

World Energy Trilemma Index | 2019

EXECUTIVE SUMMARY

In Partnership with Oliver Wyman



OVERVIEW

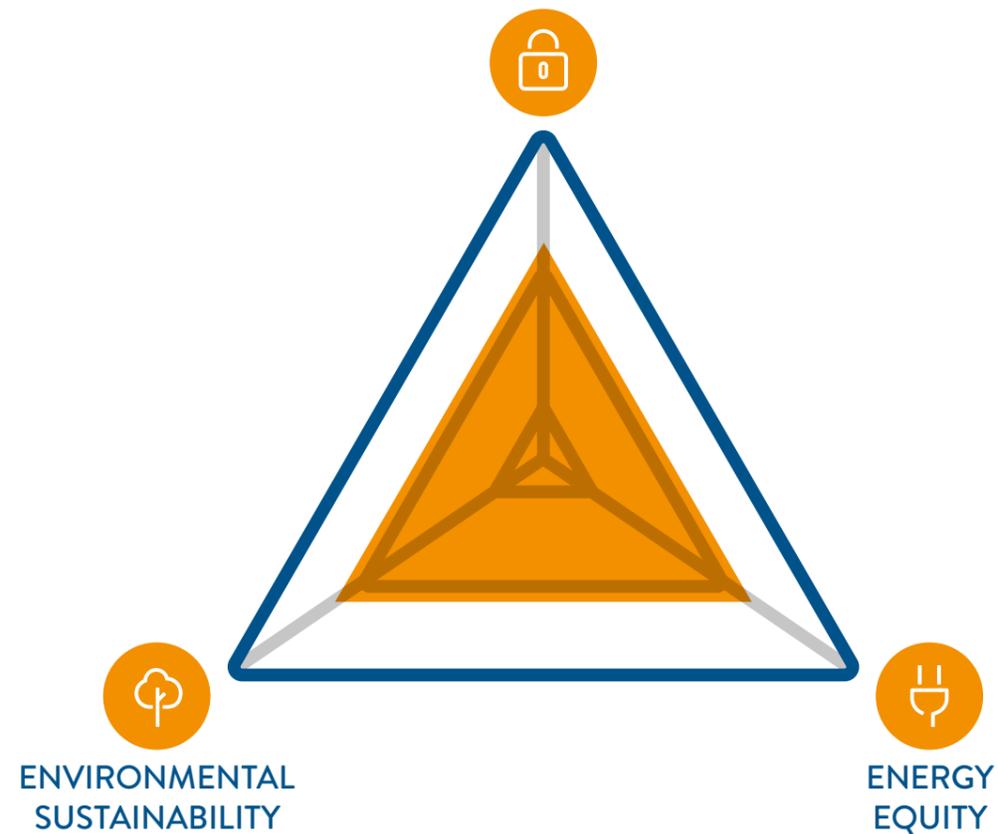
The World Energy Council's definition of energy sustainability is based on three core dimensions: Energy Security, Energy Equity, and Environmental Sustainability of Energy Systems. Balancing these three goals constitutes a 'Trilemma' and balanced systems enable prosperity and competitiveness of individual countries.

The World Energy Trilemma Index has been prepared annually since 2010 by the World Energy Council in partnership with global consultancy Oliver Wyman, along with Marsh & McLennan Insights of its parent Marsh & McLennan Companies. It presents a comparative ranking of 128 countries' energy systems. It provides an assessment of a country's energy system performance, reflecting balance and robustness in the three Trilemma dimensions.

Access the complete Index results, national Trilemma profiles and the interactive Trilemma Index tool to find out more about countries' Trilemma performance and what it takes to build a sustainable energy system:

<https://trilemma.worldenergy.org>

World Energy Trilemma Index 2019, published by the World Energy Council 2019 in partnership with OLIVER WYMAN.



