

CLEAN ENERGY IMPACT REPORT



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Introduction

In 2012, Goldman Sachs established a target to finance and invest \$40 billion in clean energy globally over the following decade. Just over four years later, we achieved this initial goal. In November 2015, we increased our existing target to \$150 billion by 2025, expanding our ambitions and underscoring our commitment to mobilizing capital to scale up clean energy and foster sustainable economic development.

Goldman Sachs has a long-standing commitment to harnessing innovative market solutions to address critical environmental challenges, in particular climate change. Since energy accounts for the vast majority of greenhouse gas emissions, clean energy is key to addressing climate change. It also brings benefits of energy diversification and security, technology innovation and green jobs, as well as sustainable economic growth and health improvements.

Clean energy is at an inflection point as rapid cost declines have facilitated significant growth of the industry. However, the clean energy sector, and renewable energy generation in particular, is capital intensive, with high upfront costs and payback materializing over subsequent years. As such, the ability to mobilize capital and facilitate efficient financing is particularly important.

Clean energy companies often look to the capital markets to meet their capital needs, but due to a variety of barriers there is still insufficient capital available relative to the global need.

As a leading financial institution, we play an important role in mobilizing capital, facilitating innovative financing mechanisms and helping to address market barriers to scale up clean energy and aid in the transition to a low carbon economy.

In 2012, when there was significant volatility in the capital markets for clean energy, we set our original goal for deploying \$40 billion in capital to reinforce our long-term commitment to and conviction in the sector.

In May 2016, we reached and exceeded our initial goal with the completion of over \$41 billion in financings and investments. With this capital, we have helped clients establish themselves as major clean energy producers around the world. For example, we have invested in clean energy developers, including the largest offshore wind developer globally and one of the largest Indian independent renewable developers. We have also made a number of investments to help expand access to clean energy for underserved markets.



¹ The target was expanded in November 2015 as part of our updated Environmental Policy Framework. [Learn More.](#)

This report highlights the impact of the companies that we have helped finance and the investments that we have made since 2012. As of this report's publication, there is no consensus on the methodology for measuring impact across the different types of capital deployed. We have defined a methodology based on publicly available information, where available, and assumptions commonly used by the industry. Please see our methodology on page 15 for further detail.

We break down our capital deployed as investments and financings according to the following:

Investing in Clean Energy: Our investments include capital deployed through our principal investing activities, middle market investing teams and our impact investing platform, across both equity and debt transactions. These include investments in new management teams and in established companies that need capital, as well as in projects and structured transactions. In addition to capital, we bring deep expertise, long-standing relationships and strategic insight to our investments.

Financing Clean Energy: Financings are transactions where we play an intermediary role connecting clients seeking capital with investors looking to deploy capital. We provide a diverse range of financing solutions to meet a variety of needs, and have further segmented the capital deployed into three categories for purposes of considering the impact:

- I. **New Energy Deployment:** Financing clean energy developers to help them construct and bring new projects to commercial operations.
- II. **Refinancings:** Refinancings of clean energy projects, which free up balance sheet capital for further deployment.
- III. **Clean Tech Ecosystem:** Financings for companies developing advanced clean technologies primarily in sectors outside of renewable electricity generation.

Key Impact Highlights

- ▶ The \$41 billion in capital we have harnessed through investments and financings has helped **89 companies and projects scale up clean energy technologies and renewables across 29 countries.**
- ▶ Through our investments and financings in new energy deployment, we have helped facilitate **31 gigawatts (GW) of new renewable generation, which can power the equivalent of 5.5 million U.S. homes with clean energy.** The aggregate new generation includes 4.5 gigawatts from investments and nearly 27 gigawatts from the companies we have financed.
- ▶ We have helped clients **refinance almost 15 gigawatts of solar and wind**, freeing up balance sheets for new development.
- ▶ In addition, we have helped companies **finance and deploy advanced clean energy technologies** ranging from electric vehicles and smart grids to solar components and advanced bio-products.
- ▶ Collectively, the clean energy technologies supported by our financings and investments will **avoid 74 million metric tons of greenhouse gases** in 2016, equivalent to the carbon sequestered by 70 million acres of forests or taking 16 million cars off the road. Taking into consideration the electricity produced throughout the life of these assets, which averages more than 20 years, the impact will be multiple folds greater than this annual number.
- ▶ In aggregate, the companies we have invested in and helped finance **employed more than 129,000 people in green jobs and generated total revenues of over \$34 billion** in fiscal year 2015. The revenue these companies produce and the jobs they create catalyze the broader growth of the clean energy industry across the value chain and drive an even greater indirect economic impact.

