budget that includes everything from large manufacturing facilities to coffee pots. If ESG scores become more important in the coming years, we hope to have our sustainability requirements covered through these internal goals.

Do you have specific recommendations for what other downstream companies can do to implement value chain programs?

Internal buy-in is the crucial first step. Achieving buy-in involves a cross-pollination of ideas from both your sustainability and finance teams. C-Suite support becomes imperative when making overarching company decisions such as going to 100 percent renewable energy. Second, companies need to establish science-based targets to understand the size of their scope 1-3 emissions. This assessment will allow them to create a carbon budget and accurately track their progress. Finally, companies need to engage and educate their suppliers on the benefits of implementing sustainability goals.

In our case, influencing upstream companies (raw materials and manufacturers) to reduce their GHG emissions has been the most impactful. This is because most of our scope 3 emissions come from the beginning of our value chain. By aligning renewable energy goals with upstream companies, we can squeeze the gap and maximize scope 3 emission reductions. Overall, Mars sees the development of value chain sustainability initiatives as a growing trend across the C&I industry. We believe that with the right suppliers and market incentives, companies can increase renewable energy deployment across their value chains and expand their influence in a decarbonized economy.

ABOUT THE AUTHOR

In addition to leading the Renewable Energy Program during the past five years, Winston Chen has been with Mars Incorporated for over 15 years, during which he has lead procurement strategy for various infrastructure and energy efficiency related projects including Co-generation, Energy monitoring system, Waste and Water treatment upgrades and helped achieve Mars' first LEED Gold certification process with the North America Chocolate Headquarter renovation project.

www.mars.com

INTERVIEW WITH THE DOW CHEMICAL COMPANY:

Advancing Renewable Adoption in the Industrial Sector

The Dow Chemical Company is a leading industrial company committed to sustainability and renewable energy strategies. ACORE spoke with *Edward Stones who is the Global Business Director of Energy and Climate Change* to discuss how the company is adopting renewable energy and encouraging its use throughout the C&I sector.

As one of the largest industrial manufacturers in the world, how is Dow Chemical achieving its ambitious 2025 Sustainability Goals?

As part of Dow's commitment to sustainability, we have committed to seven 2025 Sustainability Goals which are strongly linked to the 17 UN Sustainable Development Goals. These commitments build on Dow's 2005 Environmental, Health & Sustainability Goals and our 2015 Sustainability Goals. As part of this journey, Dow has committed to lowering greenhouse gas emissions and is positioned to provide innovations that lead to the adoption of energy alternatives and less carbon use throughout the value chain. Dow will maintain all GHG emissions below 2006 levels, in part, by:

1. Finding solutions to grow profits, without increasing Dow's GHG emissions;
2. Developing a Net Impact Tracking Tool to quantify the energy and GHG profile of products across the lifecycle, including Dow's raw material supply chain, manufacturing and distribution, product use and end of life;
3. Procuring 750 MW of clean energy by 2025. Dow Chemical currently has 700 MW of clean energy contracts, and we are confident we will meet our 750 MW goal by 2025.

In which regions is Dow Chemical purchasing renewable energy, and how did you select them?

Dow has purchased renewable energy in Europe, Latin America and North America. Because the economics for renewables vary, the company purchases wind, solar, hydro, biomass and landfill gas, depending on the location. Our projects are selected based on the lowest long-term cost of power or steam from available alternatives.

What is the company's outlook on the value of committing to new wind and solar contracts?

Using renewable energy is part of Dow's strategy to supply power and steam to the company's sites, and to reduce its scope 2 emissions. Wind and solar projects will be part of the portfolio to serve Dow's specific loads when their long-term costs are lower than alternatives.

Downstream companies such as Mars and Walmart are actively engaging their suppliers to reduce carbon emissions across their value chains. Is this a global trend which will gain momentum as carbon is priced into financial markets?

We see downstream companies more actively involving their value chains through CDP and with direct programs (e.g., Walmart's Gigaton Project). We believe this drive from downstream companies will keep growing. All supply chain participants need to be aware of and share the costs of delivering reliable, affordable and sustainable energy to consumers.

Do you see a potential appeal from customers for products that are made with renewable energy?

There is a group of customers who have more awareness. Consequently, we see brands launching products made with renewable energy, such as Budweiser and Proctor and Gamble.

As an upstream company, has Dow Chemical ever collaborated with its suppliers or customers to help lower value chain emissions?

Dow seeks to lead in developing societal blueprints that integrate public policy solutions, science, technology and value chain innovation to facilitate its transition. Since 2016, Dow Performance Building Solutions has offered a line of products in North America made with 100 percent renewable energy. Dow Packaging and Performance Plastics has a Renewable Energy Made Polyethylene that will be presented during Pack Expo in fall 2018. We have sold 35 million pounds of the Renewable Energy Made Polyethylene year to date, and the business is currently engaged with several customers and brand owners to increase the adoption of Renewable Energy Made Polyethylene Resin.

How can upstream and downstream companies work together to integrate renewable energy procurement into supplier criteria?

At Dow, we see the role of business as a catalyst for change; a driver of innovations that protect life and the environment while creating sustainable economic growth. We are collaborating with groups such as Ocean Conservancy, Ellen MacArthur Foundation and stakeholders across the packaging value chain to identify pathways to new business models that enable a more circular economy. A close relationship among companies is needed, as Dow is in some cases the supplier of the supplier of the brand owners. All companies need to work together to set specific goals and strategies.

Do you have recommendations on how companies can overcome barriers in their decarbonization and renewable energy procurement strategies?

