



# AES CLIMATE SCENARIO REPORT

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# Legal Disclaimer



This report was prepared in 2018, and the results are based on specific assumptions and estimates made in the context of the scenarios modeled in the report. Given the inherent uncertainty in predicting and modeling future conditions, caution should be exercised when interpreting the information provided. The results are not indicative of, and this report does not represent, a preferred or expected outcome of the future.

The scenarios modeled in this report are largely derived from assumptions contained in the International Energy Agency's (IEA) 2017 World Energy Outlook (WEO) and the Representative Concentration Pathways (RCPs) established by the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5). These scenarios should not be mistaken for forecasts or predictions. Accordingly, there can be no assurance that the scenario modeling or assessments presented in this report are a reliable indicator of the actual impact of climate change on AES' portfolio or businesses.

This report contains forward-looking statements within the meaning of the Securities Act of 1933 and of the Securities Exchange Act of 1934. Such forward-looking statements include, but are not limited to, those related to future energy demand, future power prices, the availability and cost of natural gas, the growth of solar and other renewable forms of electricity generation and energy storage, future carbon taxes or regulations, potential rates of reduction in coal-fired electricity generation, the expected operating life of existing coal-fired electricity generation plants, the level of energy efficiency investments, the impact of demand-side management and AES' corporate strategy. Forward-looking statements are not intended to be a guarantee of future results, but instead constitute AES' current expectations based

on reasonable assumption, or, as noted in the report, expectations provided by third-parties such as the International Energy Agency (IEA). These assumptions include, but are not limited to, continued normal levels of operating performance and electricity volume at our distribution companies and operational performance at our generation businesses consistent with historical levels, as well as achievements of planned productivity improvements and execution of AES' corporate strategy.

Actual results could differ materially from those projected in our forward-looking statements due to risks, uncertainties and other factors. Important factors that could affect actual results are discussed in AES' filings with the Securities and Exchange Commission (SEC), including, but not limited to, the risks discussed under Item 1A "Risk Factors" and Item 7 "Management's Discussion & Analysis" in AES' 2017 Annual Report on Form 10-K and in subsequent reports filed with the SEC. Readers are encouraged to read AES' filings to learn more about the risk factors associated with AES' business. AES undertakes no obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

Any Stockholder who desires a copy of the Company's 2017 Annual Report on Form 10-K dated on or about February 26, 2018 with the SEC may obtain a copy (excluding Exhibits) without charge by addressing a request to the Office of the Corporate Secretary, The AES Corporation, 4300 Wilson Boulevard, Arlington, Virginia 22203. Exhibits also may be requested, but a charge equal to the reproduction cost thereof will be made. A copy of the Form 10-K may also be obtained by visiting the Company's website at [www.aes.com](http://www.aes.com).

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The AES Corporation (AES) strives every day to improve our customers' lives by providing reliable and affordable access to power while setting the bar for innovation in the industry. Our actions are guided by the objective to build a sustainable energy future while meeting the ever-changing energy needs of the markets in which we operate. Put simply, AES' mission is to improve lives by accelerating a safer and greener energy future.

The desire to limit climate-related impacts is driving change in our industry, and I am proud to say we are leading the way. AES is committed to a corporate strategy that aims to lower our greenhouse gas emissions and create a clean energy future. Pivoting our strategy toward renewables and low-carbon technologies allows us to capture greater opportunities while serving our customers for years to come. Proven technologies that reduce greenhouse gas emissions, including solar, wind and energy storage, are completely aligned with AES' mission of improving lives. Our renewable energy projects are providing low-cost, emissions-free energy for our customers, while improving air quality and protecting the environment for future generations. AES is leading innovation in the integration of renewable energy and storage solutions, and we believe this is one of the most promising opportunities in our industry.

We are fundamentally shifting our portfolio in a manner that both reduces our carbon intensity and our exposure to carbon price risk. With the publication of this report, we are pleased to announce that we are increasing our 2030 target from 50% to a 70% reduction of carbon intensity from 2016 levels. Through 2020, we expect to add two to three gigawatts (GW) of new capacity in renewables annually.



**70% reduction in carbon intensity by 2030.**

As we highlight throughout this report, our work over the past several years has positioned AES for what many are referring to as "transition readiness". Our investments in renewable energy and flexible power generating units, supported by robust commercial structures, provide significant value and resiliency across multiple climate change

scenarios. Four Clean Energy Growth Platforms are core to our strategy: renewables, energy storage solutions, liquefied natural gas (LNG) and energy efficiency. These platforms focus on deploying new technologies and providing clean, affordable electricity by:

- Continuing our growth from **renewables** such as wind and solar.
- Deploying **energy storage solutions** alongside intermittent generation sources to provide innovative grid reliability and flexibility support.
- Providing clean, affordable **LNG** to regions traditionally reliant on oil-fired or diesel power with high emissions.
- Promoting **energy efficiency** to help electricity customers save money and enable AES and other utilities to better manage the grid.

The impacts of climate change and policy responses are dynamic. As a company with operations in 15 countries, we have developed a portfolio and growth strategy that is resilient across a number of possible scenarios pertaining to both physical and transition climate-related risks. This report implements recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and provides additional analysis for stakeholders into the strength and resilience of our portfolio – whether we are navigating policies that limit global warming to 2°C or withstanding the possible physical impacts of a world that fails to achieve that goal.

We believe there is immense opportunity for companies that can play a critical role in tackling climate change. With our global presence and leading platforms across renewables, energy storage and LNG, AES is uniquely positioned to be such a company. We are fully committed to executing on our strategy and delivering attractive returns for our shareholders while being one of the world's leading global sustainable energy companies for years to come.

Andrés Gluski  
President and Chief Executive Officer



Our objective in publishing this report is to provide stakeholders with an understanding of the strength and resilience of our portfolio under various climate change scenarios using recommendations issued by the Task Force on Climate-related Financial Disclosures (TCFD). We have included a discussion about our strategy and risk management approaches for managing risks and opportunities related to climate change and have presented the results of our portfolio stress test across three primary reference scenarios.



AES Distributed Energy, San Diego Unified School District, CA.

## ACCELERATING A TRANSITION TO A CLEANER ENERGY FUTURE

Our mission is to improve lives by accelerating a safer and greener energy future. Our strategy is built on our vision to be the world's leading sustainable power company and our belief that local and national policies that support cleaner forms of energy will continue to materialize across our markets over the long-term. Our Board of Directors and management have taken steps to significantly shift our portfolio and expand our Clean Energy Growth Platforms. In support of our target to reduce our carbon intensity 70% by 2030 from 2016 levels, we will meet the future energy needs of our customers through a variety of generation sources, including renewables, energy storage solutions, LNG and other low-carbon technologies.

## CLIMATE RISKS ARE FUNDAMENTAL TO OUR RISK MANAGEMENT APPROACH

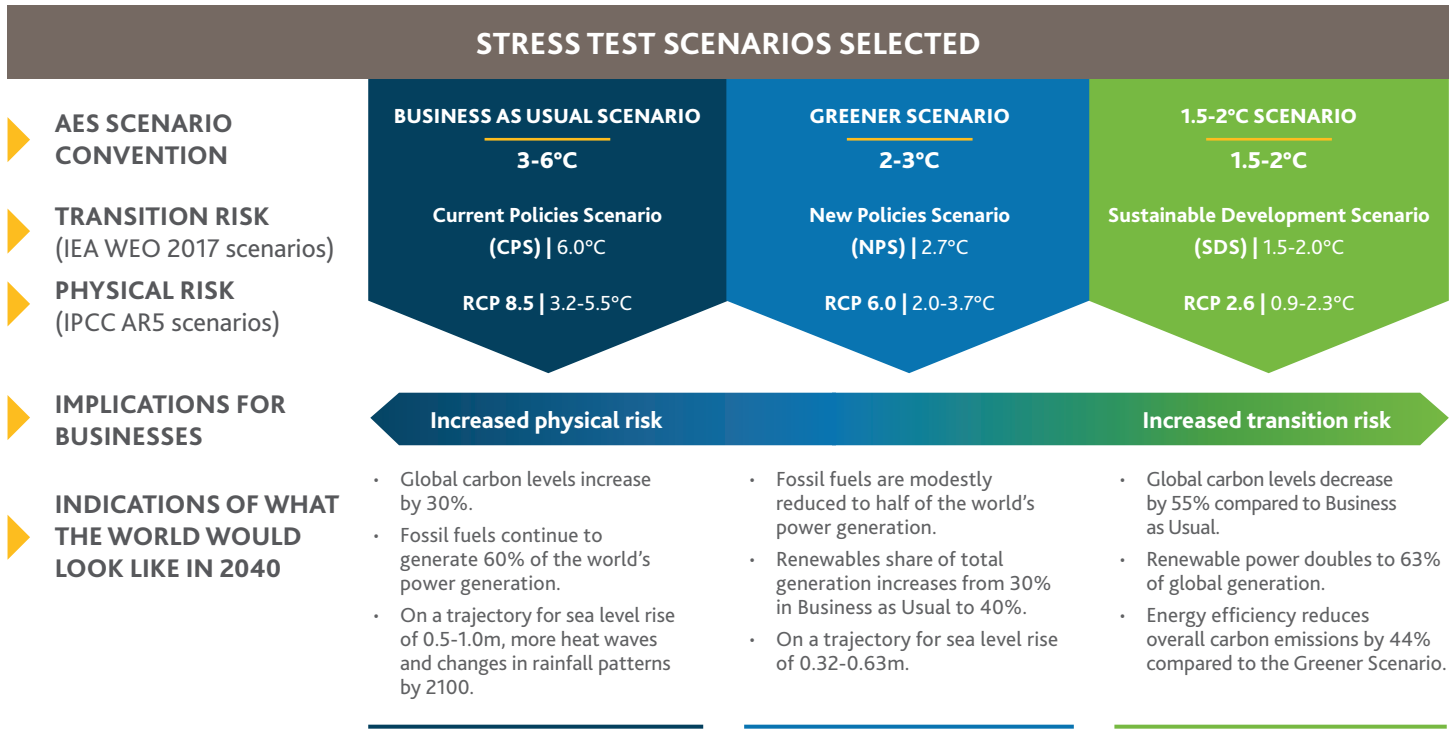
As a power company, risks and opportunities posed by climate change are intrinsic to our industry. We assess and manage these risks and opportunities at all levels within the organization. Our planning process is designed to identify the key internal and external drivers that have a significant impact on value creation by performing risk and scenario analysis, assessing strategic options and identifying priority projects. Each of our businesses is responsible for identifying risks related to climate change, environmental regulations, severe weather, hydrology and other relevant issues. These risks are used to inform our strategic options and, ultimately, our corporate strategy and related priorities, goals and targets. Additionally, the execution of our corporate strategy is tied to management's compensation structure through performance metrics, including growing our Clean Energy Growth Platforms which reduce our carbon intensity.

## CAPITALIZING ON THE LOW-CARBON ECONOMY TREND AND DRIVING MAXIMUM VALUE FOR OUR CUSTOMERS AND SHAREHOLDERS

Future growth across our company is heavily weighted toward less carbon-intensive sources of energy and related innovations that are critical to limiting the impacts of climate change. We are pursuing these opportunities through four Clean Energy Growth Platforms:

- **Renewable Energy:** In 2017, we partnered with the Alberta Investment Management Corporation (AIMCo) to jointly acquire sPower, the leading independent solar operator and developer in the United States. With a portfolio of 1.3 GW of solar and wind projects in operation, another 1.3 GW of signed Power Purchase Agreements (PPA) and a development pipeline of more than 10 GW of renewables, sPower positions us to significantly grow our renewables portfolio in the coming years. The addition of sPower to the portfolio built on a prior acquisition that established AES Distributed Energy – our fast-growing pioneers of solar-plus-storage and community solar solutions.
- **Energy Storage:** With over 450 megawatts (MW) in operation, under construction or in advanced development, we are proud to operate one of the world's largest advanced energy storage fleets. In 2018 we partnered with Siemens to create Fluence, the leading global energy storage technology and services provider. This market is expected to have rapid growth alongside the increased build out of intermittent power resources.
- **LNG:** In 2019, our second LNG terminal in the Central America and Caribbean region will become operational. The terminal will help substitute carbon-intensive diesel and fuel oil for clean-burning natural gas. We have additional storage and regasification capacity at the terminals to meet needs beyond those of our co-located gas plants. This allows for access to cleaner natural gas for regional energy clients and upside for our business.
- **Smart, Energy-efficient Grids:** AES recently became a strategic investor in Simple Energy, a leading provider of utility-branded marketplaces and software that helps utilities engage customers in managing their energy use. Energy efficiency is a critical part of any low-carbon transition pathway and this platform positions us to grow with that opportunity. In addition, AES utilities are leading in the adoption of these technologies and will continue to grow through their broader grid modernization efforts in all scenarios.