MONITORING THE SUSTAINABILITY OF NATIONAL ENERGY SYSTEMS

The world is undergoing an unprecedented energy transition, from a system based on carbon-intensive fossil fuels to a system based on low carbon, renewable energy, driven by the twin imperatives of mitigating climate change and generating economic prosperity. The speed of change and the effectiveness of individual governments to develop and implement policies to deliver energy sustainability varies across countries and geographies. The World Energy Council recognises the value of adopting a whole energy systems approach in providing the benefits of sustainable energy to all. This energy transition is a connected policy challenge – success involves managing the three core dimensions; Energy Security, Energy Equity and the Environmental Sustainability of Energy Systems throughout the transition process.

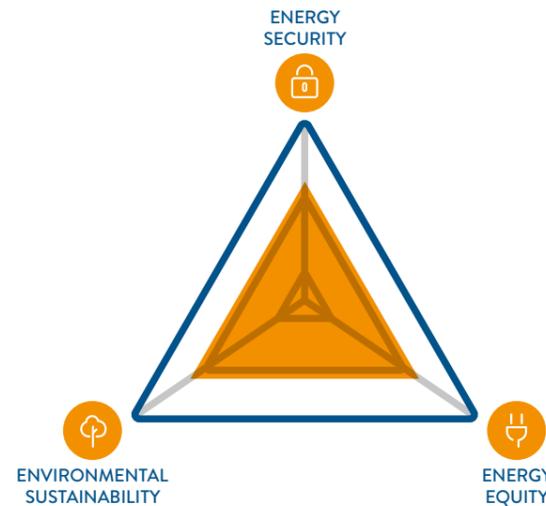
The Council's World Energy Trilemma Index, developed in partnership with Oliver Wyman, provides an objective rating of national energy system performance across these three Trilemma dimensions. We have created the Trilemma to support an informed dialogue about improving energy policy to achieve energy sustainability, by providing decision-makers with information on countries' relative performance. Objectively comparing the success of energy systems around the globe is challenging, but a high-level ranking of performance against a set of benchmark indicators helps start a conversation about policy coherence and effectiveness. Deeper analysis at regional and national levels can give policy makers real insights on trajectories and outlooks, informing future priorities.

To provide greater insight, we have evolved the methodology for the 2019 Trilemma and, for the first time, introduced visualisation of historical trends to enable the Trilemma performance of individual countries to be tracked back two decades to 2000. The new time-series analysis provides insights into a country's historical trends, challenges and opportunities for improvements in meeting energy goals now and in the future. The Index demonstrates the impact of varying policy pathways countries have taken in each of the dimensions over the past 20 years. Looking at these trends can inform a dialogue on national energy policy to promote coherence and integration to enable better calibrated energy systems in the context of the global energy transition challenge.

Ten countries achieve the top AAA balance grade in the 2019 World Energy Trilemma Index, representing top quartile performance in every dimension. Since 2000, no countries have consistently improved in each dimension every year; instead most show historical trends with a variety of peaks and troughs in a general upward direction. Overall Trilemma performance for 119 countries over the 20-year period has improved, with only 9 countries seeing their overall performance declining. The rate of improvement in overall Trilemma performance also increases as the transition progresses and encourages countries to improve their energy policies.

TOP 10 OVERALL RESULTS

1. Switzerland
2. Sweden
3. Denmark
4. United Kingdom
5. Finland
6. France
7. Austria
8. Luxembourg
9. Germany
10. New Zealand



TOP 10 ENERGY SECURITY

1. Sweden
2. Denmark
3. Finland
4. Latvia
5. Canada
6. Angola
7. Ukraine
8. Romania
9. Slovenia
10. Czech Republic

TOP 10 ENERGY EQUITY

1. Luxembourg
2. Bahrain
3. Qatar
4. Kuwait
5. United Arab Emirates
6. Oman
7. Saudi Arabia
8. Netherlands
9. Iceland
10. Singapore

TOP 10 ENVIRONMENTAL SUSTAINABILITY

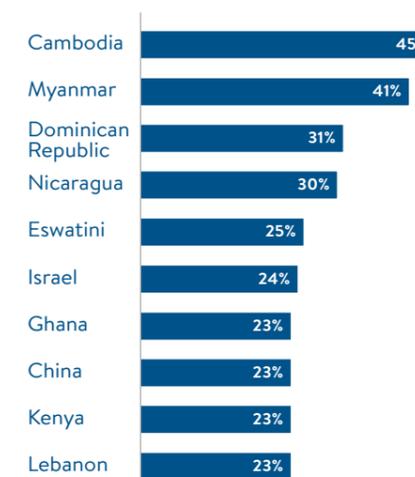
1. Switzerland
2. Denmark
3. Sweden
4. France
5. Norway
6. United Kingdom
7. Costa Rica
8. Luxembourg
9. Namibia
10. Slovakia

The ability to differentiate between top performers and top improvers is an important new feature of the enhanced Trilemma tool.