Goldman Sachs Clean Energy Impact Summary



See our methodology for assessing impact

Investing in Clean Energy

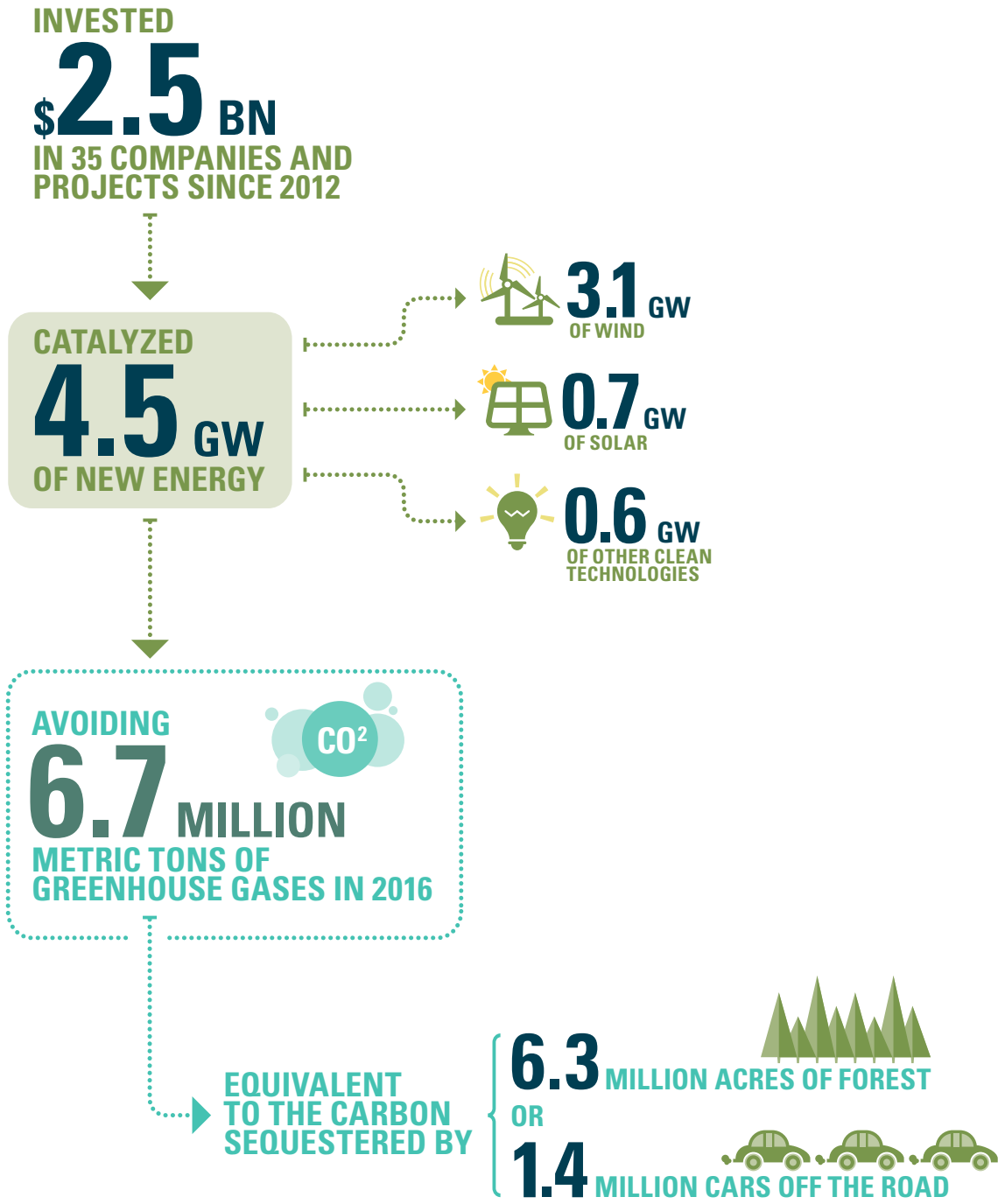
Through our investment activities, we are involved in the growth of companies across the clean energy ecosystem. We have a long history of investing in new management teams and companies that need capital, as well as directly in projects and structured transactions. In addition, we have a long-standing commitment to impact investing in communities across the United States, which includes providing capital that enables access to clean energy and efficiency solutions in underserved markets.

Across the vast majority of our investments, we work alongside our clients to bring both capital and strategic insight to high-quality companies with strong management teams. We provide support for our portfolio companies' long-term goals and efforts to build value. Though the total capital invested includes all our investments, we have only included the impact from investments where we played a key role. Impact metrics for passive minority investments have been excluded.

- ▶ Since 2012, we have invested more than **\$2.5 billion in capital across 35 companies and projects**. These investments span nine countries across the Americas, Europe and Asia.
- ▶ This capital has led to **4.5 gigawatts of new renewable capacity** since our investment. Wind accounts for 3.1 gigawatts of new development. Solar accounts for 740 megawatts, and 630 megawatts have been in other clean energy technologies including advanced biomass and sustainable hydropower, reflecting the relative maturation of these technologies during our investment period.
- ▶ This new renewable energy capacity will **generate enough clean energy to power one million U.S. homes**. In developing countries such as India, where we have helped build one of the nation's largest independent renewable energy developers, deployment of wind and solar provides significant economic and social co-benefits given 360 million people still lack access to grid-connected energy and reliable electricity remains a significant challenge.¹
- ▶ Collectively, the 4.5 gigawatts of renewable energy will **avoid 6.7 million metric tons of greenhouse gases** in 2016, equivalent to the carbon sequestered by 6.3 million acres of forest or taking 1.4 million cars off the road. Accounting for the lifetime energy generation of the assets, the impact will be multiple times greater.
- ▶ The companies that we invested in **directly employ more than 3,000 people globally** as of the first quarter of 2016.

¹The Climate Group, The Business Case for Off-Grid Energy in India. [Learn more](#).

