Paris Session 2022

Energy Transition – featuring equipment, technology, systems and sector coupling

Opening Panel Session 2 - Changes in Planning and Design of Transmission and Distribution Systems

Zia Emin (SC C4 Chair)
Christine Schwaegerl (SC C6 Chair)

29th August 2022

Paris Session 2022

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Hanne Storm Edlefsen

Vice President

Energinet

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Zac Richardson

Director of New Infrastructure

National Grid

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Ahmed Ali Al-Ebrahim

Chief Executive Officer

GCC Interconnection Authority

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The Energy Islands in Denmark

Hanne Storm Edlefsen
Vice President of the Energy Islands, Energinet

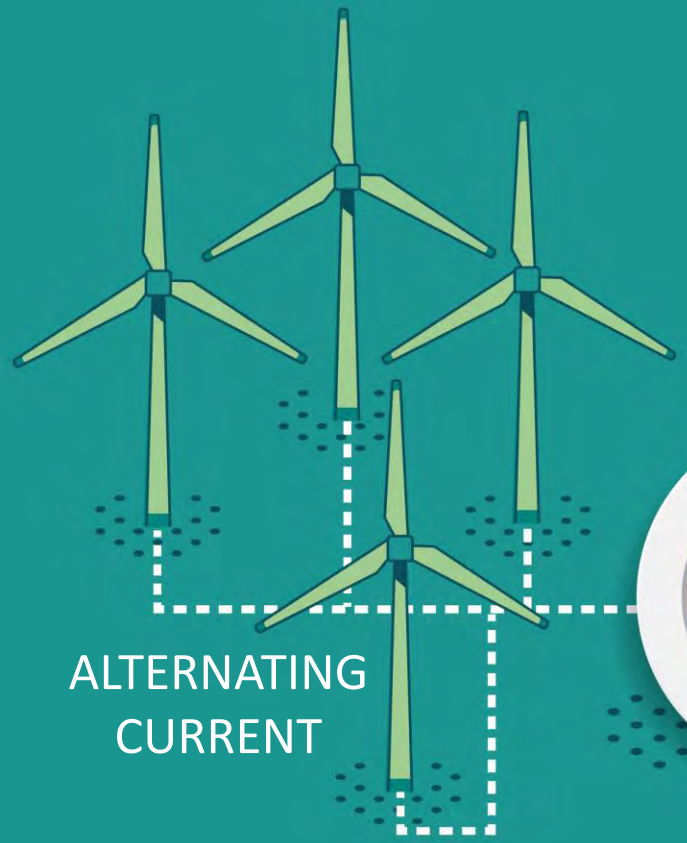
29th August 2022

ENERGY ISLANDS OR HUBS