At Dow, we believe all energy solutions, whether technological or policy-based, must address five areas:

1. Sustainability (environmental impact)
2. Societal demands, including political realities
3. Chemistry and physics, and what is possible with existing technologies until we innovate better ones
4. Reliability, including infrastructure limitations and grid design
5. Affordability

Dow's Energy and Carbon Envelope is deliberately staffed to synthesize expertise from all five areas, while many of our external counterparties focus on, or preferentially prioritize, only one or two of those considerations. We would encourage business and regulatory leaders alike to consider all five dimensions in their analysis and decision frameworks. We are convinced that meaningful solutions and true progress can only be achieved by addressing each. Dow is a willing and active collaborator in driving these five principles across the value chain.

ABOUT THE AUTHOR

Edward Stones is Global Business Director Energy and Climate Change for Dow Chemical. Stones is accountable for delivering energy business profitability, power production at the 14 company-operated power facilities, as well as steam, utilities and energy services to more than 300 manufacturing facilities globally. He leads Dow's energy conservation and greenhouse gas emission reduction efforts, providing business guidance for the company's global advocacy efforts in energy sustainability and climate change. Stones holds a bachelor's degree in Chemical Engineering, a master's degree in Environmental Engineering from Stanford University, and an MBA from Louisiana State University.
www.dow.com



CASE STUDY:

IBM Supplier Responsibility Program

Author:

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For many corporations, like IBM, value chains consist of many businesses spanning the globe, with each supplier utilizing only a small percentage of its resources to supply each customer. IBM believes that its suppliers' resources are best applied to identifying and implementing actionable projects that will reduce their environmental impacts. In 2010, IBM updated its criteria to require all first-tier suppliers to establish an environmental management system (EMS) to address their social and environmental responsibilities. Further, suppliers are now required to identify their significant environmental aspects – which must include an inventory of and reduction plans for energy consumption, GHG emissions and waste generation – publicly report on their goals and results and cascade these requirements to their suppliers. Such requirements can have a ripple effect on how other corporations can incorporate sustainability into their value chains.


Its objective in establishing these requirements is to help its suppliers build their own capabilities to succeed. IBM's supplier EMS program rests on the foundational belief that real results in reducing environmental impacts, including GHG emissions reductions, are enabled by each supplier's collection of credible and actionable data such as a company's energy use and GHG emissions; and that suppliers are best positioned to assess opportunities, set goals and take actions.

IBM's view on the need for a supplier responsibility program extends to the subject of renewable energy procurement and use. IBM suppliers have two key levers to reduce their GHG emissions: lowering energy demand through efficiency projects and procurement of renewable energy. It is important that each company identify how best to prioritize their investments to support their business objectives and financial approaches to ensure sustained GHG reductions. Where procurement of renewable electricity fits their strategy, there are many factors to consider when making a complex renewable procurement transaction. These factors can include physical versus virtual delivery, the role of bundled or unbundled renewable energy credits, the term of the procurement contract, and the identification of viable projects and retail supply partners.

IBM has collaborated with clients and suppliers to share our knowledge and domain expertise to explore opportunities for renewable energy procurement and integration of renewables into the reliable electricity supply that it depends on to run its facilities. Finding workable contracting and reliable supply solutions is an ongoing journey that will require collaboration amongst corporate purchasers, project developers, energy retailers and utilities. IBM encourages all companies, inclusive of its suppliers, to engage in the effort to expand and integrate renewable electricity generation into a reliable, robust electricity supply infrastructure. A broad base of participation is essential in integrating renewable generation sources into global electricity supply.

ABOUT THE AUTHOR

Jay Dietrich is an IBM Distinguished Engineer and IBM's recognized global technical expert and leader for energy and climate. His knowledge about energy, climate and how they relate to IBM business make him a critical and unique technical resource who effectively bridges hardware energy efficiency, data center practices, operational management of energy and greenhouse gas emissions with laws, regulations and client expectations. Jay's technical leadership has brought success to numerous significant cross-functional projects in the areas of product, data center and operational energy efficiency and GHG emissions reduction. He is an effective industry advocate with regulators and external standards organizations to shape requirements that affect IBM products, services solutions and operations, ensuring they are sensible, meet regulators goals, and can be implemented cost-effectively.



NEW TOOLS FOR C&I SECTOR COMMITMENTS: Policy Objectives and PPA Evolution

ALIGNING CORPORATE POLICY OBJECTIVES IN REGULATED MARKETS

Author:

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The explosion of corporate and industrial demand for renewable energy projects may now feel like a well-worn storyline. An incredible 2017 has given way to an earth-shattering 2018 – the previous annual record for U.S. corporate wind and solar power purchase agreements was broken by August – without signs of slowing down.

However, the biggest story is not how far the corporate PPA market has come, but much opportunity remains. Just a few years ago, corporate renewable energy demand was limited to a handful of household names with large energy loads and massive balance sheets. Today, there are dozens of corporate purchasers, and the list has grown beyond technology companies to car companies, candy makers, breweries, and large manufacturers up and down the supply chain. According to a 2017 survey, 83 percent of the country's largest manufacturers had GHG reduction targets, 25 percent had renewable energy targets and 11 percent had a goal of 100 percent renewable energy.³

Furthermore, the demand is widespread. In the competitive markets, brokers (both old and new) have quickly connected projects with buyers of either financial or physical products, and retail electric providers have created 100 percent renewable products that follow load. Supply is meeting demand.