Goldman Sachs Clean Energy Impact Investments



See our methodology for assessing impact

Among our \$2.5 billion in investments, there are a number of strategic investments where we are an equity investor with board positions in clean energy developers. We have facilitated strong growth and enabled the companies to focus on building renewable energy projects at scale. In addition, we have invested directly into renewable energy projects across the range of capital structures, including equity and tax equity, as well as debt. We have also invested in mid-sized companies, where our capital helps scale up operations and increase market penetration. Finally, through our impact investment platform, we have invested in underserved communities to provide more equitable and affordable access to clean energy. The following are highlights of select investments:

Clean Energy Developers	Project-Level Investments
 <p>One of the largest independent renewable developers in India with 1 GW of installed capacity</p>	<div data-bbox="862 684 1083 800" style="border: 1px solid #ccc; border-radius: 15px; padding: 5px; display: inline-block;">TRES MESAS WIND FARM</div> <p>150 MW wind farm in Mexico</p>
 <p>Largest offshore wind developer globally with 1.7 GW of new wind capacity in the past two years</p>	<div data-bbox="862 886 1083 1001" style="border: 1px solid #ccc; border-radius: 15px; padding: 5px; display: inline-block;">SOUTH PLAINS WIND FARM</div> <p>200 MW wind farm in Texas</p>
 <p>Renewable development platform in Japan helping to transition to a clean energy mix post-Fukushima</p>	<div data-bbox="862 1077 1083 1192" style="border: 1px solid #ccc; border-radius: 15px; padding: 5px; display: inline-block;">U.S. DISTRIBUTED SOLAR</div> <p>165 MW of distributed solar across the U.S.</p>
Mid-Sized Growth Investments	Clean Energy Access
 <p>Distributed solar developer focused on commercial and industrial projects in China</p>	 <p>Solar and energy efficiency for low-to-moderate income (LMI) families in Louisiana, New York and Connecticut</p>
 <p>Distributed and utility solar developer focused on projects across Singapore and southeast Asia</p>	 <p>Distributed solar for a portfolio of single-family homes in Salt Lake City, predominantly leased to LMI families</p>
 <p>Minnesota-based manufacturer of solar modules designed for commercial and industrial projects</p>	 <p>Largest public housing Energy Performance Contract to improve energy efficiency for 10,000 residents</p>

Financing Clean Energy

We have long-term relationships with our clients as an advisor and financier. Through our Investment Banking activity, we work with our clients to help raise capital across their full growth cycle, connecting capital providers to companies that need capital to grow. From private placements, initial public offerings (IPOs) and follow-ons to hybrid instruments including convertible bonds, we look for efficient and effective ways to help our clients meet their capital needs.

We consider the impact of our financing activities across the following three categories:

I. New Energy Deployment

II. Refinancings

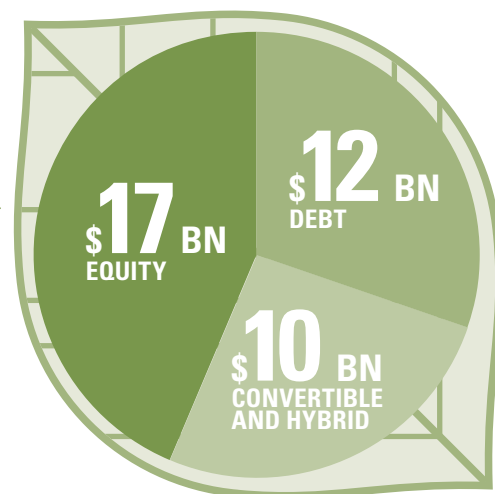
III. Clean Tech Ecosystem

- ▶ Since 2012, we have financed almost **\$39 billion through 119 transactions** in the clean energy sector. These transactions include \$17 billion of equity financings, \$10 billion of convertible and hybrid instruments, and \$12 billion of debt financings. As the companies and the sector have matured, we have been able to harness more diverse financing tools to expand the investor base and facilitate greater cost of capital efficiency.

FINANCED

\$39 BN

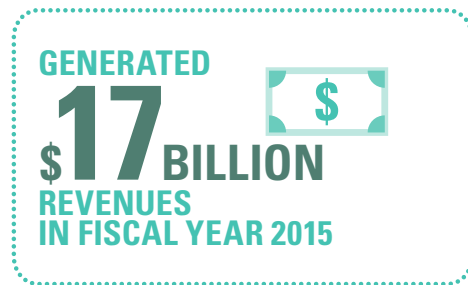
THROUGH 119 TRANSACTIONS
SINCE 2012



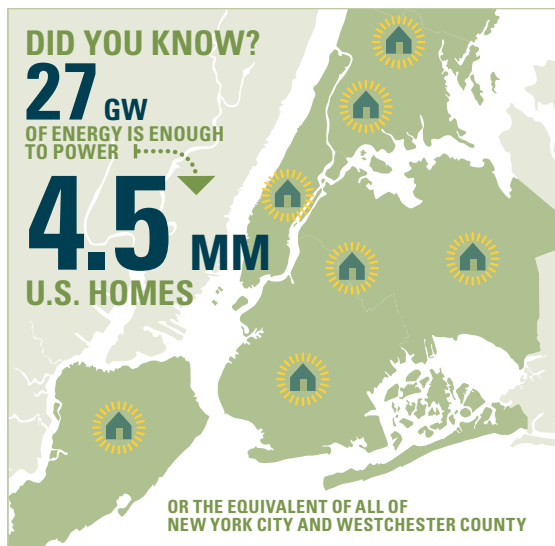
I. New Energy Deployment

Solar and wind energy are adding more new generation to the grid each year than conventional energy sources, with costs having decreased by 80% and 20%, respectively, over the past several years.¹

