Sempra Energy®

SHAPING THE FUTURE

A SUPPLEMENT TO OUR 2019 CORPORATE SUSTAINABILITY REPORT

LNG: Supporting the energy transition

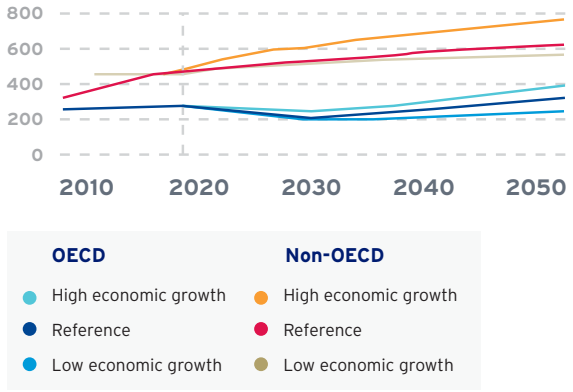
The need for action

At Sempra Energy, our vision is to deliver energy with purpose. We were founded on the principles that the businesses and communities of tomorrow will be powered by the smart, new infrastructure we build today. In fact, our infrastructure helps reduce emissions in every market we serve. This includes liquefied natural gas (LNG) infrastructure, which enables lower-carbon energy to be delivered globally. We developed and co-own Cameron LNG, our first liquefaction operation on the U.S. Gulf Coast that supports the export of 12 million tonnes per annum of LNG.

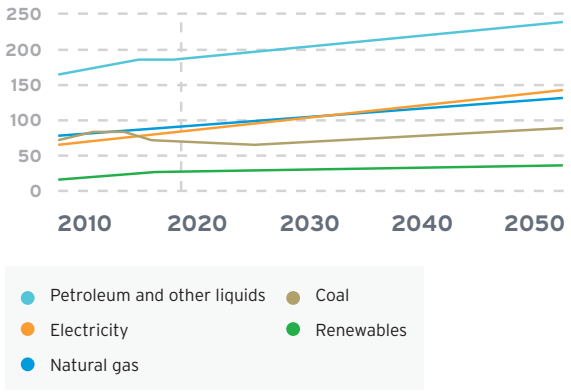
In 2018, leading climate scientists, known as the Intergovernmental Panel on Climate Change (IPCC), published a landmark report that finds that global emissions will need to reach net-zero by 2050 – that equates to a global rise in temperature of no more than 1.5° C.

More than a million megawatt hours of wind and solar resources are wasted every year[1] due to a supply-demand imbalance and the most advanced utility-scale battery storage technologies can only hold electrons for around four hours[2]. The International Energy Agency (IEA) also predicts increasing demand for energy and, specifically, for higher carbon fuels including coal.

Energy consumption*
(quadrillion British thermal units)



End-use energy consumption by fuel, world*
(quadrillion British thermal units)



* Source: U.S. Energy Information Administration's International Energy Outlook 2019 *https://www.eia.gov/outlooks/ieo/*

While increased use of renewable resources, such as wind and solar, will play a critical role, they will not be able to do it alone.

Local coal resources provide the most-affordable domestic source of energy in many emerging economies[3] – energy that is needed as hundreds of millions of people seek middle-class prosperity. And so, as coal plants are shuttered in advanced economies, they may be replaced by new coal plants in emerging economies[4].

The emissions impact of this should come as no surprise: by 2030, in almost every[5] forecast[6] based on current trends, global greenhouse gas emissions will increase. Decreases that might be achieved in advanced economies (through energy efficiency, new or improved technologies and expansion of solar and wind) are unlikely to offset the emissions increases in emerging economies.

The role of LNG

LNG can play an important role in addressing this emissions impact. LNG is natural gas that has been liquefied and supercooled, decreasing in volume by a factor of 600.

Liquefying natural gas makes it possible to transport large amounts of this fuel around the world. This gives countries the opportunity to choose something other than coal as their primary fuel source for electricity generation.

The United States provides an example of the impact switching from coal to natural gas can have on emissions. Since 2016, the US has shifted from coal to natural gas as its main source of energy for electricity generation. As a result, this has reduced emissions by more than 2,800 million metric tons (MMT) [see chart below]. Additionally, the availability of natural gas has provided the flexibility and reliability needed to add significant (but intermittent) wind and solar generation resources to the electric grid.

Emissions from power generation in the United States have dropped more than 40% below 2005 levels, according to the most recent data[7]. Overall U.S. CO_2 emissions, from all sources, are down over 1 gigatonne (GT) from their peak in the year 2000, the largest absolute decline of any country on earth[8].