Likewise, regulated utilities are responding to this demand by providing new green options. An increasing number of corporate deals are happening in regulated markets, but policies are still lagging demand. For corporate offtakers to fully tap regulated markets, they will need to secure access to policies that allow customer choice. To do so, corporations will need first to understand their policy options and then use their public platforms to become effective clean energy advocates.⁴

Four Principles of Effective Corporate Renewables Policy

For policy to thrive in regulated markets, it should align the interests of offtakers, utilities and ratepayers. Adding greater choice and flexibility in the marketplace can help meet such interests while ensuring that utilities receive fair compensation and ratepayers are insulated from costs associated with the deals. Achieving this balance relies on four principles:

- **Market-based for market compensation.** Corporate access policy should allow corporate customers to pay market-based rates for new renewable power while ensuring utilities are compensated for providing transmission, distribution and other ancillary or administrative costs. These policies should also insulate other customers from any costs associated with the transaction.
- **Create more opportunity.** Some states restrict third-party options to certain classes of customers. Opening direct transactions to other customers – such as corporations, universities or other large institutions – will extend these policies' benefits, ensuring equitable access to renewable energy and reducing emissions beyond business as usual.
- **Increase flexibility.** Where appropriate, lawmakers should increase the number of financing options, allowing for more extended and variable-term contracts, and different types of purchasing agreements, whether they are direct access, sleeved PPAs, green tariffs or other mechanisms.
- **Showcase the benefits.** Public support is vital for the sustainability of corporate procurement programs and the supplying projects (and transmission lines). Corporate renewable energy transactions should demonstrate that connecting large customers with new renewable power will offer economic development benefits, especially in jurisdictions requiring a public interest determination for such utility transactions.

Becoming Effective Energy Advocates

Businesses are effective advocates for clean energy policy. As business leaders bringing jobs, investment and a long-term presence to the state, companies are important electricity customers from which policymakers and regulators are interested in hearing. Additionally, corporations can amplify policy objectives by collaborating with other companies to increase the demand for renewable energy in regulated markets. Renewable energy policy advocacy is not markedly different from other business policy issues, but lawmakers and regulators may not commonly hear from large companies about renewable energy. Below are several touchstones that can simplify advocacy efforts:

3. Alexandra Rekkas, *The Growing Demand for Renewable Energy Among Major U.S. and Global Manufacturers*, David Gardiner and Associates, September 2017, <https://www.dgardiner.com/dga-publishes-white-paper-growing-demand-renewable-energy-among-major-u-s-global-manufacturers>

4. Christian Roselund, "Big Steel Goes Big Solar In The US," *PV Magazine*, August 20, 2018, <https://www.pv-magazine.com/2018/08/20/big-steel-goes-big-solar-in-the-us>

- **Work with existing advocacy networks.** National groups like ACORE can help businesses understand the landscape and craft a message and goals. In-state coalitions can offer on-the-ground expertise and established networks. Learn who the players are and become part of the conversation.
- **Talk to utilities and regulators.** Discuss the policy landscape and communicate the need for more clean energy options in the state.
- **Talk to lawmakers.** Let them know electric options are a top factor for expansion and investment. Connect the dots between clean energy policy and job growth. Helping elected officials understand the needs of job creators helps them plan for policy action.
- **Build corporate coalitions.** Aggregating energy load with like-minded companies can be an effective tool in advocating for stronger renewable energy policies.

Larger companies can work across supply chains and their networks to create alliances to advocate for these policies. While clean energy developers can help devise policy, advocating for change in regulated markets is most effective when it comes from those customers using the electrons.

Growing the map of corporate renewable energy projects in regulated markets requires telling the story of why access to renewable energy is vital to businesses while highlighting the benefits this deployment brings to communities. Access to renewable energy plays an

increasingly significant role when siting new business locations, and this message is still new to policymakers in many areas of the country.

Corporations are at the vanguard of large-scale market expansion. Success is self-fulfilling. The next wave of wind and solar projects are cheaper, power prices are falling, and the grid is becoming greener. It will take time to implement the right policies in all markets, but this work is incredibly important – the example set today will inform the decisions made tomorrow.

ABOUT THE AUTHOR

Steve Vavrik is Chief Commercial Officer for Apex Clean Energy, leading the company's business development team and driving the strategy for engaging with commercial and industrial offtakers. Steve has more than 20 years of power development experience, having worked at GE Capital, Enron, Dynegy, First Wind, and SunPower. At Apex, Steve is part of a leadership team that has installed over 2.2 GW of wind energy and created \$4 billion of clean energy opportunity. Steve earned a JD from Yale Law School, an MPA from Princeton, and MS and BS degrees in mechanical engineering from the University of Illinois.



CASE STUDY:

Google Partners to Advance Renewables in Georgia

Overview

In April 2018, Google partnered with Walmart, Johnson & Johnson and Target to procure 177 MW of new solar power through Georgia Power's Commercial & Industrial Renewable Energy Development Initiative (C&I REDI). The agreement highlights the role corporations can play in expanding renewable energy in regulated markets by collectively advocating and aggregating their demand for renewable power.

Objective

Google aims to procure renewable electricity in the same grids where it operates.⁵ Over the past few years, Google has been working with the state of Georgia and Georgia Power to introduce regulations that would allow the purchase of renewable energy for the company's data center in Douglas County. By collaborating with a consortium of large companies in the region, Google successfully worked with Georgia Power to establish a new program that will lead to the construction of two new solar projects with a combined capacity of 177 MW. While the program is imperfect and required a lengthy timeline to develop, the C&I REDI program represents a significant step forward to creating access to renewable purchasing in regulated markets.

Methods

While solar power is an abundant and increasingly cost-effective resource in the south, Georgia's electricity market operates under a regulated market construct, which has not traditionally offered companies the option to procure renewable power directly.