- ▶ Since 2012, we have raised **\$11 billion for 14 clean energy developers and projects**. These financings include IPOs and convertible bonds for U.S.-based solar and wind developers, as well as financings to support the deployment of wind and solar projects in China, the world's largest renewable energy market. In addition to corporate-level financings, we have completed project-level financings, including those for solar in the United Kingdom and sustainable hydropower in Vietnam.
- ▶ Since our involvement, our clients have collectively deployed **27 gigawatts of new clean energy**, including 15 gigawatts of solar, 12 gigawatts of wind and 200 megawatts of other clean energy technologies including sustainable hydropower.
- ▶ The 27 gigawatts of new renewable assets **can power more than 4.5 million U.S. homes**.
- ▶ These renewable assets will **avoid 42 million metric tons of greenhouse gases** in 2016, equivalent to the carbon sequestered by 40 million acres of forest or taking 9 million cars off the road. The emission benefits will be multiple folds greater when accounting for the lifetime energy generation of these assets.
- ▶ These companies **generated more than \$17 billion in total revenues** in fiscal year 2015. From the year immediately prior to our initial financing through fiscal year 2015, they grew revenue by more than 25%.

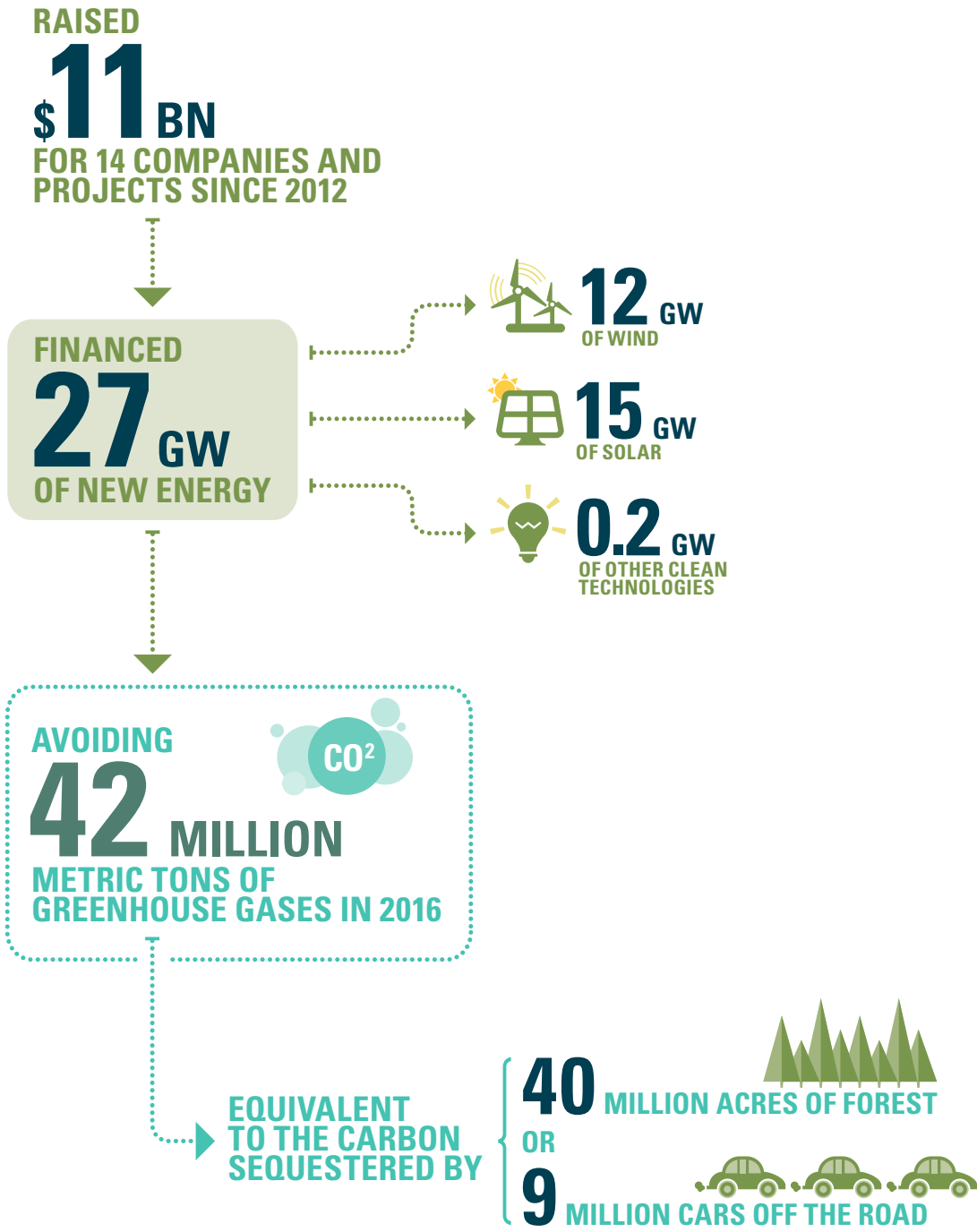


- ▶ During this period, these companies nearly doubled the number of people they employ, directly creating 20,000 new green jobs, and **employing 43,000 people globally** as of fiscal year 2015.



