GSMA
Intelligence

Green shoots: a new model for renewables from the GCC

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Foreword

The GCC Sustainability Innovation Hub for the telecoms sector has been established to address the demand for innovative solutions aligning with the unique requirements of the GCC telecoms operators, particularly those related to sustainability goals and targets. The Innovation Hub illustrates that competitors can collaborate effectively to accelerate the realisation of necessary outcomes and establish an ecosystem congruent with solution providers. Additionally, it aims to shorten the market introduction period for sustainability-focused products in the region, benefiting not only the telecoms sector. Collaborative efforts are recognised as the most sustainable and effective approach to achieving results.

Hearing from each telco involved in the hub underlines a consensus in the value of pooled resource and best practice to drive up renewables.

Renewables and decarbonisation are not just aspects of our corporate strategy; they are its very core. The establishment of the Sustainability Innovation Hub marks a significant step in our leadership, demonstrating a hands-on commitment not just to our own goals, but to bringing together peers across the region. It's about uniting efforts to overcome a shared challenge.

– Harrison Lung, Chief Strategy Officer, e&

Beyon recognises the importance of the GCC Sustainability Innovation Hub and its significant role in aligning with the broader sustainability goals of the sector. Therefore, Beyon is dedicated to sharing their knowledge and expertise on their own success sustainability stories and projects. Through these collaborative efforts the GCC Sustainability Innovation Hub has the potential to significantly accelerate sustainability efforts and facilitate the adoption of sustainable practices.

– Bader Al Khalifa, Chief Communications and Sustainability Officer, Beyon

By fostering an environment of collaboration and innovation, the hub allows us to leverage collective knowledge, share best practices, and explore cutting-edge solutions that align with our sustainability objectives. Our support for the hub manifests in several ways, including contributing research and expertise that aids in the development of sustainable solutions. We are also committed to making strategic investments in promising projects and startups that emerge from the hub's ecosystem.

– Saleem Alblooshi, Chief Technology Officer, du

The GCC Innovation Hub is a crucial platform for supporting sustainability plans, offering a governance structure that fosters discussion and innovation, particularly from a renewable energy perspective. We draw particular benefit from exposure to best practices, evidence-based costs, and decision-making tools that help us support Oman's 2050 Net Zero and Hydrogen strategies.

– Cara Laing, General Manager, Governance and Enterprise Risk Management, Omantel

Ooredoo is steadfast in its commitment to embedding sustainability at the heart of its strategy, prioritising renewable energy adoption and enhancing carbon footprint efficiency. As a key participant in the GCC Sustainability Innovation Hub, Ooredoo harnesses this collaborative platform to engage with regional telecoms leaders, exchanging best practices, expertise and forward-thinking solutions that propel the industry towards a sustainable future.

Through the hub, Ooredoo contributes to a variety of initiatives aimed at addressing shared environmental challenges, such as improving energy efficiency across operations and exploring pioneering technologies that support decarbonisation goals. By participating in this dynamic ecosystem, Ooredoo not only accelerates its own sustainability journey but also amplifies the collective impact of the GCC telecoms sector on global sustainability. This commitment resonates with Ooredoo's vision of fostering a greener, more sustainable future for the communities it serves throughout the region.

– Fatima Sultan Al-Kuwari, Group Chief Human Resources and Sustainability Officer, Ooredoo

We have taken a big leap in uniting the GCC telco operators along with their vendors and partners for the cause of sustainability. GCC Sustainability Innovation Hub has become an impactful platform for discussing innovative solutions, knowledge sharing, and achievements. Furthermore, challenges and opportunities are being identified and discussed to leverage pervious experiences for advancing the GCC region in a harmonised single flow towards a more sustainable telco and tech industry.

– Maha Alnuhait, General Manager for Sustainability, stc Group

The Sustainability Innovation Hub is a key initiative in region. Having a common ground for discussing shared challenges helps understand what solutions are most workable, and where targeted policy actions can help to incentivise renewables investment and take-up. Our participation is very much in line with Zain's broader ESG goals and ambitions.

– Jennifer Suleiman, Chief Sustainability Officer, Zain

Executive summary

Renewables: core to the decarbonisation imperative

Decarbonisation in the telecoms industry refers to two objectives: removing carbon from the telecoms operator business, and removing it from the supply chain and customers. Increasing the use of renewables and energy efficiency are core to both objectives.

Data from the GSMA Intelligence Telco Energy Benchmark study indicates that renewables almost doubled as a percentage of total operator energy consumption, to around 20% in 2023. However, that is still *only* 20%, with grid power supplying the majority of the sector's energy. The growth in renewables usage is welcome and reflects increases in capacity in Europe, and to a lesser extent in China and the US. Privately financed power purchase agreements (PPAs) and long-term supply deals (forward contracts) have also helped.

The challenge is on the supply side – particularly in Africa and Asia, where renewables infrastructure is far more limited and operators face a more difficult set of economics operating base stations in low-density, rural areas. There are various reasons for the constraints; the most common are access to land and space for deployments, and disincentives to invest in economies where access to fossil fuels is already plentiful and relatively cheap. Solutions and policy remedies to the challenges are urgent considering the timelines and milestones for net zero.

The GCC Sustainability Innovation Hub was formed by telcos with operations in the Middle East, North Africa and parts of Asia, with a view to driving up renewables usage. While not the only such initiative, it is a leading example of operator collaboration and resource pooling to help overcome market distortions that have hindered renewables in the Middle East and other regions.

Several factors are driving the urgency to act:

- **Hitting net zero**
  - Achieving net zero by 2050 means CO_2 reductions of 50% in each of the next three decades. The 2020s is the hardest as reductions are from the highest emissions base.

- **Tapping into the enablement effect**
  - For the geographical footprint analysed in this report, 10–15% of the required CO_2 savings by 2030 can be enabled by mobile and digital technology, depending on the industry. The carbon savings are equivalent to 3–8× the telecoms sector's own emissions.

  - The savings are highest for industries where use of 5G connectivity, IoT and other connected devices are highest (e.g. oil & gas and buildings), and are

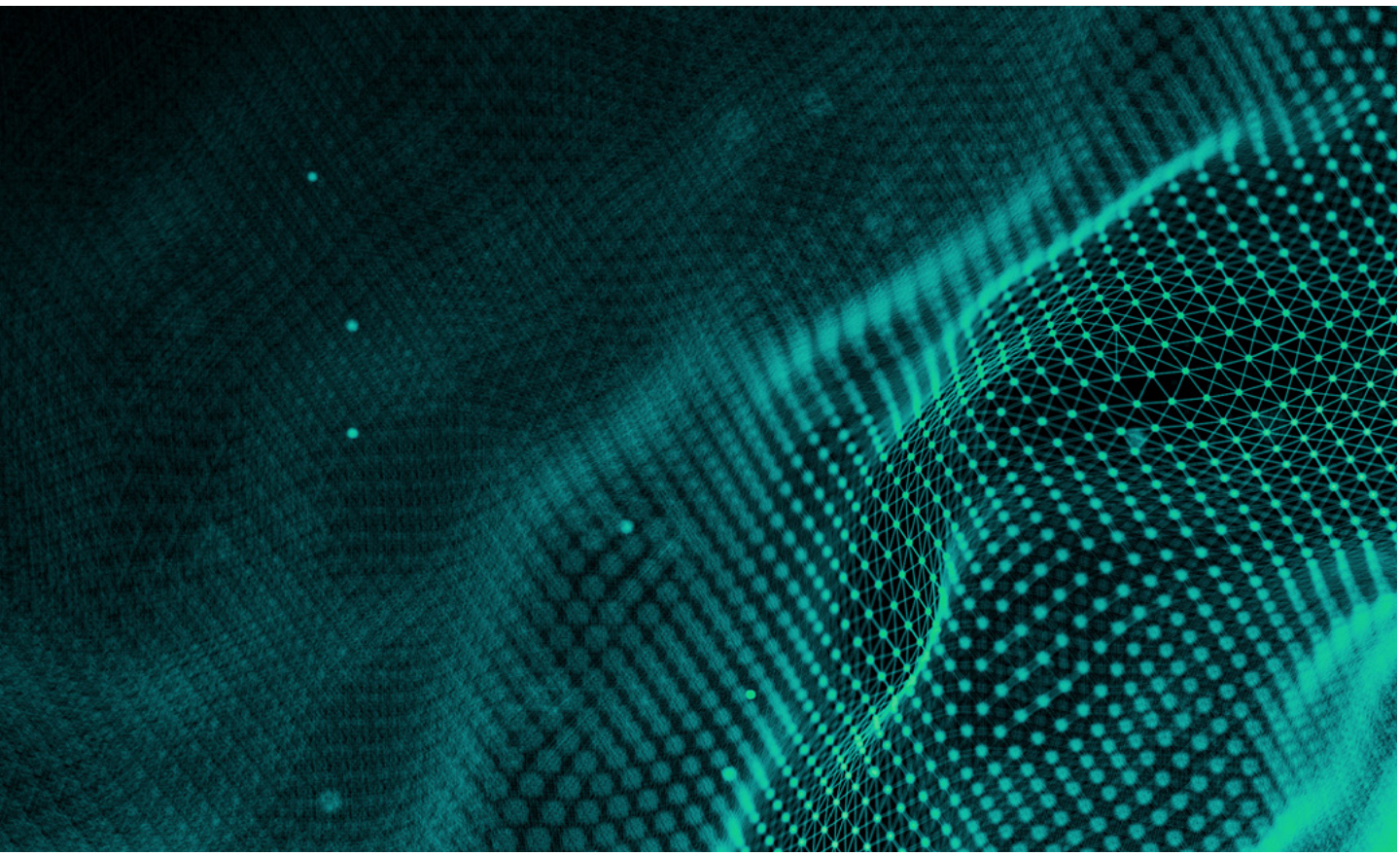
lowest where digitisation is at an earlier stage (e.g. agriculture). This can change over time as slower-to-adopt industries deploy mobile and digital solutions in their operations.

