THE POWER GENERATION MIX:
KEEPING THE LIGHTS ON IN AN ESG-FOCUSED WORLD

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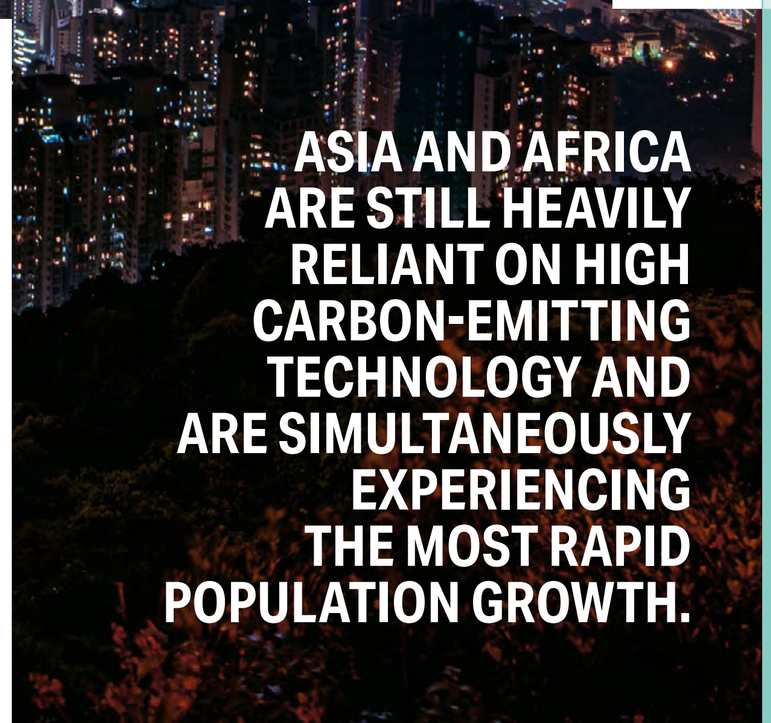
Global demand for power is expected to double from 20,000 TWh in 2020 to around 45,000 TWh in 2050, due to population growth, economic development and infrastructure requirements, especially in Asia, Africa and the Middle East.

Concurrently, Environmental, Social and Governance (ESG) policies have become prominent in the financing, construction, operation, regulation and insurance of power generation assets. Meeting both power and ESG demands is a complex challenge with wide-ranging impacts on regional economic development and living standards. This article provides a brief overview of this complex relationship.



THE GLOBAL GENERATION MIX & INCREASING DEMAND FOR POWER

The global power generation mix relies on approximately 63% fossil fuels (37% coal, 23% gas, 3% oil) 10% nuclear, 16% hydro and 11% from wind, solar and other renewables. Coal, the highest carbon emitter, is still the largest single source of power generation.

However, the generation mix varies significantly between regions, as shown below:

SOURCE (%):	COAL	GAS	OIL	NUCLEAR	HYDRO	WIND	SOLAR	OTHER RENEWABLES
GLOBAL	37	23	3	10	16	5	3	2.5
UK	2	43	3	16	2	27	5	2
US	19	39	1	18	6	10	5	2
INDIA	74	3	0	3	10	4	5	1
CHINA	61	3	0	5	15	9	5	2
SOUTH AFRICA	85	0	1	5	1	5	3	0

In OECD countries, the environmental impact of power generation is being reduced by moving to lower carbon technologies such as wind, solar and nuclear, with gas seen as a stepping stone to lower carbon (emissions are half that of coal). However, Asia and Africa are still heavily reliant on high carbon-emitting technology and are simultaneously experiencing the most rapid population growth.

Economic development, living standards and health are all dependent on reliable access to affordable power. Countries with low CO_2 emissions are associated with energy (and social) poverty, whilst high GDP countries (> $25,000 per capita) with advanced living standards also produce unsustainably high CO_2 emissions. Regions with the fastest population growth are set to see the greatest rise in carbon emissions (notably from coal).

RELEVANCE OF ESG FACTORS TO POWER GENERATION

ESG factors are increasingly prominent within government and the corporate sector, where boards, shareholders, clients and staff are all engaged on the topic. Power generation has particular relevance with numerous technologies involved:

- **Coal:** Although the highest CO_2 emitter with the most damaging effect on the environment, coal provides continuous generation, has a small geographical footprint per MWh and strong financial and social benefits by employing local communities.
- **Gas:** With 50% of the CO_2 emissions of coal, gas provides continuous generation, has a small footprint and offers strong local employment benefits.
- **Nuclear:** Whilst benefits include zero CO_2 emissions, continuous generation, a small area footprint and significant local employment, nuclear waste handling is a difficult issue and nuclear's large water requirement has a negative environmental impact.
- **Hydroelectric:** Although hydro has zero CO_2 emissions, it is limited by geographical location.
- **Solar/ Wind:** This produces zero CO_2 emissions, but can be limited by weather conditions and geographical factors. Also, its intermittent generation requires battery or thermal storage.

FINANCE AND INSURANCE SECTOR PERSPECTIVE

Investors and insurers have adopted ESG strategies and are moving their financial and underwriting capacity for construction and operational assets to low-carbon emission technology. Many institutions aim to pull out of "dirty" power generation, but recognise their clients are on a journey to transition from oil and gas to renewables (e.g. Statoil to Equinor, DONG to Orsted, GDF to Engie) and continue to underwrite high-carbon emission technology to support their clients and protect their premium income.