¹ REN21, Renewables 2016 Global Status Report. [Learn more.](#)

Goldman Sachs Clean Energy Impact I. Financing New Energy Deployment



See our methodology for assessing impact

II. Refinancings

Renewable energy projects often benefit from long-term power purchase agreements with creditworthy buyers and have visible cash flows once operational. As long-dated cash-yielding assets, clean energy matches well with financing structures that can tap into the large liquid capital markets. We have led innovative transactions that have helped companies leverage the capital markets to efficiently refinance and free up their balance sheets.

- ▶ Since 2012, we have raised nearly **\$15 billion through refinancings for 22 companies and projects**. These transactions include securitizations and yield-vehicles that enable developers to take clean energy assets from their balance sheet, aggregate and refinance them through the public capital markets, which brings benefits of diversification and liquidity. For investors, these transactions provide a liquid instrument through which they can gain exposure to the long-term yield of clean energy assets. We have also provided warehousing facilities and led green project bonds to refinance operating renewable assets.
- ▶ Collectively, these transactions have facilitated the **refinancing of nearly 15 gigawatts** of clean energy projects globally, helping to enhance cost of capital efficiency and expand the investor base.
- ▶ If this capital were redeployed to the same amount of new renewable projects, it would equate to **avoiding 20 million tons annually of greenhouse gases**, equivalent to the carbon sequestered by 19 million acres of forest or taking 4 million cars off the road.
- ▶ The companies we have helped refinance **generated \$3 billion in total revenues** in fiscal year 2015.

Select Transactions

JAPAN MEGA SOLAR BOND TRUST

In September 2013, we underwrote the first rated solar securitization globally via the Japan Mega Solar Bond Trust. This structure has enabled developers to raise capital against the operating cash flows of renewable projects that are under construction and newly constructed, while providing investors with direct exposure to higher yielding clean infrastructure assets. In doing so, it has brought together developers and institutional investors and opened up a new investor base through capital market financings.

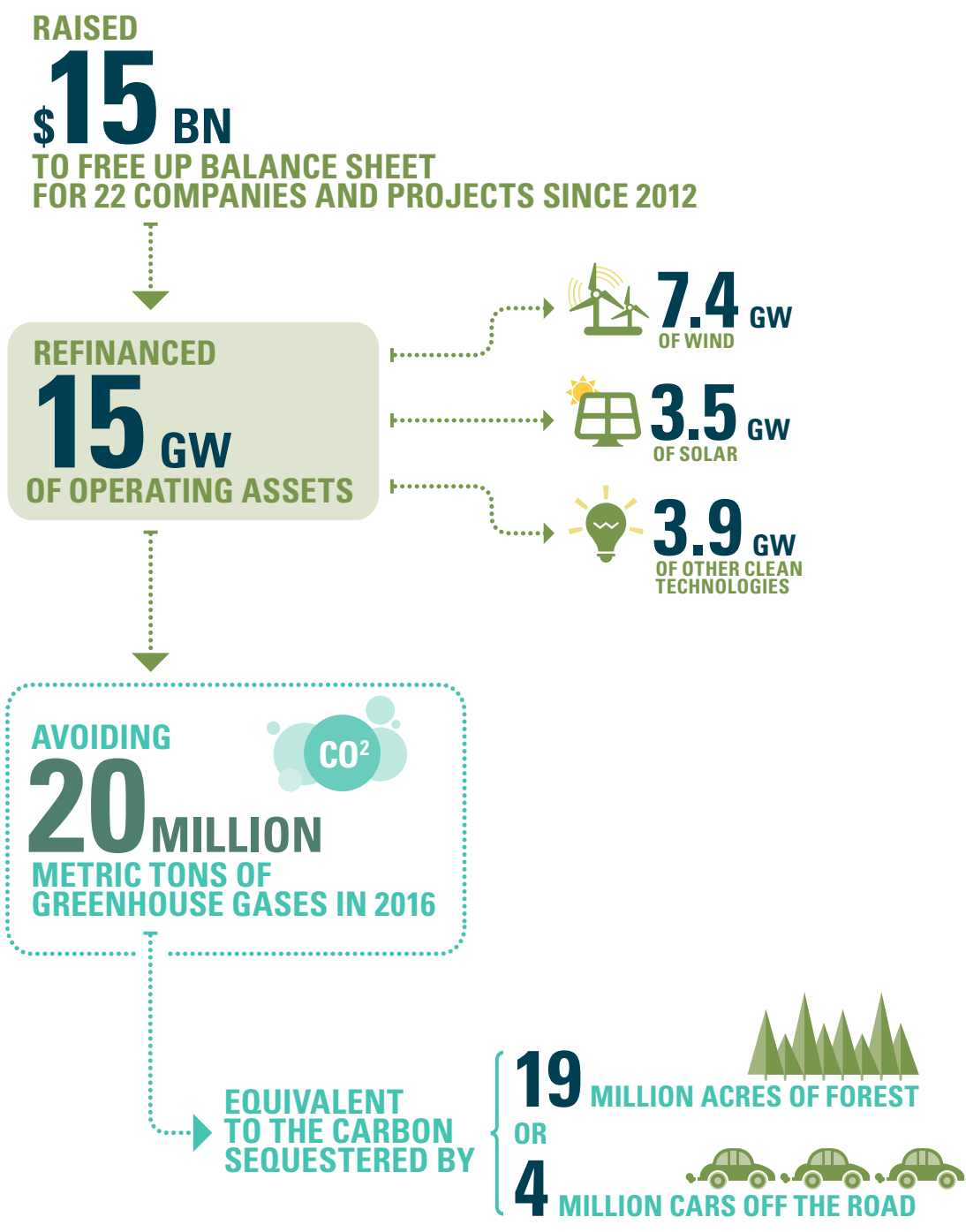
NRG YIELD

In July 2013, we were a joint book runner for the IPO of NRG Yield, the first U.S. YieldCo. NRG Yield acquired clean energy assets from its parent company NRG Energy, freeing up its balance sheet, while providing investors with a liquid investment that provides the benefits of both yield and growth. Subsequent financings included a follow-on equity financing and debt financing to fund the acquisition of the Alta Wind Facility, a one-gigawatt wind farm in the western U.S. and at the time the largest operating wind farm in the country.