10-16 GW

HUB

100 KM OR MORE TO LAND



ALTERNATING CURRENT

DIRECT CURRENT

DIRECT CURRENT

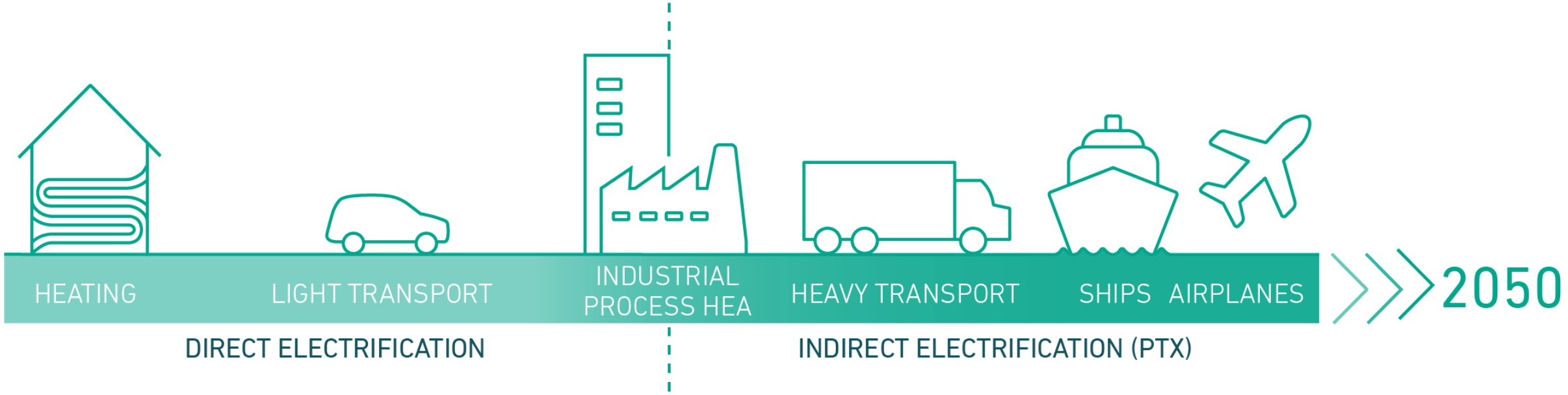
HYDROGEN

ALTERNATING CURRENT

HYDROGEN

GREEN FUELS

MORE THAN JUST POWER

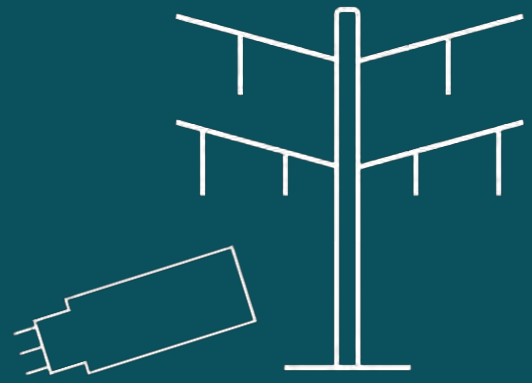


ENERGY ISLANDS

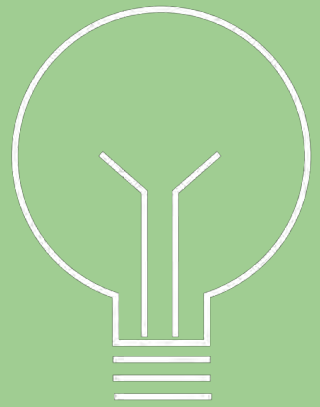
IN DENMARK

MORE RES & FURTHER OUT AT SEA

EFFICIENT USE OF INFRASTRUCTURE



HIGHER SECURITY OF SUPPLY



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Paris Session 2022

Enabling Net Zero
UK Perspective

Zac Richardson
Director of New Infrastructure, National Grid

29th August 2022

The world is embarking on an energy transition

Looking across the UK and European transition typifies these challenges

Unprecedented scale not seen since the 1970's

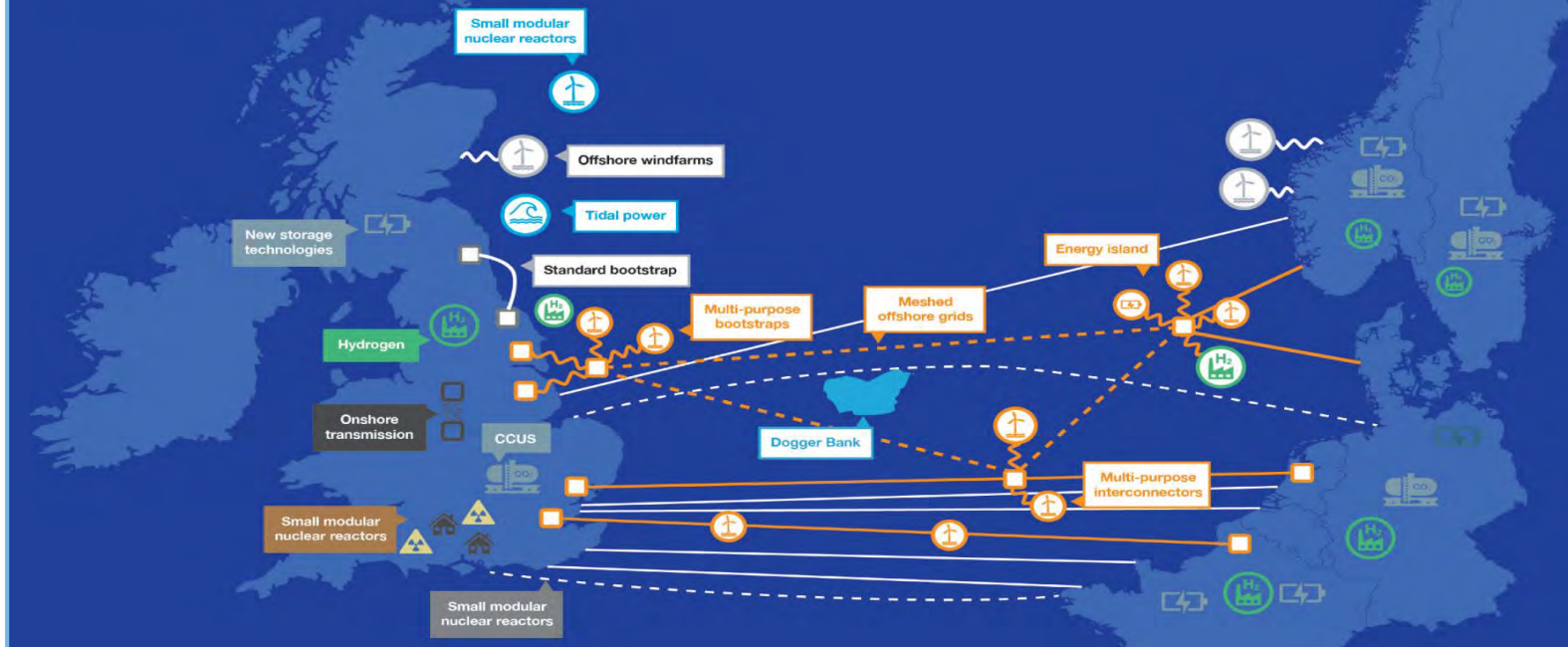
- Global annual investment in networks anticipated to reach $1,000bn

