

# S&P Kensho

## Renewables: Clean Energy In Focus



**S&P Dow Jones  
Indices**

A Division of **S&P Global**

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- Context – The Fourth Industrial Revolution
- What are Renewables?
- Drivers – Declining Costs & the Paris Agreement
- Electricity Generation Landscape – The Growth Of Renewables
- Viability Of A Totally Green Future
  - Pros & Cons Of Individual Technologies
- Introducing S&P Kensho New Economies

# Catalysts driving 'Industrial' Transformation

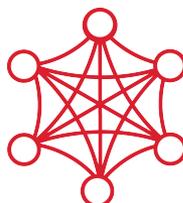
S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

## Mutually reinforcing catalysts transforming society & the global economy

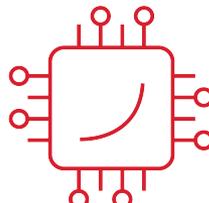
- Mutually reinforcing catalysts driving innovation at an unprecedented rate and breadth
- Significant impact to the global economy - industries are being transformed and new ones created
- The catalysts themselves are interesting but how they are being applied is more so
- Not purely a technologically driven revolution: cultural shift to a more open, shared economy is also fueling this latest industrial epoch



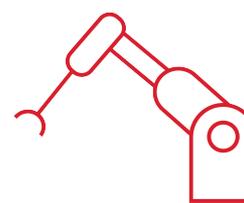
ARTIFICIAL  
INTELLIGENCE



HYPERCONNECTIVITY



EXPONENTIAL  
PROCESSING POWER



ROBOTICS &  
AUTOMATION



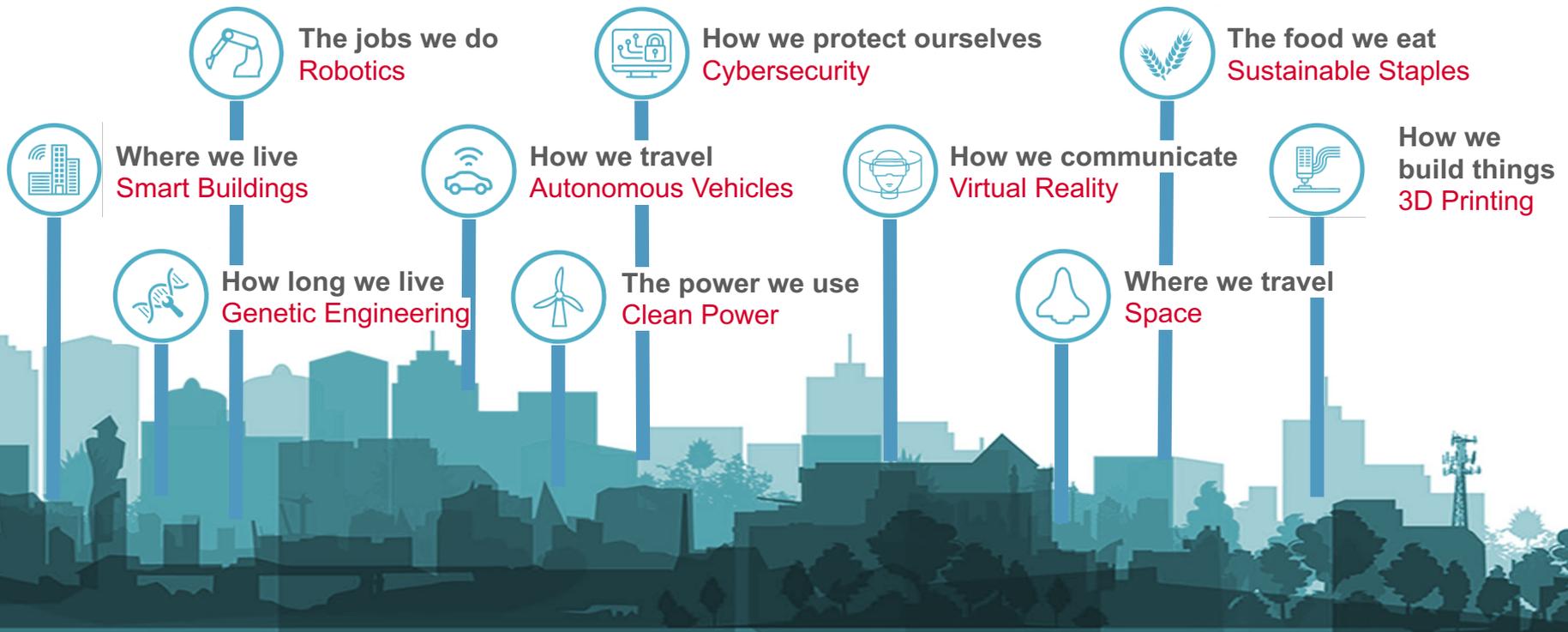
DEMOCRATIZED  
INFRASTRUCTURE

# Impact of the Fourth Industrial Revolution

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

Every aspect of our lives will be impacted

- ~50% of activities are automatable (\$16T in wages globally) McKinsey Global Institute
- 32% of US workers, 14% globally, may need to change occupations by 2030 PwC



# Introducing: S&P Kensho New Economies

## Capturing the industries and innovation of the Fourth Industrial Revolution

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

A comprehensive framework with which to understand and precisely capture exponential innovation and growth – 21<sup>st</sup> Century Sectors

### Tracking Indices

#### New Economies Composite (KNEX)<sup>^#</sup>

#### New Economies Select (KNESLX)<sup>^</sup>

#### Sectors

Intelligent Infrastructure (KINFRA) <sup>#</sup>	(10) (20)
Smart Transportation (KMOVE) <sup>#</sup>	(7) (11) (21)
Future Security (KSECURE) <sup>#</sup>	(1) (2) (4) (5) (6) (7) (9)
Clean Power (KPOWER) <sup>#</sup>	(3) (8)
Final Frontiers (KEXPLORE) <sup>#</sup>	(1) (7)
Future Communication (KCONNECT)	(9) (12) (13)
Democratized Banking (KFIN)	(23) (24) (25)
Human Evolution (KEVOLVE)	(2) (6) (9) (16) (17) (18)
Advanced Fabrication <sup>**</sup>	(17) (18) (19)
On Demand Economy <sup>**</sup>	(14)
Sustainable Staples <sup>**</sup>	(15) (16)

#### Subsectors

(1) Space (KMARS) <sup>^</sup>	(14) On Demand Economy (KPDQ) <sup>**</sup>
(2) Robotics (KBOTS) <sup>^</sup>	(15) Sustainable Farming (KFARM) <sup>**</sup>
(3) Clean Energy (KENERGY) <sup>^</sup>	(16) Genetic Engineering (KDNA) <sup>^</sup>
(4) Cyber Security (KCYBER) <sup>^</sup>	(17) 3D Printing (KDDDP) <sup>^</sup>
(5) Smart Borders (KDMZ) <sup>^</sup>	(18) Nanotechnology (KNANO) <sup>^</sup>
(6) Wearables (KBORG) <sup>^</sup>	(19) Smart Factories (KMAKE) <sup>**</sup>
(7) Drones (KDRONE) <sup>^</sup>	(20) Smart Grids (KGRIDS) <sup>^</sup>
(8) Clean Tech (KCLEAN) <sup>^</sup>	(21) Adv. Transport Systems (KATS) <sup>^</sup>
(9) Virtual Reality (KVR) <sup>^</sup>	(22) Electric Vehicles (KEV) <sup>^</sup>
(10) Smart Buildings (KHOME) <sup>^</sup>	(23) Alternative Financing (KALTFIN) <sup>^</sup>
(11) Autonomous Vehicles (KCARS) <sup>^</sup>	(24) Future Payments (KPAY) <sup>^</sup>
(12) Digital Communities (KSOCIAL) <sup>^</sup>	(25) Distributed Ledger (KLEDGER) <sup>^</sup>
(13) Enterprise Collaboration (KTEAM) <sup>^</sup>	

# What Is Renewable Energy?

- Renewable energy is energy derived from natural resources that replenish themselves in less than a human lifetime without depleting the planet's resources.