As we scale our Clean Energy Growth Platforms, we will continue to invest in our regulated utilities and drive value from our conventional generation assets. Local markets rely on many of our thermal plants to support the build out of intermittent resources because of the critical grid support they provide. We are innovating new ways to run these plants at some of the lowest levels of daily generation in the industry to reduce our costs and emissions. For more on how we are de-risking these assets, please see *Focusing on Reliability and De-risking Our Thermal Assets*.



## STRESS TESTING OUR PORTFOLIO AGAINST THIRD-PARTY CLIMATE SCENARIOS

To stress test our portfolio, AES identified third-party scenarios covering varying degrees of transition and physical risk. We ultimately selected the International Energy Agency's (IEA) 2017 World Energy Outlook (WEO) for transition risk scenarios, and for physical risk scenarios, we selected the Representative Concentration Pathways (RCPs) established by the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5). The temperature ranges indicated represent the projected increase in global surface temperatures from pre-industrial levels. As these two sets of scenarios are not formally harmonized, we have grouped them into the scenario conventions for purposes of the stress test and this report. Please see *Building the Scenarios* for more information.

The TCFD and other proponents of scenario planning for climate change impacts have highlighted the importance of using recognized third-party scenarios. While the scenarios may not be aligned with AES' view of the future, our stress test uses the assumptions and outputs of third-party frameworks referenced by the TCFD as directly as possible so that investors can more easily compare companies.

Our climate resilience stress test is fundamentally an in-depth financial analysis assessing the sensitivity of gross margin across our entire business – from every individual plant, up through to our strategic business units. Our effort was guided by a steering group consisting of members from our financial planning and analysis, corporate risk and strategy, sustainability, legal, operations and other teams.

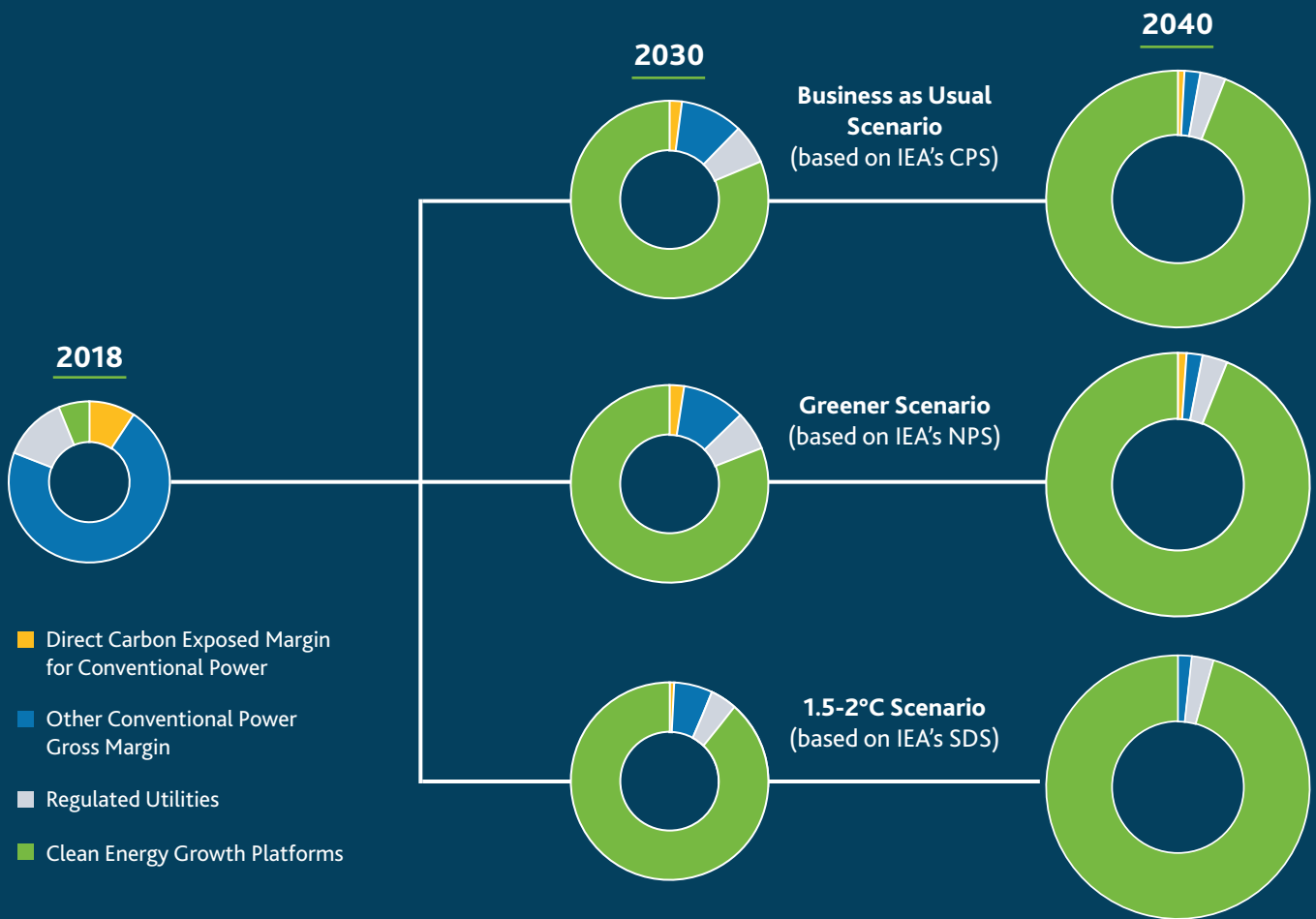
## OUR PORTFOLIO IS NOT ONLY RESILIENT, BUT POSITIONED FOR GROWTH

**Given our modest exposure to direct carbon risk and our pivot toward Clean Energy Growth Platforms, transition risk can enhance our upside potential.**

The stress test highlights the effectiveness of our efforts to mitigate climate change risk given the decreasing portion of our margin that is directly exposed to carbon pricing as we move from the simulated Business as Usual Scenario (3-6°C) to a 1.5-2°C Scenario. In the results that follow, direct carbon exposed margin refers to margin that has the potential to be directly and negatively affected by, or has been subject to, a price on carbon. Even in the 1.5-2°C Scenario, where carbon prices reach \$125/tonne for emerging economies and \$140/tonne for advanced economies by 2040, our direct carbon exposed margin is virtually zero. Under this scenario, our existing thermal plants are considered to be retired at the end of their anticipated useful life or contracted for reliability with the off-taker bearing the cost of carbon. The majority of the margin from these plants comes from capacity payments, which are not directly carbon exposed. These payments are essentially for availability and are received regardless of the amount of energy generated. However, these plants have indirect carbon exposure if the credit quality of our off-takers deteriorates due to carbon pricing. Please see *Focusing on Reliability and De-Risking our Thermal Assets* and *Transition Risk Resilience* for more information.



# SIMULATED GROSS MARGIN ACROSS THE THREE CLIMATE SCENARIOS



Direct carbon exposed margin largely refers to energy sales from fossil-fired plants that are selling power on the merchant market or plants that are contracted in a way that does not allow for a carbon price pass-through to an off-taker. Please see Transition Risk Resilience for more information.

The scenarios highlight the upside growth exposure our platforms create as we take or maintain leading market positions that are directly aligned with technologies required to unlock a low-carbon economy. For example, the 1.5-2°C Scenario assumes global wind and solar photovoltaic electrical capacity grows at a compound annual growth rate (CAGR) of approximately 8% and 10%, respectively, per year until 2040, and 44% of carbon mitigation will come from energy efficiency to offset the growing demand for energy. Further declines in the cost of renewables and, in some scenarios, the impact of high

carbon pricing leads to the retirement of most of our thermal assets by 2040. As a result, our Clean Energy Growth Platforms provide the vast majority of margin under all scenarios, and the growth in our clean energy businesses more than compensates for reduced margins from conventional power. The stress test conclusion is that our corporate strategy is resilient across the three scenarios.



The stress test results highlight the resilient nature of our strategy in three primary ways:

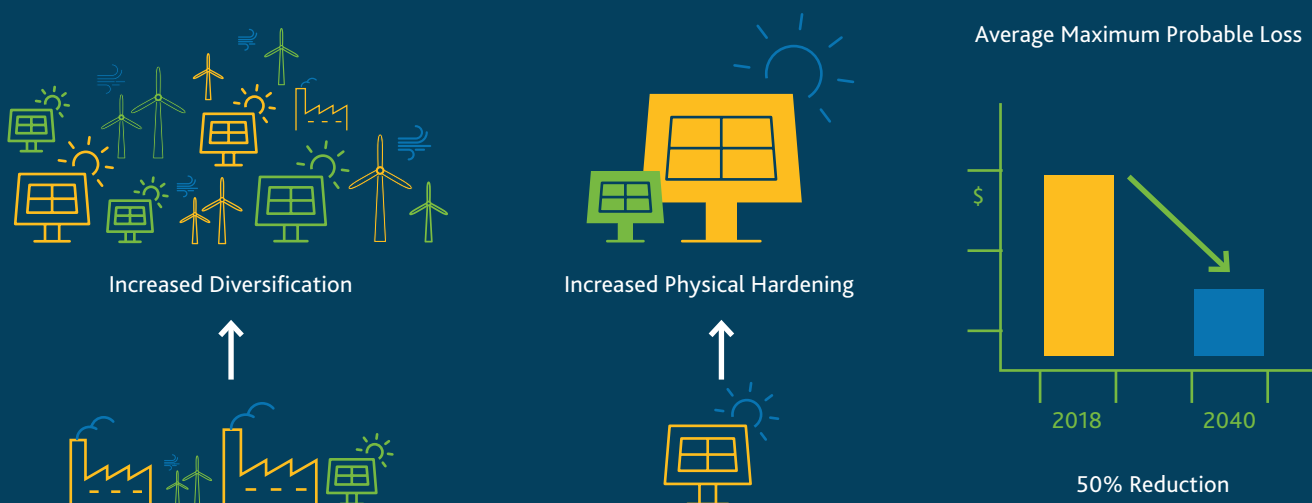
- **Fundamental shift in our portfolio to clean energy sources and services:** Our growth is largely derived from our Clean Energy Growth Platforms, which, for the most part, are not adversely exposed to a carbon price. One way that we have been funding our platforms is through the divestment of a portion of our thermal portfolio, resulting in further reduced exposure to a carbon price.
- **Geographical diversification of our exposure:** We operate across 15 countries, inherently reducing our risks to any individual government's carbon policy.
- **Strong contracts that protect margin:** Our PPAs usually provide for capacity payments, which are unaffected by the amount a plant is dispatched as their purpose is to compensate generators that support the grid by being available to provide energy whenever needed. Please see *Focusing on Reliability and De-risking Our Thermal Assets* for more information on capacity payments. Reduced dispatch due to carbon prices should not alter capacity payments, which typically provide all or most of the margin for these assets. Additionally, most of our PPAs have provisions intended to pass-through future costs of carbon to our off-takers.

### We are mitigating physical risk by building our assets for future exposures and diversifying the physical risk of our portfolio.