Urged by Google's and its partners' advocacy efforts, Georgia Power included provisions in its 2016 Integrated Resource Plan that not only committed the utility to deploy over 1.5 GW of new wind and solar development, but also created a new program for C&I customers to directly procure renewable energy: The C&I REDI program. Through this program, Georgia Power pledged to sign power purchase agreements for up to 200 MW of additional renewable generation with developers who will build, own and operate the projects, and then sell the production to C&I customers.⁶ In April 2018, the Georgia Public Service Commission approved a deal for Google, Walmart, Johnson

& Johnson and Target to purchase 177 MW of solar capacity through the program collectively.⁷

Georgia Power signed two 30-year PPAs on behalf of these corporate customers, with a 120 MW solar plant in Dougherty County, which is expected to be online in late 2019, and a 57.5 MW project in Mitchell County, which is scheduled to begin operation in mid-2020.⁸ Corporate program participants will purchase the renewable production at a fixed portfolio price and receive an hourly credit based on the plants' power production as well as its generated renewable energy credits, via contracts between 10 to 30 years in length.

Collaboration between the companies and Georgia Power was critical to the success of the project. Led by Google, the companies worked for two years to build the program, frequently communicating with Georgia Power about their renewable energy goals and other constraints they faced as electricity customers. By aggregating the renewable power demand of the parties involved, participating companies increased the scale of the project and will likely secure more favorable pricing for the new solar plants, while benefiting from the variable-length contract window. In addition to bringing new, low-cost renewable energy to the grid, the companies agreed to pay any extra costs associated with the new solar projects so that other ratepayers would not be affected.

CONCLUSION

The approved arrangement amongst Georgia Power and Google, Walmart, Johnson & Johnson and Target exemplifies the role that businesses can play in improving access to renewable energy. While the program structure has room for improvement to make it accessible to a broader set of buyers and to reduce the time from inception to contracting, the C&I REDI program represents an important step forward. Through strategic policy efforts, each company leveraged their influence to expand the use of renewable energy in a regulated market. The momentum and public support generated by these projects will help establish a roadmap for other corporations to follow.

5. "Achieving Our 100% Renewable Energy Purchasing Goal and Going Beyond," Google, December 2016, <https://static.googleusercontent.com/media/www.google.com/en//green/pdf/achieving-100-renewable-energy-purchasing-goal.pdf> (page 11)

6. "C&I REDI," Georgia Power, Accessed October 24, 2018, <https://www.georgiapower.com/company/energy-industry/energy-sources/solar-energy/solar/c-and-i-redi.html>

7. Gary Demasi, "A new partnership to drive renewable energy growth in the U.S.," Google, 2018, <https://www.blog.google/outreach-initiatives/environment/new-partnership-drive-renewable-energy-growth-us/>

8. "Georgia Power to add 177 MW of solar resources for C&I REDI program," 2018, <https://www.prnewswire.com/news-releases/georgia-power-to-add-177-mw-of-solar-resources-for-ci-redi-program-300626410.html>

EVOLVING MODELS FOR CORPORATE PPAS

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One of the largest growth areas in renewable energy procurement over the past five years has been the development of corporate renewable PPAs. In the prevailing model, a large, corporate power purchaser (the “Purchaser”) will enter into a financial transaction with respect to all or a significant portion of the energy produced by a utility-scale solar or wind project and will receive a proportional share of the project’s renewable energy credits (RECs). The financial transaction is a fixed-for-floating rate swap. The Purchaser pays the special purpose limited liability company that owns the project (the “Seller”) a negotiated, fixed price (in dollars per kilowatt hour), and the Seller pays the Purchaser a “floating rate” that is determined based on the real-time or day-ahead market energy prices in the regional transmission organization or independent system operator where the project is located. The fixed and floating payments are netted, the Purchaser and Seller determine a monthly or quarterly payment amount, payment is made, and project RECs are transferred to Purchaser or retired on Purchaser’s behalf.

Corporate PPAs allow project developers to finance their projects with a steady, long-term income stream (the fixed price). In that sense, the Purchaser’s involvement “makes the project happen” and thus satisfies a strong, project-specific additionality standard. However, while this traditional model of Corporate PPAs appears to have worked for large, sophisticated and well-capitalized early adopters, it creates a variety of issues for supply chain commercial and industrial purchasers:

- **Project Size:** Outside of the Fortune 100, few C&I offtakers (i.e., power purchasers) will have the energy footprint needed to be the “anchor tenant” or even a major part of the offtake picture for a utility-scale wind or solar project. A typical project in the Corporate PPA space ranges from 80 to 200 MW in size. To be a viable Corporate PPA counterparty, a C&I purchaser would need to be able to offtake at least half of the project’s output. Consequently, the earliest adopters in this space were data center-dependent tech companies and global manufacturers.
- **Term:** Many C&I purchasers struggle with the requirement that they lock themselves into a take-or-pay contract with a term of 12 to 20 years as required by the capital markets that finance such projects. The non-recourse project finance model dominant in the energy sector, based in large part on multi-decade utility procurements, requires such long-term offtake contracts.
- **Creditworthiness:** The same project finance model also requires that any offtake contract is with a creditworthy Purchaser. In addition to having a long tenor, a financeable Corporate PPA is one with a stable, investment-grade offtaker, which is as close to a large, monopolistic utility as possible. Smaller C&I customers thus might not have the balance sheet or be able to meet the security posting requirements necessary for a developer to get a project financed.
- **Complexity:** Most C&I offtakers will lack familiarity with Corporate PPA structures and market norms, and may not be familiar with the balkanized, unevenly deregulated U.S. energy markets. This steep learning curve is often bridged with costly consultants and outside counsel, making the prospect of entering a Corporate PPA a daunting task for any in-house counsel or sustainability manager.
- **Risk Assessment:** Corporate PPAs offer many benefits but also contain inherent risks, most of which are difficult for C&I offtakers to assess. The risk that the targeted project will never be built can be mitigated but not avoided. There are also construction and project size risks that offtakers cannot barter away. Additionally, there are market factors that even the best paid consultants cannot account for, such as the long-term cost of energy in a given geographical area. Moreover, once a project is online, a Purchaser must deal with operational risk, and make sure that the project is run and producing energy as advertised. These threshold concerns do not begin to address some of the more nuanced risks familiar to energy specialists in California and elsewhere, such as shape risk, basis risk and curtailment risk.