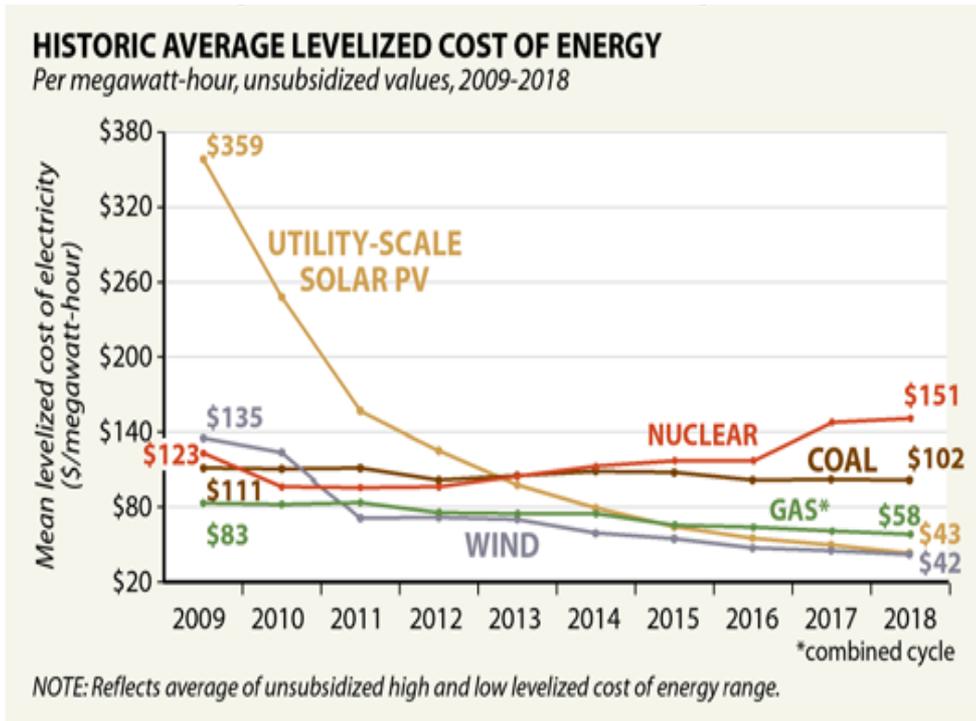


biomass  
wind hydro  
solar  
geothermal

# Drivers For Growth

## Rapidly Declining Costs

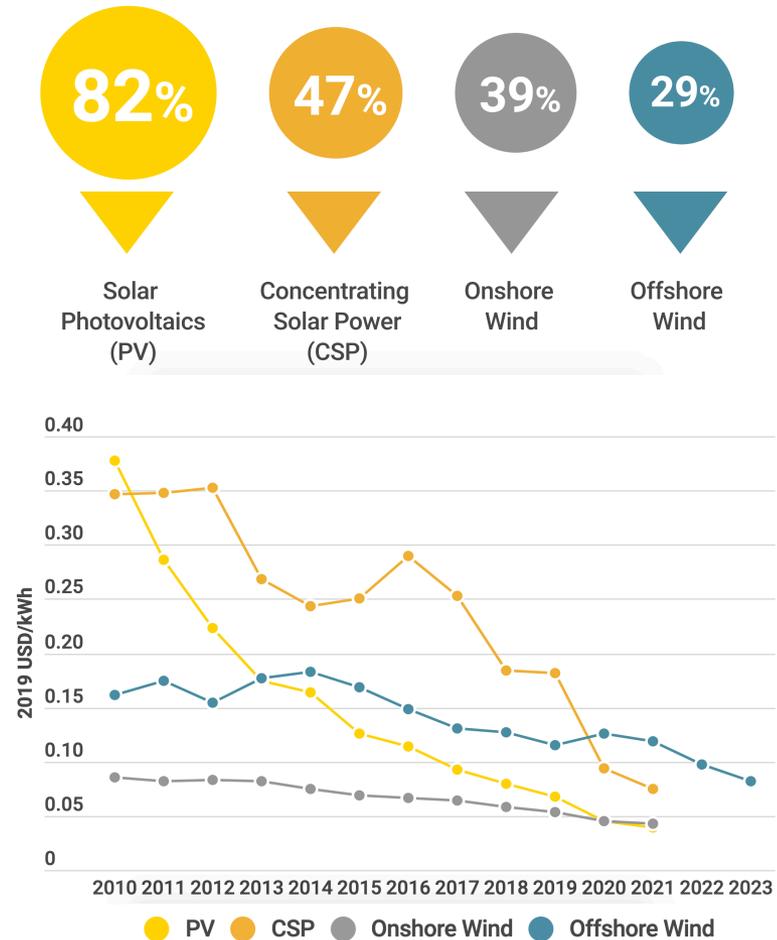
- Solar PV and onshore wind are already the cheapest ways of adding new electricity-generating plants in most countries today.



SOURCE: Lazard

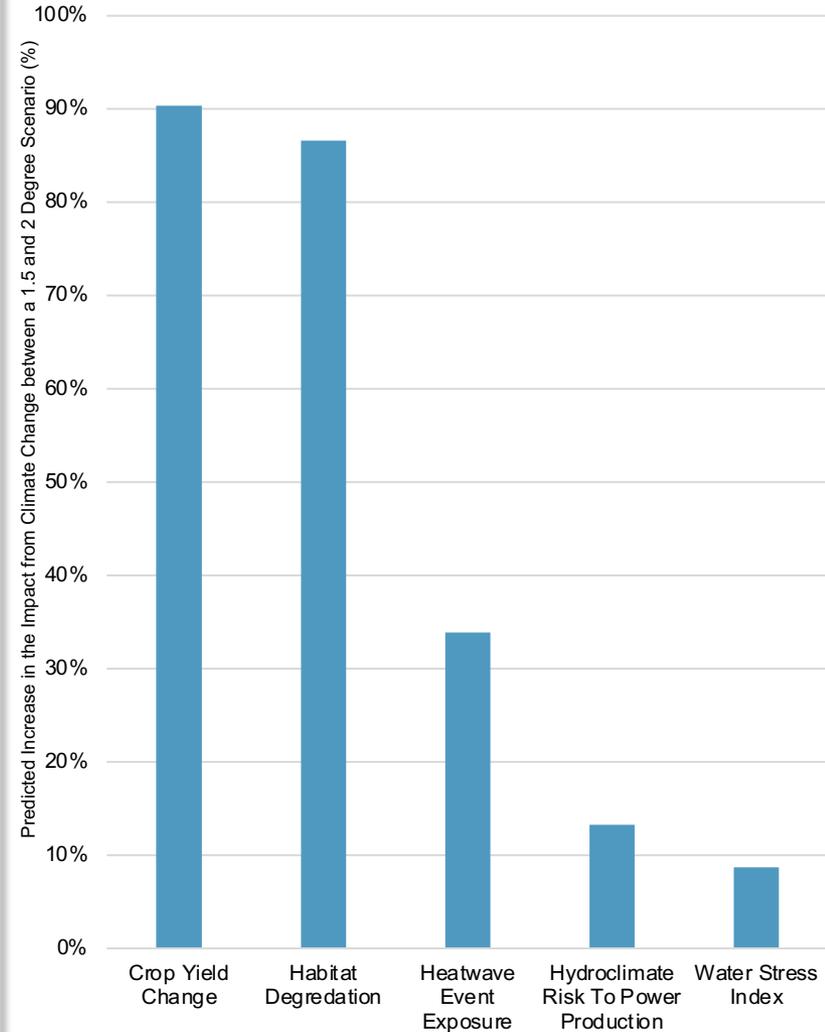
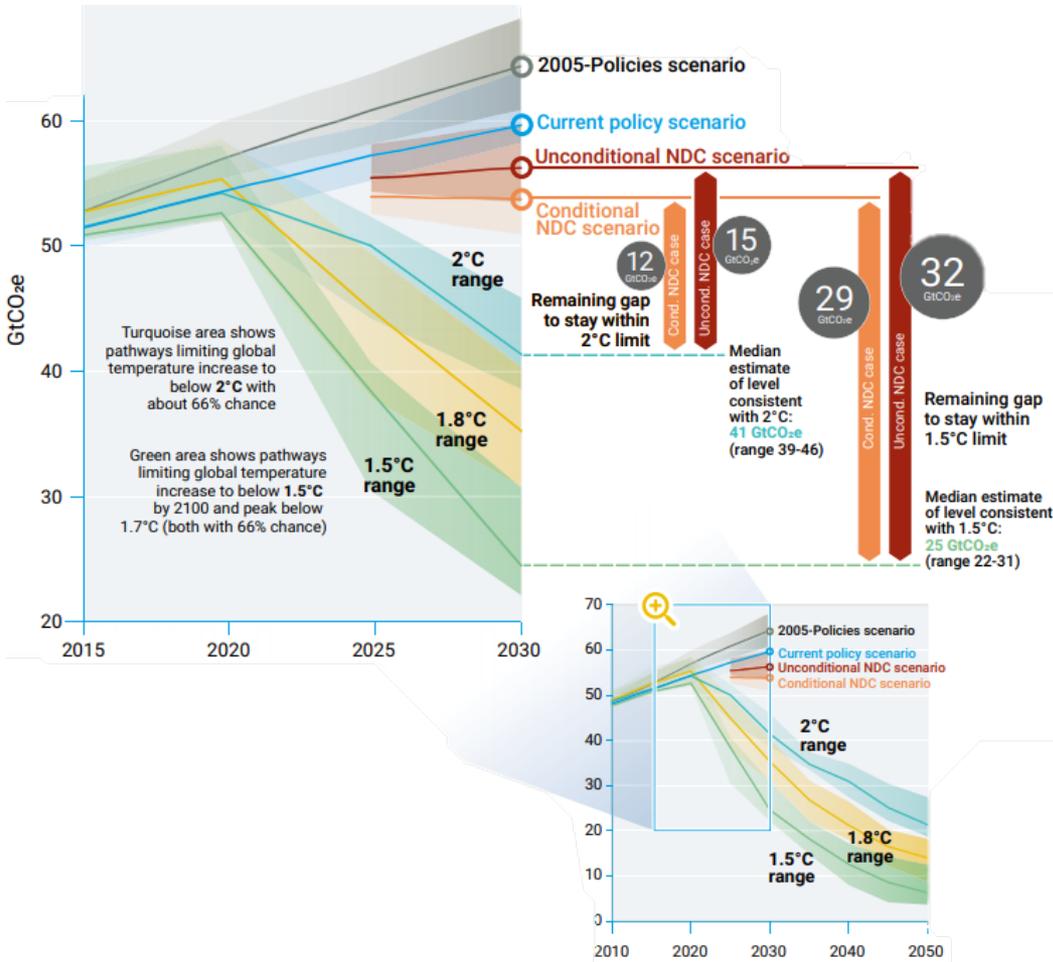
InsideClimate News