Step change in volume, nature and expectations of customers

Energy cost and security driving political urgency

Other sectors transforming to the same overall goal (e.g., water, transport)

Big challenges, require big solutions



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Transmission planning is changing to rise to this challenge

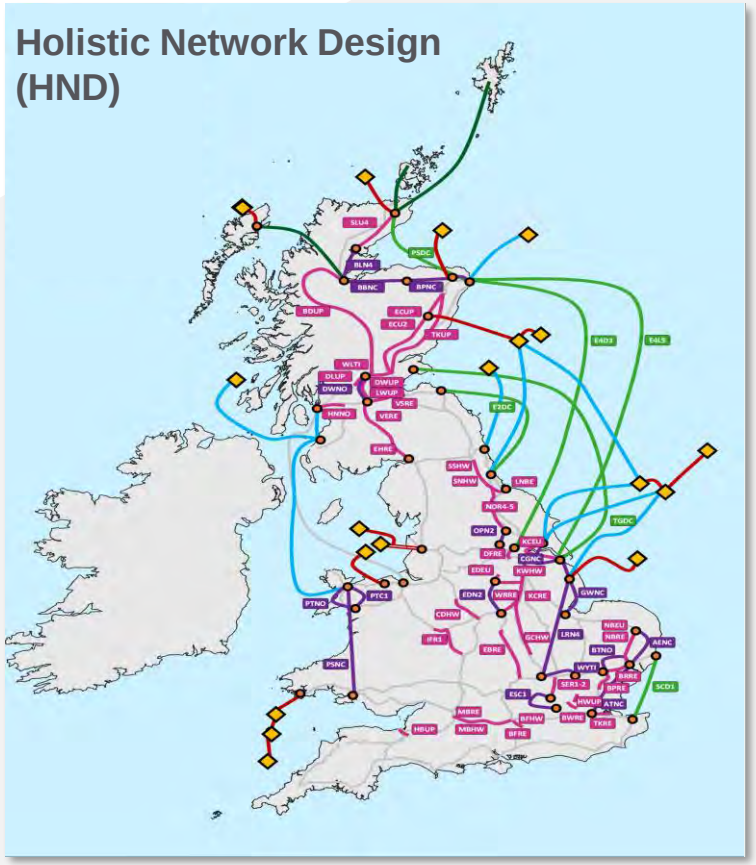
- From connect and manage to anticipatory transmission investment
- From developer led to strategic or holistic designs
- From incremental capacity to large scale solutions
- Designed considering system access costs
- All whilst continuing to manage;

Cost to consumers

Impact on the environment

Deliverability and operability

Impact on local communities



UK Example

We must balance many factors in the planning, development and delivery of net zero infrastructure

Socio-economic

Environment

Planning & Consenting

Technical

Skills & Talent

Cost

Stakeholder feedback

Delivery Vehicle

We are connecting a changing customer base more efficiently than ever…

…expanding the network in innovative ways to deliver performance and security…

…and reimagining how we maintain world class reliability at lower cost

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Vision of an Electricity Highway towards Europe