From 2015 to 2018, most Corporate PPAs fit the standard model: the tenor was 12 to 20 years, Purchasers contracted for somewhere between 25-100 percent of a project's output, and Purchasers posted relatively expensive collateral support, such as a letter of credit. Broker-like entities emerged to help coach C&I offtakers through the steep Corporate PPA and energy market learning curves and coordinate with counsel during the RFP, term sheet and definitive documentation negotiation phases of a Corporate PPA. Certain contractual features of a Corporate PPA became market standards: covenants with respect to the operation of a project, a guaranteed commercial operation date, and/or an availability or output guarantee offered by the project's developer. These contractual provisions mitigated certain risks, but supply chain C&I purchasers were left trying to fit a square peg into a round hole for the reasons described above.

The past twelve months have seen the rise of several innovations that address some of the ongoing concerns of the C&I market when entering a Corporate PPA or PPA-like structure. These new tools and trends are attempting to solve for some of these barriers.

Demand Aggregation

Groups of C&I offtakers are increasingly bundling their demand and taking smaller "slices" of the same project. Aggregation can take place in one of two ways:

- i. A "lead" purchaser negotiates the Corporate PPA with the project developer and the other offtakers agree to accept, or at least minimally diverge from, that negotiated form; or
- ii. A "buyers group" forms and collectively negotiates a Corporate PPA which they will all agree to accept. These structures allow smaller, supply-chain buyers to confront the challenges of project size and complexity outlined above. Because there is a group of buyers, the size of each company's energy footprint does not need to scale to a utility-size project; only the group's collective demand needs to.

Allowing a lead negotiator to interface directly with a project developer or work in a buyers group allows the various C&I offtakers to pool their resources and institutional knowledge, and lowers both the cost and informational barriers to the execution of a Corporate PPA. To date, however, these structures have not addressed concerns around tenor, risk, or creditworthiness, other than in a tangential nature, but they have allowed newer participants to enter the market.

Rise of Intermediaries

One of the new trends in the Corporate PPA market is the introduction of an "intermediary" to sit between the project developers and the C&I purchasers. These intermediaries act as an "anchor tenant" among purchasers or as financial intermediaries entering the transaction to digest, commoditize and parcel out a new financial energy product

for the ultimate purchasers. Intermediated structures address project size and complexity issues because the supply chain purchasers can sign up for a small part of the intermediated offtake of energy produced. Additionally, because the intermediary typically negotiates all of the core commercial provisions, the other C&I purchasers can keep their transactional costs minimal because the lead negotiator will often have the same incentives as each smaller C&I purchaser.

Intermediated transactions also address the creditworthiness barrier that has often removed smaller C&I purchasers from the conversation. A project developer can look solely to an anchor tenant or financial intermediary's creditworthy balance sheet to satisfy its project finance requirements. This setup also cuts down the costs for smaller C&I purchasers, because they do not have to post bonds or letters of credit for the Seller's account.

Green Tariffs

While historically recalcitrant, utilities are uniquely situated to act as intermediaries and address the issues outlined above; thanks to strong customer demand, certain utilities have started to do so through the use of "green tariffs" that are specially approved by the applicable state regulatory body. A green tariff is a tariff offering provided by a utility, whereby the utility will source retail customer's energy from a renewable source, and "sleeve" slices of a single renewable energy project to a group of smaller buyers, often for a relatively minor markup. Because utilities have a built-in customer base, are creditworthy counterparties, and are intimately familiar with the energy markets, they are uniquely situated to scale down the market barriers that have previously left smaller C&I purchasers out of the renewable procurement arena. The traditional Corporate PPA market emerged without utility involvement because of the demand for sustainable power production that many utilities did not offer. As the Corporate PPA market has grown, utilities have realized they must address this rapidly growing demand or risk losing valuable customers. The intermediary structure has allowed utilities to play an important role previously neglected in the renewable energy procurement space.

Product Innovation

A variety of financial products introduced in the previous year have also helped to address the project-specific risks that are inherent in every Corporate PPA. Two that are worth mentioning are:

- **The use of proxy generation to address performance risk:** Traditional Corporate PPAs have a performance guarantee in the form of an availability or output guarantee. Such guarantees are "lumpy" in that they are only settled every year or two. A proxy generation transaction is one that settles not upon annual performance but on the hourly amount of energy that a project *should* produce given the actual weather conditions. A proxy generation Corporate PPA

establishes a technical formula that determines the amount of energy a project would produce given the actual solar irradiance, wind speeds, temperature and other variable conditions. The fixed-for-floating swap that is at the center of all Corporate PPAs then settles based on this amount. Settling on proxy generation removes any risks that the project will not be fully operational during a given hour, day or week.

- **Firming swaps to address weather/resource risk:** Corporate PPAs traditionally address “as available” energy production and shift to the Purchaser all risk of calmed winds or clouded skies. Insurance mainstays are starting to offer weather insurance, typically in the form of “firming swaps.” These firming swaps will take a project’s profile and location and will “firm” the amount of energy a project will guarantee to produce. Along with proxy generation, firming swaps can effectively eliminate performance and weather risk for a C&I buyer. While this comes at a cost, many buyers may prefer this new product because it minimizes downside risk.