As a long-time owner of power infrastructure across the globe, we have been exposed to climate risks such as storm events, flooding and droughts, and have applied lessons on design, construction and operation to the way we run and build our portfolio. Unlike many regulated utilities and power companies whose assets may be concentrated in a single or a few geographic areas, our portfolio spans 15 countries and multiple continents. As we shift our underlying business from fewer large conventional power sources to more, smaller renewable assets, the stress test highlights that the average maximum probable loss within our portfolio (i.e., the maximum loss we would expect to occur at a facility due to an insurable event, including physical damage and business interruption, and adjusted for probability) declines by 50%.

In the event that any of our assets are impacted by a climate event, we leverage a combination of self-insurance and third-party insurance to reduce our exposure. We believe that our use of a captive insurance model provides us with enhanced visibility into our underlying physical risks and creates a feedback loop that incentivizes us to invest in capital projects that harden our assets from physical risks. We have considerably improved the risk profile of our portfolio through reduction in loss expectancy by implementing over 2,000 internal risk reduction recommendations from a team of engineering experts over the last five years.

## OUR STRATEGY REDUCES AVERAGE MAXIMUM PROBABLE LOSS OF THE PORTFOLIO



Not all of AES' assets are insured through its captive insurance company, however, the full portfolio of assets has been depicted to illustrate the total physical risk exposure.





## OUR MISSION:

Improving lives by accelerating a safer and greener energy future.

## WE SEE TREMENDOUS OPPORTUNITY

We are guided by our mission of improving lives and will continue to prepare our business and the world for the future in ways that benefit people, businesses, and society. With the world increasingly dependent on electricity, it is the partnership between companies like AES and our customers that will create the most meaningful progress toward aggressive climate objectives.

We work with our customers and stakeholders to transform the fuel mix of whole economies, deploying new technologies that provide clean, affordable electricity by expanding and accelerating access to new forms of power. Through this process we are shifting our portfolio and innovating customer solutions with both our Green Blend and Extend offering, which systematically replaces coal with lower cost renewables over time, and our Clean Energy Growth Platforms. This collective win-win action, driven largely by the commercial interests of the parties, is already making a material improvement in carbon emissions while benefiting the shareholders of the companies involved. We are able to competitively grow these solutions through financial partnerships with investors seeking the larger scale and reduced risk profile our strategy delivers.

**The 1.5-2°C Scenario assumes global wind and solar PV electrical capacity grows at a compound annual growth rate (CAGR) of 8% and 10% respectively per year until 2040.**

Energy related companies and utilities are experiencing rapid change in technologies and business models. AES' strategic commitment to being a leader in technology applications for energy allows us to benefit from this change by better serving our mission while improving our competitiveness. Driven by this commitment, we have taken the lead in forming several technologies into practical business solutions from the introduction and development of our world leading Lithium-ion battery products for utilities over the past decade, to the rigorous scaling of drone technologies across our operations. The talents, creativity, and dedication of AES people have been and will continue to be central to such technology leadership.

Our strategy to grow our business and our platforms in renewables, energy storage, LNG and smart, energy efficient grids puts us at the convergence of several trends that are transforming the energy sector. The cost of renewables has consistently declined over the last decade, putting these technologies at or near grid parity in many markets.

Customers, nations and energy markets alike now demand cleaner sources of energy, further fueling the build out of renewables and expanding the opportunity to provide grid reliability solutions. We also see wide-scale electrification as part of the climate change solution as many markets are investing in energy efficiency and decarbonizing the transport sector through electric vehicles and LNG. This electrification and cleaner energy trend is expected to go beyond transportation to nearly every sector, including industrial machinery and agriculture. There is an ongoing fundamental shift that decouples economic growth from carbon emissions, and AES is poised to accelerate this shift with our Clean Energy Growth Platforms, while capturing value for shareholders.

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FOR THE WHOLE COMMUNITY.

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DP&L customer campaign focused on associated savings from rate-based energy efficiency projects.



## BALANCING RISK AND OPPORTUNITY

Climate change presents AES with a host of risks and opportunities. Our job is to manage these appropriately and to position the company in a way that is consistent with our mission and maximizes long-term shareholder value. As a power company, these risks and opportunities are intrinsic to our industry, and thus deeply rooted in our corporate strategy. They inform our decisions for how to best provide safe and reliable power, develop the energy solutions our markets need and build resilient infrastructure. AES is focusing on natural gas and zero-emission renewable energy like solar, wind and energy storage in its strategy. This helps mitigate risks while leveraging opportunities created by climate change. Since 2016, we have reduced our direct carbon exposed margin while growing our overall margin through our focus on long-term contracting, clean energy growth and strategic asset sales. Please see *Transition Risk Resilience* for more information on direct carbon exposed margin.

## TAKING A PORTFOLIO VIEW

We take a portfolio view to create value and reduce risk. Our geographic footprint spans 15 countries and we use a diversity of

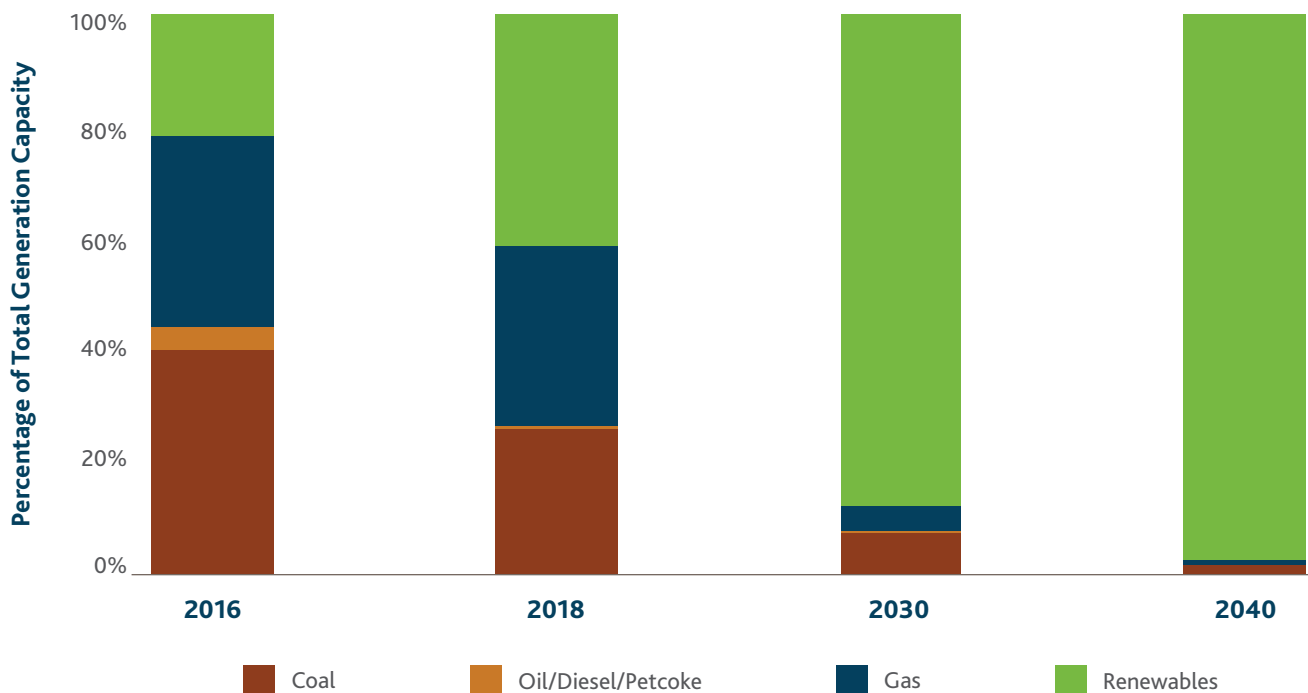
fuel types across more than 100 generation facilities and six utilities to meet the needs of the markets we serve.

Since 2016, we have taken significant actions to reshape and de-risk our portfolio by:

- Adding 1.5 GW of natural gas and renewable generation and signing long-term PPAs for an additional 1.9 GW of wind and solar.
- Selling or shutting down 4.3 GW of thermal plants, or 37% of our coal-fired capacity.
- Extending the average contract life of our assets from 7 years to 10.

As a result of our efforts to decrease our exposure to coal-fired generation and increase our portfolio of renewables, energy storage and natural gas capacity, we are significantly reducing our carbon dioxide emissions per megawatt hour (MWh) of generation. In early 2018, we set a target to reduce our carbon intensity, as measured by carbon dioxide emissions per MWh, by 25% from 2016 to 2020 and by 50% by 2030. With the publication of this report, we are increasing the 2030 target from 50% to a 70% reduction of carbon intensity. In a 1.5-2°C Scenario the stress test shows that reductions in carbon intensity would be further accelerated and would avoid additional emissions in our portfolio by 2030 and 2040. Please see our *Sustainability Report* for current and previous three years Scope 1, 2 and 3 emissions.

## CURRENT AND FUTURE STATE PORTFOLIO IN A 1.5-2°C SCENARIO



Future capacity mix is simulated as a result of the 1.5-2°C Scenario referenced in this report and, therefore, may not reflect how AES' portfolio evolves. This estimation is contingent on power price assumptions leveraged from the third-party climate scenarios assessed, which play a part in the calculation of margin and the resulting cash we are able to reinvest to build clean energy projects.



## BUILDING RENEWABLE ENERGY ASSETS

A cornerstone of our corporate strategy and future growth is shifting our portfolio toward less carbon-intensive sources of generation with an emphasis on zero-carbon technologies like wind and solar. According to Bloomberg New Energy Finance, costs of solar and wind have declined 44% and 23%, respectively, over the last five years. Many forecasts expect this trend to continue, with wind and solar becoming the largest sources of new generation over the next few decades. In several markets solar and wind are already at grid parity with traditional sources of generation.

The climate scenarios assessed in this report show that renewables account for over a third of the total carbon abatement needed to take the world from the Greener Scenario (2-3°C) to the 1.5-2°C Scenario (2°C or below). The third-party climate scenarios estimate that, in the 1.5-2°C Scenario, global wind and solar capacity will need to grow by approximately 8% and 10% per year, respectively, between 2016 and 2040. This is more than double the wind and solar capacity projected to be built by 2040 in the Business as Usual Scenario (3-6°C).

Across AES' businesses, we expect to sign Power Purchase Agreements (PPA) in multiple countries for 7.5 GW of new renewable projects between 2018 and 2020. This represents an increase of more than 20% of our total portfolio capacity with clean sources of energy in just three years. We also expect to incorporate energy storage into many future renewable projects, as we have done with AES Distributed Energy's 47 MW of solar photovoltaic capacity and 34 MW of five-hour duration battery-based energy storage in Hawaii.



## EXPANDING OUR RENEWABLES PORTFOLIO

In 2017, we acquired roughly 1 GW of wind and solar generation in Brazil and Mexico.

2017:

## Acquired sPower, the leading independent solar operator and developer in the US



sPower's 72.9 MW Redwood Solar Farm cluster in California.



## ACCELERATING ENERGY STORAGE ADOPTION

We believe that battery-based energy storage is one of the keys to unlocking a cleaner energy future. As utilities face increasing challenges integrating intermittent generation sources, there is a critical need for grid stabilization and reliability support. Energy storage is a proven, cost competitive solution with global demand expected to grow tenfold in five years and reaching at least 28 GW of installed capacity by 2022. Bloomberg New Energy Finance estimates that the energy storage market will reach \$100 billion of cumulative investment by 2030. AES' energy storage systems represent one of the world's largest battery-based energy storage fleets, with over 450 MW in operation, under construction or in advanced development across six countries.

In 2018, we partnered with Siemens to form Fluence, a new global energy storage technology and services company. The combined company has deployed or been awarded over 650 MW of energy storage projects in 16 countries around the world. Through a sales partnership with Siemens, Fluence has the ability to sell energy storage solutions and services in 160 countries as this market continues to grow.

Storage projects provide flexible capacity needed to support a low-carbon electric grid. Energy storage serves as a key complement to renewable resources, such as solar and wind generation, and will play a critical role in integrating these technologies seamlessly into the grid.