### Costs Declines (2010-2019)



# Drivers For Growth

## The Impact Of Climate Change



Source: UN Environmental Program. Chart is provided for illustrative purposes.

Source: IOPScience, "Global exposure and vulnerability to multi-sector development and climate change hotspots," May 31, 2018. Chart is provided for illustrative purposes.

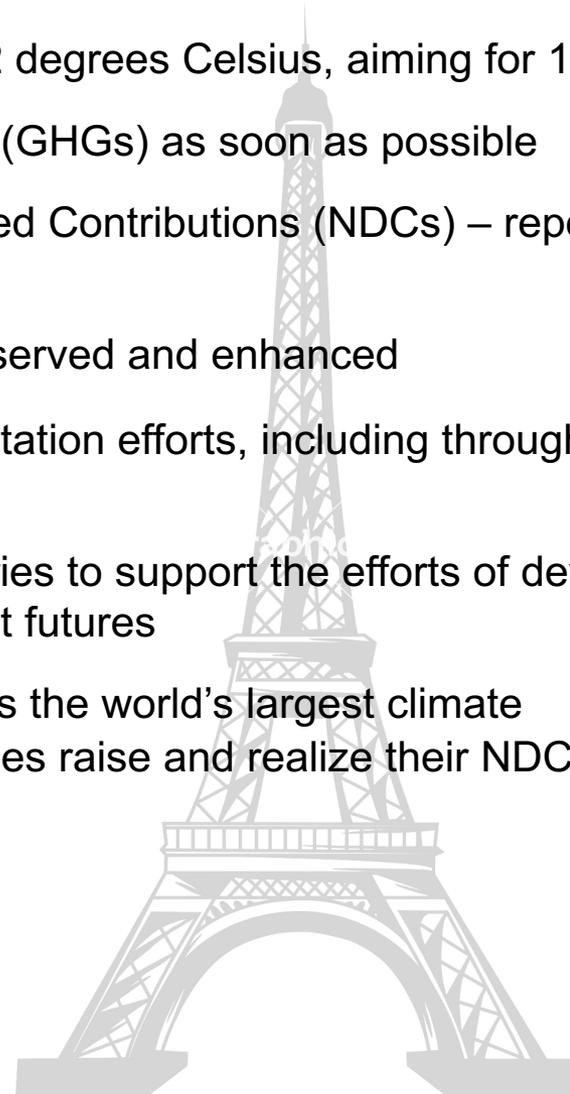
# The Paris Agreement

195 countries have signed; 190 have ratified the treaty

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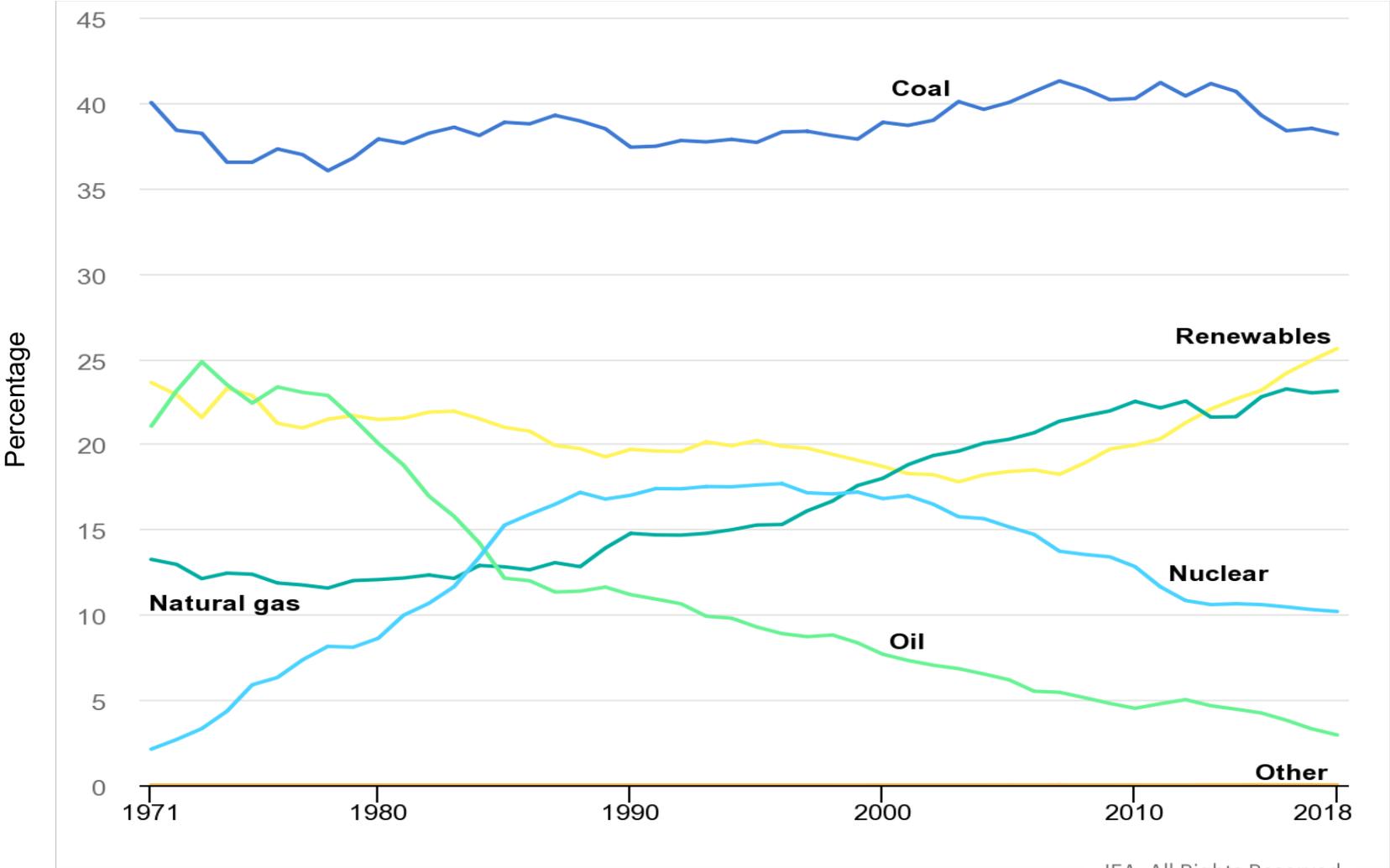
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- Long-term goal of limiting warming to below 2 degrees Celsius, aiming for 1.5 degrees
- Aim for global peaking of green house gases (GHGs) as soon as possible
- Commitments to binding Nationally Determined Contributions (NDCs) – reported every 5 years
- Sinks & reservoirs are encouraged to be conserved and enhanced
- Aims to significantly strengthen national adaptation efforts, including through support and international cooperation
- Reaffirms the obligations of developed countries to support the efforts of developing country Parties to build clean, climate-resilient futures
- Establishes the Green Climate Fund (GCF) as the world's largest climate fund, mandated to support developing countries raise and realize their NDCs



