

Microgrids, hybrid power, and the future of renewable energy

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- Proven science
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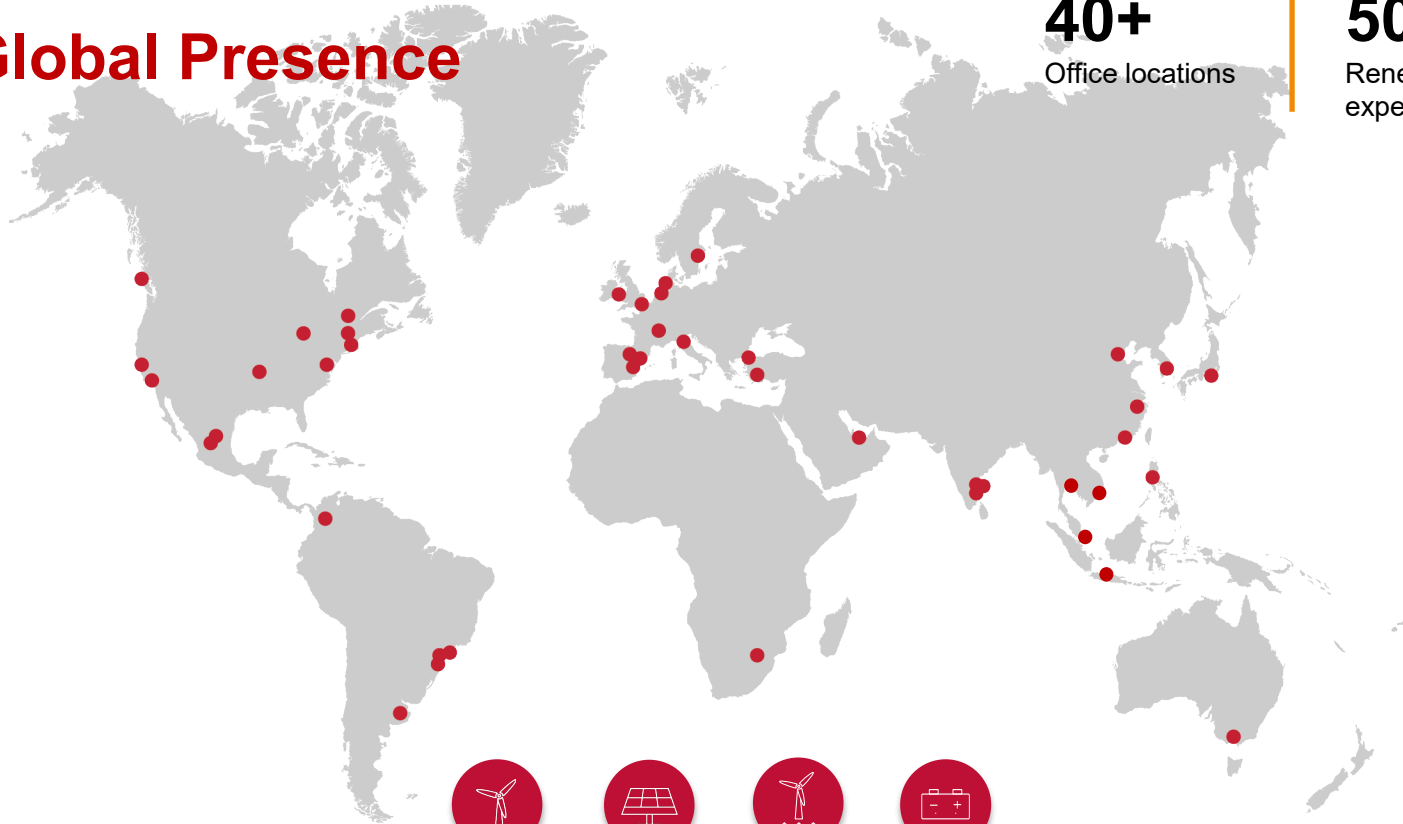
Our Global Presence

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Office locations

500+

Renewable energy experts



● Key Locations



WIND



SOLAR



OFFSHORE



STORAGE



Renewables are showing resilience

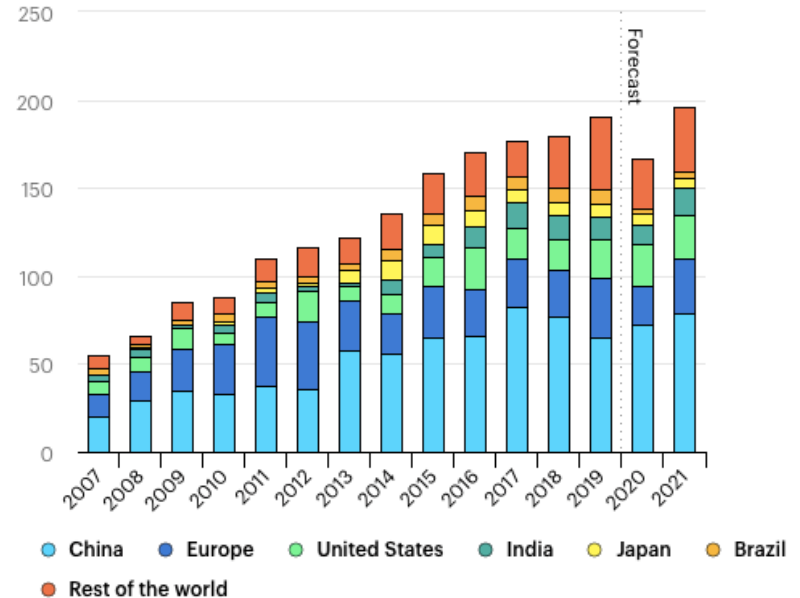
Power generation from clean renewable sources has grown steadily around the world through