CONTOURGLOBAL

In December 2014, we acted as joint lead book runner on a \$204 million, 20-year issuance for Energía Eólica, a Peruvian wind farm operator of ContourGlobal. This was the first green project bond issued in Latin America, demonstrating that green bonds can be viable financing vehicles for issuers to raise project-specific debt in emerging markets. This transaction won the Bond of the Year award from *Environmental Finance* in 2015.

Goldman Sachs Clean Energy Impact II. Refinancings



See our methodology for assessing impact

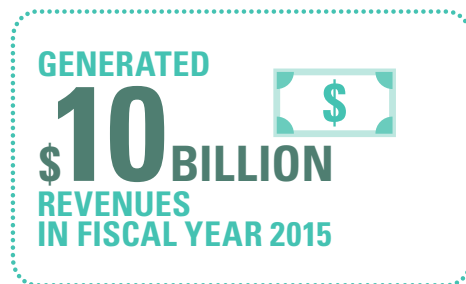
III. Clean Tech Ecosystem

We have also helped raise capital to facilitate the development of advanced clean technologies across the low carbon economy. These technologies are integral to the low carbon ecosystem as they enable smarter, more efficient consumption, cleaner transportation and greener products, and facilitate the increased uptake of clean energy across the value chain.

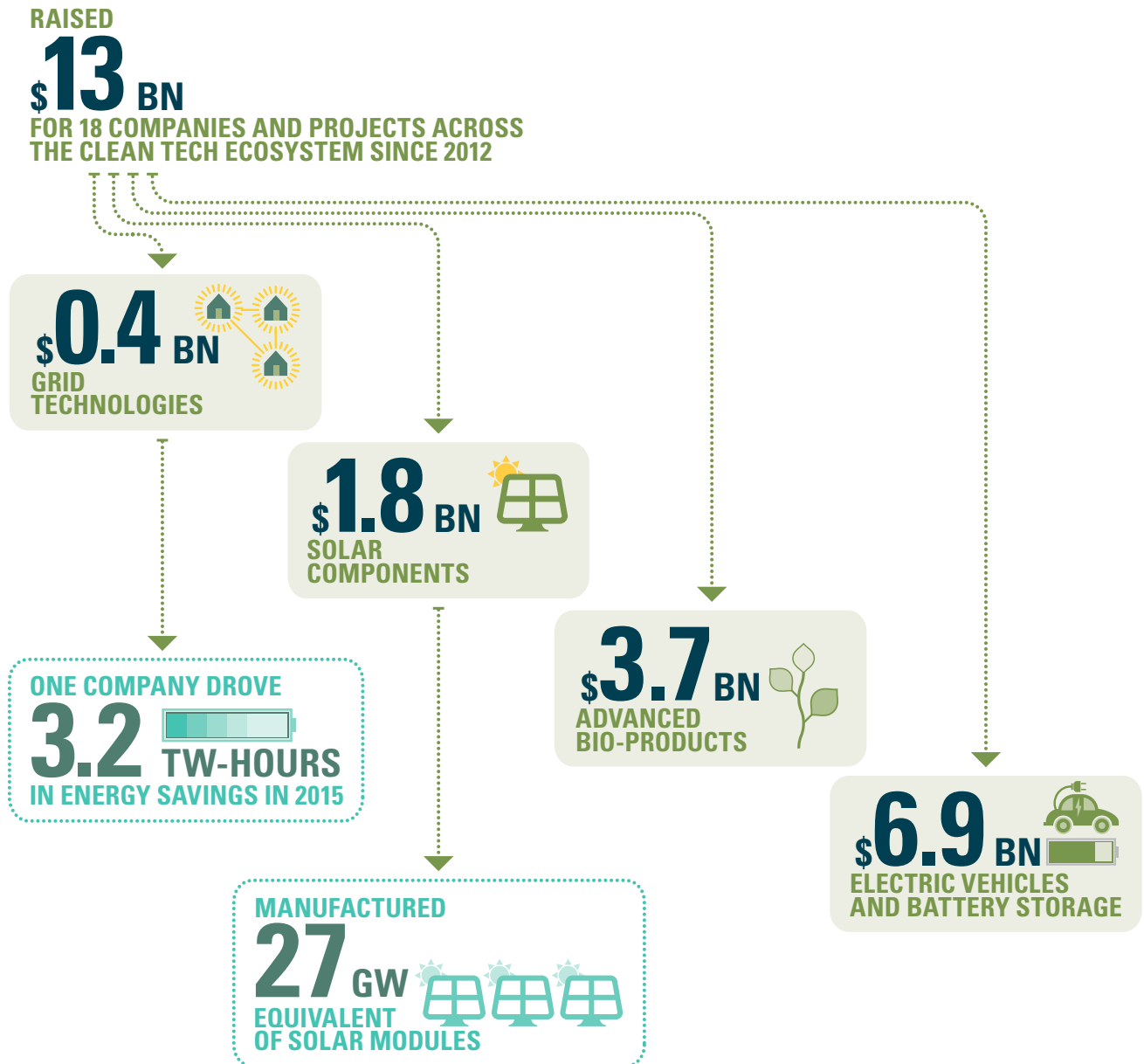
- ▶ Since 2012, we have helped raise nearly **\$13 billion across 38 transactions for 18 companies and projects**, including:
 - i. **Electric Vehicles (EVs) and Battery Storage:** We have led a number of financings to facilitate greater deployment of EVs and the scale-up of battery storage, which both powers EVs and can provide energy services to the grid. For example, our financing is facilitating the construction of the world’s largest battery factory.
 - ii. **Solar Components:** The scale-up of manufacturing the components necessary to construct and operate solar energy systems has helped rapidly reduce overall costs. The companies that we have financed have collectively manufactured the equivalent of 27 gigawatts of solar modules since our initial financings.
 - iii. **Advanced Bio-Products:** We have financed companies that produce advanced bio-based products, including drop-in biofuels, pelletized biomass and bio-based chemical feedstocks. The impact of advanced bio-based products varies based on lifecycle emissions, and we focus our impact analysis on products that are produced sustainably.
 - iv. **Grid Technologies:** The smart grid companies we have worked with have collectively deployed nearly 84 million networked devices, also known as “endpoints,” which enable optimized monitoring, delivery and consumption. These companies leverage data analytics and the “Internet of Things” to engage customers and drive greater efficiencies.