# Global Electricity Generating Landscape

The growth of Renewables & Natural Gas

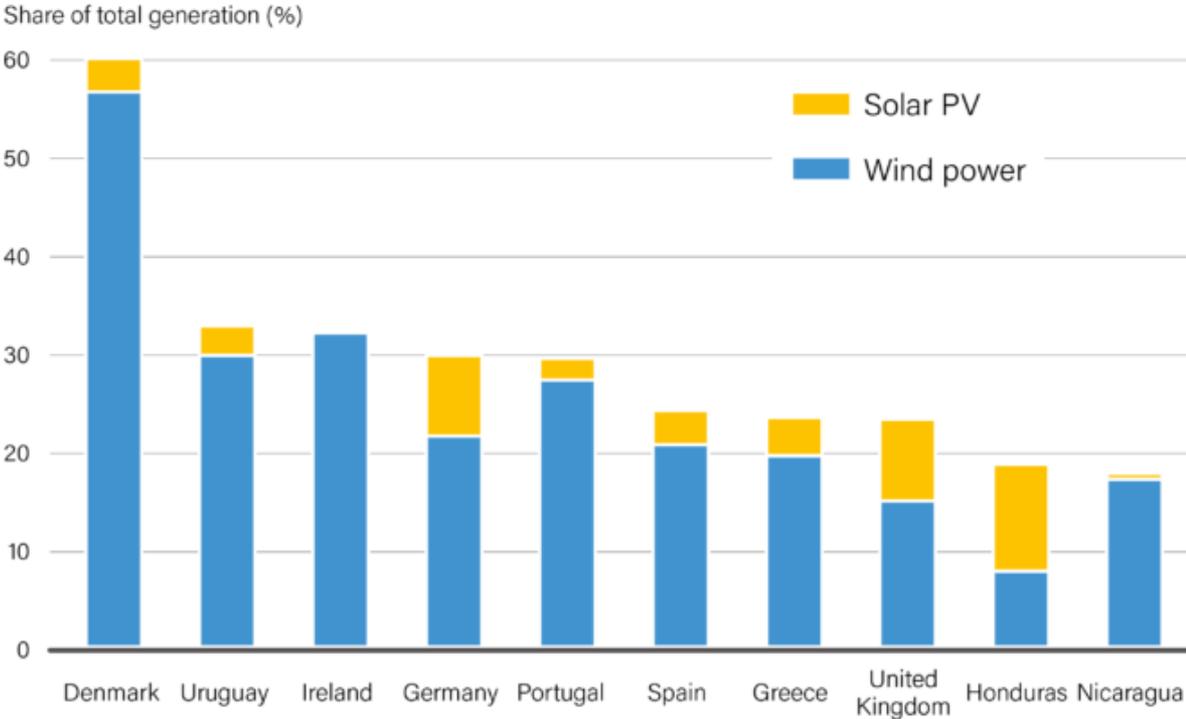


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# Global Electricity Generation

Some countries have already made substantial progress

Share of Electricity Generation from Variable Renewable Energy, Top Countries, 2019



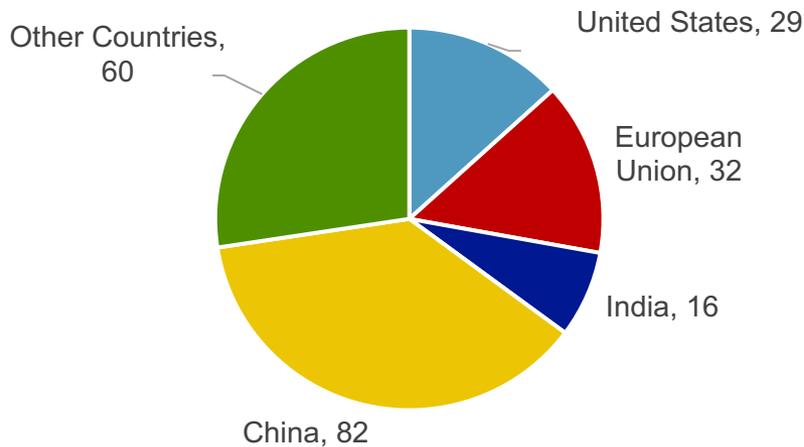
Note: Figure shows countries among the top 10 according to the best available data at the time of publication. However, several small-island countries with low total generation may be excluded from this list.

# New Generating Capacity in 2021

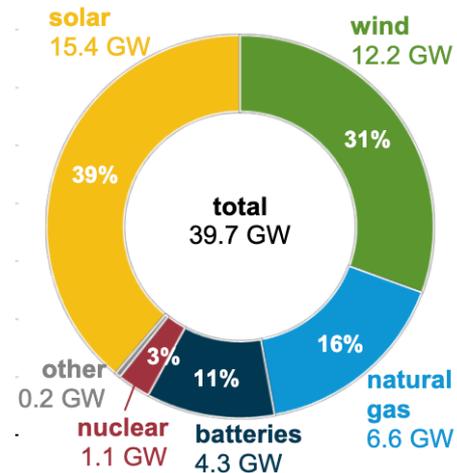
## US Renewables to account for 81% of new generating capacity

- In sharp contrast to all other fuels, renewables used for generating electricity grew by almost 7% in 2020. Global energy demand declined 5%
- Solar installations will set record in 2021 with 15.4GW, surpassing 2020's record of 12GW
- Wind power's projected 12.2GW follows a record 21GW in 2020
- Battery capacity to quadruple in 2021 as it is increasingly paired with Renewables

Global Renewable Capacity Additions in 2021 (GW)



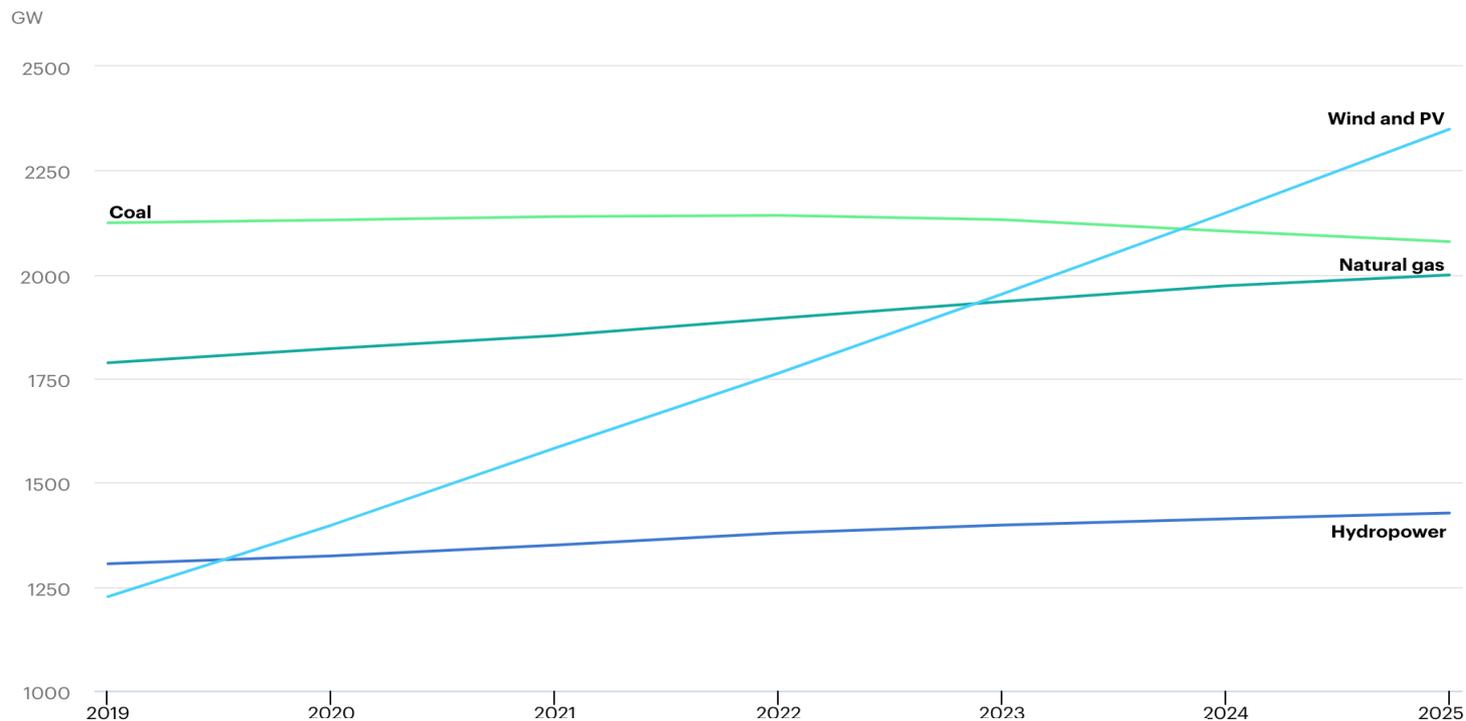
Planned US Utility-Scale Generating Capacity in 2021