- **Helping with costs**
  - Energy still represents 15–20% of opex for an average operator – a high and stubborn cost line.
  - Renewables help the cost profile of operators in tandem with use of more energy-efficient network equipment.
  - There is a potential boost to the EBITDA margin of 0.5–4.0 percentage points (pp) depending on how much energy costs reduce by and the size of the operator, which tends to dictate margin. For example, an operator with a 25% EBITDA margin that reduces energy costs by 10% would have a boost to EBITDA of around 2 pp.

Decoupling economic growth from carbon emissions to mitigate environmental risks and achieve sustainability requires the barriers hindering the transition to renewables in the GCC and other regions to be addressed. Governments can help in a number of areas, by:

- introducing or expanding investment incentives around renewables infrastructure and connection nodes for domestic and international investors
- phasing down hydrocarbon subsidies that artificially lower electricity tariffs and, by extension, make the investment case for renewables much less compelling
- easing land access and/or building rights for private sector companies (including mobile operators) to deploy renewable infrastructure.

Both the public and private sectors must play a pivotal role in addressing these challenges, paving the way for a transition to a cleaner, more efficient energy system. By taking proactive steps now, the GCC region can secure long-term prosperity while reducing its environmental footprint.



1. Understanding the GCC Sustainability Innovation Hub and its relevance

1.1 About the GCC Sustainability Innovation Hub

Telecoms operators in the Gulf region have formed a partnership – the GCC Sustainability Innovation Hub – to take on the challenges highlighted above through a new model of energy sourcing. It includes:

- seven operators: Beyon, du, e&, Ooredoo, Omantel, stc Group and Zain
- 39 operating subsidiaries
- 33 countries.

The partnership involves setting common standards for equipment vendors to follow in responding to RAN and core infrastructure request for proposals (RFPs), rather than having to design different approaches for different companies. This standardised approach and pooled procurement from operators aims to boost scale economies in network equipment, and improve the investment case for a power-sector investor to deploy renewable energy capacity in the footprint countries of these operators across North Africa, the Gulf and parts of Asia.

There is also a benefit to the broader sector from sharing case studies and proof points from the initiative on how to source renewables at a lower cost.

The relevance today comes from the pressures on energy efficiency, ongoing cost strain (energy still accounts for 15–20% of opex for the sector on average) and the need to establish a sustainable model for renewables. There is also a leadership point in showing initiative on the renewables transition by companies based in countries regarded as oil economies, underscoring that climate action is an imperative rather than a choice.

This is about walking the walk. Early proof points from the hub give credence to that. For example, e&'s new solar solution in the UAE has reduced power consumption in mobile networks by 40%. PTCL in Pakistan, in partnership with Huawei, is now engaged in swap-outs of diesel generators for hybrid battery-solar power for sites across the country. Zain is using AI with its vendors to reduce power consumption at base stations

by 15–20%. stc Group has optimised data-centre energy consumption by 20%.

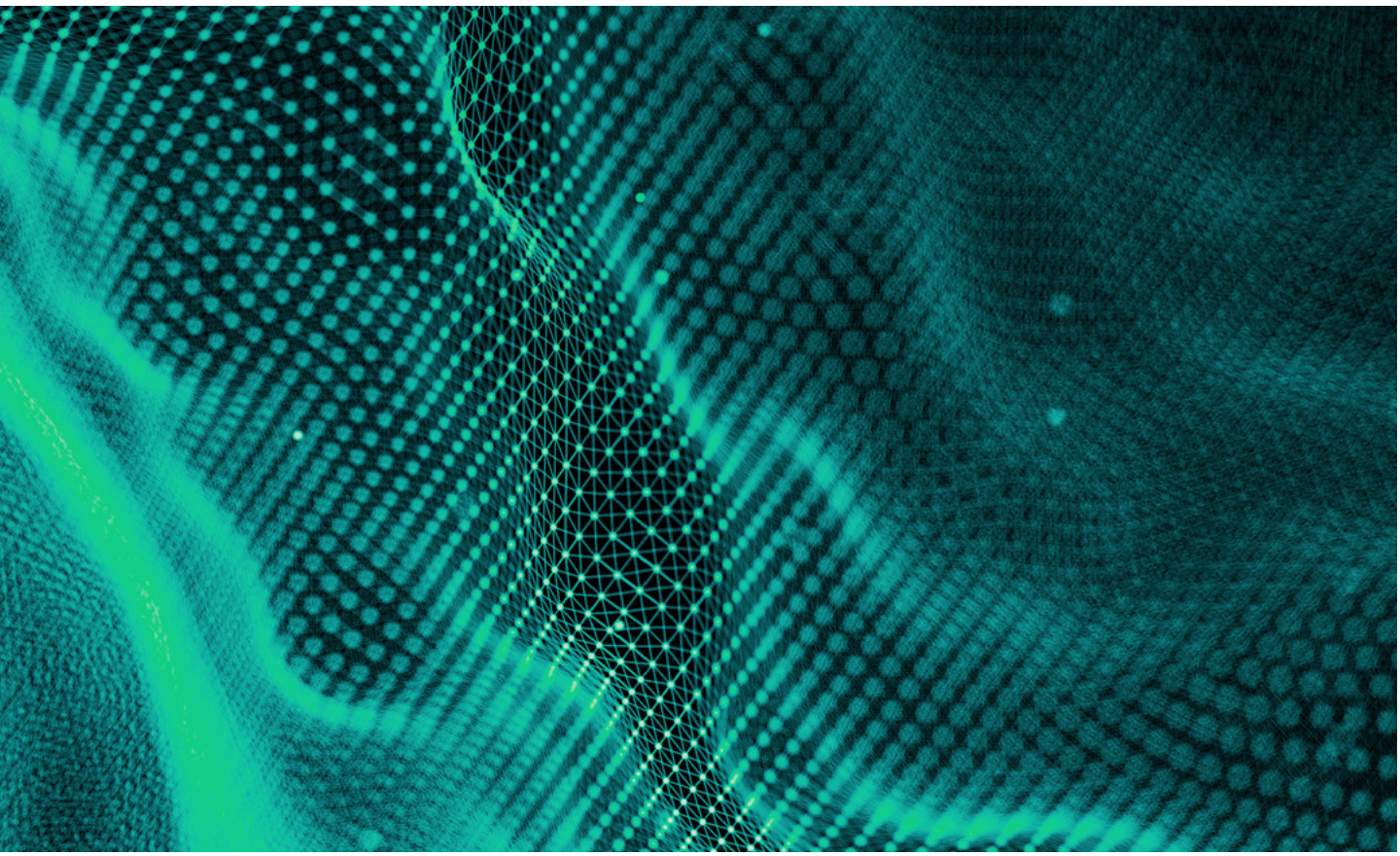
In Bahrain, Beyon has the first solar-powered data centre in the country. The solar park generates 3.6 GWh of clean energy, leading to a carbon footprint saving of more than 2,000 tonnes each year. The company is also expanding its investment in renewables. In 2024, it invested more in the solar park project, engineered to power a certified tier-3 data centre. With 1.5 MW capacity and 2.5 GWh generation, it will drive annual carbon reductions of 1,584 tonnes. Over its lifetime, three phases of solar investment are forecast to result in 152.5 GWh of clean power generation, removing 100,650 tonnes of carbon.