- Government support
- Technology improvements and declining costs

Covid19 will impact capacity additions this year, but they should resume in 2021

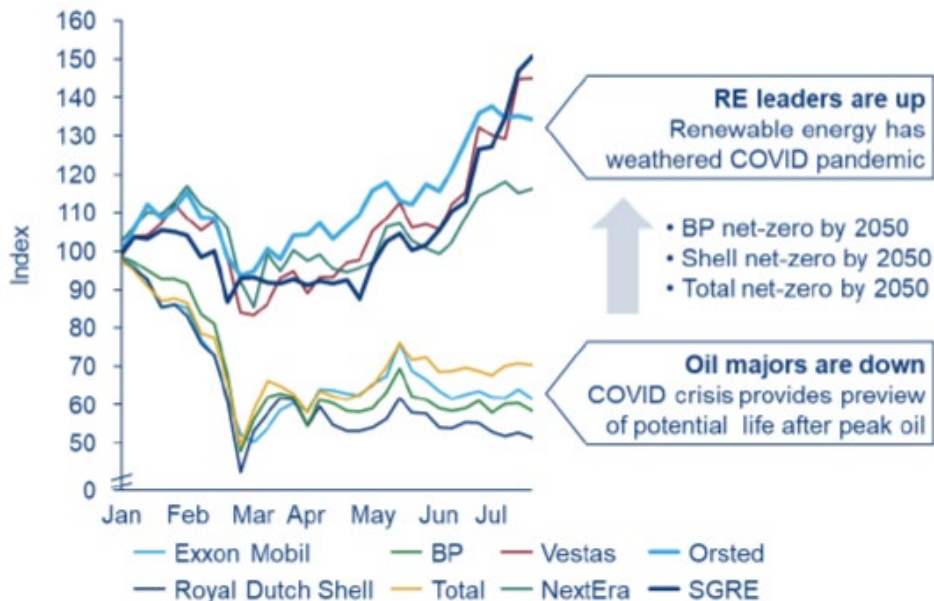
- Project delays in America, EU
- US production tax credit extension
- EU green investments

Global renewable energy capacity additions, 2007-2021 (Source: IEA)



Markets are betting on clean energy

Stock price performance of selected renewable and O&G firms (Source: WoodMackenzie)



Covid19 and the economic downturn may accelerate the shift to resilient, zero-carbon power

- Clean energy investments are seen as job creators
- Renewable energy is local energy – an antidote to globalization
- Climate change is adding to energy supply risk, helping renewables

But if the economy stagnates for long, prices and demand for new clean power may be depressed

Distributed energy with storage is the future

Global DER and microgrid installed capacity increasing fast

- Distributed energy resources (DER) grew 50GW in 2019 to 528GW (+10%)
- Microgrids projected to expand from 3.5 GW in 2019 to nearly 20 GW in 2028 (21% CAGR)

Market Drivers

- Demand for resilience in developed countries
- Demand for access to reliable power in developing countries



Power supplied by a microgrid in Sigora, Haiti



DER Challenges

Hybrid power systems are inherently more complicated than traditional renewables

- Solar, wind, storage, gensets, other technologies combined in one integrated system
- Must deliver reliable, high-quality power while being simple to operate
- Accurate performance predictions are needed for financing commercial and utility-scale projects

Being close to the user, DER poses added safety risks

- Lithium-ion batteries can be especially hazardous
- Thermal runaway is difficult to extinguish

S&C Electric
battery fire (2016)








Ochang, South Korea,
battery factory fire (2010)



Walmart
PV array fire (2019)



Relevant Safety Standards for ESS & UPS

Stationary Applications		
Product	Application	Standard
Stationary Batteries 	Battery cell, module, and packs used for residential, commercial, and utility energy storage	ANSI/UL 1973
Energy Storage Systems 	Battery or other storage technology used in conjunction with inverters	ANSI/UL 9540
Standby Batteries 	Lead-acid batteries used in standby or UPS applications	ANSI/UL 1989
UPS 	Maintain continuity of an alternating power source &/or Improve the quality of power source	ANSI/UL 1778
Energy Storage Systems 	Thermal Runaway Fire Propagation Within Battery Energy Storage Systems	UL 9540A

Due Diligence

The due diligence process assesses all the risks in a hybrid or distribute power system

- Safety
- Technology
- Performance
- Contractual & financial
- Operational



Towards a resilient, zero-carbon future



Distributed energy resources and microgrids are the way of the future



Distributed energy raises challenges to ensure reliable performance and safety in urban settings



Covid19 has had an impact, but it appears likely to be temporary, and has hurt conventional energy much more



At UL, we believe in the distributed energy future and will continue to support the community to get there



Questions?

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