# Share Of Electricity Generation Globally

## Renewables to overtake coal to become largest fuel source by 2025

- Cost reductions and sustained policy support are expected to drive strong renewables growth beyond 2022
- Total installed wind and solar PV capacity is on course to surpass natural gas in 2023 and coal in 2024



# Share Of US Electricity Generation

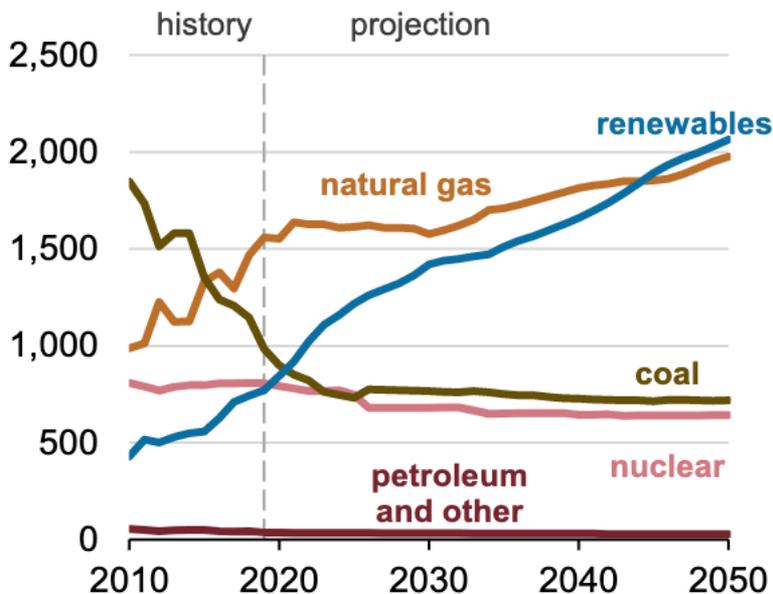
Renewables projected to double to 42% by 2050

- Solar electric generation (photovoltaic (PV) and thermal technologies and both small-scale and utility-scale installations) will surpass wind energy by 2040

## U.S. electricity generation, AEO2020 Reference case (2010-2050)

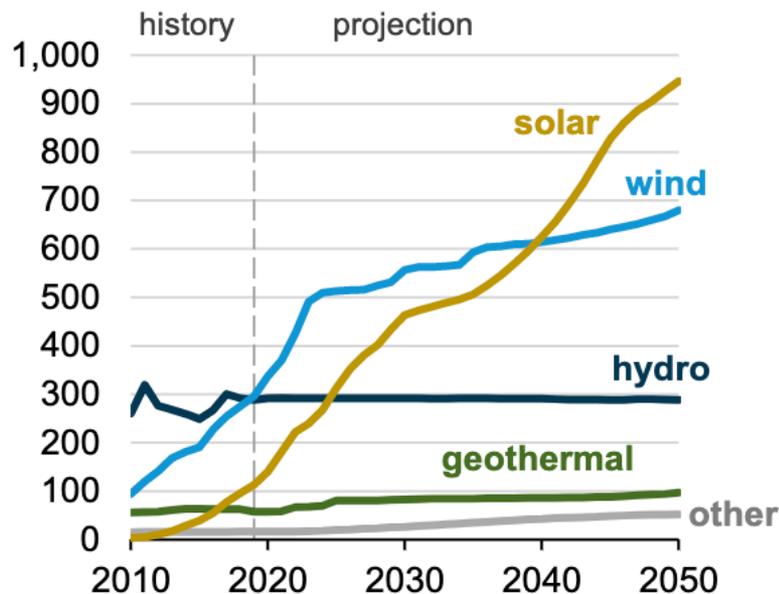
### all fuels

billion kilowatthours



### renewable fuels

billion kilowatthours



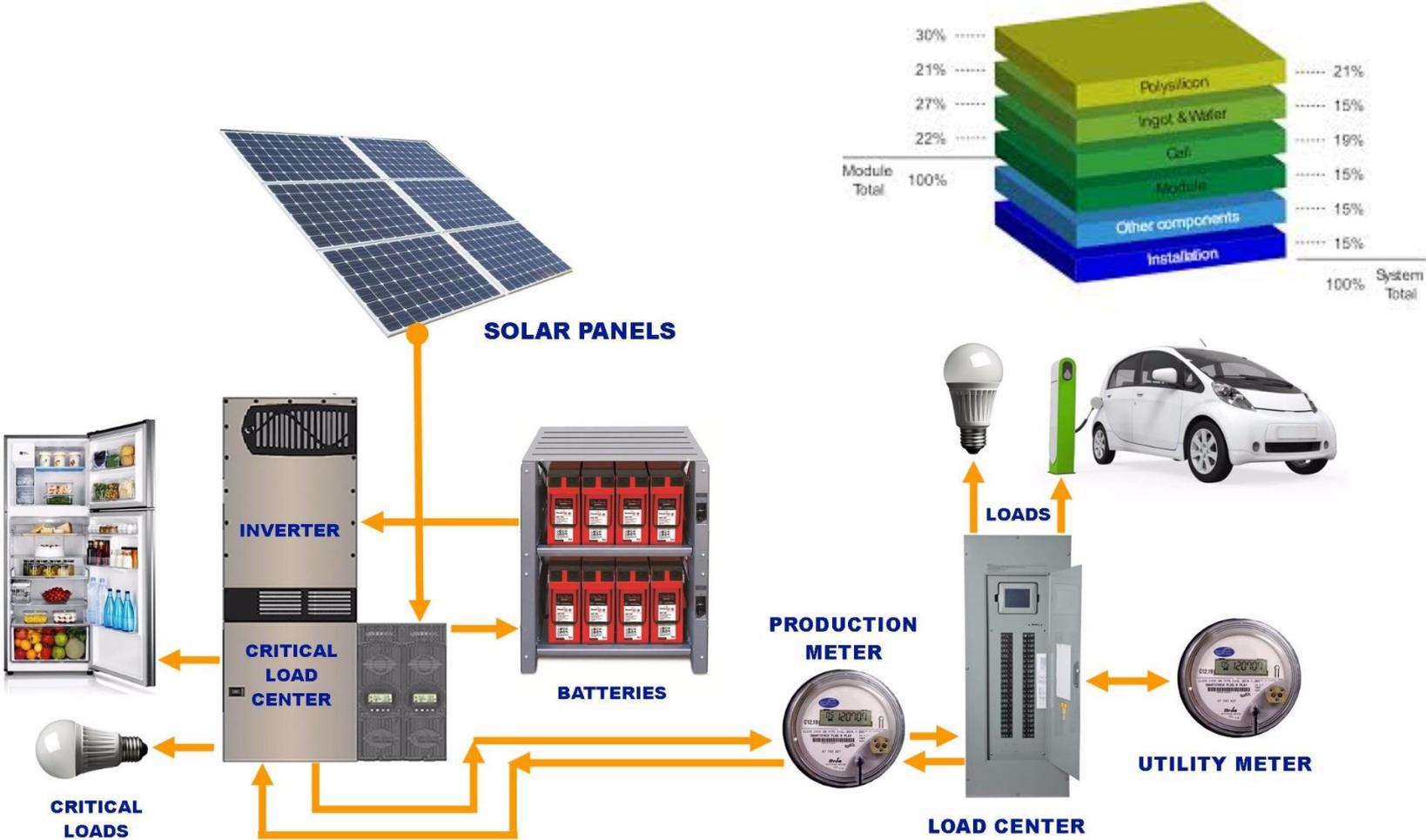
Source: U.S. Energy Information Administration, [Annual Energy Outlook 2020](#)