Standardization and Commodification

Increasing commodification in the Corporate PPA space has allowed for increased liquidity. Intermediaries and corporate “anchor tenants” alike are thinking about standardizing and commodifying the “renewable energy virtual offtake” so that it can be a more readily tradeable, liquid instrument. To date, the focus of these efforts has been along two lines: (i) standardizing commercial contracts, and (ii) creating a mutual fund approach to power purchases. Many in the Corporate PPA space have made efforts to standardize contracts across the board, which has resulted in the increasing use of International Swaps and Derivatives Association (ISDA) documentation, for example. ISDA documentation has the benefit of being familiar to many CFOs and in-house counsel because of its prevalence in the interest rate and commodity swap markets. Because of the fixed-for-floating nature of most Corporate PPAs, C&I purchasers can easily adapt the ISDA document set to renewable energy purchases, and

these documents have started to achieve some level of acceptance and stability within the marketplace. They can also be easily re-traded, allowing for smaller portions of energy to be resold to smaller C&I purchasers with relative ease. Additionally, certain market participants are increasingly focused on making the energy offtake non-unit contingent (independent of any specific project) while preserving its additionality (making the potential underlying projects attain a pre-arranged standard set of criteria), analogous to a mutual fund model. While in its nascent stages, the development of mutual fund-like products would allow C&I purchasers an entry into the world of renewable energy procurement, at a fraction of the cost.

While smaller C&I purchasers may have been wise to wait on the sidelines during the developmental years of the Corporate PPA market, market trends are increasingly creating pressure for them to source their energy from renewable sources. The trends outlined above may further induce smaller C&I purchasers to enter the space and may make the idea of a Corporate PPA less daunting.

ABOUT THE AUTHOR

WSGR’s energy team represents the proponents of innovative technologies, business models and transaction structures. Our practice is focused entirely on renewable energy and facilitating technologies like energy storage, and much of our work has provided retail energy customers with increased access to renewable energy. We have successfully negotiated over 2,000 MW of corporate offtake transactions such as virtual power purchase agreements. We have represented buyers, sellers and some of the leading market makers in the corporate PPA space. More recently we have worked on a number of transactions intended to facilitate greater access to the “next rank” of corporate buyers seeking direct contracts with renewable energy facilities.



ENABLING RENEWABLE ENERGY PROCUREMENT IN GLOBAL MARKETS

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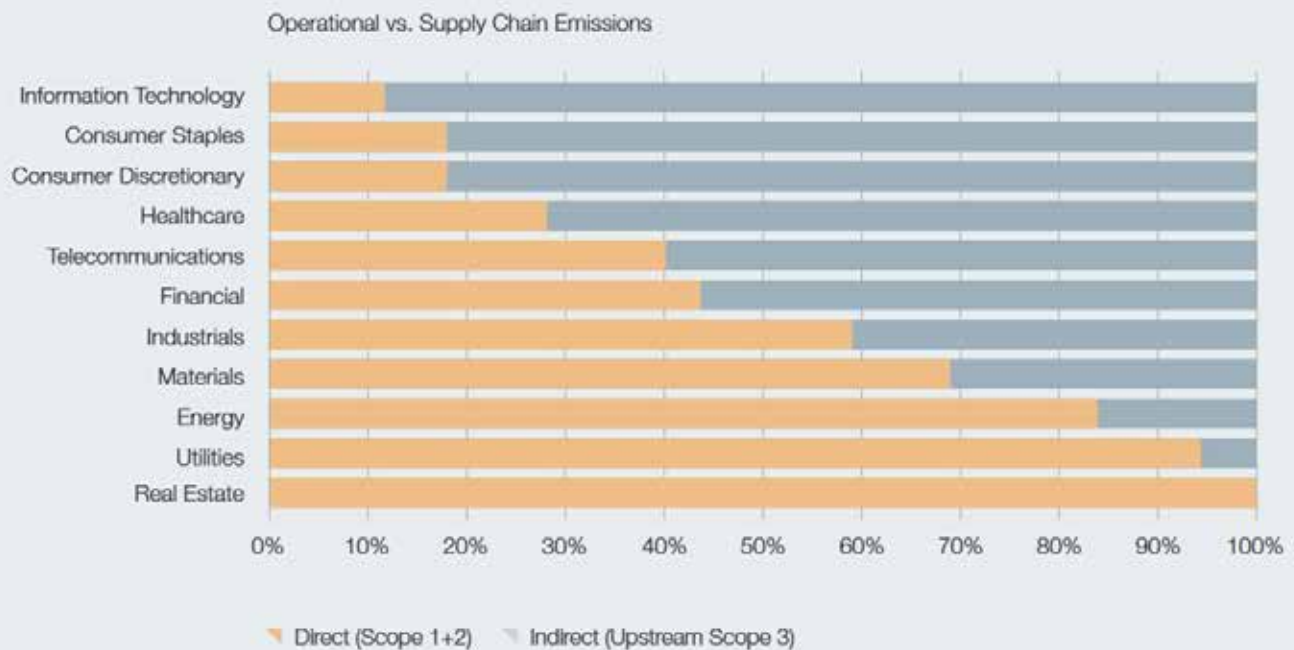
While corporate leadership in sustainability and renewable energy is at an exciting inflection point, a crucial gap remains in addressing the indirect impacts of upstream carbon emissions in companies' value chains. Finding renewable energy solutions for companies throughout the supply chain can be a challenge, but also presents tremendous opportunities.

This section will dive into what is emerging as the hottest topic in corporate renewable energy use: that of enabling each company's value chain to procure renewables. The indirect impact of a corporation's carbon footprint is many times larger than its direct activities and is often concentrated in polluting manufacturing hubs. The impact of looking upstream in companies' value chains and addressing the full supply chain must become a focus of corporate sustainability platforms. The paragraphs that follow explore value chain sustainability efforts, the challenges companies face internally and with ineffective regulatory policies, and solutions for bringing companies throughout the corporate and industrial sector along this wave of corporate sustainability.

Is Setting a Renewable Energy Commitment Impactful?