For example, one client has been able to reduce electricity consumption by 3.2 terrawatt-hours (TW-hours) in 2015, which is equivalent to the electricity produced by 2.3 gigawatts of distributed solar projects.

- ▶ The technologies deployed by a subset of these companies will **avoid more than 5 million metric tons of greenhouse gases** in 2016, equivalent to the carbon sequestered by 5 million acres of forest or taking 1 million cars off the road.
- ▶ In fiscal year 2015, these companies **generated total revenues of more than \$10 billion and employed 81,000 people globally**, of which 17,000 new jobs have been added since our initial financings.



Goldman Sachs Clean Energy Impact III. Financing the Clean Tech Ecosystem

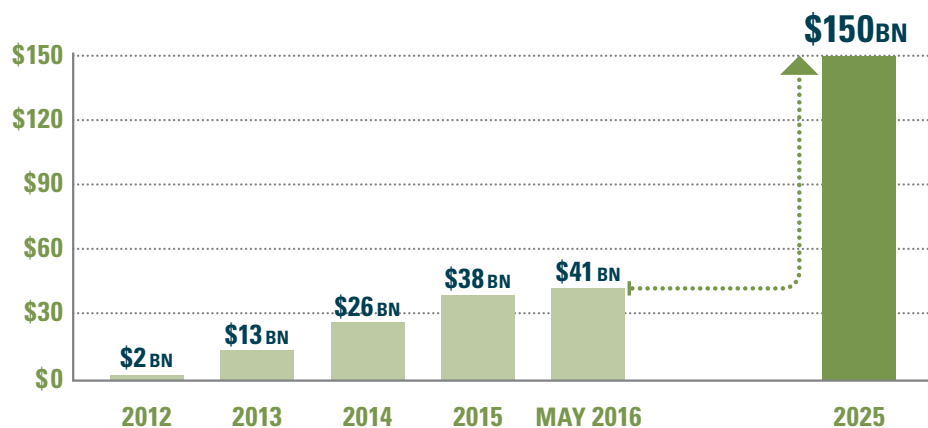


See our methodology for assessing impact

Looking Forward

The global energy requirements of the future are extensive, and clean energy will be a major and growing part of that future. Our role in bringing greater capital access and efficiency to the clean energy market remains important. Last year, as part of our revised Environmental Policy Framework, we expanded our existing target from \$40 billion to \$150 billion in capital deployment for the clean energy sector by 2025.

Goldman Sachs Expanded Clean Energy Target



In the past several years, the clean energy industry has scaled up faster than market expectations. We have reached a critical inflection point in the deployment of clean energy technologies, with lower costs and significant co-benefits accelerating global uptake.

This uptake of clean energy has expanded beyond traditional energy producers. In 2012, our clients focused on this sector were largely solar and wind developers and a handful of companies developing cutting-edge clean technologies. As we look at 2016 and the years ahead, the ecosystem has and will continue to become more expansive, cutting across industries and providing a large global market opportunity.

Already, an increasing number of corporates, including large technology companies and retailers, are procuring clean energy for their operations, acting as credit-worthy long-term off-takers and often targeting 100% of their power needs from renewables. We at Goldman Sachs are among these companies, and have a 100% renewable goal for

our global electricity needs by 2020. Some of these companies across sectors are also directly investing in clean energy projects as well as issuing green bonds that align their capital-raising with their green activities.

More broadly, clean technologies are rapidly disrupting a number of industries. LED lighting has reached 28% market share as of 2015 and is expected to reach 69% by 2020 from only 1% in 2010, one of the most rapid technology shifts that is underway.¹ Automotive companies are facilitating a future of mobility that is based on advanced clean vehicles, investing in connectivity and shared models that meet the mobility needs of consumers in the most optimal and sustainable way. Chemical companies are developing new processes based on renewable resources.