# Capturing The Solar Economy

Essential to incorporate the full value chain

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# Growth In The Solar Economy

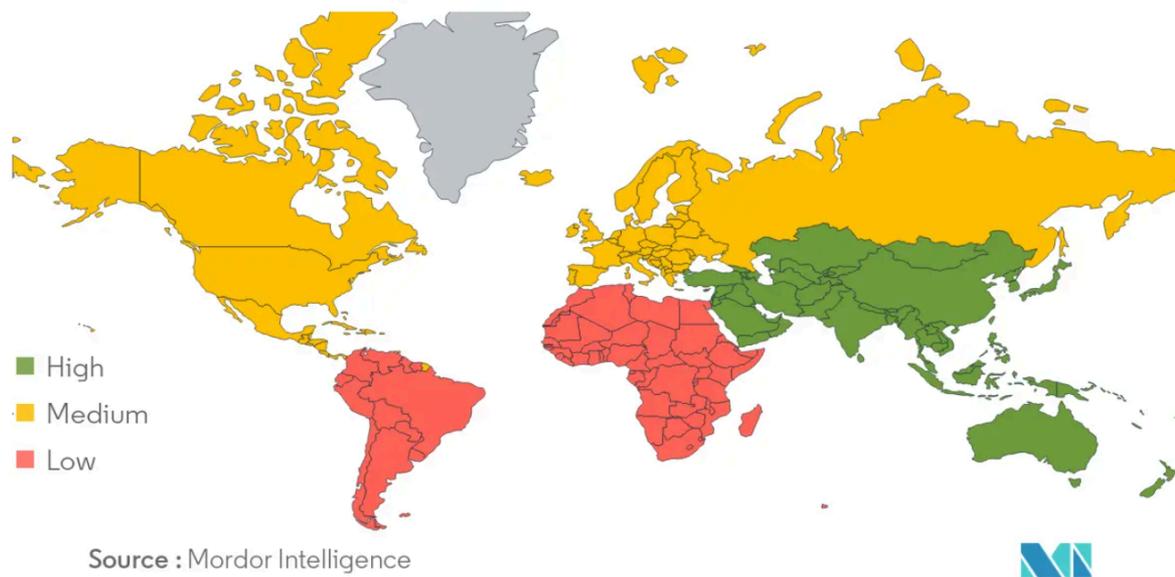
Global growth, dominated by AsiaPac

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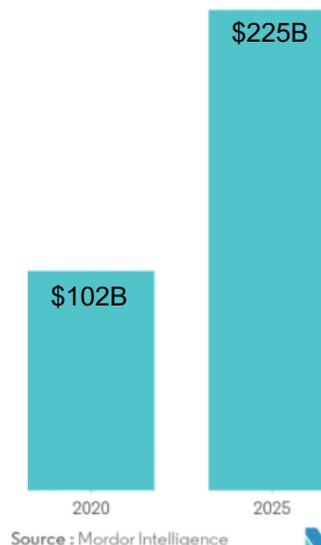
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- Solar market to grow at 17% CAGR through 2025, reaching \$225B
- AsiaPac is the largest solar energy market; China, Japan, and India are key markets
- US increases have been stable at ~25% YoY
- European Union increased its solar market size by 98% in 2019

Solar Energy Market - Growth Rate by Region, 2020-2025



Market Summary  
CAGR 17 %

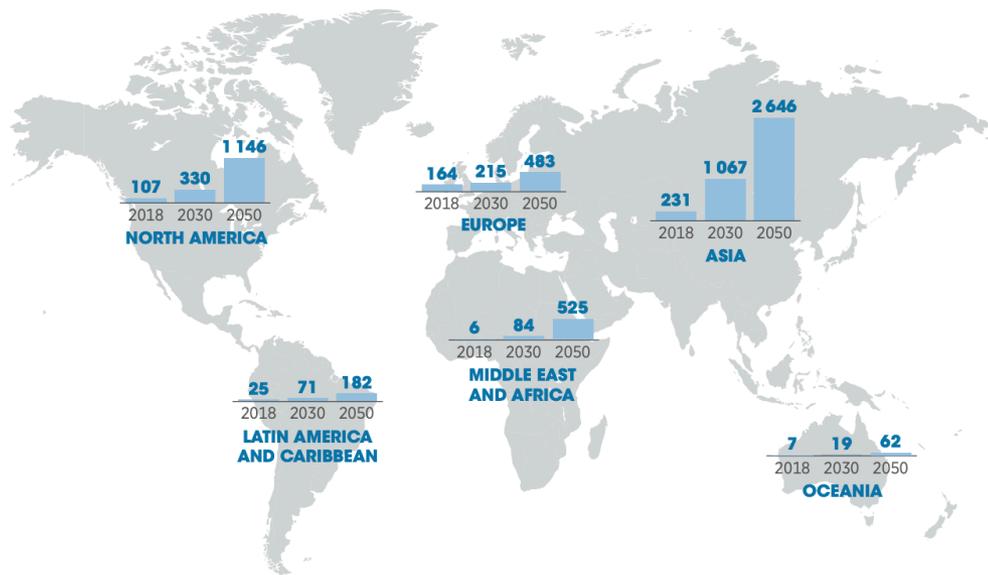


# Growth In The Wind Economy

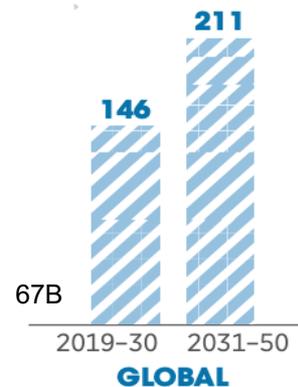
## Substantial growth in North America and Asia

- Wind Power market size is projected to reach USD 208 Billion by 2026, from USD 199 Billion in 2020.
- Combination of improved wind turbine technologies, higher hub heights and longer blades has led to increased capacity factors for a given wind resource

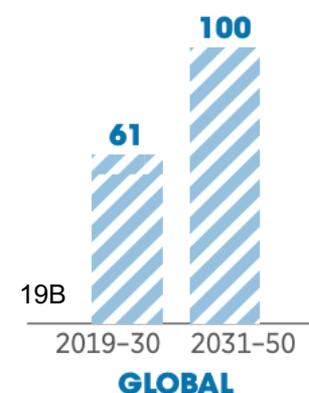
Onshore wind installed capacities (GW)



Onshore Wind Investments (annual \$B)



Offshore Wind Investments (annual \$B)



Source: Based on IRENA analysis.