The overall top three – Switzerland, Sweden and Denmark – have balanced policies for consistent performance in each dimension, and high baselines in each indicator coupled with steady economic growth. Cambodia, Myanmar and the Dominican Republic are the greatest overall improvers, gaining 30-40% from the 2000 baseline. Their rapidly improving energy systems are the result of a focus on electrification, energy generation diversity, and infrastructure investment, pushing up performance from a low baseline.

Energy Security: The top performing countries in 2019 are Sweden, Denmark, and Finland, with the most robust and secure energy systems that manage supply and demand effectively. The countries displaying the greatest advances since 2000 are Malta, Jordan and the Dominican Republic. These countries have all implemented small but significant changes with big impacts, such as increasing supplier diversity or stock levels or investing in grid stability.

TOP 10 OVERALL INDEX SCORE IMPROVERS 2000 – 2019



Full results and profiles per country, historical trends in each dimension and analysis from national stakeholders are available via the online Trilemma Tool: <https://trilemma.worldenergy.org>

TOP 10 SECURITY IMPROVERS

- 84% Malta
- 70% Jordan
- 62% Dominican Republic
- 54% Israel
- 54% Cyprus
- 49% Tanzania
- 47% Singapore
- 41% Uruguay
- 25% Cameroon
- 25% Jamaica

TOP 10 EQUITY IMPROVERS

- 140% Cambodia
- 131% Nepal
- 114% Myanmar
- 112% Bangladesh
- 95% Indonesia
- 91% Kenya
- 76% Ghana
- 67% Nicaragua
- 65% Sri Lanka
- 64% Ethiopia

TOP 10 SUSTAINABILITY IMPROVERS

- 66% Myanmar
- 65% Qatar
- 62% Poland
- 57% China
- 52% Czech Republic
- 49% Malawi
- 48% Israel
- 46% Ireland
- 46% United States
- 46% Australia