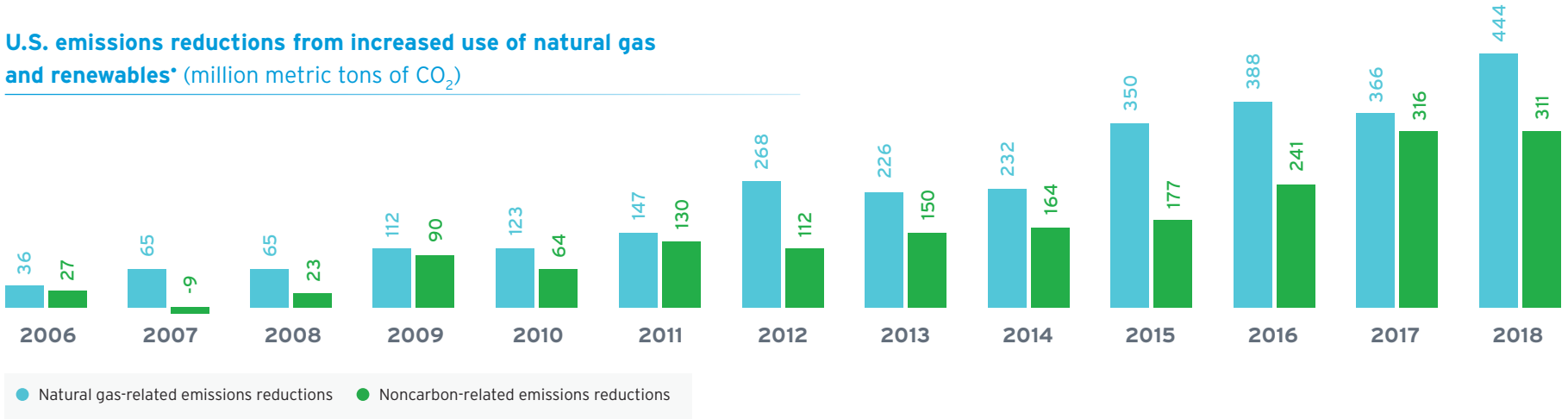
According to the International Energy Agency (IEA), with LNG, the United States can export this success[9]:

The clearest case for switching from coal to gas comes when there is the possibility to use existing infrastructure to provide the same energy services but with lower emissions.

There is potential in today's power sector to reduce up to 1.2 gigatonnes of CO_2 emissions by switching from coal to existing gas-fired plants, if relative prices and regulation support this potential. The vast majority of this potential lies in the United States and in Europe. Doing so would bring down global power sector emissions by 10% and total energy-related CO_2 emissions by 4%.

Even greater reductions become possible if additional North American LNG projects are completed as planned.

U.S. emissions reductions from increased use of natural gas and renewables* (million metric tons of CO_2)



U.S. power sector emissions reductions. Note that natural gas has had a greater impact than renewables in reducing these emissions.
* Source: U.S. Energy Information Administration's Monthly Energy Review, October 2019 https://www.eia.gov/totalenergy/data/monthly/archive/00351910.pdf

Seeking lower-carbon intensity in LNG operations

While LNG does have greenhouse gas emissions across its value chain, the life-cycle emissions from the use of LNG in power generation are roughly half[10] the life cycle emissions from the use of coal.

Sempra LNG develops, operates, and invests in North American LNG infrastructure. We consider the carbon emissions impact of this infrastructure and apply the latest technology and operational efficiencies to reduce the emissions intensity of the liquefaction process and associated midstream infrastructure. We believe this is a critical component of our business and will maximize the climate benefits of LNG.

Our first fully operational LNG facility, Cameron LNG, is expected to operate at a carbon dioxide intensity (CO_2 per ton of LNG produced) that is 10-15% below the per-year level allowed by its environmental permit. Future facilities in Baja California, Mexico and Port Arthur, Texas, have been permitted and designed to even lower CO_2 intensity levels.

Beyond the fence line of these facilities, we are also exploring opportunities to improve the CO_2 intensity of the electricity we buy to power these facilities. Entergy, Inc., our power provider for Port Arthur LNG and Cameron LNG, has publicly announced a goal to halve its CO_2 emission rate by 2030.