Many C&I companies face challenges when measuring their sustainability commitments. CDP, formerly the Carbon Disclosure Project, helps to drive carbon reductions in the C&I sector by bringing reporting, awareness and action to corporate sustainability while aligning with investors that inform their investment allocations on companies' sustainability records. A robust renewable energy commitment and active steps toward progress can indicate whether a company is taking serious steps to lower its carbon emissions. However, a company should also assess its indirect value chain emissions to measure its total impact. Thanks to CDP reporting, many corporations have found that while their carbon footprint is significant, their value chain can be 50 percent to 900 percent larger (see the following chart from the CDP 2017 Supply Chain Report),⁹ pointing to a massive decarbonization opportunity.

Figure 8. Proportion of operational and supply chain greenhouse gas emissions by sector



Source: CDP¹⁰

9. *Global Supply Chain Report*, CDP, 2017, <https://www.cdp.net/en/research/global-reports/global-supply-chain-report-2017>

10. Source: CDP, *Missing link: Harnessing the power of purchasing for a sustainable future* <https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/001/500/original/CDP-Supply-chain-report-2017.pdf?1490272235>, page 27

Over the years, industrial manufacturers have relocated their operations to emerging markets in pursuit of cheaper labor, higher returns and more efficient use of capital. Many companies have sited new plants or found suppliers in Asia. This shift has fueled the construction of carbon-emitting thermal power plants that electrify the factories which produce the goods consumed by the rest of the world. Multinational corporations have a unique opportunity to dramatically reduce carbon emissions throughout the value chain by engaging their suppliers to deploy renewable energy. In doing so, companies can actively promote the expansion of clean energy in some of the dirtiest regions on the planet.

Corporates Committing to Renewable Energy

Every company must build internal consensus on their sustainability goals. This alignment often begins at the C-suite and Board level, then by identifying the internal champions and doers who will make it happen. The corporate then embarks to find renewable energy solutions enabled by policy frameworks in jurisdictions which allow new projects to interconnect to the grid, have flexible PPA mechanisms and typically transparent electricity pricing for project financeability.

Lack of Policy and Functioning Frameworks

Many corporations have suppliers in the United States where electricity markets are relatively transparent, forecasting is possible and financing is available. Abroad, the elements that enable renewable energy project development are often opaque due to inadequate policies.

As the world's second largest economy, China is contending with significant environmental challenges of its own. Serious health concerns amid increases in airborne particulates and pollutants have led to temporary government-ordered factory shutdowns, bans of vehicles from city roads and a reassessment of the country's energy mix. As a result, China is slowing the pace of coal plant development and replacing generation with nuclear and renewable energy. However, technical and regulatory barriers in China have made it increasingly difficult for corporations to procure renewable energy. With abundant wind resources and recent wind development in Northwest China, an inflexible grid and lack of transmission to the industrial Southeast has meant that over 40 percent of that generation is curtailed.¹¹

Additionally, inter-provincial transactions face challenges because each is measured by GDP-target growth rates. Regulation is evolving via implementation of a national renewable energy certificate system to enable provincial-level renewable portfolio standard (RPS) targets, but there is a lack of transparency on who claims the RECs – the central government, the province or the C&I off-taker. An effective tracking system is a critical aspect of ensuring

a corporate's claim of renewable energy additionality and greenhouse gas reporting is accurately accounted. Electricity frameworks in China continue to evolve, but because of these challenges, many companies are focusing on onsite development, which, due to space constraints, effectively limits renewable energy production to no more than 20 percent of the local load.

China, along with other manufacturing hubs such as Korea, Taiwan, Malaysia, Vietnam and Indonesia, also lack effective policies that provide the regulatory framework, pricing transparency and financing to enable off-site renewable energy development. In addition to a reliable REC accountability system, regulatory challenges also exist with physically interconnecting to the grid, transacting a power purchase agreement and forecasting electricity prices. Without these elements, financing and constructing a renewable energy project becomes untenable. It is difficult to trace the cause of each hurdle; however, a set of local, vested interests that stand a lot to lose from renewable energy development are stonewalling its advancement. This opposition permeates political influence and is a longer, yet critical battle where partnership across corporations, NGOs and governments must align to advance energy markets.

Supplier Perspective

Supplier engagement presents a tremendous opportunity for renewable energy deployment across the value chain. However, key obstacles for medium-sized suppliers remain prevalent. Midstream companies tend to operate on slim margins in an already hyper-competitive market. Furthermore, they may not have the internal knowledge, creditworthiness and energy load to make traditional renewable energy procurement financially viable. Trying to justify the cost of renewable energy on already slim corporate margins remains an uphill battle for these companies. Finally, entering into long-term renewable energy PPAs requested by customers with whom there is only a short-term supplier agreement can be a difficult internal sell.

Possible Solutions

- Over 150 companies have committed to 100 percent renewable energy.¹² Leading corporations have tremendous renewable energy experience, which can be disseminated to educate and instill confidence in suppliers embarking on the same journey.
- Economies of scale can be achieved in procurement and pricing by leveraging aggregation with multiple buyers to negotiate competitive renewable energy PPAs.
- Credit challenges can also be mitigated when a corporation takes a lead role in anchoring and transacting an oversized PPA.
- Corporations can purchase PPAs that are oversized above their load requirements and distribute excess electricity to their suppliers. These contracts can

11. Zach Boren, "Data: China is wasting lots of renewable energy," Greenpeace, 2017, <https://unearthed.greenpeace.org/2017/04/19/china-wind-solar-renewable-curtailment-energy-wasted/>

12. "RE100, 154 RE100 companies have made a commitment to go '100% renewable,'" RE100, Accessed October 25, 2018, <http://re100.org/>

address rotating suppliers via syndication of different volumes and tenors, thus accommodating a dynamic value chain.