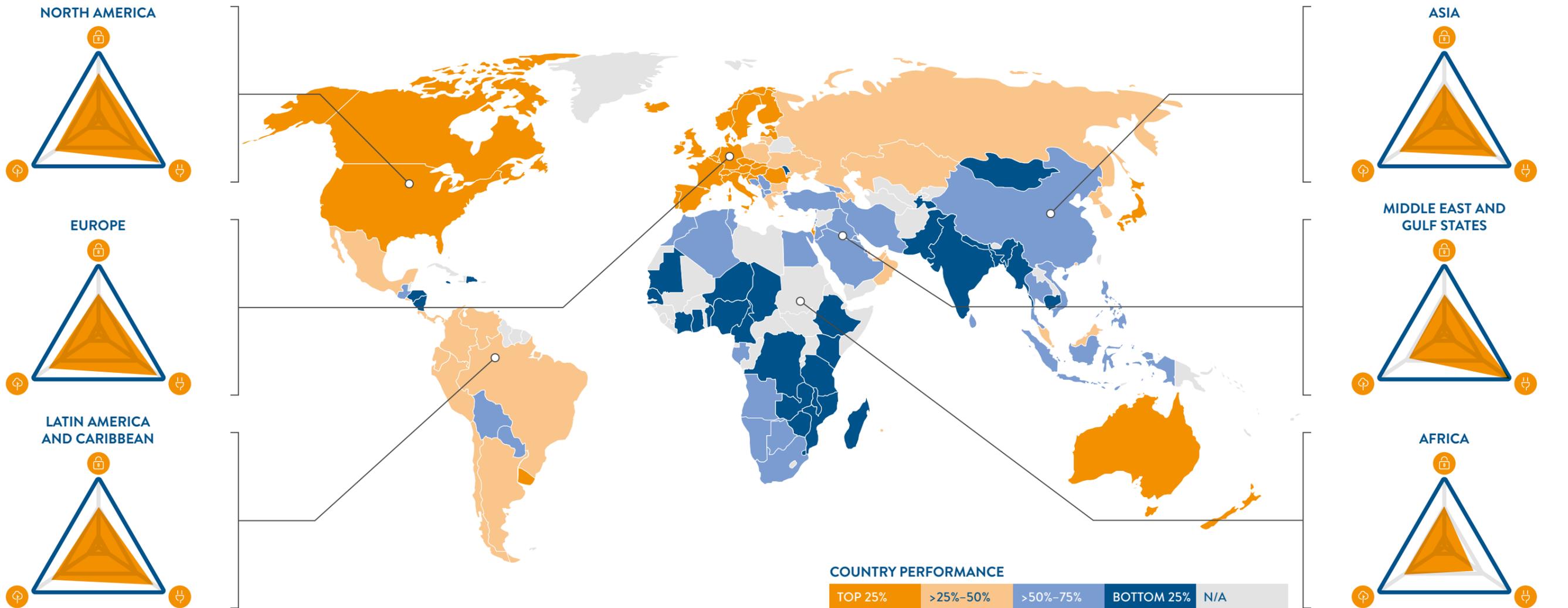
Energy Equity: This dimension traditionally ranks well-endowed or well-connected countries and populations with access to abundant and affordable energy: Luxembourg, Bahrain and Qatar are the top performers in 2019. The historical improvement story is very different; the top improvers are focused on UN Sustainable Development Goal 7 – achieving universal access to basic energy needs. Cambodia, Nepal, and Myanmar have more than doubled levels of energy access above their 2000 baseline.

Environmental Sustainability of Energy Systems: Switzerland, Denmark and Sweden, the 2019 leaders in this dimension, are firmly on the pathway to decarbonisation, pollution control and sustainable economic growth. Significant improvers over time, showing progress against lower baselines, are countries tangibly decarbonising since 2000, like China and Poland.

Readers are encouraged to use the Trilemma framework with its three dimensions of Security, Equity and Sustainability to inform an engaged dialogue with policy makers and energy communities about navigating the energy transition effectively and building prosperity for a nation's citizens.



WORLD ENERGY TRILEMMA INDEX 2019: REGIONAL OVERVIEWS



NORTH AMERICA

OPPORTUNITIES IN THE ENERGY TRANSITION

North America has strong energy security based on a long track record of developing abundant and diverse energy resources. Large energy trade flows between the countries enable supply diversity and the redundancy inherent in the continental transmission networks with mutual aid cooperative arrangements. Energy equity is strong and generally remains a relatively low-profile matter in the region. Energy is a critically important and highly-valued component of the North American economies, and the energy transition creates a challenge and a major opportunity. Countries will take diverse pathways given their diversity in environmental policy and also the diversity in policies between national and state or provincial governments in Canada and the United States.

EUROPE

TRILEMMA CHALLENGES OF ADVANCED TRANSITION

European countries dominate the top 50 overall Index recognizing Europe's substantial progress on the energy transition pathway, yet multiple policy challenges remain. The European Union's current mitigation commitments will not allow it to meet its sustainable energy objectives, whilst further rapid penetration of renewables can be a risk to supply reliability and short-term affordability of energy to citizens. Energy poverty is a concern in Europe, as high prices affect affordability. European countries have focused on increasing diversity of energy sources and supply and interconnection to improve energy security. Modernising and optimising fossil-based infrastructure and integrating new renewable infrastructure will require coordinated efforts to ensure a technology-neutral, level playing field of fiscal policies.

LATIN AMERICA AND CARIBBEAN (LAC)

REGIONAL INTERCONNECTIONS NEEDED TO STRENGTHEN TRILEMMA OUTCOMES

Eleven LAC region countries rank in the Trilemma top 50 on environmental sustainability, and show positive trends. However, extreme weather challenges energy security given the region's high dependence on hydro generation. The region also faces challenges of poor diversification of energy sources, inequality of wealth distribution, and limited utilisation of interconnections and grid infrastructure. A 250% projected rise in electricity usage over the next 40 years highlights the need for large-scale infrastructure development and regional integration to improve energy security and resilience. Energy access is nearly 100% but 30 million people still do not have access to power. Distributed generation can play a key role in improving energy equity in the region.