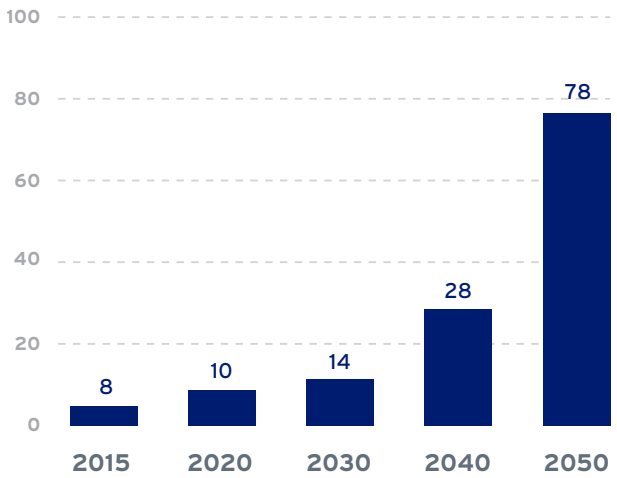
We also support eliminating routine flaring and venting and other methane emissions that occur during exploration for, or production of, natural gas upstream of our infrastructure. Such efforts are critical to maximizing LNG's role in a lower-carbon energy system. We seek to engage others in partnerships in this area to determine what is possible – and how we can help.

LNG's role in development of hydrogen resources

In addition to LNG's more obvious benefits (lower emissions compared to coal), this fuel source also plays a crucial role in the advancement and scalability of hydrogen – a zero-emissions energy source. We believe a robust LNG trade will accelerate the emergence of a hydrogen economy and expect that hydrogen and natural gas will co-exist side-by-side as technologies and delivery systems mature over the next several decades.

Hydrogen produced using natural gas is called blue hydrogen. According to the IEA, blue hydrogen makes up about three quarters of the annual global dedicated hydrogen production of around 70 million tonnes[11].

Growth in hydrogen demand worldwide* 2015-2050 (in exajoules)



* Source: *https://hydrogencouncil.com/wp-content/uploads/2017/11/Hydrogen-scaling-up-Hydrogen-Council.pdf*

This is unlikely to change because hydrogen can be produced from natural gas, with low emissions through the use of carbon capture technology, and at one-third the cost of electric-powered production. This is primarily due to the availability and affordability of natural gas.

Following growing efforts to keep global warming to a maximum of +2 degrees Celsius, hydrogen demand is expected to increase to 78 exajoules worldwide by 2050[12]. And green hydrogen produced from renewable electrolysis could become cheaper and more widely available in the future, which would make it an important zero-emission energy and transport fuel source.

Beyond emissions reductions, LNG provides additional benefits. The growth of U.S. LNG exports has the potential to strengthen U.S. foreign policy and improve our trade balance. While an abundance of U.S. natural gas is leading to a manufacturing resurgence in the U.S., it also has the potential to strengthen alliances with developed and developing countries by providing a stable, affordable, flexible, and reliable source of energy that gives those countries the certainty they need to build their energy infrastructure. U.S. natural gas exports also can help our European allies reduce their energy dependence on Russia[13].

Looking to the future, LNG can play a key role in building a brighter future. It can serve as a catalyst in the global transition to lower-carbon energy while improving trade and providing energy security for U.S. allies. These can be important wins in the decade ahead.

1 *https://www.greentechmedia.com/articles/read/california-renewable-curtailments-spike-as-coronavirus-reduces-demand*
2 *https://www.eesi.org/papers/view/energy-storage-2019*
3 *https://www.weforum.org/agenda/2019/02/these-countries-are-driving-global-demand-for-coal/*
4 *https://www.carbonbrief.org/mapped-worlds-coal-power-plants*
5 *https://www.statista.com/statistics/263980/forecast-of-global-carbon-dioxide-emissions/*
6 *https://www.sciencemag.org/news/2019/11/new-un-climate-report-offers-bleak-emissions-forecast#*
7 *https://emissionsindex.org/*
8 *https://www.iea.org/articles/global-co2-emissions-in-2019*
9 *https://www.iea.org/reports/the-role-of-gas-in-todays-energy-transitions*
10 *https://www.energy.gov/sites/prod/files/2019/09/f66/2019%20NETL%20LCA-GHG%20Report.pdf*
11 *https://www.iea.org/reports/the-future-of-hydrogen*
12 *https://hydrogencouncil.com/wp-content/uploads/2017/11/Hydrogen-scaling-up-Hydrogen-Council.pdf*
13 *https://www.nytimes.com/2019/02/26/business/poland-gas-lng-russia-usa.html*

For more information on Sempra Energy's sustainability efforts, please visit www.sempra.com/sustainability or email us at sustainability@sempra.com.

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