**2018:**

## Partnered with Siemens to launch Fluence energy storage joint venture

# FLUENCE

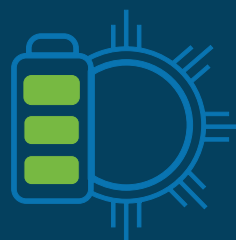
A Siemens and AES Company



Arizona Public Service, a 2 MW, 4-hour duration system that will take the place of rebuilding about 20 miles of transmission and distribution poles and wires.



AES Hawaii solar-plus-storage 47 MW of solar photovoltaic capacity and 34 MW of five-hour duration battery-based energy storage project under construction.



## ENERGY STORAGE SOLUTIONS & SOLAR PROJECTS

We are developing solar-plus-storage projects in Hawaii, on the island of Kaua'i, utilizing 47 MW of solar photovoltaic capacity and 34 MW of five-hour duration battery-based energy storage. This will allow for emissions-free energy for most of the day and night. When completed, this fleet will be one of the largest solar-plus-storage installations in the world.



Energy storage solutions are proven to provide unmatched system flexibility and resiliency, providing critical support when it's needed. During Hurricane Maria in 2017, our two 10 MW projects in the Dominican Republic remained fully operational during the storm, helping stabilize the grid and keep the lights on.



## FINDING NEW OPPORTUNITIES FOR LNG

By investing in LNG platforms, we are improving the environmental and economic well-being of consumers in the Caribbean and Central America by substituting carbon-intensive, and often expensive fuel oil and diesel, with clean-burning natural gas.

In 2003, we introduced natural gas to the Dominican Republic’s generation mix which had previously relied primarily on fuel oil and diesel power. We constructed an LNG import terminal and storage and regasification facility along with the adjacent AES Andres 319 MW combined cycle gas turbine power plant (CCGT). AES Andres has greened the country’s electricity and transportation markets, resulting in lower prices for customers, fewer emissions and savings to the Dominican government of more than \$2 billion in electricity costs since the inception of the LNG terminal in 2003. This approach is helping to transform the transportation sector, as trucks have been switching from diesel to natural gas, which they get either directly or indirectly from the terminal. We are also developing a pipeline to connect our LNG terminal to oil-fired power plants owned by third-parties in order to switch them over to cleaner and cheaper natural gas.

Another LNG receiving terminal will begin operations in Panama in 2019. With slightly larger capacity than AES Andres, AES Colón will serve AES Panama’s adjacent 381 MW power plant and meet the regional and domestic demand for natural gas, including from the downstream transportation sector.

We typically support our LNG regasification investments with long-term commitments from our adjacent gas-fired power plants to purchase sufficient volumes of LNG that cover our costs of building the LNG terminals. In addition, we design these facilities for potential expansion with storage and regasification capacity to meet demand beyond that of our co-located gas plants. This expansion potential enables us to achieve upside growth for additional power plants, commercial and industrial customers in the region, the transportation sector and other end-use customers who seek to utilize cleaner natural gas that can be delivered from our LNG terminals. Many of these customers purchase a structured product that delivers LNG or regasified LNG and remunerates us for storage and regasification services, contributing incremental margin to our businesses.



AES Colón 381 MW CCGT plant in Panama co-located with AES Colón LNG terminal.

## DRIVING CUSTOMER-CENTRIC ENERGY EFFICIENCY AND UTILITY GROWTH

Energy efficiency and load management will be key to limiting emissions while supporting continued economic growth across the globe. The third-party climate scenarios assessed suggest that in order to stay within a 2°C increase, close to 45% of global carbon abatement will need to be achieved through energy efficiency when compared to the global carbon levels in the Greener Scenario (2-3°C). A large portion of this growth is expected on the customer side of the meter, but there is also a significant growth opportunity within utility platforms to upgrade to more modern systems and infrastructure. Several countries are implementing reforms in the buildings and

The screenshot shows the IPL Marketplace website interface. At the top, there's a navigation bar with the IPL logo and 'MARKETPLACE' text. Below that, a horizontal menu lists various product categories: Smart Thermostats, Connected Home, LED Lighting, Advanced Power Strips, Air Filters, EV Chargers, Water Saving Products, Rebated Products, and Buyer's Guides. The main content area features a large banner with the text 'COMFORT. CONTROL. SAVINGS.' and a sub-link 'VIEW ALL SMART THERMOSTATS'. Below the banner, a 'FEATURED PRODUCTS' section displays three smart thermostat models: the ECOBEE4 WIFI THERMOSTAT with a price of \$199, the 3RD GEN NEST LEARNING THERMOSTAT with a price of \$199, and the NOTION SMART HOME MONITORING KIT with a price of \$149. Each product listing includes a small image of the device and a note about a \$50 instant rebate. At the bottom of the page, there are links for 'About Us', 'Privacy Policy', and 'Terms of Service', along with a logo for 'powered by SIMPLE energy'.

IPL Marketplace enabled by Simple Energy delivering higher customer satisfaction and rate-based growth through rebate programs.

industrial sectors that improve standards for energy efficiency, and companies are finding innovative ways to help customers improve their energy use through smart and connected systems. As mentioned previously, the Greener Scenario (2-3°C) estimates that global annual investments in energy efficiency will grow by 180% from current levels to almost \$800 billion in a scenario where countries execute on announced carbon policies. In other markets, remotely adjusting consumer energy demand during periods of high grid burden can reduce energy use and costs across the system by avoiding excess peak capacity.

AES recently became a strategic investor in Simple Energy, a leading provider of utility-branded marketplaces and software that helps utilities engage customers on managing energy use. The utilities working with Simple Energy serve nearly 30 million end customers. Simple Energy’s digital enablement for these utilities allows them to



increase adoption of rate-based demand management and energy efficiency solutions. Two of our subsidiaries, Dayton Power & Light Company (DP&L) and Indianapolis Power & Light Company (IPL), have partnered with Simple Energy to provide their customers greater access to energy savings and rebates while allowing them to maximize the impact of their demand side management programs. We are excited about our early progress and look forward to scaling this capability beyond the US market.

## FOCUSING ON RELIABILITY AND DE-RISKING OUR THERMAL ASSETS

Most of AES' generation assets have long-term PPAs with creditworthy off-takers. Under these PPAs, AES typically receives both a capacity payment and an energy payment. The capacity payment is generally intended to provide a reasonable return on the fixed costs associated with developing and building the power plant and other costs such as debt and fixed operations and maintenance costs. The energy payment is intended to cover variable operations, maintenance and fuel costs and is considered more of a pass-through payment. Under most PPAs, the capacity payment is required to be made regardless of how much electricity is generated by the plant, while the energy payment is made in proportion to the electricity generated.

One reason for this structure is that all electricity markets require stability and reliability support in order to serve power. There will always be moments when the wind is not blowing or the sun is not shining, or when malfunctions in one part of the grid need to be compensated for in other parts to meet demand. It is for these reasons that capacity markets exist, which allows generators to be paid for the availability services they provide in cases when they need to ramp up production on command. As these payments enhance grid reliability, they are inherently less carbon-intensive than energy payments. A vast majority of the margin from our thermal plants comes from capacity payments.

We recognize that our thermal portfolio is a critical part of the infrastructure that supports communities around the world and we are working to reduce the greenhouse gas emissions of these assets. In doing so, we believe we have fundamentally shifted the majority of carbon policy risk from our portfolio.

- **Innovating how we dispatch:** In supporting reliability and a clean energy future, we are finding ways to run our coal generation sources at unprecedentedly low dispatch levels – in some cases as low as 20% of total potential power dispatch, which is among the lowest in the industry. By keeping these assets available for emergency situations but at a minimum run level, they can strengthen the grid, continue to preserve margins and emit much lower amounts of carbon dioxide.
- **Green blend and extend of contracts:** We are working with some of our off-takers of coal power generation to extend the terms of our contracts using renewable generation when it is considerably cheaper to do so than to burn fuel in thermal power plants. This allows us to reliably serve power at more cost effective rates, support development of cleaner power markets and, as a whole,

reduce carbon emissions by running our plants at lower levels.

- **Focusing on value during the contract period:** Our PPAs generally expire before the end of a plant's useful life, but we expect an adequate to attractive return over the PPA term. This means that by the time the contracts end, AES has typically derived the majority of the expected value from these assets, and the remaining asset life represents only a modest portion of their expected value, regardless of whether they are generating energy.
- **Repowering with gas:** We are exploring how we can also meet expectations for cleaner power by converting coal plants to run on natural gas. At Indianapolis Power & Light, we ceased coal combustion at two thermal plants and re-powered several units from coal to natural gas, reducing emissions of sulfur dioxide and particulate matter by greater than 90% from the two plants, in addition to reducing red mercury by nearly 100%. We also completed a multi-year investment in environmental upgrades to our remaining coal-fired units. Additionally, we have undertaken a repowering project for AES Southland, including a 1,284 MW combined-cycle natural gas power plant and 100 MW of energy storage capacity, which will increase fuel efficiency by 50%, reduce the need for fresh water by 65% and eliminate the use of ocean water.

## HARDENING ASSETS FOR A 2°C+ WORLD

AES has a long history of building and operating power infrastructure across the globe. We carefully consider the implications of severe weather in siting, design, engineering and operations in order to withstand physical environmental risks, and we have developed processes for operating within emergency events and for responding to disasters. Over the past few years, our business resilience and crisis preparedness plans have been tested successfully in severe natural disasters. Following these types of events, we have demonstrated our ability to effectively activate recovery processes, fulfill our contracts and access insurance coverage to minimize the impact. Our strength does not stop at the asset level – our portfolio has and is modeled to continue to have substantial geographic diversification.

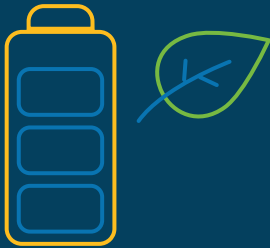


*Indianapolis Power & Light service representative.*



## RESILIENCE IN THE CARIBBEAN

Key examples of this resilience and diversification include our efforts in the Caribbean, which has experienced severe weather events recently.



During Hurricane Maria, our storage facilities in the Dominican Republic were not just resilient in staying fully operational during the storm, but also provided stabilizing support to the grid when other power sources could not at that time.

In Puerto Rico, while our 24 MW Ilumina solar plant sustained modest damage during that same storm, we only sustained limited damage to our 524 MW coal-fired AES Puerto Rico plant. Our teams were able to restore both facilities within a few weeks.



Hurricane Irma severely damaged one of the solar plants we acquired in the US Virgin Islands. Through the use of our captive insurance model, we will apply the lessons learned to other projects we acquire or build in the future to minimize potential loss.



AES Andres LNG Terminal in the Dominican Republic with co-located AES Andres 319 MW CCGT plant and 10 MW energy storage facility.



Ilumina, AES' 24 MW solar plant in Puerto Rico.

# Our Approach to Risk Management



## RISK MANAGEMENT MODEL

Climate change risk is assessed and discussed at several levels within our company. Business level impacts are discussed at the regional business unit level while consolidated impacts are reported up through senior management and to the Board of Directors. The discussions can include near-term quantification and longer-term action plans to manage climate-related risks. AES integrates its risk identification process across the whole company through our formal Risk Management Committees (RMC) and Risk Oversight Committee (ROC). At the local level, each business aggregates risks and opportunities and reports monthly at the RMC.

At the parent company level, risks are discussed among our Executive Leadership Team (ELT) at both the ROC and the Company's Investment Committee. Risks are closely monitored, and critical risks are analyzed and addressed with close coordination between our operations, finance and commercial teams. Our risk process and action planning allowed for 20 MW of energy storage to be deployed in the Dominican Republic just a few weeks before Hurricane Irma hit in 2017 and assisted the island nation in keeping power supplies running during the devastating storm.