ASIA

TRYING TO MEET RISING ENERGY DEMAND AND BALANCE THE TRILEMMA

Trilemma rankings reflect regional diversity, with nine of the 23 countries ranking in the top half of the Index, and only New Zealand ranking in the top ten. Despite significant progress in energy equity, the region struggles with energy security as the largest market for energy imports, and energy sustainability as growing demand currently exceeds the ability to rely on renewables to mitigate emissions. To improve trilemma performance, many countries are developing energy plans that include a focus on renewables. Yet challenges remain including outdated infrastructure; a lack of coordinated national energy policies; limited regional integration; trade patterns; an unbalanced distribution of resources and an uncertain global economic situation.

MIDDLE EAST AND GULF STATES (MEGS)

THE TIME TO FOCUS ON ENERGY DIVERSIFICATION IS NOW

MEGS countries have a range of energy resources and economic diversification, but face common environmental challenges including extreme weather, desertification and water stress. The group is strong in energy access and affordability, but increased diversification of energy generation and innovative solutions need to be adopted to meet rising energy demand and improve energy sustainability. Going forward, renewable and nuclear energy programmes are expected to be deployed throughout the region, improving energy security, system resilience, and environmental sustainability. The easing of energy subsidies, coupled with energy efficiency measures, have slowed the unsustainable growth in energy demand while freeing up some capital for investment in renewable energy infrastructure.

AFRICA

PROGRESS TOWARDS SUSTAINABLE ENERGY FOR ALL NEEDS IMPROVED INSTITUTIONAL CAPABILITIES

Many African countries are making substantive improvements in energy access but long-standing issues such as grid stability and supply reliability remain. Large disparities in demographics and consumption patterns, in the context of lower economic development has the region in the bottom half of Trilemma rankings. Cost-effective development of the region's abundant energy resources along with expanded use of decentralised grids and distributed generation would enable a more reliable energy supply. Top security performers have developed energy resources to meet domestic and export demands. Energy efficiency programmes and increasing deployment of renewables are growing in the continent. Further development, along with improved grid stability and universal access would help Africa improve its Trilemma triangle.

ABOUT THE WORLD ENERGY COUNCIL

The World Energy Council is the principal impartial network of energy leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all.

Formed in 1923, the Council is the UN accredited global energy body, representing the entire energy spectrum, with over 3,000 member organisations in over 90 countries, drawn from governments, private and state corporations, academia, NGOs and energy stakeholders. We inform global, regional and national energy strategies by hosting high-level events, including the World Energy Congress and publishing authoritative studies, and work through our extensive member network to facilitate the world's energy policy dialogue.

Further details at www.worldenergy.org and [@WECouncil](https://twitter.com/WECouncil)

ABOUT OLIVER WYMAN

Oliver Wyman is a global leader in management consulting. With offices in 60 cities across 29 countries, Oliver Wyman combines deep industry knowledge with specialized expertise in strategy, operations, risk management, and organization transformation. The firm has more than 5,000 professionals around the world who work with clients to optimize their business, improve their operations and risk profile, and accelerate their organizational performance to seize the most attractive opportunities. Oliver Wyman is a wholly owned subsidiary of Marsh & McLennan Companies. For more information, visit www.oliverwyman.com. Follow Oliver Wyman on Twitter [@OliverWyman](https://twitter.com/OliverWyman).

The full report can be found at www.worldenergy.org/publications

Published by the World Energy Council 2019

Copyright © 2019 World Energy Council. All rights reserved. All or part of this publication may be used or reproduced as long as the following citation is included on each copy or transmission: 'Used by permission of the World Energy Council'

www.worldenergy.org

World Energy Council

Registered in England and Wales
No. 4184478

VAT Reg. No. GB 123 3802 48

Registered Office

62-64 Cornhill
London EC3V 3NH
United Kingdom