The GCC Sustainability Innovation Hub is ultimately one initiative among others across the industry to drive up renewables usage. However, it is a leading example of operator collaboration and resource pooling to help overcome market distortions that have hindered renewables in the Middle East and other regions. The hub also helps improve the business case for outside investors to finance new renewables deployments – a key prerequisite to growing renewables take-up.

1.2 Report scope

This research presents the state of play and outlook for renewables. It also outlines the long-term benefits to decarbonisation that such an energy transition offers. Focus areas cover:

- the net-zero outlook
- the state of play for renewables in telecoms
- calculations on the financial benefits from renewables and better energy efficiency
- the enablement effect on vertical sectors from mobile and IoT connectivity
- the constraints to renewables access and how to address them.



2. Net zero by 2050: closer than you think

2.1 Pressure on energy consumption

Decarbonisation of the telecoms industry involves two objectives, with increasing the use of renewables and energy efficiency core to both:

- removing carbon from the telecoms operator business (scope 1 and 2 emissions)
- helping enterprise customers in other industries and the supply chain lower their carbon footprints (scope 3).

The first goal primarily targets mobile and fixed networks, as they account for 90% of energy usage for an average operator; the remaining 10% comes from fleet, property and ancillaries. Net-zero commitments to a 2050 timeline imply CO_2 reductions of 50% in each of the next three decades. The 2020s is the hardest, as the carbon load to reduce is the largest.

Taking energy usage by telecoms operators in total, GSMA Intelligence estimates the industry accounts for around 1% of energy use worldwide (see Table 1). This equates to around 115 megatonnes of carbon, which is actually a lower share of the global total (0.3%) than energy because of the greater use of renewables than other industries such as manufacturing and aviation. However, renewables still only account for 20% of power usage among operators on average. There is also significant regional variation, with operators in several parts of the world much lower than the average.

Pressure on energy consumption is driven by a mix of factors, including 5G data traffic, enterprise workloads and now AI training and inferencing. Each is likely to continue trending up for the next five years. AI is likely to be the single biggest factor impacting energy use across the technology world, with the compute load in data centres implying the energy curve for hyperscalers will rise further before it comes down (see Figure 1).

Table 1

Operators account for 1% of global energy usage

	Electricity usage		CO_2 footprint	
	Terawatt hours (2022)	% of global total (2022)	Megatonnes of CO_2e (2022)	% of global total (2022)
Mobile networks (excl. operator data centres)	168	0.6%	64	0.2%
Fixed line networks	132	0.5%	50	0.1%
Total mobile and fixed line networks	300	1.1%	114	0.3%
Operator data centres	19	0.07%	7	0.02%
Hyperscaler and other data centres	319	1.2%	120	0.3%
Total data centres	338	1.3%	128	0.3%
Global total (all industries)	26,799	100%	37,857	100%

Source: GSMA Intelligence

Telecoms operators, as network providers, will not feel the AI energy impact to the same extent. However, even a declining curve (share of global total energy use) does not necessarily mean falling usage per se, let alone falling costs. In many cases, energy pressures are likely to continue unabated, particularly in countries reliant on foreign imports, including most of Europe. This trend places greater urgency on network efficiencies and renewables access to counteract the anticipated higher electricity usage.

The energy challenge also underpins commercial opportunities. Power efficiency is increasingly a competitive differentiator for operators selling into enterprises. There are also opportunities around new products in the EV space, sustainability-as-a-service and even retail power sales as a bundled add-on to operator services.

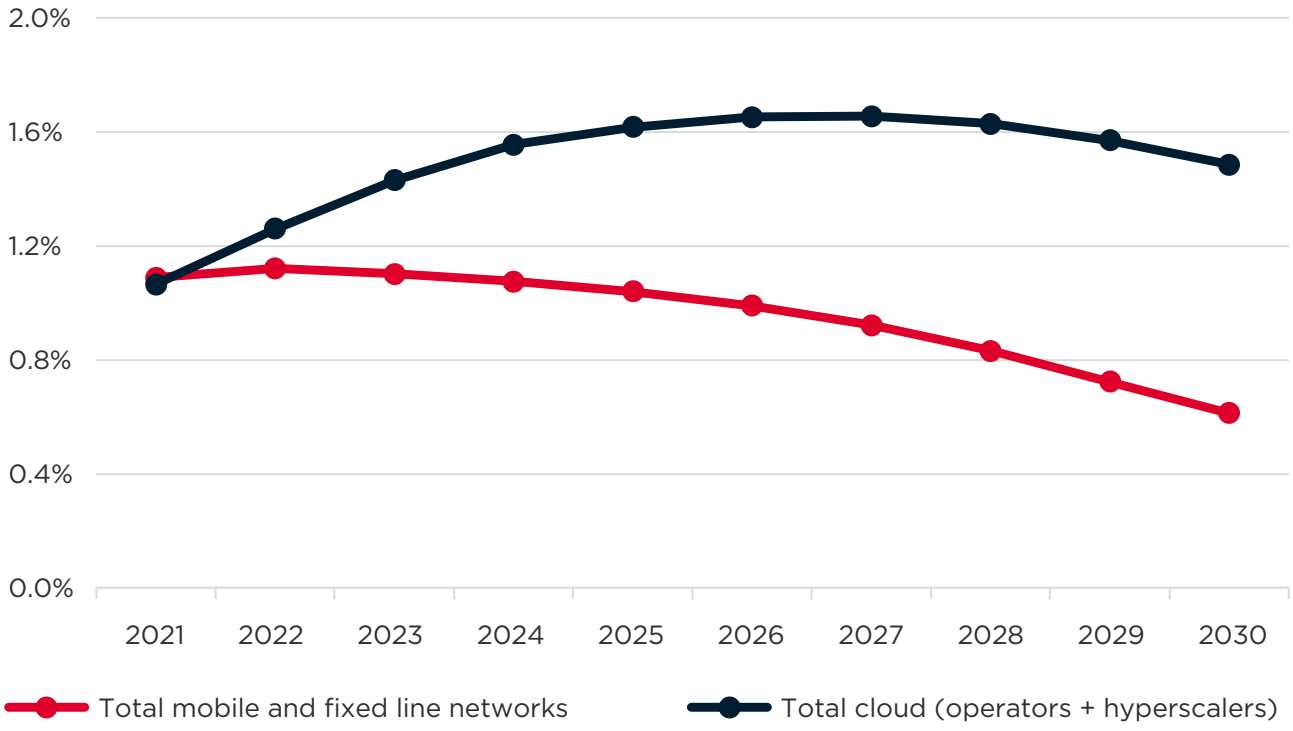
2.2 Sizing the challenge: overall

Carbon emissions expressed on a per-capita level (the best way to standardise comparisons) are higher in the GCC than on average globally and in neighbouring regions. On average, emission rates in the GCC are 3–7x higher than those in low- and middle-income countries, revealing a stark imbalance in environmental impact and added urgency to the green transition. There is also significant variation across the Middle East and neighbouring regions (see Figure 2). This underscores the challenge that high-income markets with energy-intensive economic activities and high fuel consumption (i.e. Qatar, UAE, Saudi Arabia) have in reducing emissions, and the challenge that low- and middle-income markets (i.e. Indonesia, Pakistan, Myanmar) have in building climate change resilience.