## RISK MANAGEMENT MODEL



### Board of Directors

#### Board Committees

- Governance Committee
- Innovation & Technology Committee



### Corporate

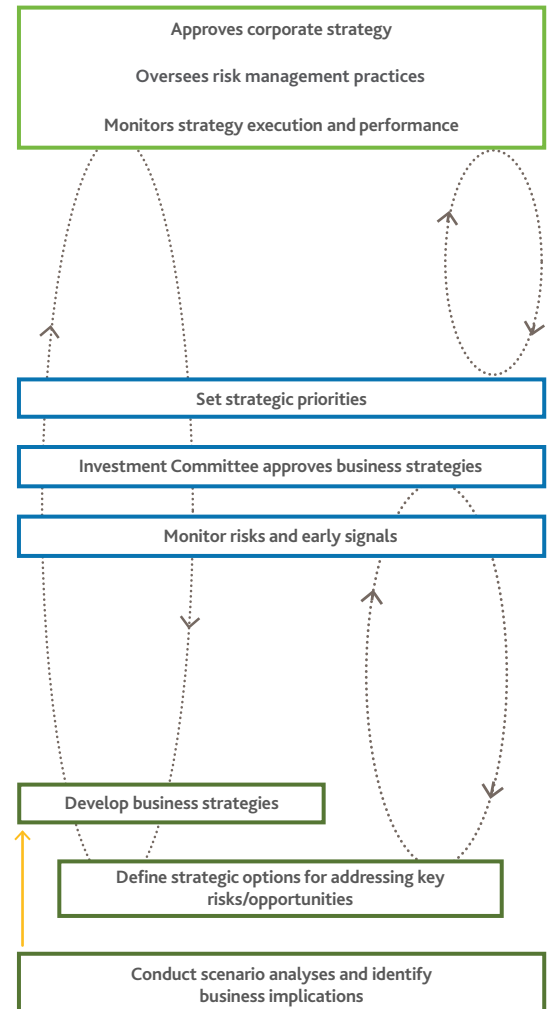
#### Executive Leadership Team

- Investment Committee
- Risk Oversight Committee
- Hydrology Risk Committee
- Captive Insurance Program



### Strategic Business Units

- Risk Management Committee
- Compliance Functions







AES' risk management process includes a Hydrology Risk Committee (HRC). The HRC serves as the company's center of excellence for hydrology and is responsible for identifying, monitoring and establishing best practices around hydrology risk on both a portfolio and individual business basis. The HRC meets regularly and reports to the ROC at least quarterly, and more frequently to the ELT as hydrological conditions warrant.

Another strength of our risk management approach is our use of a captive insurance program. We believe that our captive insurance model provides us with a unique understanding of our underlying physical risks and creates a continuous improvement feedback loop within the organization. We have a risk engineering team that assesses global facilities, identifies risk mitigation recommendations and tracks progress on implementation. We have considerably improved the risk profile of our portfolio through reduction in loss expectancy by implementing over 2,000 internal risk reduction recommendations of our engineering experts over the last five years. On average, our business units are exposed to a \$1 million deductible per event and we retain an additional \$40 million of exposure within our wholly-owned captive insurance company with excess exposure ceded to reinsurers. We maintain reserves within our captive insurance company equal to its aggregate exposure, further protecting AES in the case of losses. In a recent case, this coverage has already helped us recover most of the necessary proceeds in order to place our 24 MW solar plant in Puerto Rico back into service after it was damaged in Hurricane Maria.

## INTEGRATION OF RISKS AND OPPORTUNITIES IN STRATEGY PLANNING

AES undergoes strategic planning at the parent company annually and at the business levels periodically where we define and track our goals and targets, which include actively analyzing the risks and opportunities related to climate change. Our planning process is designed to identify the key internal and external drivers that have a significant impact on value creation. This process involves risk and scenario analysis based on those drivers and helps identify priority projects for selected strategic options. Once a business strategy and measurable goals are defined, they are approved by the Investment Committee, consisting of a group of senior leaders of the company. Corporate strategy is separately approved by the AES Board.

AES' business strategy formulation process combines analytical tools and innovation principles to assess long-term risks and opportunities and define the strategy to be followed by the given market or region. The process incorporates data and analysis to quantify multiple long-term views of the future and their impact on our businesses with a view to enhancing our decision-making process. This scenario analysis involves identifying key uncertainties and their drivers to model these "Multiple Views of the Future" for both quantitative and qualitative business implications. A system is put in place to monitor the evolution of the strategy.

Through this strategy process, AES developed its LNG strategy in the Mexico, Central America and Caribbean region. The LNG strategy leverages our two LNG terminals in the region to substitute cleaner natural gas for the fuel oil and diesel traditionally used in power plants and the transportation sector throughout the region. In addition to guiding businesses as they define their strategy and set their own targets and goals, the businesses' strategy process is key to developing AES' corporate strategy and influences the parent company's multi-year strategic plans.

Overall, our management team is responsible for the execution of our strategic priorities, which include scaling our Clean Energy Growth Platforms and reducing our carbon intensity. As we look to scale our clean energy growth, the Investment Committee has defined a process for prioritizing investment opportunities by a projects risk profile, earnings and cash contribution and whether it "greens" the portfolio. Additionally, our company's management's compensation structure includes performance metrics tied to achieving our strategic goals, such as growth in renewables and LNG.

## BOARD RESPONSIBILITIES

AES' strategy and risk profile are discussed as part of each Board meeting. The full Board approves our corporate strategy, which considers risks and opportunities relating to climate change. The Board receives a risk report at each meeting that identifies top risks and major market trends. They then oversee the risk management practices implemented by management and maintain oversight over such risks through receipt of reports from the Committee Chairpersons at each meeting.

Two committees of the Board have direct responsibilities relating to climate change related issues. The Governance Committee oversees all environmental, social and governance issues. Other responsibilities of the Governance Committee include reviewing our commitment to acting in a socially responsible way, and monitoring environmental and safety compliance of the company and our subsidiaries. The Innovation and Technology Committee oversees AES' efforts to foster growth through innovation and to address risks, opportunities and the application of emerging technologies in the power industry. These technologies include renewables, energy storage, LNG and energy efficiency, all of which comprise key parts of our Clean Energy Growth Platforms.



## OUR APPROACH TO STRESS TESTING

We use scenario analysis to test our portfolio’s resilience under various climate change scenarios in alignment with the guidance developed by the TCFD. Our climate resilience stress test is fundamentally an in-depth financial analysis assessing the sensitivity of gross margin across our entire business – from every individual plant, up through to our strategic business units. We used simulations to evaluate third-party assumptions and examine the potential impacts to gross margin out to 2040 across three scenarios. Our effort was guided by a steering group consisting of members from our financial planning and analysis, corporate risk and strategy, sustainability, legal, operations and other teams.

## A NEED FOR STANDARDIZATION

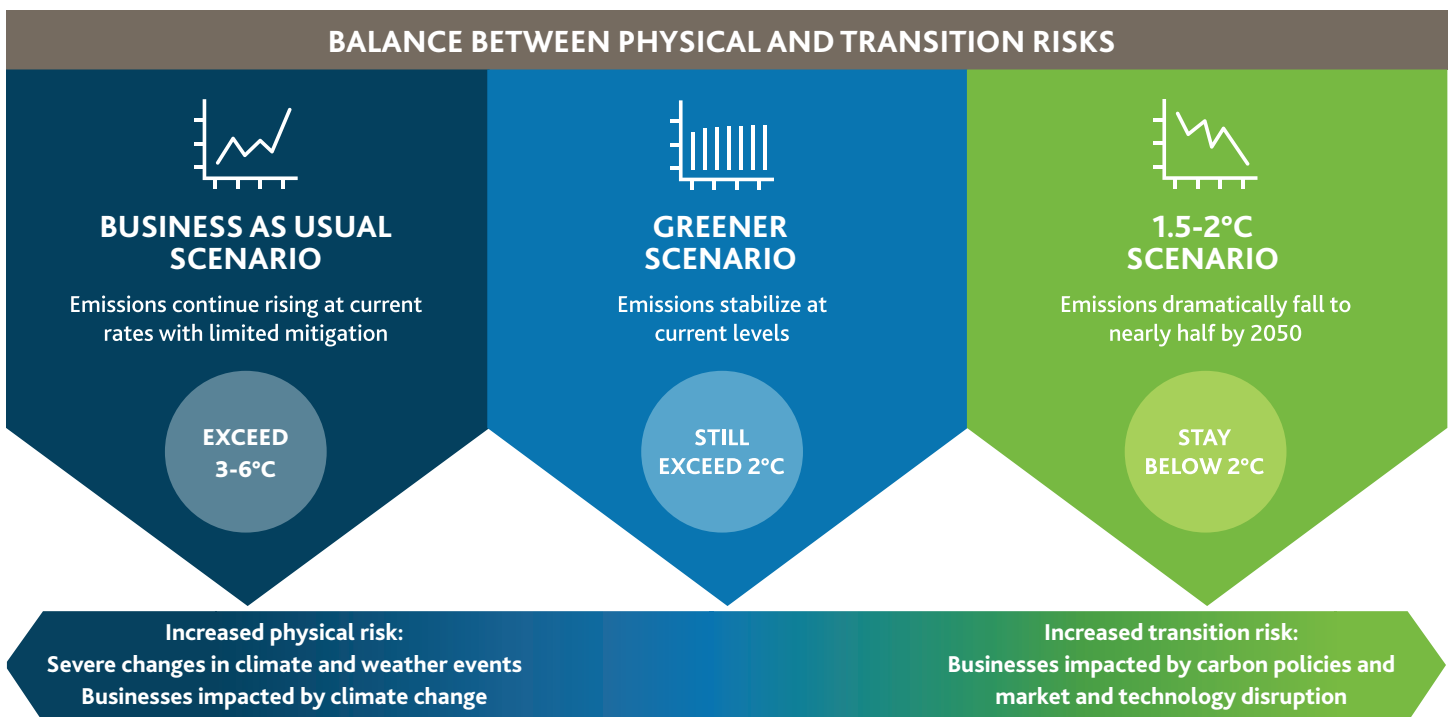
The TCFD and other proponents of scenario planning for climate change impacts have highlighted the importance of using standardized third-party scenarios in order for investors to compare climate resilience across companies. It has also been recommended that companies use a range of scenarios where at least one scenario is built around the achievement of limiting global temperature rise to 2°C above pre-industrial levels. We stress test our portfolio against scenarios developed by independent, recognized organizations and reference the assumptions provided as closely as possible. While AES’ view of the future might differ from the reference scenarios with regard to the assumptions, we recognize that the use of consistent

and comparable data by multiple companies may make it easier for investors to evaluate and compare these companies. The scenarios chosen are described in *Building the Scenarios*.

## SCOPE AND BOUNDARIES

The stress test includes all of AES’ global assets, both current assets and planned assets that have been publicly announced at the time of this report. We account for our equity stake in each asset as well as any announced retirements or divestments. A significant portion of future cash flow is assumed to be reinvested in our Clean Energy Growth Platforms. To understand the full implications of potential climate change impacts to our business, it is important to assess a spectrum of scenarios.

The 1-5-2°C Scenario envisions a world characterized by strong climate policy action to curb emissions and presumes there are increased transition risks as businesses adapt to the pace of climate policies needed to avoid a 2°C increase. The Business as Usual Scenario envisions a world that reaches high concentrations of carbon dioxide in the atmosphere, leading to physical risks from extreme weather events and heat, rising sea levels and more intermittent water flows.



Please see *Building the Scenarios* for more information on each scenario.