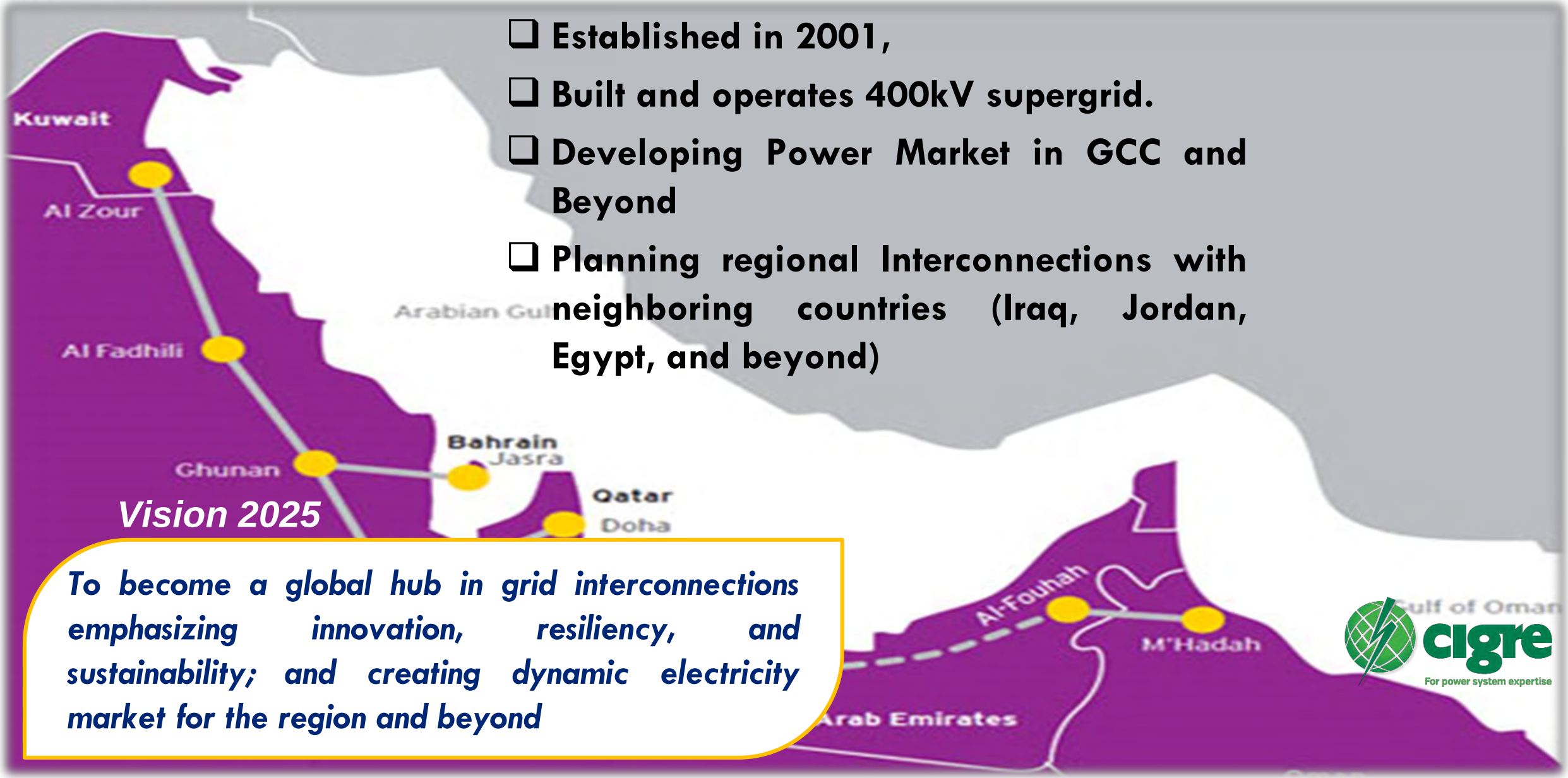
Ahmed Al-Ebrahim
CEO GCC Interconnection Authority

29th August 2022

هيئة الربـط الكهربائي
لدول مجلس التعاون لدول الخليج العربية
GCC Interconnection Authority

The GCC Interconnection Authority

- Established in 2001,
- Built and operates 400kV supergrid.
- Developing Power Market in GCC and Beyond
- Planning regional Interconnections with neighboring countries (Iraq, Jordan, Egypt, and beyond)