Figure 1

A forward view of energy use for telecoms networks and data centres

Percentage of global energy consumption

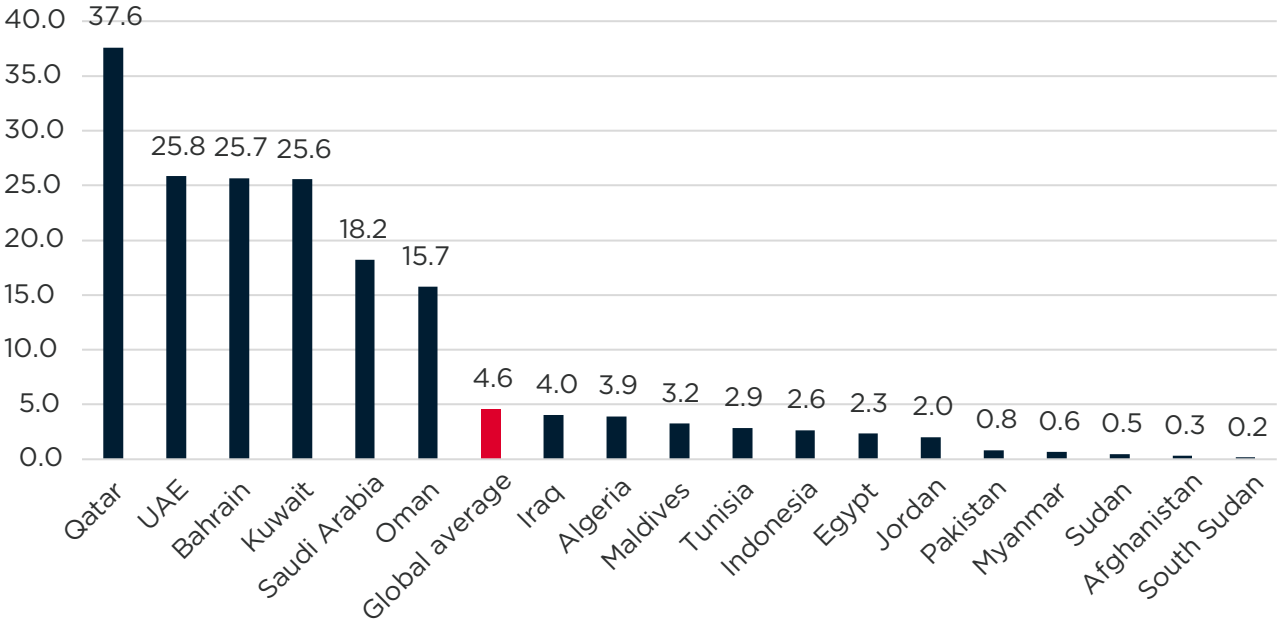


Source: GSMA Intelligence

Figure 2

GCC carbon emissions per capita are higher than the global average

Emissions per capita



Countries shown are those where the GCC Sustainability Innovation Hub operators have telecoms operating subsidiaries

Source: Our World in Data

2.3 Sizing the challenge: by industry

The carbon profile by industry is shown in Figure 3 for regions where the GCC Sustainability Innovation Hub operators have subsidiaries.

- **GCC**
  - The bulk of emissions comes from oil & gas and power & utilities.
  - Unsurprisingly, nearly all the electricity generated in the region comes from natural gas and oil resources.
- **North Africa**
  - Oil & gas is the primary contributor to increasing greenhouse gas (GHG) emissions.
  - As with the GCC, subsidies disincentivise renewable energy while hindering adoption of low-carbon technologies, contributing to the region's rising emissions. Algeria's universal hydrocarbon subsidies are a good example, furthering fossil fuel-based consumption and undermining the renewables investment case.
  - There are positive examples from the region. Egypt has implemented a series of renewable energy projects that leverage solar, wind and biofuels. In Jordan, solar or wind power accounts for approximately 29% of the electricity grid.
- **Other Innovation Hub markets**
  - In other low-middle income markets such as Myanmar, Afghanistan and South Sudan, the bulk of emissions comes from other industries, with agriculture accounting for the most.

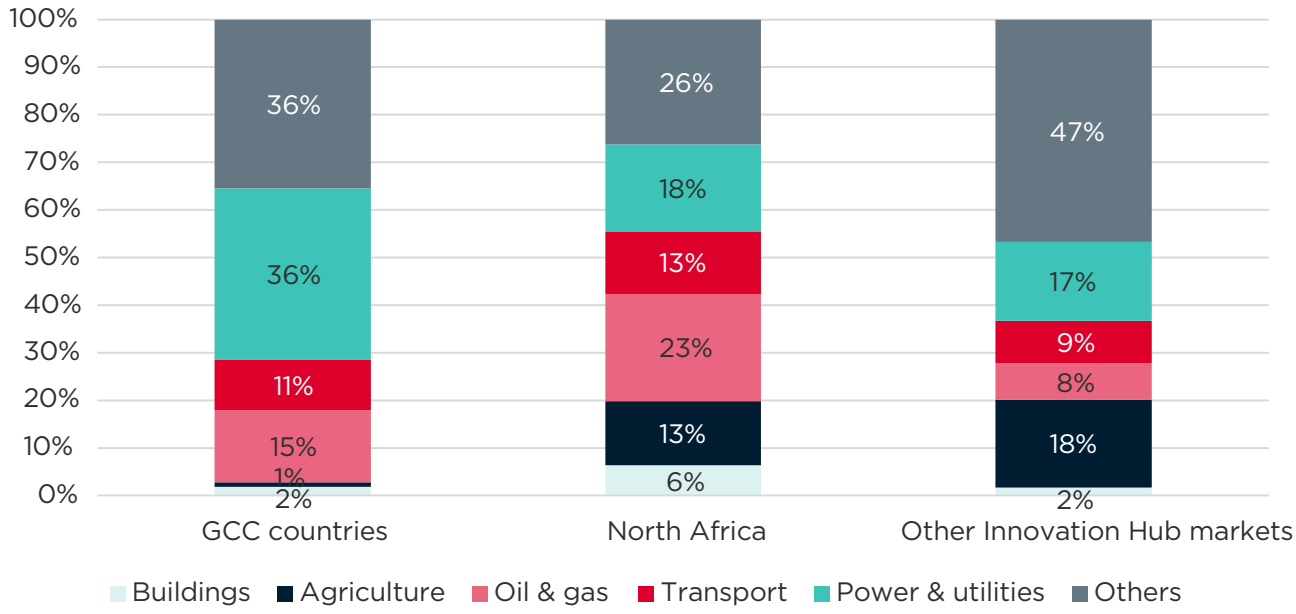
Several factors are driving increased use of electricity across each region. These include higher-than-average economic growth, increased temperatures and consequent use of air conditioning, and the lack of more sustainable alternatives.

Government policy of subsidising electricity and energy in general through state-imposed tariffs and tax-free regulation has also played a role. For example, for domestic use, Kuwait and Qatar offer electricity for free to their citizens, while Saudi Arabia, Bahrain and Oman subsidise its cost to maintain relatively low prices. Low fuel and gas prices discourage investment in clean energy while locking in inefficient technologies.

The transport industry, which accounts for 11% of emissions generated in the GCC, is notable in this respect. Electric vehicle (EV) subsidies, direct purchase benefits and owner privileges are yet to be announced across most of the region. So far, only Dubai has launched incentives for EVs in the form of dedicated free EV parking spaces and free charging through the public charging network of the Dubai Electricity and Water Authority (DEWA). While welcome, these incentives will not be sufficient to translate into ownership levels that would meet the UAE government's target of EVs representing 50% of total car sales by 2050.

Figure 3

Share of emissions by sector for selected GCC Sustainability Innovation Hub markets



GCC countries – Qatar, UAE, Bahrain, Kuwait, Saudi Arabia, Oman.
North Africa – Algeria, Tunisia, Egypt, Jordan, Sudan.
Other Sustainability Innovation Hub markets – Iraq, Indonesia, Pakistan, Maldives, Myanmar, Afghanistan, South Sudan.
Others – waste, agriculture, aviation, land and forestry, manufacturing, other fuel combustion.

Source: Our World in Data, GSMA Intelligence

3. Renewables: state of play

3.1 The supply-side challenge

Rebalancing the energy consumption portfolio in favour of renewables continues to be a priority for the telecoms sector, as it is across the broader economy. The rationale is anchored in net-zero objectives, requiring CO_2 reductions of 50% in each of the next three decades. The 2020s is the hardest as reductions are from the highest emissions base.