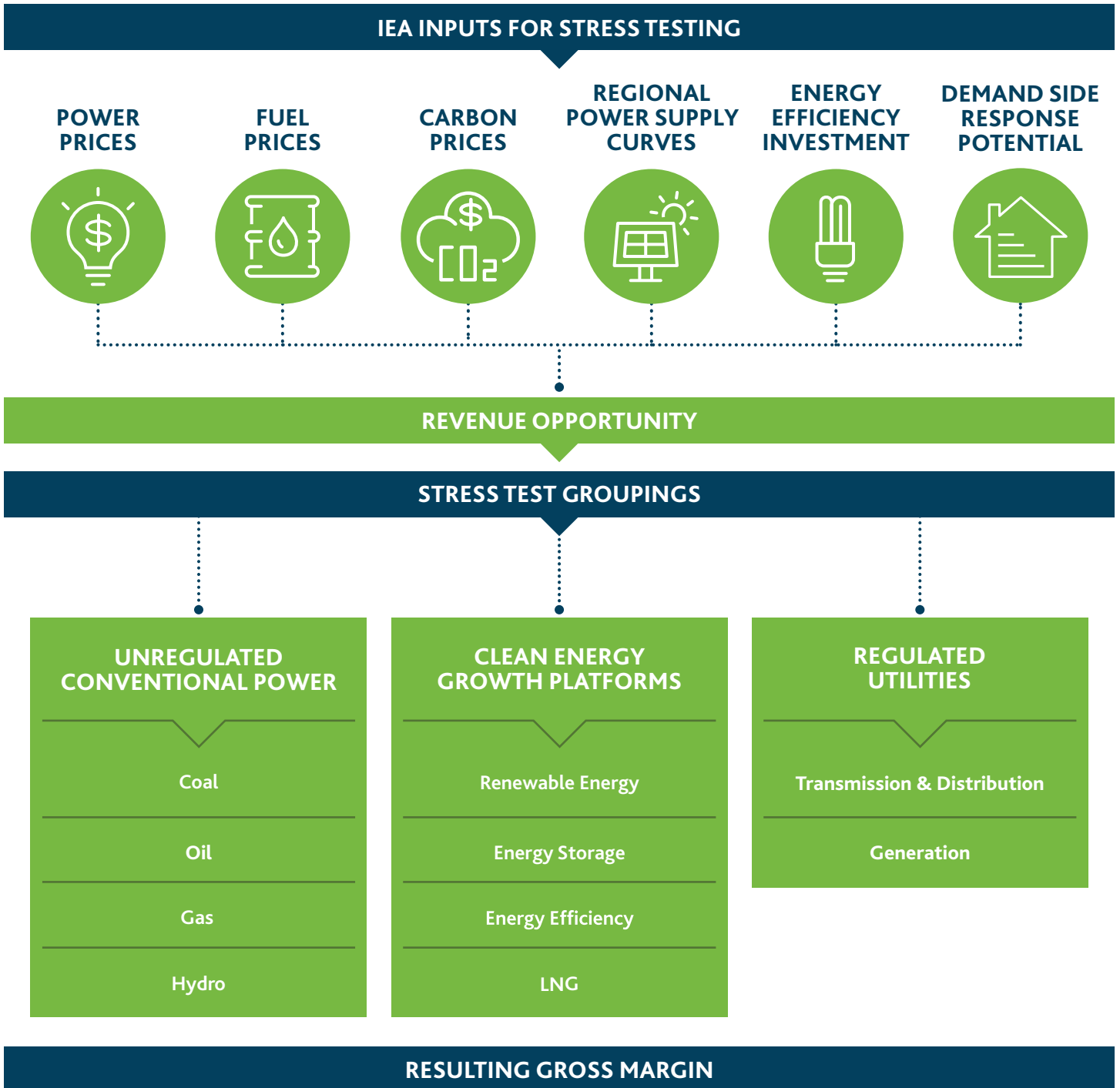


## POTENTIAL CLIMATE RISK IMPACTS

On the whole, our portfolio is diversified across geography and technology, representing a point of relative strength in our overall strategy and resilience. For purposes of the stress test, we have analyzed our business using the following high-level groupings to

articulate the connection between our strategy and resilience to climate change:

- Unregulated conventional power generation.
- Clean Energy Growth Platforms.
- Regulated utilities.



# Building the Scenarios



Our stress test approach is aligned with the assumptions and outputs of third-party frameworks as closely as possible. We have chosen the most recent transition risk scenarios presented by the IEA's 2017 World Energy Outlook (WEO), and the physical risk scenarios – known as Representative Concentration Pathways (RCPs) – established by the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5).

While the IEA studies the implications of climate-related policies on the energy system, the IPCC assesses the resulting climate impacts from varying degrees of CO<sub>2</sub> concentration and mitigation in the atmosphere. We have grouped the IEA scenarios and IPCC RCPs as closely as possible.

AES SCENARIO CONVENTION	TRANSITION RISK IEA WEO 2017 SCENARIOS	PHYSICAL RISK IPCC AR5 SCENARIOS
<b>Business as Usual Scenario</b> 3-6°C	<b>Current Policies Scenario (CPS)</b> 6.0°C Considers policies and measures enacted into legislation by mid-2017	<b>RCP 8.5</b> 3.2-5.5°C Global emissions continue rising at current rates; likely not to exceed 4°C
<b>Greener Scenario</b> 2-3°C	<b>New Policies Scenario (NPS)</b> 2.7°C Models existing policies and announced policy intentions for the energy sector	<b>RCP 6.0</b> 2.0-3.7°C Global emissions rise to 2080 then fall; likely to exceed 2°C
<b>1.5-2°C Scenario</b> 1.5-2°C	<b>Sustainable Development Scenario (SDS)</b> 1.5-2.0°C Examines where the energy sector needs to stand in 2040 to achieve policy goals in line with the UN's SDS: urgent action on climate change, universal access to modern energy by 2030 and reduction in air pollution	<b>RCP 2.6</b> 0.9-2.3°C Global emissions halved by 2050; not likely to exceed 2°C

It is important to note that the time period envisioned under the stress test is also subject to the bounds of the scenarios – in this case, the IEA's scenarios selected for transition risk limit our analysis to 2040. The IPCC assesses CO<sub>2</sub> concentrations in 2050 and 2080. Both sets of scenarios refer to changes in global temperature that result from action taken over the next few decades.

We apply these scenarios as they are reported and to the extent information is available with as little judgment from AES as possible. There are many instances where the assumptions are impractical, contrary to current trends or do not represent AES' view of the future on which our corporate strategy is grounded, but they are modeled as presented for standardization purposes.

For example, our corporate strategy recognizes battery storage alongside solar and wind as a far more viable decarbonization pathway than carbon capture and storage (CCS) – a technology

that we currently believe is unlikely to be economical at scale in the time frame the IEA's SDS depicts. For the most part, the underlying technology pathway is not necessary for our modeled stress test outcomes, but we wanted to highlight the divergence in point of view here and note that we are not assuming CCS implementation at any AES facility.



## BUSINESS AS USUAL SCENARIO (3-6°C)

### Scenario at a Glance

A reference case where countries execute on the low range of commitments to reduce greenhouse gas emissions announced by mid-2017 leads to a world characterized by relatively little policy action, continued reliance on fossil fuels and resulting extensive changes in the climate due to failure to contain global temperature increases.

## AES' VIEW

This scenario presents high physical risk from increased severe weather events, creating increased importance on hardening our assets and skillfully managing exposure through insurance, geographic diversification and other measures. Renewables, energy storage, LNG and energy efficiency are likely to continue to grow significantly in this scenario but at more modest rates than in the other scenarios.

## BUSINESS AS USUAL SCENARIO

# ALIGNS IEA'S CPS AND IPCC'S RCP 8.5



Global carbon levels increase by 30% from today's levels

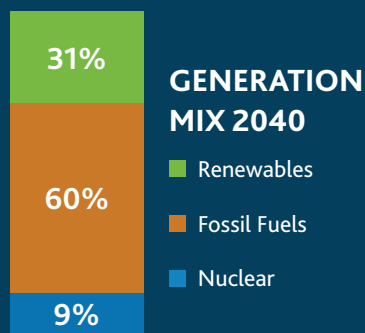


Carbon prices are relatively limited on emissions



Global electricity demand nearly doubles from today's levels

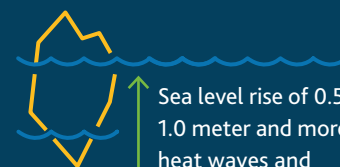
### The world is on a 2100 trajectory toward:



CO<sub>2</sub> concentrations 3-4 times higher than in pre-industrial levels by century end



3-6°C increase from pre-industrial levels



Sea level rise of 0.5-1.0 meter and more heat waves and changes in rainfall patterns by 2100

Characteristics of the modeled scenario presented here come from the Current Policies Scenario presented in the IEA's 2017 World Energy Outlook and from RCP 8.5 of the IPCC's Fifth Annual Report.



## GREENER SCENARIO (2-3°C)

### Scenario at a Glance

Countries fully enact existing policies to achieve prior commitments and related emissions targets. These policy and target likelihoods were assessed by IEA in the 2017 WEO's NPS and have been updated since the Nationally Determined Contributions were established for the Paris Agreement. This scenario avoids the worst impacts of climate change, but even with expanded climate initiatives, the world continues on a trajectory of more than a 2°C temperature increase, resulting in moderate climate changes.

## AES' VIEW

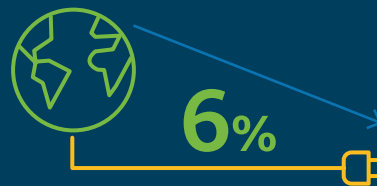
While current and announced policies on reducing carbon dioxide emissions will help limit global temperature increases, they are not expected to achieve a 2°C target. This scenario shows increasing policy support for growing renewables capacity and enhanced infrastructure, while still preparing for changes in the climate. Our investments in hardening our assets and natural business diversification help mitigate the physical risks of this scenario, while our Clean Energy Growth Platforms provide us with significant upside opportunities as low-carbon trends accelerate in the power industry.

### GREENER SCENARIO

## ALIGNS IEA'S NPS AND IPCC'S RCP 6.0



Global carbon levels decrease by 14% compared to the Business as Usual Scenario



Global electricity demand is 6% lower than in Business as Usual Scenario, even as electric vehicles play an increasingly larger role



Carbon prices implemented in select countries

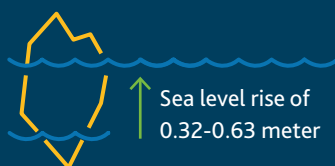
### The world is on a 2100 trajectory toward:



Stabilizing atmospheric CO<sub>2</sub> concentrations at twice those of pre-industrial levels by century end



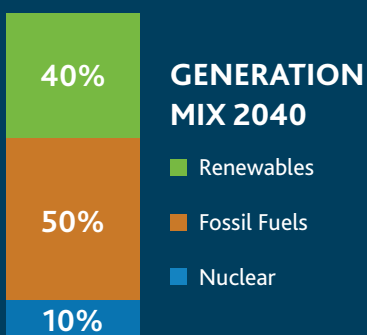
2-3°C increase from pre-industrial levels



Sea level rise of 0.32-0.63 meter



Generally mitigating the worst climate change impacts by 2100, but it is projected that there will be more frequent and longer heat waves, more unusually hot and fewer unusually cold days and regional trends will vary widely



Characteristics of the modeled scenario presented here come from the New Policies Scenario presented in the IEA's 2017 World Energy Outlook and from RCP 6.0 of the IPCC's Fifth Annual Report.



## 1.5-2°C SCENARIO (1.5-2°C)

### Scenario at a Glance

A vision – assessed by IEA in the 2017 WEO’s SDS – of where the energy sector needs to stand in 2040 to not only stay within a 2°C temperature increase, but also to achieve related policy goals including near universal access to electricity. Under this scenario, the world has a near even chance of staying within the 2°C temperature increase, thereby mitigating extreme impacts to climate and their associated physical risks.

### AES’ VIEW

Experts continue to highlight that global climate policy in general is not currently on track to limit warming to a 2°C increase. In striving to achieve the 1.5-2°C Scenario, we see great opportunity in the ability of energy storage to accelerate renewables deployment, stabilizing the electricity grid and, ultimately, decarbonizing the energy sector. We also see energy efficiency and load management as key to limiting emissions while supporting continued economic growth across the globe. This scenario presents the greatest upside of our Clean Energy Growth Platforms.