Vision 2025

To become a global hub in grid interconnections emphasizing innovation, resiliency, and sustainability; and creating dynamic electricity market for the region and beyond

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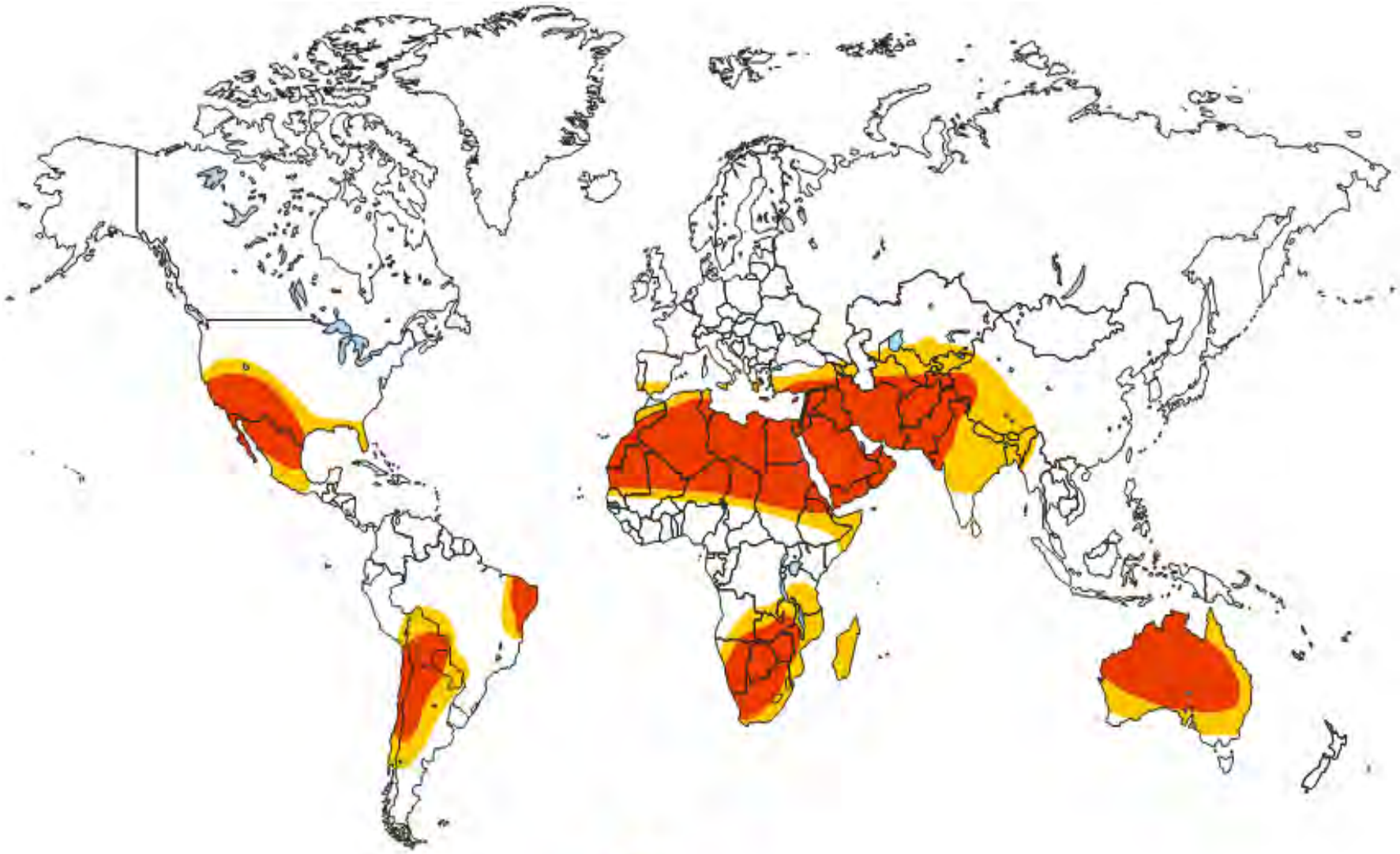
Renewable Energy Potential in the GCC and MENA



Favorable for Concentrated Solar Power (CSP)
Worth considering for CSP

Huge potential for wind and solar energy development in the region:

- 630,000 GW solar power,
- 75 GW of wind power.