Establishing a hedge against wholesale energy market volatility, particularly for operators in countries highly reliant on foreign imports (such as the UK), is similarly important over the longer term, considering the unabated pressures on energy consumption for mobile operators.

Data from the GSMA Intelligence Telco Energy Benchmark study indicates that renewables almost doubled as a share of total operator energy consumption to around 20% in 2023 (see Figure 4). However, it is still *only* 20%, with grid power supplying the majority of the sector's energy.

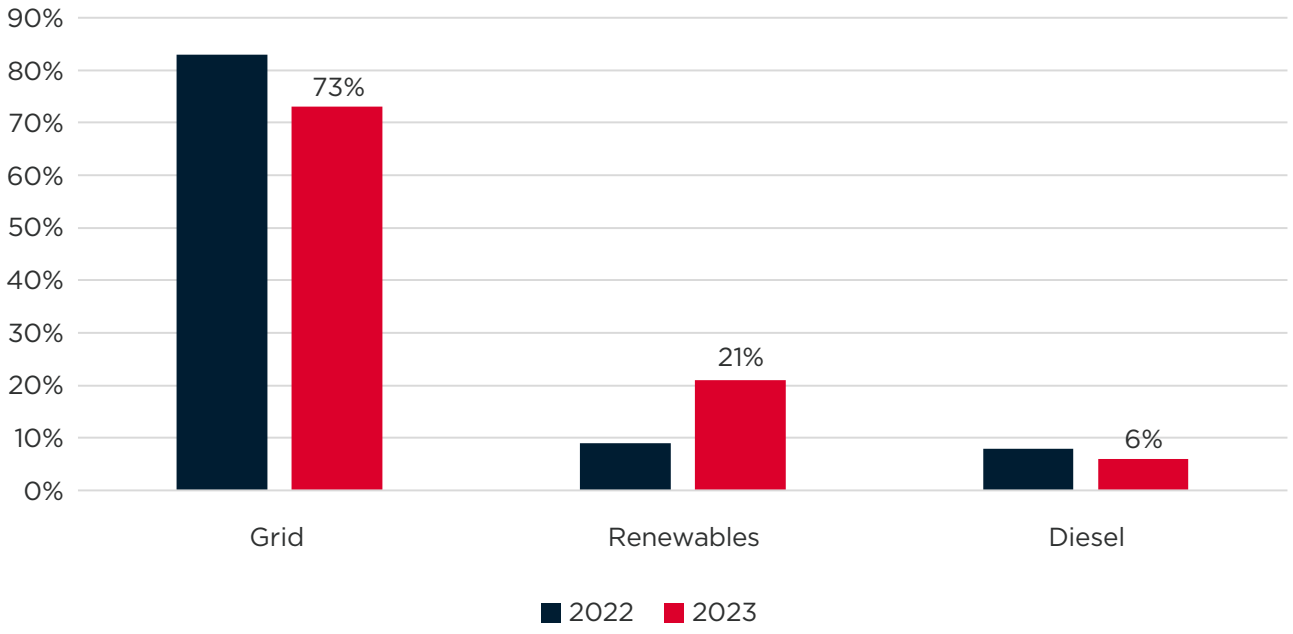
Growth in the use of renewables usage is, of course, welcome, and reflects increases in capacity in Europe, and to a lesser extent in China and the US. This is shown in the regional data shown in Figure 5. Privately financed power purchase agreements (PPAs) and long-term supply deals (forward contracts) have also helped. Nuclear power is also in play to complement renewables, albeit at a lower scale because of costs and environmental risk management.

The challenge is on the supply side – particularly in Africa and Asia, where renewables infrastructure is far more limited and operators face a more difficult set of economics in operating base stations in low-density, rural areas. There are various reasons for the constraints. The most common are access to land and space for deployments, and disincentives to invest in economies where access to fossil fuels is already plentiful and relatively cheap. Solutions and policy remedies to the challenges are urgent, considering the timelines and aforementioned milestones for net zero.

Figure 4

Use of renewables among operators: growing but still only a fifth of the power draw

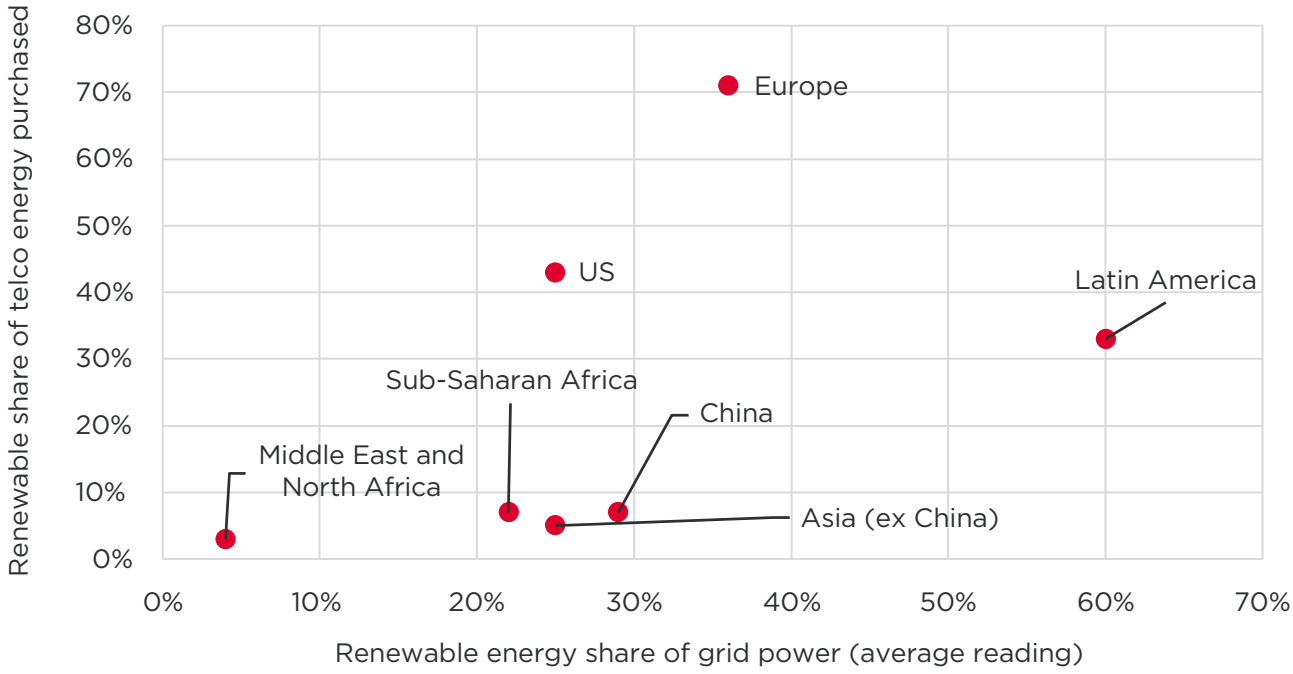
Percentage of global operator energy consumption drawn from each fuel type



Source: GSMA Intelligence Telco Energy Benchmark 2024

Figure 5

European and US operators record the highest use of renewables



Note: data based on operator survey covering around 50% of global market share. As such, figures for entire global operator base may differ.

Source: GSMA Intelligence

4. Decarbonising profitably

4.1 Exploring cost structure and energy's contribution

The shift to renewables and a more energy-efficient network architecture has a direct impact on operator profitability. Energy continues to be a stubbornly large cost line for a typical mobile operator. Energy is mostly consumed in the network and consolidated into network opex for mobile and fixed line businesses. GSMA Intelligence estimates these energy costs represent around 20% of opex; this has not changed significantly over the last 10 years. Putting aside the environmental impact of rising energy usage, there is a clear cost implication for operators that is a drag on profitability.

Figure 6 splits out the P&L. Energy costs represent about 5% of overall revenue for an operator with a 35% EBITDA margin – the single largest cost line in network opex. While that may not seem like a lot, in an operating environment where revenue growth remains subdued (in low, single digits), the pressure on costs is high to sustain cashflow to fund future network investments.