First Solar is working with customers to accomplish these four steps in integrating a renewable energy value chain. The movement is still in its infancy, so successful programs are taking a carrot rather than a stick approach. Downstream companies should consider granting suppliers more favorable contract terms or publicly highlighting them as preferred partners to help build their reputation. In turn, these actions and the other levers will help align market incentives and provide additional value for suppliers to procure renewable energy and decarbonize.

The Big Picture

Renewable energy is an incredibly impactful tool that is sustainable and customized for long-term growth. While fiercely competitive in the downstream marketplace, we must take a shared view to influence upstream partners. Addressing a corporation's direct energy consumption and emissions is a great starting point. Impacting the full value chain yields 50-900 percent greater impact. To achieve rapid, deep decarbonization throughout our economy and around the world, corporations must work together in advancing value chain programs.

ABOUT THE AUTHOR

Gale Clark is on First Solar's Global Corporate Origination team. First Solar is a leader in module innovation, project development, EPC and O&M services, helping to deploy over 17 GW of solar plants globally. First Solar works tirelessly to help partners achieve renewable energy goals in the U.S. and overseas. Prior to that, Gale led Schneider Electric's global retail business. He is a commercial leader with experience growing businesses and developing partnerships in the U.S., Europe, Latin America and other markets. Gale began his career as a submarine officer having received his bachelor's degree in Systems Engineering from the U.S. Naval Academy and received an MBA from Harvard Business School.



METHODS TO TRACK EMISSIONS AND RENEWABLE USE IN COMPANY VALUE CHAINS

Science-based targets are holistic greenhouse gas emission reduction strategies that align with the latest findings of climate scientists to help limit climate change. Over 149 companies have created science-based targets, while another 497 are actively pursuing baseline goals.¹³ Renewable energy use can play an important role when executing such targets.

Establishing GHG emission baselines is an important first step in the development of science-based targets and supporting Renewable Value Chain Initiatives. Companies can measure their scope 1-3 emissions, as identified by the GHG Protocol Corporate Standard,¹⁴ to gain a holistic perspective of their value chains' carbon footprint and identify how renewable energy can help reduce its impact.

- Scope 1 emissions refer to direct emissions from a company's own operations.
- Scope 2 emissions are all indirect emissions produced by purchased energy.
- Scope 3 emissions are all indirect emissions from the value chain, which encompasses many areas from raw materials and manufacturing, to retail stores.

Roughly 70 percent of a company's emissions come from scope 3. Most of these emissions are located upstream in their value chain, produced by raw materials and industrial manufacturing.

Setting science-based targets with an understanding of scope 1-3 emissions can create a framework from which to manage value chain initiatives. Downstream companies can analyze their scope 3 emissions to identify the suppliers with the largest carbon footprints and encourage them to commit to renewable energy procurement and maximize their GHG emissions reductions.

For example, Apple launched a supplier clean energy program in October 2015 with an aim to transition its entire value chain to 100 percent renewable energy.¹⁵ By mapping its scope 1-3 emissions, Apple found that manufacturing makes up 77 percent of its carbon footprint.¹⁶ In response, the company is engaging its global supplier base to transition to renewable energy. Apple has specifically targeted manufacturers that produce aluminum made from hydroelectricity, which has reduced emissions associated with aluminum by 83 percent. This reduction is significant considering that 24 percent of Apple's carbon footprint comes from aluminum.¹⁷ By placing an intrinsic value on products with lower carbon emissions, the company's engagement with suppliers has created a ripple effect in renewable energy use throughout its value chain.

Finally, the use of new technologies such as blockchain can help simplify scope 1-3 tracking. Blockchain is a distributed ledger that can record cryptocurrency transactions chronologically and publicly. While there are many uses for blockchain technology, the most important feature for scope 1-3 emissions is its ability to tokenize credits and create transparent accounting systems. This feature gives it the ability to track a company's carbon footprint cost-effectively.

13. "Companies Taking Action, Science Based Targets," 2018, <https://sciencebasedtargets.org/companies-taking-action/>

14. "FAQ," Greenhouse Gas Protocol, accessed October 25, 2018, https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf

15. "Supplier Clean Energy Program Update," Apple, April 2018, https://www.apple.com/environment/pdf/Apple_Supplier_Clean_Energy_Program_Update_April_2018.pdf

16. *Environmental Responsibility Report*, Apple, 2018, https://www.apple.com/environment/pdf/Apple_Environmental_Responsibility_Report_2018.pdf

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GLOSSARY

Downstream Company: A company focused on downstream activities in a supply chain that purchases from suppliers and sells products to customers. Downstream companies typically carry the most influence in lowering greenhouse gas emissions from the supply chain.

Midstream Supplier: Suppliers of products distributed downstream, which are often mid-cap companies. Typically, midstream suppliers have smaller electricity loads and less appetite for large renewable energy offtake agreements.

Renewable Value Chain Initiative: Business-to-business market incentives typically adopted by downstream companies that encourage midstream suppliers and upstream companies to produce products and services that are made by renewable energy. Initiatives can encompass supplier engagement programs, leveraging new contracting structures (e.g., aggregated PPAs) and advocating for public policies supportive of their suppliers' renewable energy appetites.

Supply Chain: The network of processes involved in manufacturing, producing and distributing a product to a final user.

Upstream Company: A company focused on upstream activities in a supply chain including raw material extraction and manufacturing. Upstream companies account for the majority of greenhouse gas emissions across the supply chain.

Value Chain: The process by which a company adds value to raw materials to create a finished product. In the context of a "renewable energy value chain," companies analyze each production step and identify methods to create competitive advantages by reducing total greenhouse gas emissions and increasing the use of renewable energy.