### 1.5-2°C SCENARIO

## ALIGNS IEA’S SDS AND IPCC’S RCP 2.6



Global carbon levels decrease by 55% compared to the Business as Usual Scenario



Global electricity demand is 12% lower than in the Business as Usual Scenario, due to:



Carbon price schemes are established in all advanced economies, and emerging countries implement cap and trade schemes



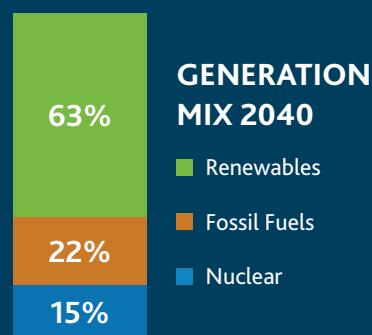
Electrification of all emerging economies



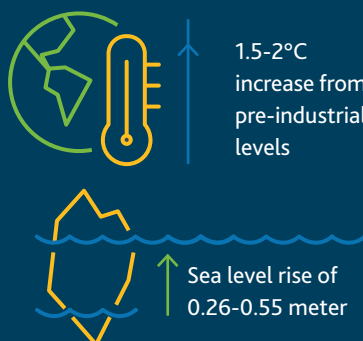
Strong energy efficiency measures



Tripling of electric vehicle deployment compared to the Greener Scenario



### The world is on a 2100 trajectory toward:



Generally mitigating the worst climate change impacts, but they are not completely avoided

Characteristics of the modeled scenario presented here come from the Sustainable Development Scenario presented in the IEA’s 2017 World Energy Outlook and from RCP 2.6 of the IPCC’s Fifth Annual Report.



## CORE ASSUMPTIONS

- AES' portfolio is constructed from current and announced investments and the portfolio is assumed to stay the same from current state, aside from any announced capacity additions, retirements and divestments.
- High-level future regional power prices available from the IEA can be applied to country-level power prices where AES operates.
- Power prices used in the 1.5-2°C Scenario simulation are derived from the only available power price information from the IEA, which is for the NPS. We adjust these NPS prices for the other scenarios in the stress test by applying the costs of carbon needed to be incorporated into overall system costs, which are derived from the IEA's regional supply mixes, carbon emissions and carbon prices.

## RECOMMENDED STRESS TEST IMPROVEMENTS

In aligning with TCFD guidance on scenario selection and in utilizing scenario outputs and assumptions from third parties, our stress test has highlighted the need for several improvements in the reference scenarios, including:

- Detailed and consistent visibility into assumptions and outputs across all three scenarios.
- Greater country level (and sub-country) specificity.
- Increased clarity around assumptions for energy storage and energy efficiency.
- Quantitative likelihood or probability measures for severe weather events.

We recognize that the TCFD guidelines are relatively new and evolving rapidly. As mentioned previously, we have endeavored to use recognized third-parties for scenarios and related assumptions whenever possible to allow for comparability across companies. In the future, as third-party established scenarios are enhanced, we will look to update our modeling and stress tests to take these enhancements into account.



*AES Energy Storage and San Diego Gas & Electric's Escondido 30 MW, 120 MWh energy storage facility in CA, one of the biggest lithium ion battery installations in the world.*





## HOW CLIMATE CHANGE COULD IMPACT OUR PORTFOLIO

Although the third-party scenarios used for the stress test are not necessarily aligned with AES' view of the future, they provide a standardized way for looking at our business under various climate change scenarios. The results from the stress test not only demonstrate our resilience under various scenarios, but also highlight how we are positioned to capture value from the accelerated deployment of low-carbon technologies and solutions across the electricity industry. Our corporate strategy is aligned with the global transition needed to stay within 1.5-2°C – increased reliance on renewables and cleaner forms of energy, support for intermittent sources and increased energy efficiency.

## TRANSITION RISK RESILIENCE

We categorize our conventional revenue sources in the stress test as direct carbon exposed and other gross margin. Direct carbon exposed refers to margin that has the potential to be directly and negatively affected by, or has been subject to, a price on carbon. This designation largely refers to fossil-fired energy margin from plants that are selling power on the merchant market, or plants that are contracted in a way that does not allow for a carbon price pass-through to an off-taker. Other gross margin refers to other conventional power sources that receive margin from capacity services, often with PPAs that allow for a carbon price pass-through or margin from our hydro assets. We also assess revenue sources from our regulated utility businesses that allow for rate recovery, and from our Clean Energy Growth Platforms. While we believe that most of our PPAs provide reasonable protection from carbon price risk through provisions intended to pass-through to the off-taker future costs of carbon pricing, there is the possibility of disputes over these terms and that we will not be successful in passing through such costs. Also, there is indirect carbon exposed margin if a counterparty becomes insolvent due to carbon pricing and fails to honor the terms of its PPA – please see *Item 1A-Risk Factors of our Annual Report on Form 10-K* for more information.

The stress test highlights the effectiveness of our efforts to mitigate climate change risk given the limited variance in the simulated margin results across the three scenarios, as well as the decreasing portion of our margin that is directly exposed to carbon pricing as we move from the simulated Business as Usual Scenario (3-6°C) to a 1.5-2°C Scenario. In fact, our Clean Energy Growth Platforms show the immense opportunity for AES under these climate change scenarios. Shifting our portfolio to cleaner sources of energy reduces our carbon exposure and our overall carbon intensity while creating significant upside margin growth over time in each of the scenarios. In the 1.5-2°C Scenario, where carbon prices reach \$125/tonne for emerging economies and \$140/tonne for advanced economies by 2040, our carbon exposed margin is immaterial as our existing thermal plants are considered to be retired at the end of their useful lives, divested or contracted

for reliability with the off-taker bearing the cost of carbon. The vast majority of the margin from these plants comes from capacity payments, which are not directly carbon exposed and are received regardless of the amount of energy generated.

Our Clean Energy Growth Platforms drive the majority of our future margin as we continue to take leadership positions in technologies such as renewables, energy storage, LNG and smart, energy-efficient grids. In 2018, our portfolio of operating assets is largely concentrated in contracted, thermal unregulated power plants as we continue to build out our Clean Energy Growth Platforms. By 2040, new margin from our Clean Energy Growth Platforms under all three scenarios is much greater than our total margin today. The value of the platforms in these scenarios are largely attributed to uplift from the IEA merchant power prices for a very large portfolio of renewables assets once their PPAs expire, as well as the high compounded growth of the platforms as we reinvest significant portions of our margins into additional Clean Energy Growth projects. This growth in our platforms is aligned with the 1.5-2°C Scenario, where renewables make up almost two-thirds of total global generating capacity and energy efficiency is estimated to reduce overall carbon dioxide emissions by 44% compared to the projected reductions in the Greener Scenario (2-3°C). Utility transmission and distribution platforms like AES' are expected to play a central role in this transition.

The stress testing results reflect reduced energy margin from our conventional unregulated power business. This reduction is not solely driven by carbon prices.

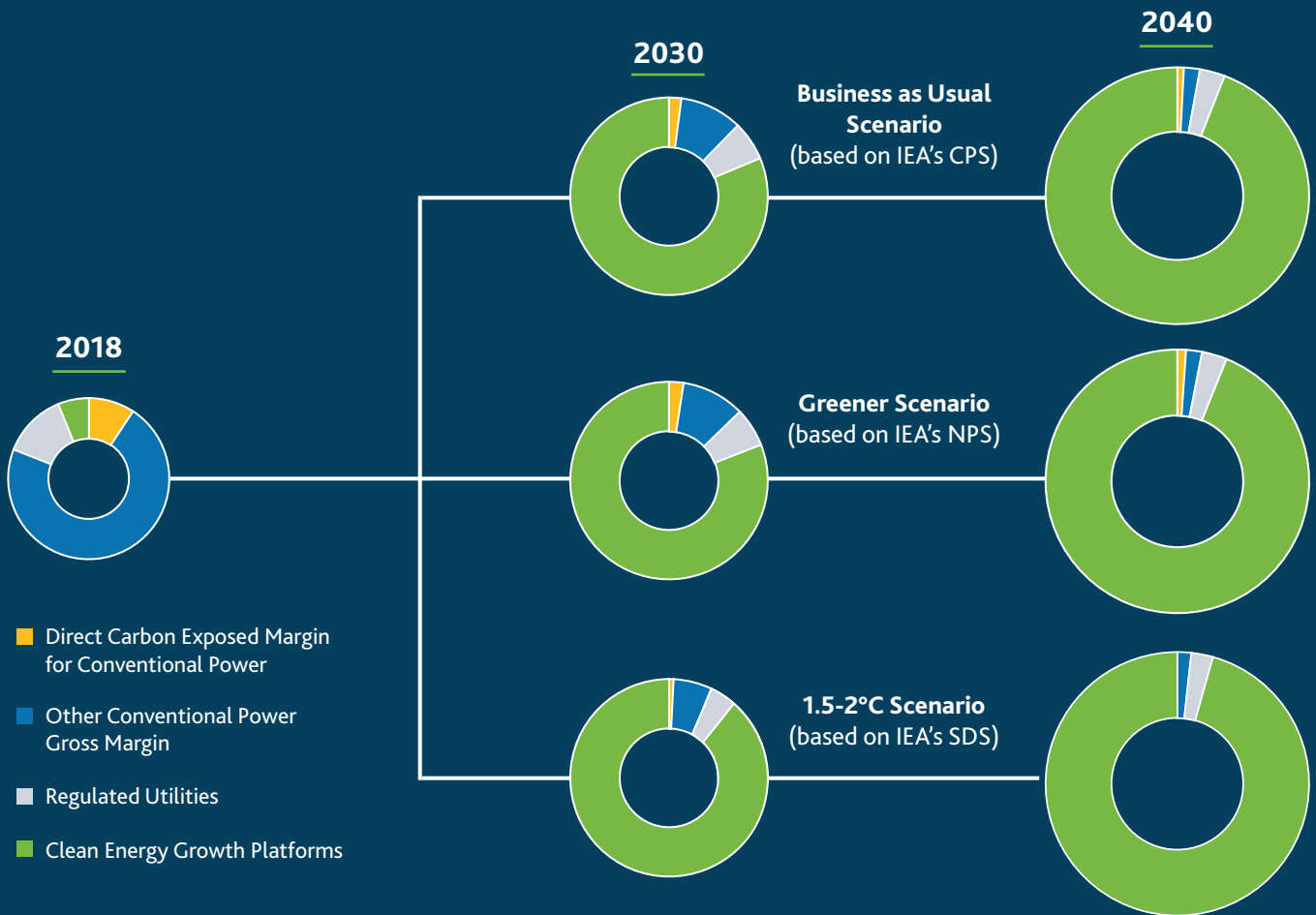
- Several of our thermal plants retire, divest or enter their merchant tail periods as their PPAs expire, regardless of the scenario.
- Merchant power price and fuel price assumptions from the IEA do not show positive energy margins in 2040 for thermal plants in a majority of the scenarios.
- For plants that continue to operate, we assume that existing payments for reliability, such as capacity payments, will extend into the future.

Further declines in the cost of renewables and, in some scenarios, the impact of high carbon pricing leads to the retirement of most of our thermal assets by 2040. As a result, our Clean Energy Growth Platforms provide the vast majority of margin under all scenarios, and the growth in our clean energy businesses more than compensate for reduced margins from conventional power. The stress test conclusion is that our corporate strategy is resilient across the three scenarios.

Given our focus on emerging markets for a significant portion of our growth, the Business as Usual (3-6°C) and the Greener Scenario (2-3°C) generally yield similar results. The 1.5-2°C Scenario shows the share of direct carbon exposed margin becomes a minimal portion of our gross margin by 2040 as the high price of carbon makes it largely uneconomical to run a merchant fossil-fired power plant purely for energy revenue.



## SIMULATED GROSS MARGIN ACROSS THE THREE CLIMATE SCENARIOS



Direct carbon exposed margin largely refers to energy sales from fossil-fired plants that are selling power on the merchant market or plants that are contracted in a way that does not allow for a carbon price pass-through to an off-taker. Please see Transition Risk Resilience for more information.