Looking forward, there are clear signs of an accelerating transition to a smarter, more efficient low carbon economy. We remain firmly committed to facilitating this transition and doing our part as a leading financial institution.

¹ Goldman Sachs Global Investment Research, The Low Carbon Economy. [Learn more.](#)

Methodology

We have defined a methodology to assess the impact of our financing and investing activity. In doing so, we reviewed existing methodologies and consulted with industry experts. Given the absence of a common methodology, lack of consistent public disclosure, geographic differences and the unavailability of certain impact metrics, there are limitations to the scope and consistency of this impact report. However, we have strived to be transparent in our approach and our descriptions of impact. Minor differences in aggregate numbers may occur due to rounding.

Our Target

Our target is focused exclusively on the clean technology and renewable energy sector, and on commercial transactions. It includes financing and investments for clean technologies including solar, wind, sustainable hydropower, biomass, geothermal, electric vehicles, energy storage, energy efficiency, advanced materials, advanced bio-products, LED lighting, and grid technologies, including smart grid and renewable energy transmission, among others.

For financings, we include the total amount of capital raised for a company when we are a bookrunner on a transaction, and our pro rata allocation of a financing when we are a co-manager. For bank loans and certain other private debt transactions, we include the full lending amount of capital in cases where we played an integral role in structuring the loan and developing the syndicate. Otherwise, we include our pro rata commitment to the facility.

For investments, we include the direct amount of capital we invested in the companies and projects.

We separately track strategic advisory transactions (mergers and acquisitions), green bond proceeds directed towards uses other than clean energy, environmentally-related grants, and our internal renewable energy and green operational investments, but do not include these as part of this target.

For the purposes of this report, we include transactions from the beginning of 2012 through May 2016, when we achieved our initial target.

Impact Analysis for Investing

For our investing activity, we take the approach of only assessing the impact of companies where we have a seat on the board of directors or a similar role. In these cases, we are working directly with management teams to bring capital and insight to help these companies grow, and therefore consider the full impact of the company. For projects, we consider the full impact of the project given the direct connection of the capital invested to the development of the project.

We assess the impact of our investments from the date of our initial investment through the first quarter of 2016. We include the growth in megawatts deployed following our investment and exclude any megawatts already deployed prior to our involvement. Employees and revenues are included solely for corporate-level investments and are as of the first quarter of 2016 and fiscal year 2015, respectively.

Data is sourced from the companies we have invested in, as well as from public company filings and press releases where available.

Impact Analysis for Financing

For corporate-level financings, we assess the impact of the companies that we have served, as we have long-term relationships with our corporate clients and often help them raise capital throughout their growth cycle, across multiple transactions. More specifically, we consider the full impact of these companies from our first financing since 2012 through the first quarter of 2016. For project-level financings that entail new development, we consider the full impact of these projects. However, employees and revenues are excluded for project-level financings.

For New Energy Deployment, we include the growth in megawatts deployed from a baseline of the quarter prior to our first financing through the first quarter of 2016. Revenues are included in the fiscal year prior to our financing and the 2015 fiscal year to calculate growth. Similarly, employee numbers are included as of the fiscal year prior to our financing and the 2015 fiscal year.

For Refinancings, we include the total megawatts that had been refinanced as of the first quarter of 2016 to illustrate the potential balance sheet capacity that could be redeployed for additional new development. We include the total revenues from companies as of the 2015 fiscal year. For YieldCo-related financings, employee metrics are excluded.

For companies across the broader Clean Tech Ecosystem, we highlight the impacts of specific companies and transactions given the difficulty of aggregation across a variety of technologies with disparate nature of disclosure and complexities in calculating direct impacts. Revenues and employees are included in the fiscal year prior to our financing and 2015 fiscal year.

Data is sourced from public filings and press releases.

Calculating Emissions

We assess the emissions impact from the megawatt-hours produced by the operating projects which have been deployed since our initial financing or investment. We use the actual capacity factor of projects, where available. When not available, we rely on assumptions to calculate megawatt-hours. For projects in the U.S., we use 2015 annual average capacity factors from the United States Energy Information Administration. For other countries, we use governmental and other credible sources, or apply a known capacity factor from other companies' data from the same country.

In order to assess the greenhouse gases avoided, we utilize the emissions from electricity generation in each country. In the U.S., we use the latest annual non-baseload carbon dioxide output emission rate, as disclosed by the United States Environmental Protection Agency (EPA) in their eGRID analysis, which is based on 2012 data. For other countries, as non-baseload data is not available, we use system average data on CO₂ emissions per megawatt-hour from the International Energy Agency's *CO₂ Emissions from Fuel Combustion Highlights 2013 Edition*, which is based on 2011 data. Equivalencies for forests and cars are based on U.S. numbers from the EPA's Greenhouse Gas Equivalencies Calculator.

For the Clean Tech Ecosystem, we assess the emissions impact where applicable. With respect to electric vehicles, we calculate the emissions from an EV traveling an average vehicle's miles per year, utilizing California's non-baseload emission rate to calculate the emissions from electricity required to charge the vehicle, and compare it to the emissions of an average passenger vehicle per the EPA. For advanced bio-products, we adjust the emissions benefits to account for the lifecycle emissions from processing the products. For solar components, we do not assess emissions given that the solar components, once manufactured, are used by various developers and could result in duplication with New Energy Deployment impact metrics. For smart grid technologies, we rely on direct public disclosure of emissions impact given the complexity in direct calculations.



[gs.com/environment](https://www.gs.com/environment)