Fossil fuel power generation dominates the energy mix in developing economies and there is a danger that, if insurers walk away from these technologies, the rate of capacity installation may be hampered, with obvious knock-on effects to the economic development and living standards in those countries. To help justify continued underwriting of "dirty"

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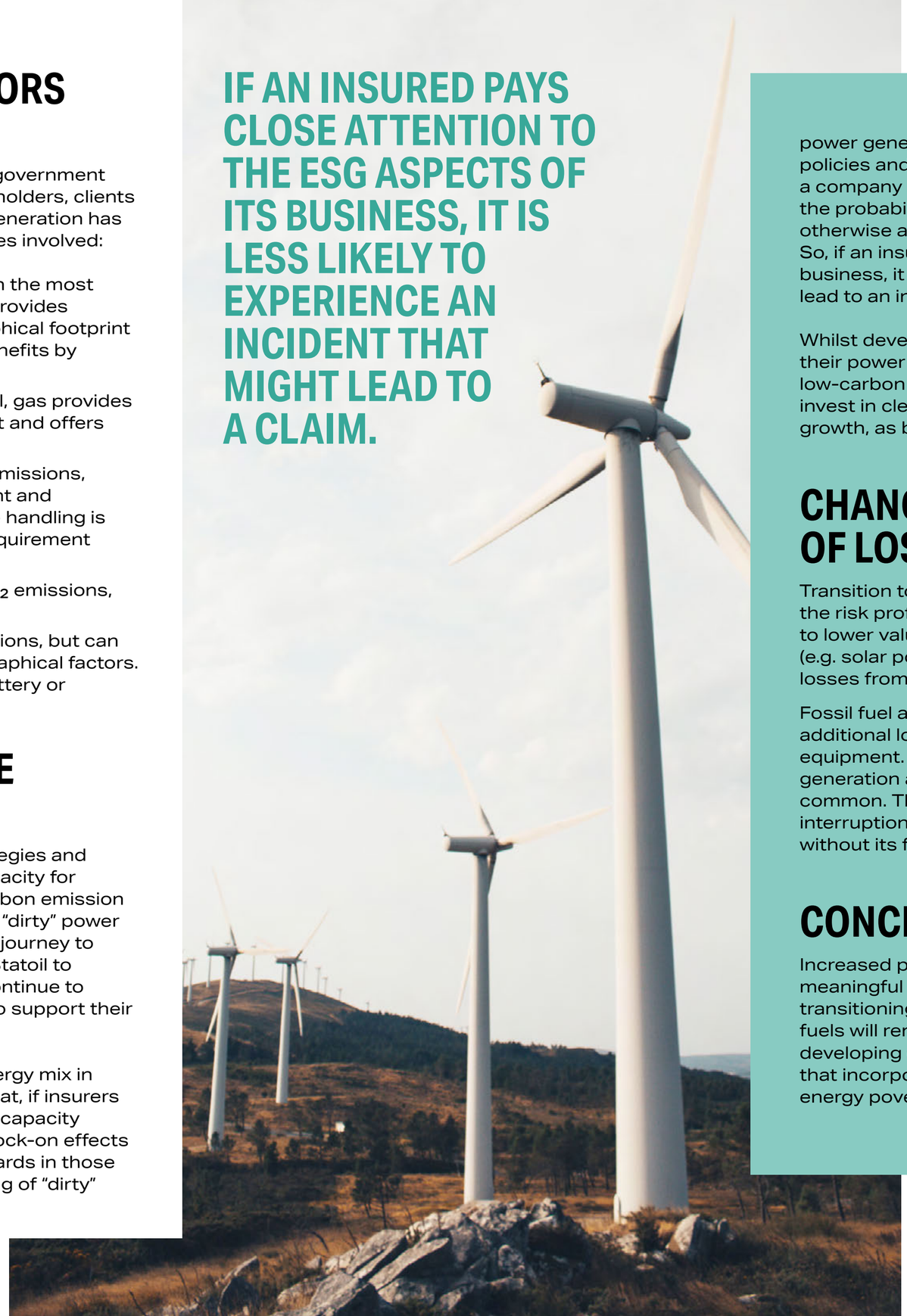

power generation, insurers are assessing the insureds' ESG policies and implementation. Actuarial studies show that when a company has a comprehensive ESG policy fully implemented, the probability of it experiencing a harmful event (insured or otherwise and regardless of technology) correlates inversely. So, if an insured pays close attention to the ESG aspects of its business, it is less likely to experience an incident that might lead to an insurance claim.

Whilst developing countries rely on fossil fuel for the bulk of their power generation today, many are looking to move to low-carbon emission technology. Their dilemma is whether to invest in cleaner power generation technologies or economic growth, as both cannot be achieved simultaneously.

CHANGE IN THE NATURE OF LOSSES

Transition to low-carbon emission technologies is changing the risk profile of the power generation industry. This is leading to lower value individual losses occurring at higher frequencies (e.g. solar power inverter losses), along with occasional larger losses from typical and atypical weather-related events.

Fossil fuel and large plant losses will continue, but with additional losses associated with carbon abatement equipment. Emission restrictions for high-carbon power generation assets and pollution penalties will likely become common. This may present some interesting business interruption losses when considering whether to run a unit without its flue scrubber.

CONCLUSION

Increased power demands over the next 30 years and meaningful ESG policies present a complex challenge to transitioning towards low-carbon emission technology. Fossil fuels will remain important in the power generation mix for developing countries. A pragmatic ESG strategy is required that incorporates cleanup technology and avoids prolonged energy poverty.