## STRENGTHS OF OUR PORTFOLIO

BUSINESS TYPE	OUR STRATEGIES AND STRENGTHS	VALUE CREATED	IMPACT IN A 1.5-2°C SCENARIO
 <p><b>CONVENTIONAL POWER (FOSSIL FUELS AND HYDRO)</b></p>	<p>Throughout their useful life, our conventional power assets provide value to AES as well as flexibility to the grid and support for increased build out of renewables.</p> <p>How we've reduced carbon risk:</p> <ul style="list-style-type: none"> <li>• Capacity payments make up a substantial portion of these assets' margins through their useful lives, as they are needed for the availability services they provide. Generally, these revenue streams are not directly exposed to carbon risk. See <i>Focusing on Reliability and De-risking Our Thermal Assets</i> and <i>Transition Risk Resilience</i>.</li> <li>• A plant's useful life normally extends beyond the term of a PPA, but we expect a reasonable return from the revenues over the PPA term. The remaining time they are selling power on the merchant market typically represents a modest portion of their expected value, regardless of whether they are generating energy. See <i>Focusing on Value During the Contract Period</i>.</li> </ul>	<p>Running our thermal generation sources at unprecedentedly low dispatch levels, some of the lowest in the industry. See <i>Innovating How We Dispatch</i>.</p> <p>Extending the terms of our contracts in exchange for lower prices to increase our flexibility and ability to serve demand using renewables when it is economic. See <i>Green Blend and Extend of Contracts</i>.</p> <p>Exploring opportunities to convert coal plants to run on natural gas. See <i>Repowering with Gas</i>.</p>	<p>Carbon costs are only borne by plants selling on the merchant market or where contracts do not allow for a carbon price pass-through. Generally these costs of carbon only affect energy margin of the plant, as any capacity or reliability payments are not expected to be impacted.</p> <p>Regardless of the scenario, by 2040, conventional power will make up a small portion of our portfolio. We anticipate that we will retire/divest several plants and that others will receive merchant pricing as their PPAs expire.</p> <p>Fossil-fired plants that continue operating under PPAs will continue to receive capacity payments.</p>
 <p><b>REGULATED UTILITIES</b></p>	<p>Our regulated businesses typically receive a fixed rate of return on the asset base and investments needed to support the power needs of the regions these utilities serve.</p> <ul style="list-style-type: none"> <li>• Our margins are relatively resilient, as any build out of renewables or changes in power infrastructure will likely be considered as part of our overall rate case.</li> <li>• As with our unregulated business, we are exploring additional opportunities to convert coal plants to run on natural gas and to increase flexibility of our systems by increasing the amount of renewables.</li> <li>• Our regulated utility portion is tilted toward transmission and distribution assets.</li> </ul>	<p>Continued service and support of our utilities customers, from reliable generation to greening the grid through renewables and energy efficiency support.</p> <p>Increased flexibility to serve demand with renewables.</p>	<p>Demand for smart, energy-efficient solutions drives an expansion of these programs, leading to an increase in rate-based investments.</p> <p>Our margins from regulated businesses are largely unchanged by the climate change scenarios assessed.</p>



## STRENGTHS OF OUR PORTFOLIO CONTINUED

BUSINESS TYPE	OUR STRATEGIES AND STRENGTHS	VALUE CREATED	IMPACT IN A 1.5-2°C SCENARIO
 <p><b>CLEAN ENERGY GROWTH PLATFORMS</b></p>	<p>Each of our Clean Energy Growth Platforms is poised to take a leading market position, and exposes us positively to the growth megatrends underlying each climate change scenario assessed.</p> <p>We are an advancing leader in the renewables space, including solar-plus-storage. See <i>Building Renewable Energy Assets</i>.</p> <p>Our energy storage systems represents one of the world's largest advanced energy storage fleets. See <i>Accelerating Energy Storage Adoption</i>.</p> <p>We are introducing LNG services to areas with traditional reliance on diesel power and providing regional energy users with cleaner energy options. See <i>Finding New Opportunities for LNG</i>.</p> <p>AES is a strategic investor in Simple Energy, a leading provider of utility-branded marketplaces and software that helps utilities engage customers on managing energy use. The digital enablement of these utilities allows them to increase adoption of rate-based demand management and energy efficiency solutions. See <i>Driving Customer-centric Energy Efficiency and Utility Growth</i>.</p>	<p>Cleaner electricity systems and markets, leading to lower emissions and carbon intensity.</p> <p>In many cases, lower prices for end customers.</p> <p>Reduced carbon exposure risks.</p> <p>Enhanced geographical and technology diversification.</p> <p>Innovation in critical green technologies.</p> <p>Increased grid reliability.</p>	<p>As a leading provider of renewables, energy storage solutions, LNG capabilities, and energy efficiency services, we are inherently positioned to capitalize on the opportunities presented in the climate mitigation pathway to get to 2°C.</p>

## KEY WEAKNESSES RELATIVE TO THE SCENARIO MODELING

Although the results show a resilience of our portfolio across various scenarios, there are still significant risks and potential weaknesses in our portfolio and strategy, including:

- Failure of Existing Technologies to Achieve Contemplated Cost Declines:** Our strategy largely relies on the competitiveness of the technologies encompassed in our Clean Energy Growth Platforms. If solar, wind and battery-based energy storage do not achieve continued cost declines of the scale contemplated in the scenarios, the growth of our Clean Energy Growth Platforms will likely be curtailed.
- Impact of New Technologies:** New technologies could be developed and deployed in our markets that could undermine the competitiveness of our existing portfolio and our Clean Energy Growth Platforms.
- Impact of Extreme Weather:** Extreme weather and its impacts are inherently difficult to estimate and could be greater than we have modeled.
- Customers Developing a "No Carbon" Preference:** As customers become more cognizant of the potential risks and impacts of climate change, a "no carbon" policy could emerge that adversely impacts our LNG business.
- Changes to Our Capital Allocation Policy or Heightened Competition for New Projects:** Under the scenarios we contemplate reinvesting most of the margin from our portfolio in new Clean Energy Growth projects. If our capital allocation methodology were to deviate from this approach or if we are unable to find significant new investments in Clean Energy Growth projects due to heightened competition, our Clean Energy Growth Platforms would not achieve the contemplated growth levels.
- Substantial and Prolonged Economic Decline:** Economic decline or sustained recessions could reduce the demand for electricity and the growth rates of our Clean Energy Growth Platforms contemplated in the scenarios.



Even with our strong climate risk management practices and shifting of our portfolio toward assets that are not exposed to carbon pricing, there are still significant risks inherent to our strategy and to operating in the power sector. For more information on these risks, please see Item 1A-Risk Factors of our Annual Report on Form 10-K.

## PHYSICAL RISK RESILIENCE

Across each of the assessed scenarios, the IPCC articulates a spectrum of potential changes in the climate depending on the assumed level of atmosphere concentrations of greenhouse gases. We recognize that as the climate changes, there may be increased intensity and frequency of storm events and droughts that can lead to flooding, high winds, wildfires and water scarcity. As a long-time owner of power infrastructure across the globe, we have been exposed to these risks and applied lessons on design, construction and operation to the way we run our portfolio.

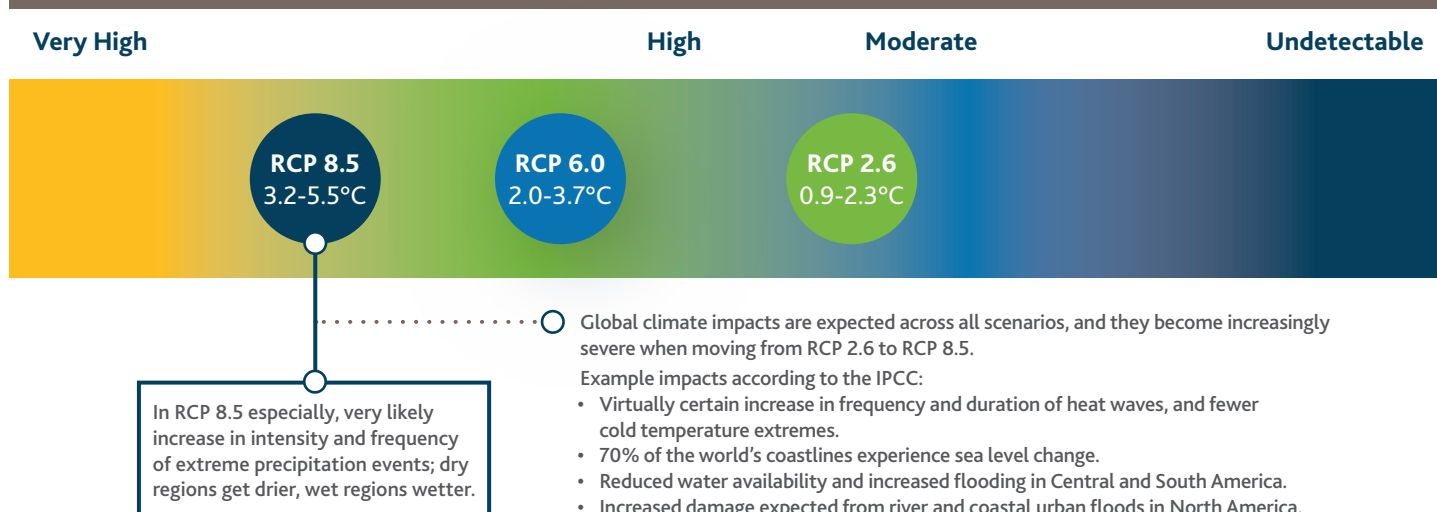
We not only design infrastructure to withstand severe weather and keep pace with the changing climate at an asset level (see *Hardening Assets for a 2°C+ World*), we emphasize the importance of geographic diversification. Unlike power companies and utilities whose assets may be concentrated in just one or a few geographic areas, our portfolio spans 15 countries across multiple continents.

Today, our physical risk is relatively concentrated in larger thermal and hydropower assets. While these assets are generally more resilient in extreme weather and have been designed based on decades of experience with respect to physical risks, the average probable loss on, for example, a coal plant is higher than an average solar plant given the cost of the infrastructure and the business interruption exposure. Over time, we anticipate that the design of renewable generation assets will evolve to have greater resiliency from physical risks by applying lessons learned, and this will further reduce the potential losses for these assets from physical risks.

We leverage a combination of self-insurance and third-party insurance to reduce our exposure to extreme weather events. As described in this report’s *Risk Management Model* section, we believe that our use of a captive insurance model provides us with enhanced visibility into our underlying physical risks and creates a feedback loop that incentivizes us to invest in capital projects that harden our assets from physical risks. Our Risk Engineering team continually assesses, scores and rates each participating AES location. Our risk scores are calculated based on current state observations and reflect both active and passive risk factors. Risk ratings are factored into how we allocate insurance premiums across the business to incentivize our businesses to address risk improvement recommendations. The learning of our captive insurance program enables the optimization of self-insurance and third-party insurance coverage and helps us manage financial risks associated with business interruption as we transition to a larger portfolio of renewable generation assets.

Going forward, as we shift our underlying business from conventional power sources to a large scale build out of renewables assets, there is a dramatic transformation in the average maximum probable loss within the portfolio (i.e., the maximum loss we would expect to occur at a facility due to an insurable event, including physical damage and business interruption, and adjusted for probability). For example, the average maximum probable loss for a coal plant today is nearly 12 times the amount for a typical solar asset. We expect our existing geographic diversification will be magnified naturally as a result of moving from fewer high concentrations of risk to smaller, more distributed risk exposure. We also expect to have less concentration of assets by the coasts, since water is essential for thermal power plants but not for solar and wind farms, further reducing our potential loss from physical risks.

## ADDITIONAL EXTREME WEATHER RISK ACROSS SCENARIOS





**OUR MISSION:**

**Improving lives by accelerating a safer and greener energy future.**

*Alto Sertão II, 386 MW AES Tietê wind plant in Brazil.*

**CONCLUSION**

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AES is resilient across the assessed climate scenarios and the stress test highlights significant upside potential in a decarbonizing future. Transition risks are largely minimized as our investments in Clean Energy Growth Platforms are intentionally aligned with the transformation needed to achieve policy objectives for a low-carbon world. Physical risks present challenges but are mitigated by our geographic diversity and risk management initiatives.

**Our mission drives us to be a leading sustainable energy company.**