# Harnessing the Exposure

## Key characteristics to consider



Adaptive



Forward-Looking



Full Ecosystem of Companies



Balanced - Modified Equal Weight

# S&P Kensho Clean Power Index

Capturing the full ecosystem of the Renewable Energy industry

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## S&P Kensho Clean Power Index

- 166.27% 1yr Total Return
- Volatility: 33% (3yr); 27% (5yr)
- 39 Holdings
- Domicile: US 64%, China 14%, Canada 11%, Other 11%

## S&P Kensho Cleantech Index

Companies focused on building technologies or products that enable generation of clean energy, such as solar, wind, geothermal, hydrogen, and hydroelectric, including:

- Technologies (hardware, software or materials) used for clean energy capture, including solar modules, wind blades & turbines, inverters, electrolyzers
- Installation of these technologies for use in residential or commercial applications
- Advanced energy storage devices, such as utility-scale batteries

## S&P Kensho Clean Energy Index

Companies focused on the generation and transmission of energy derived from clean sources, such as solar, wind, geothermal, hydrogen, and hydroelectric, including:

- Construction and operation of clean power plants
- Generation of power derived from clean sources \*

*\* Only companies for which Clean Energy activities are central to their strategy are included*

# S&P Kensho New Economies Performance

Living up to the promise

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

- 2019 & 2020 performance was excellent across the New Economies

QUARTERLY PERFORMANCE SUMMARY				
Composite Indices				
INDEX	QTD	YTD	12M	
New Economies Composite		35.23%	61.03%	61.03%
New Economies Select		35.31%	77.26%	77.26%
S&P Composite 1500®		13.24%	17.92%	17.92%

Subsectors				
INDEX	QTD	YTD	12M	
Autonomous Vehicles		62.66%	126.8%	126.8%
Cleantech		59.83%	229.8%	229.8%
Electric Vehicles		58.56%	157.8%	157.8%
Nanotechnology		57.33%	79.89%	79.89%
Virtual Reality		56.42%	84.33%	84.33%
3D Printing		51.66%	28.09%	28.09%
Smart Grids		44.17%	43.11%	43.11%
Advanced Transport Systems		43.15%	36.98%	36.98%
Genetic Engineering		34.16%	45.65%	45.65%
Smart Buildings		33.04%	44.68%	44.68%
Alternative Finance		31.49%	-9.03%	-9.03%
Drones		28.70%	42.54%	42.54%
Smart Borders		26.49%	-5.63%	-5.63%
Enterprise Collaboration		26.19%	126.9%	126.9%
Wearables		25.91%	75.05%	75.05%
Robotics		24.45%	20.16%	20.16%
Future Payments		24.25%	57.48%	57.48%
Space		23.66%	11.95%	11.95%
Clean Energy		22.50%	18.92%	18.92%
Cyber Security		22.03%	31.19%	31.19%
Digital Communities		20.70%	73.89%	73.89%
Distributed Ledger		19.88%	79.51%	79.51%

Sectors				
INDEX	QTD	YTD	12M	
Clean Power		49.24%	138.8%	138.8%
Smart Transportation		46.62%	83.16%	83.16%
Human Evolution		38.31%	61.40%	61.40%
Intelligent Infrastructure		30.54%	30.11%	30.11%
Future Communication		25.84%	85.74%	85.74%
Future Security		25.38%	20.64%	20.64%
Final Frontiers		23.69%	8.75%	8.75%
Democratized Banking		19.25%	43.59%	43.59%

# S&P Kensho New Economies<sup>SM</sup> Composite

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

## Relative returns and characteristics

### Diversified + Differentiated

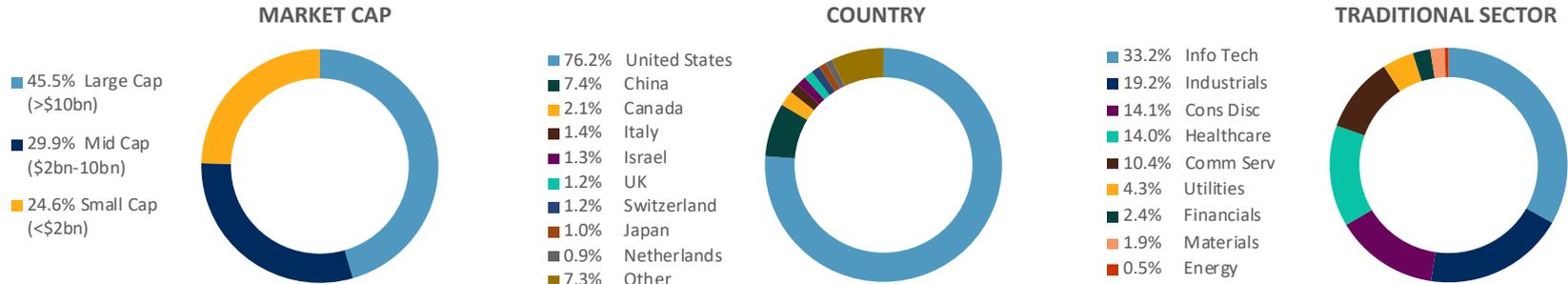
- 22 New Economy Subsectors
- 410 Companies
- 25 Countries
- 60B Weighted Avg Market Cap
- 88% Avg Active Share

Relative Performance of the S&P Kensho New Economies Composite  
(normalized price return - 1/2/2014 - 12/31/2020)



### Breakdown of the New Economies Composite

(as of 30 Sep 2020)