There is a positive side to the story when the benefits of energy reductions are considered. To illustrate these, Figure 7 splits out the individual elements of operational spend that go towards network infrastructure: antennas (10%), shelter (10%), energy/power (45%), backhaul and transmission (20%) and optimisation/maintenance (15%).

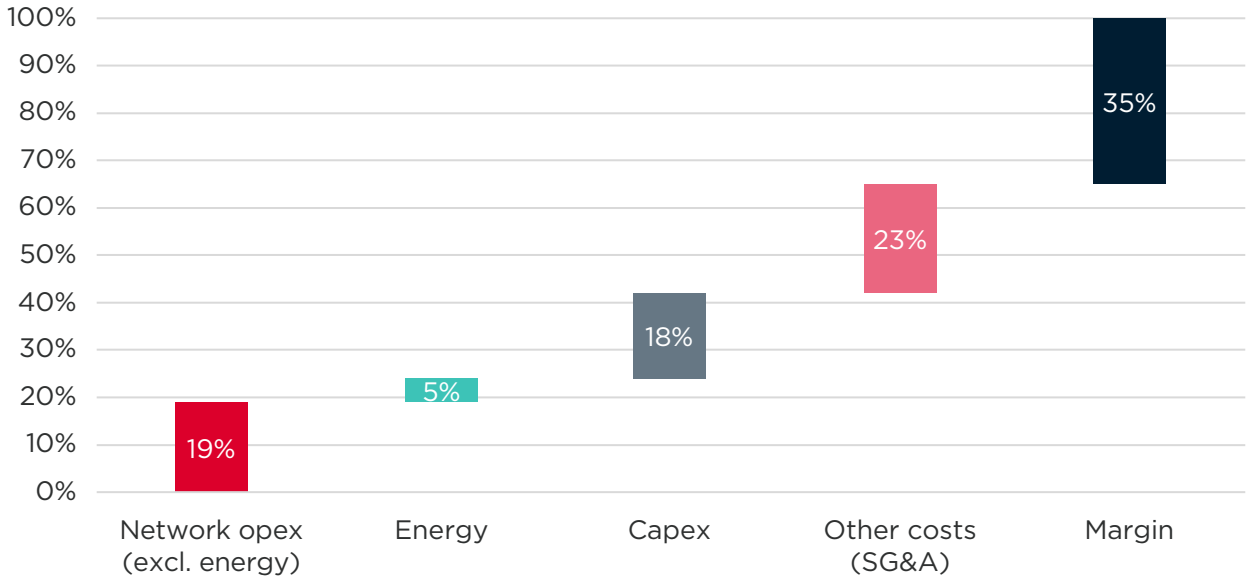
Energy is the single largest cost within network opex, at around 45%. The knock-on effect of a change in energy costs, by extension, feeds through to a larger impact on overall costs. If energy costs were reduced by 10%, it would translate into a reduction in opex of just under 2%, all else being equal. If energy costs were reduced by a higher level, for example 20%, opex would fall by around 4%.

The transition to renewables should help to lower energy costs over time as infrastructure is built at scale. This complements the benefits of using energy-efficient RAN and other network equipment to reduce consumption.

Figure 6

For an operator with a 35% margin, 5% of revenue is still spent on energy

Percentage of service revenue



Source: GSMA Intelligence

Figure 7

Energy reductions have an outsized impact on opex

	Cost-reduction level				
	-2%	-5%	-10%	-15%	-20%
Antenna system leases	-0.1%	-0.2%	-0.4%	-0.6%	-0.9%
Shelter leases	-0.1%	-0.2%	-0.4%	-0.6%	-0.9%
Power consumption	-0.4%	-1.0%	-1.9%	-2.9%	-3.8%
Backhaul and transmission leases	-0.2%	-0.4%	-0.9%	-1.3%	-1.7%
Service (optimisation and maintenance)	-0.1%	-0.3%	-0.6%	-1.0%	-1.3%
	Impact on overall opex				

Heatmap numbers represent consequent change to overall opex by cutting a cost line by percentage level. For example, reducing backhaul leases by 20% would reduce overall opex by around 1.7%. Reducing power consumption by the same level would lower opex by 3.8%.

Source: GSMA Intelligence

Figure 8 shows the flow-through impact on profitability. This is notional given that the actual result on profitability depends on cost and revenue movements entirely separate from energy. However, it is a useful measure to show the impact magnitude.

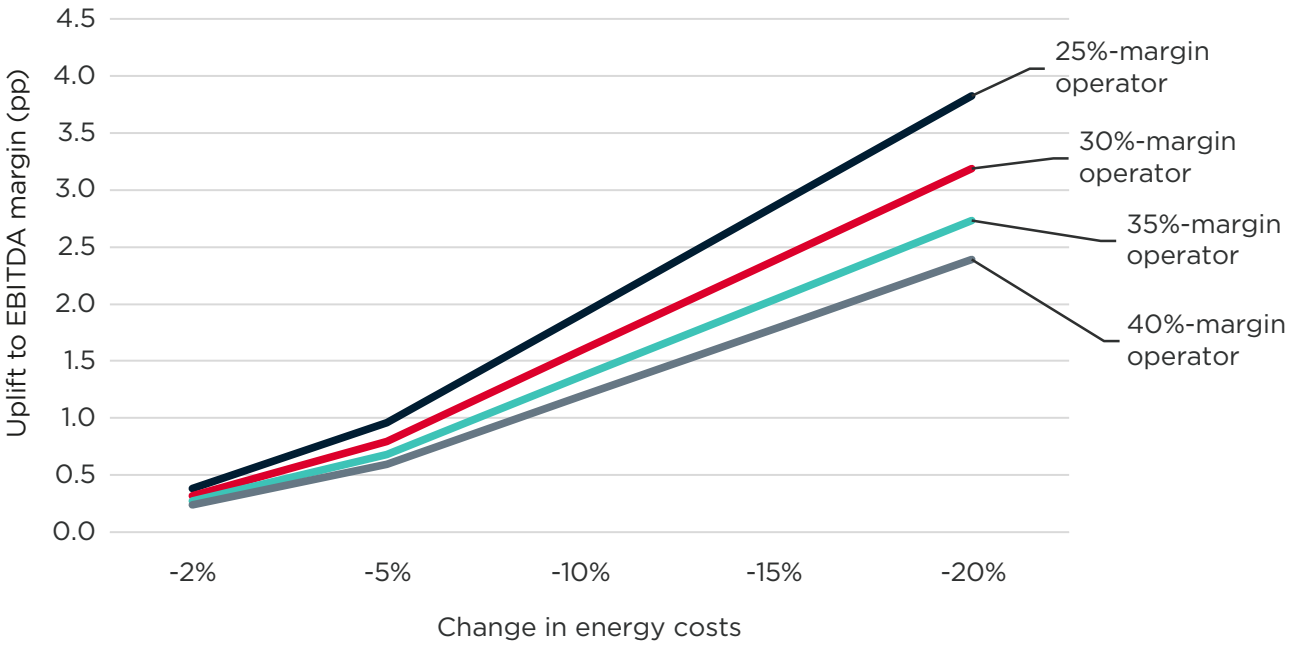
The overall range is a boost to EBITDA margin by 0.5–4.0 pp depending on how much energy costs fall by and the size of the operator, which tends to dictate its margin.

For example, an operator with a 25% EBITDA margin that reduces energy costs by 10% would have a boost to EBITDA of around 2 pp. An operator with a 40% margin that reduced energy costs by 20% would see a rise in its margin of around 2.5 pp.

Reducing energy costs through efficiencies and renewables has a direct benefit on the P&L and long-term sustainability of operators' cost structure.

Figure 8

How lower energy costs could impact margins



Source: GSMA Intelligence

5. Removing carbon from the wider economy

5.1 Understanding the enablement effect

The enablement effect refers to operators providing support to enterprise customers to reduce their carbon footprint. This means enabling carbon avoidance for enterprise customers across a range of industries using cellular and digital technologies to enhance energy efficiency and accelerate the transition to renewables. GSMA Intelligence first quantified the effect globally in 2019[1] and has since updated the projections and customised to a regional level.

For this report, countries included in the enablement analysis are those where operators in the GCC Sustainability Innovation Hub have wholly owned subsidiaries:[2] Saudi Arabia, UAE, Egypt, Pakistan, South Sudan, Algeria, Sudan, Tunisia, Indonesia, Myanmar, Afghanistan, Bahrain, Iraq, Jordan, Kuwait, Oman and Qatar.

Use cases based on 5G connectivity, IoT sensors and devices, edge compute and cloud can play a role in avoiding emissions across industries:

- **Buildings** – Technologies can drive energy savings and emissions reductions through reducing gas and electricity consumption. Among the main use cases are building management; heating, ventilation, and air conditioning (HVAC) systems; and smart meters.
- **Power & utilities** – Microgrids are solar- or wind-powered local energy networks that can operate independently from the main grid while improving energy efficiency and increasing the use of renewable energy. Through mobile technologies and ICT assets, microgrids can monitor and regulate energy supply and distribution. In addition, mobile technologies and IoT sensors can be leveraged by utility companies to quickly identify and fix issues, while the power surplus from microgrids can be sold for profit.
- **Transport (land and sea)** – 5G connectivity and IoT enables transport emissions reductions through a combination of cloud, edge compute and analytics. Telematics can optimise routes, driver performance, and enable vehicle fuel efficiencies.
- **Agriculture** – Smart irrigation systems, remote control of farm vehicles and 5G-connected drones that can monitor the health of crops are the main uses cases in smart farms enabled by 5G connectivity, mobile and ICT technologies. Remote control, in particular, can generate significant fuel savings, as there is no need for the driver to travel to and from the farmland.

[1] For more information, see Enablement effect

[2] Some small countries are excluded where emission levels are negligible and immaterial to the analysis (e.g. Maldives).

- **Oil & gas** – Seismic data collection through IoT sensors connected to 4G or 5G networks reduces the need for manual surveys, while drones can reduce manual patrols. When combined with XR and digital twins, they can also enable remote diagnostics and equipment maintenance.

5.2 Projections for 2030

To put the enablement effect into context in the Middle East and North Africa, we have updated calculations based on industry use cases used or trialled in the region. The analysis covers five industries: power & utilities, buildings, transport, agriculture and oil & gas.

Figure 9 shows that to halve emissions across the five industries by 2030, countries in the Middle East and North Africa must avoid 1.8 Gt CO_2 over the next six years.

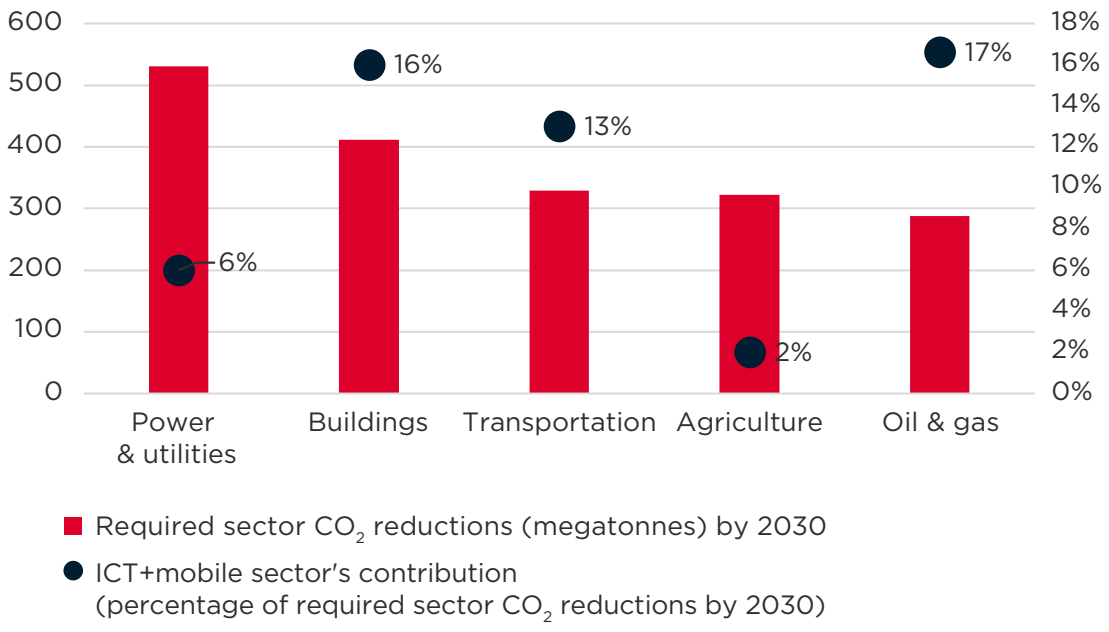
The potential enabled carbon savings rates at a country level are shown in Figure 10.

The data highlights the following:

- Depending on the industry, around 10–15% of required CO_2 savings by 2030 can be enabled by mobile and digital technology in the ICT sector in the country footprint covered by this analysis.
- The carbon savings enabled are highest for sectors where embedded use of 5G connectivity, IoT and other cellular-enabled products is highest (oil & gas and buildings) and lowest where digitisation is at an earlier stage (e.g. agriculture). This can change over time as slow-to-adopt industries deploy mobile and digital solutions in their operations.
- On a country level, the same correlation of higher technology use driving higher enabled savings is clear. For example, the UAE, Saudi Arabia and Qatar are fast movers in digitisation across a number of sectors, with high contributions to GDP.

Figure 9

Required reductions in CO_2 emissions and percentage enabled by operators and ICT: industry level



Note: Calculations cover countries in the Middle East, North Africa and parts of Asia.
Source: GSMA Intelligence

- The higher CO_2 savings that mobile and ICT technology can enable in these countries also means the multiplier effect is higher. Operators in the core GCC countries can save industries CO_2 emissions 3–8x their own carbon footprint.

- Conversely, countries where technology plays less of a role in core industry operations (such as Afghanistan, Iraq and Sudan) have a lower capability to use mobile services to decarbonise the broader economy.

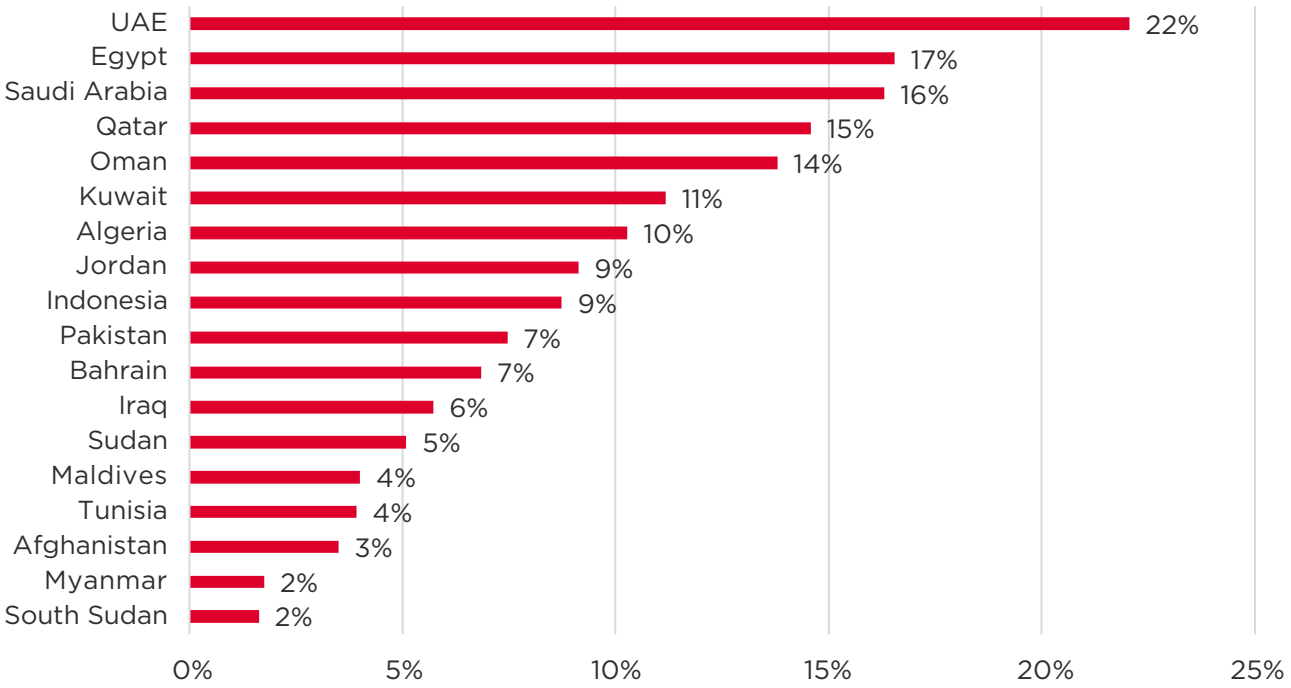
The differences in the enablement capability of mobile connectivity between the Middle East and other parts of the world are partly related to technology and partly related to public policy.