S&P Dow Jones  
Indices

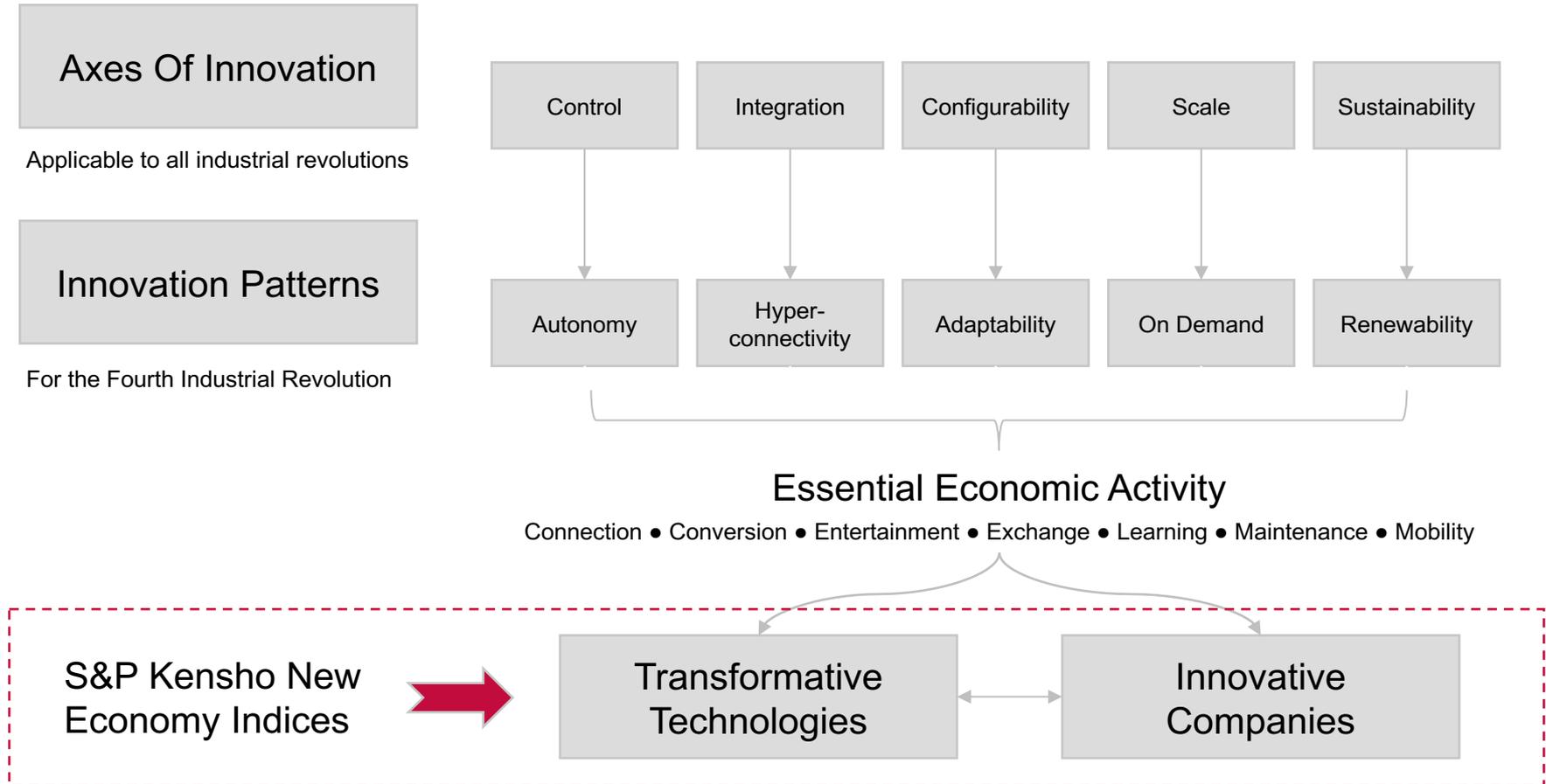
A Division of S&P Global

# Appendices

# Conceptual Classification Framework

Objective, Adaptive, and Transparent

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors



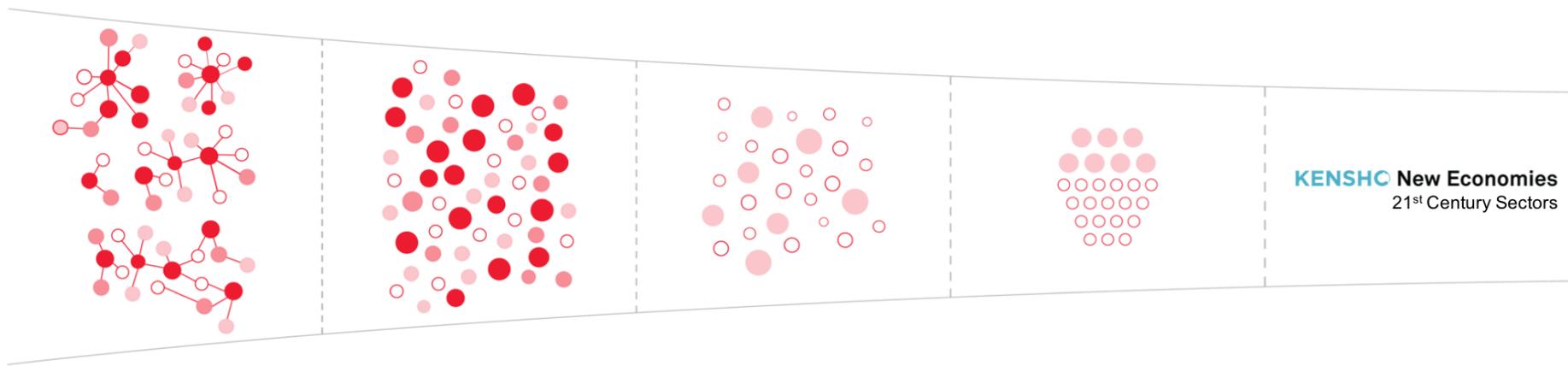
Whitepaper: [Innovation Patterns: Upgrading Sectoral Classification for the Fourth Industrial Revolution](#)

# S&P Kensho New Economies - Approach

Unique insights to capture a dynamic and transformative exposure

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

**CUTTING EDGE TECHNOLOGY** + **INNOVATIVE METHODOLOGY** = **UNIQUE INSIGHTS**



## 1 Industry Model

- Expert curation, combined with advanced topic modelling, is used to create a comprehensive model of the target industry

## 2 AI Selection

- Natural Language Processing (NLP) and machine learning identify companies from SEC filings
- Captures both pure play names, as well as the supporting ecosystems

## 3 Categorization

- Each company categorized according to the degree of its focus on the New Economy (Core vs Non-Core)

## 4 Weighting

- Core category over-weighted vs Non-Core
- Companies equal weight within each category
- Minimum market cap and ADTV
- Optimized to accommodate minimum daily trade size

## 5 Verification

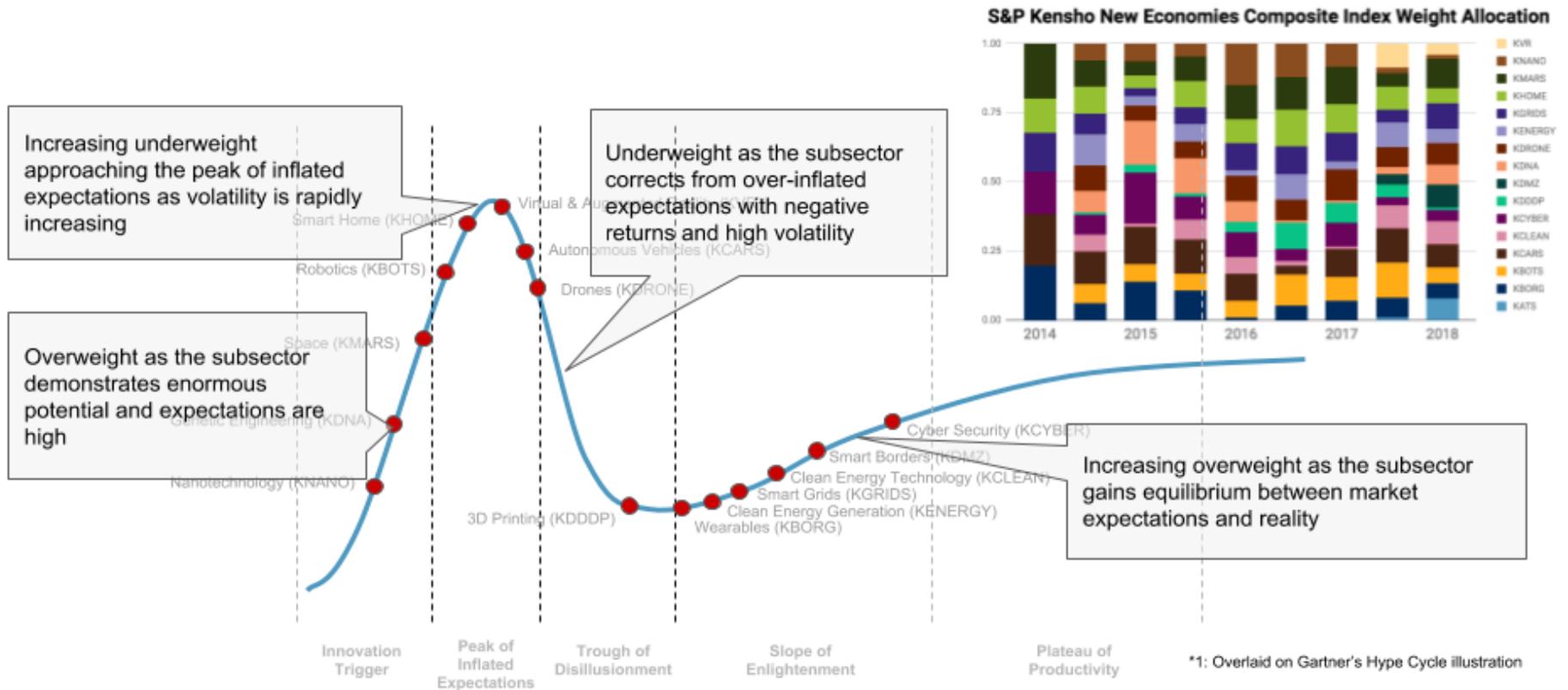
- Index construction verified by Investment Analysts and approved by the Index Committee
- Entirely rules-based and objective

# S&P Kensho New Economies<sup>SM</sup> Composite

S&P KENSHO New Economies  
21<sup>st</sup> Century Sectors

Broad exposure to the Fourth Industrial Revolution

The S&P Kensho New Economies Composite tracks all qualifying New Economy subsectors, weighting each using an algorithmic proxy for industry maturity



Please note: all final weights are relative to all other subsectors

# S&P PACT™ Indices Appendix:

## Content

### Papers

[Transition to a 1.5°C World with the S&P Paris-Aligned & Climate Transition \(PACT\) Indices](#)

[Conceptualizing a Paris-Aligned Climate Index for the Eurozone](#)

### Blogs

[Business as Usual for the S&P Paris-Aligned Climate Indices](#)

[Two Birds, One Stone: How the S&P Paris-Aligned Climate Index Concept Meets the Proposed EU Climate Benchmark Regulation and the Recommendations of the TCFD](#)

[The S&P Eurozone Paris-Aligned Climate Index Concept: A Greenwashing Minimization Approach to High Climate Impact Sector Neutrality](#)

[The S&P Eurozone Paris-Aligned Climate Index Concept: Implementing the Proposed EU Climate Benchmark Regulation](#)

[The S&P Eurozone Paris-Aligned Climate Index Concept Sensitivity Analysis: Decarbonization over Time](#)

[The EU Climate Transition and Paris-Aligned Benchmarks: A New Paradigm](#)

### Other

[Methodology](#)

[FAQ Document](#)

[Meet the S&P Paris-Aligned and Climate Transition Indices](#)

# Performance Disclosure

- The S&P Kensho New Economies Composite Index was launched February 6, 2017. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com). Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown.
- S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.
- The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at [www.spdji.com](http://www.spdji.com) for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.
- Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.
- The Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC maintains the Index and calculates the Index levels and performance shown or discussed, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US \$100,000 investment for a 12-month period (or US \$10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US \$1,650), the net return would be 8.35% (or US \$8,350) for the year. Over a three year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US \$5,375, and a cumulative net return of 27.2% (or US \$27,200).

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