- The technology side involves increasing the use of 5G and IoT sensors by enterprise customers to harness the energy-saving benefits of the technology to complement their own renewable goals. Implementation of IoT devices in enterprise settings is further along in the US, Europe and high-income Asia than the Middle East

- Public policy plays a direct role in setting the playing field to encourage investment in renewable energy infrastructure. This may seem obvious but it extends to all the associated equipment for a healthy renewables system. For example, the increasing installed capacity of solar photovoltaic and wind energy in Asia Pacific (especially China, South Korea and Australia), Europe and North America, is driving the enablement effect in the power and utilities sector. The same applies to smart meters and commercial HVAC systems across the buildings industry. The more these technologies percolate into industry operations in the Middle East and North Africa, the more the enablement effect from cellular connectivity will rise.

Figure 10

Percentage of required CO_2 reductions for 2030 enabled by operators and ICT



Note: Calculations cover countries in the Middle East, North Africa and parts of Asia.
Source: GSMA Intelligence

6. The way forward

6.1 Identifying the constraints

One of the key enablers of decarbonisation is to increase the renewable energy and supporting infrastructure that underpins electricity use across each country. If renewables still only account for 20% of energy use in telecoms globally (and lower in many parts of the world), what are the constraints? More importantly, how can these be overcome? The challenges are important to understand because public policy and industry responses need to be targeted to solve them.

Low supply via national grid
National grid/power operators have generally invested to start rebalancing energy distribution towards renewables, but this has proven a slow transition in most regions other than Europe.

The technical challenges of interconnecting new renewable generation capacity with the wider grid are significant. The move to smart energy systems that use digital technology (such as IoT sensors) to route energy from mini-grids to the main grid is promising but takes time.

Rural economics
The cost structure for running rural base stations is around 30–50% higher, on average, than urban/suburban sites for mobile operators. This is because of the high fixed cost base, especially fibre backhaul links, spread across a smaller customer base.

Energy supply contributes to the higher cost because of the long-term reliance on diesel generators in the absence of grid power. Diesel accounts for about 10% of operator energy use worldwide on average, but this is considerably higher in rural areas (often more than 50% in Africa and parts of Asia).

Investments versus returns
The payback period for privately installed renewables capacity – such as through PPAs, which many operators have invested in – can be several years depending on the prevailing market price for different types of energy. This is heavily influenced by the supply and price of oil.

Market distortions
A consequence of the influence of wholesale oil markets is that governments of large petrochemical exporters may have a disincentive to invest in renewables capacity when existing energy prices are very cheap.

The GCC is a good example; gasoline prices are multiples cheaper than in Europe and even in the US, which has benefitted from the shale boom over the last 15 years.

Space constraints and land acquisition
Solar installations often need large spaces for deployment. For operators, this is fine for base stations in suburban and rural areas where sites sit on farmland or other open areas. It is much harder in cities where sites are concentrated on rooftops, urban furniture and dense locations such as train stations and airports. This can rule out renewables supplying those sites.

Operators with businesses in countries with land acquisition restrictions or prohibitions are precluded from installing new capacity.

6.2 Addressing the barriers

Decoupling economic growth from carbon emissions to mitigate environmental risks and achieve sustainability requires addressing the challenges and barriers that hinder the transition to renewable energy in the GCC and other regions. Governments can help in a number of areas, including the following:

- Introducing or expanding investment incentives around renewables infrastructure and connection nodes for domestic and international investors.

- Phasing down hydrocarbon subsidies which artificially lower electricity tariffs and, by extension, make the investment case for renewables much less compelling.

- Easing land access and/or building rights for private sector companies (including mobile operators) to deploy renewable infrastructure.

Both the public and private sectors must play a pivotal role in addressing these challenges, paving the way for a transition to a cleaner, more efficient energy system. By taking proactive steps now, the region can secure long-term prosperity while reducing its environmental footprint.

There is ample precedent for these types of policies delivering positive outcomes. Europe and North America are the leading regions for clean energy deployment. Policy momentum has intensified in many countries at the EU level; in 2023, investment in renewables generation totalled almost $110 billion, an increase of more than 6% on the previous year.[3] Denmark and Germany remain at the forefront of the wind power sector in Europe, while Spain has led the surge in solar adoption. In North America, renewables represented about 25% of electricity generated at the end of 2023, while electric vehicle sales set a new record.[4] Meanwhile, in Asia-Pacific, the renewable energy sector of China is growing faster than its fossil fuel and nuclear power capacity, making the country a world leader in electricity production from renewable energy sources.[5]

[3] World Energy Investment 2024, European Union, IEA, 2024
[4] State of the US Clean Energy Transition: Recent Progress, and What Comes Next, World Resources Institute, 2024
[5] IRENASTAT Online Data Query Tool, IRENA, 2024

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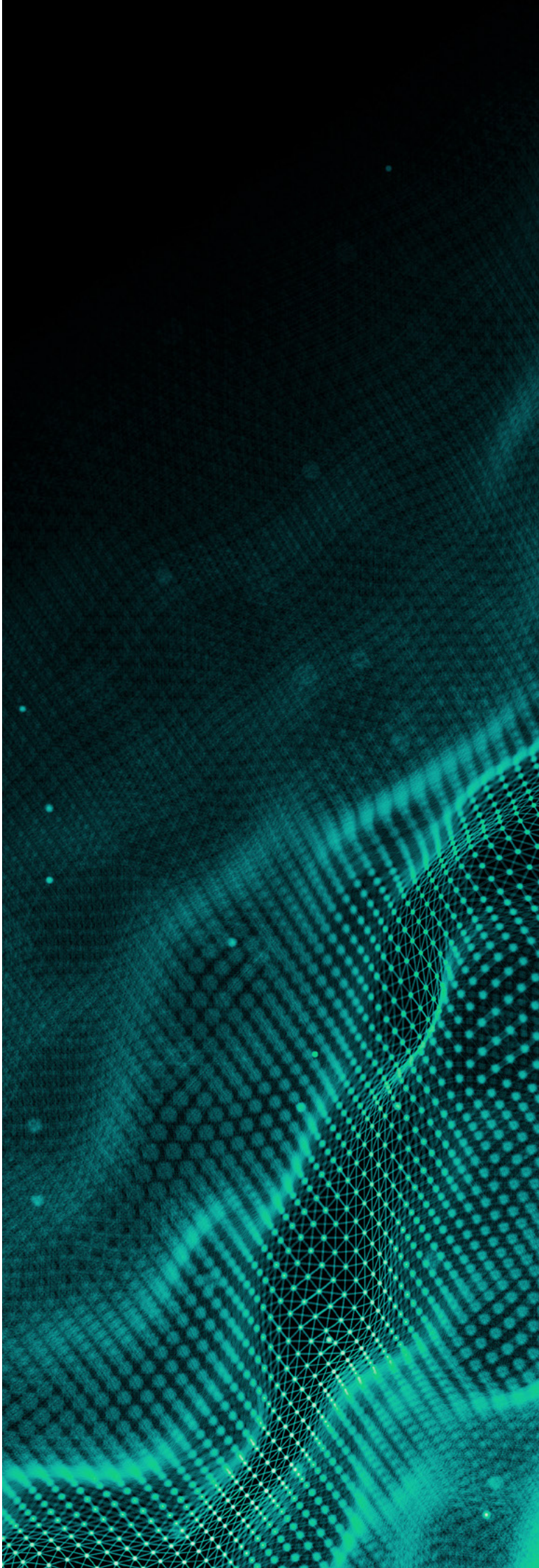

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