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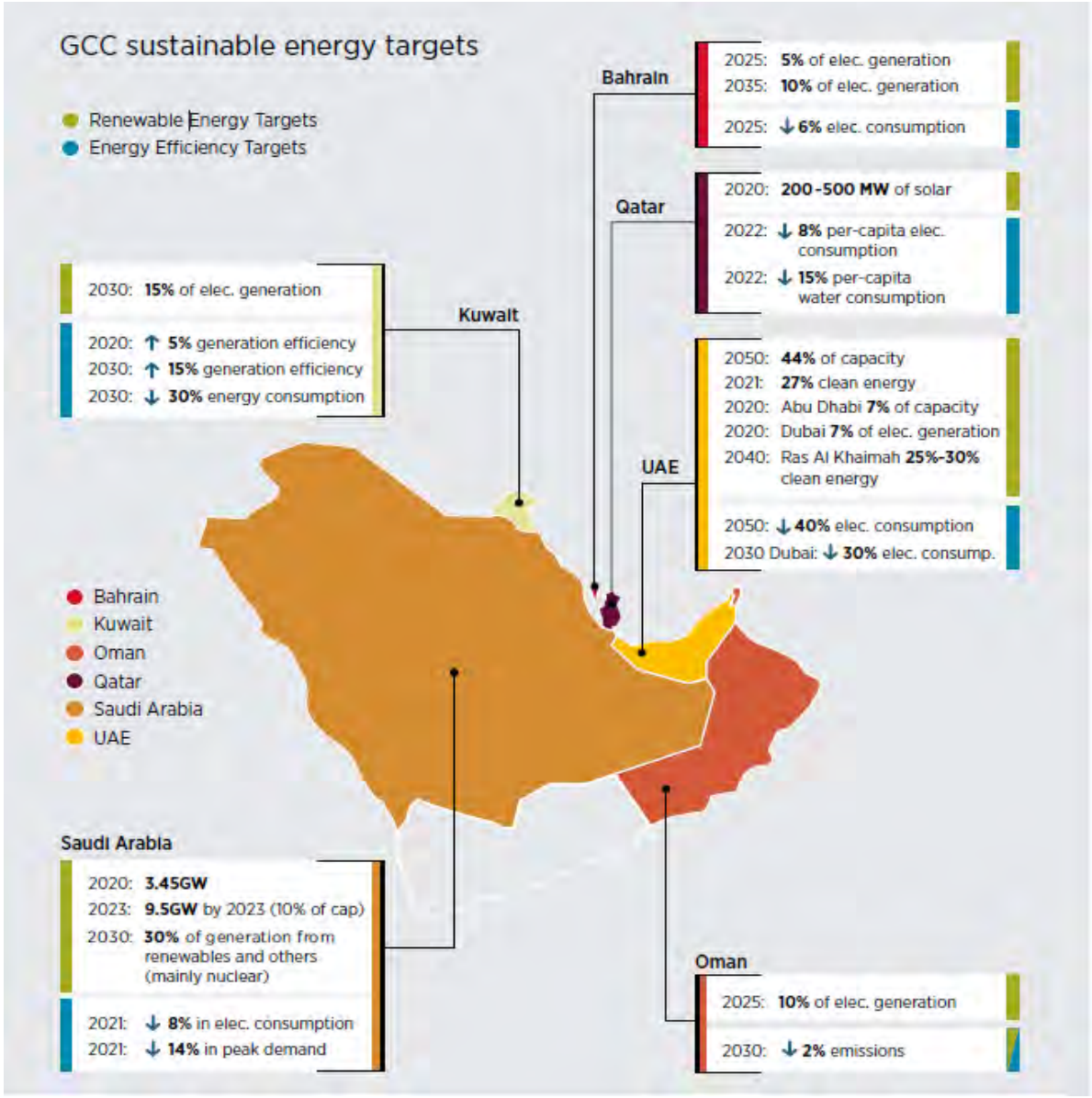
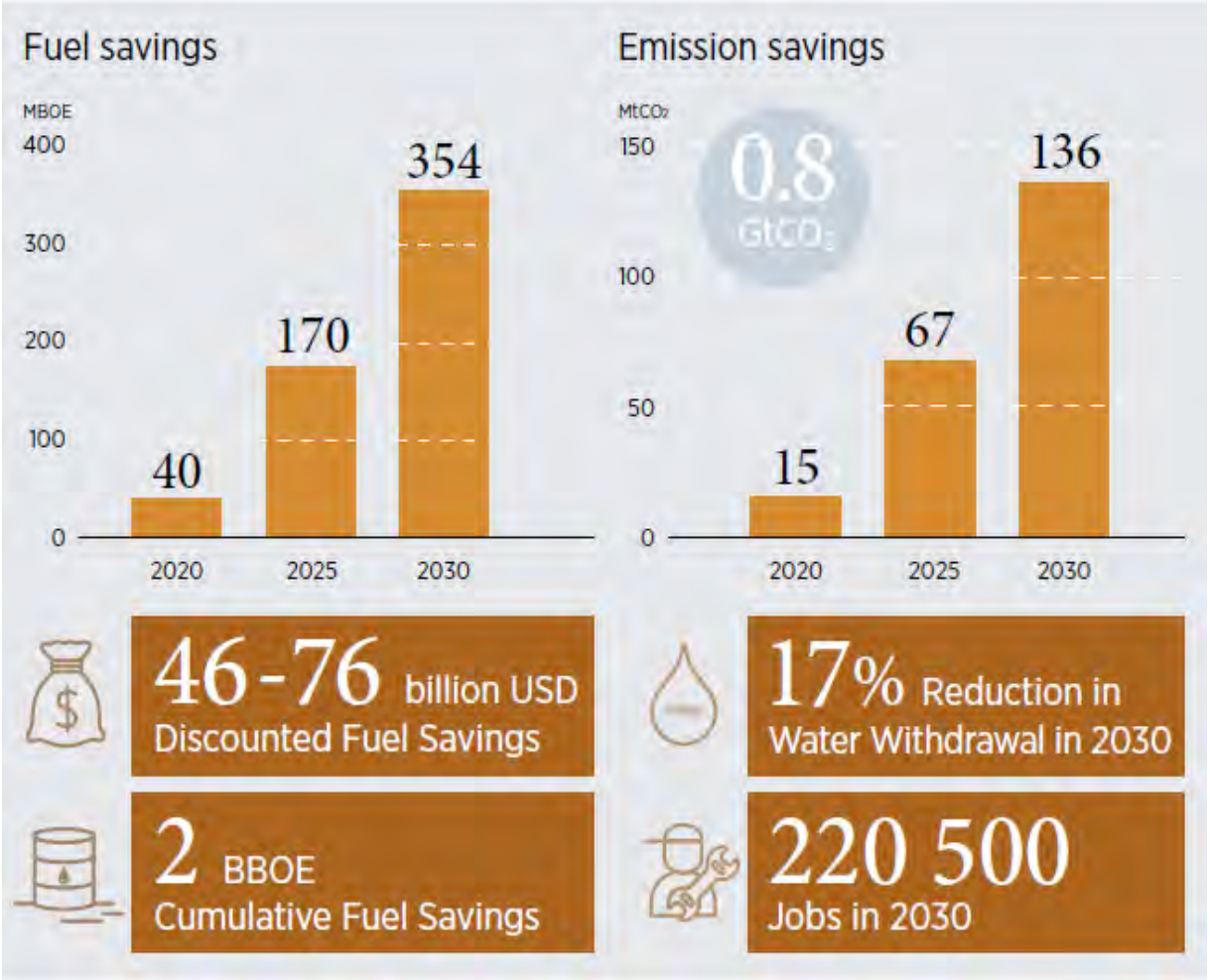
Energy Transition in the GCC





Source : IRENA (2019), 'Renewable Energy Market Analysis: The GCC Region'.

Planning Future Power Grids

➔ more HOLISTIC VIEW addressing FLEXIBILITY and RESILIENCE at large.

- **Robust transmission system ➔** Integrate renewable generation in remote areas.
- **Robust Interconnection system** move low-cost renewable energy across long distances and Cross-Borders.

➔ Need to move away from planning processes that target reliability at the local level, to a more regional vision that targets improving economic efficiency and regional system reliability.

- **Interconnections:** to evolve from neighbor to neighbor to a more meshed, or backbone interconnections **➔ ELECTRICITY HIGHWAYS** between regions

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Planning Future Power Grids

Interconnections are main Enablers

Higher **Energy Security** levels through **Cross-Border** Grid Support and availability of Resources

Flexibility and Resilience benefits connecting electrically **diverse systems**

Interregional coordination through **Regional Control Centres**

Interconnections are main enablers of the **REN** Integration

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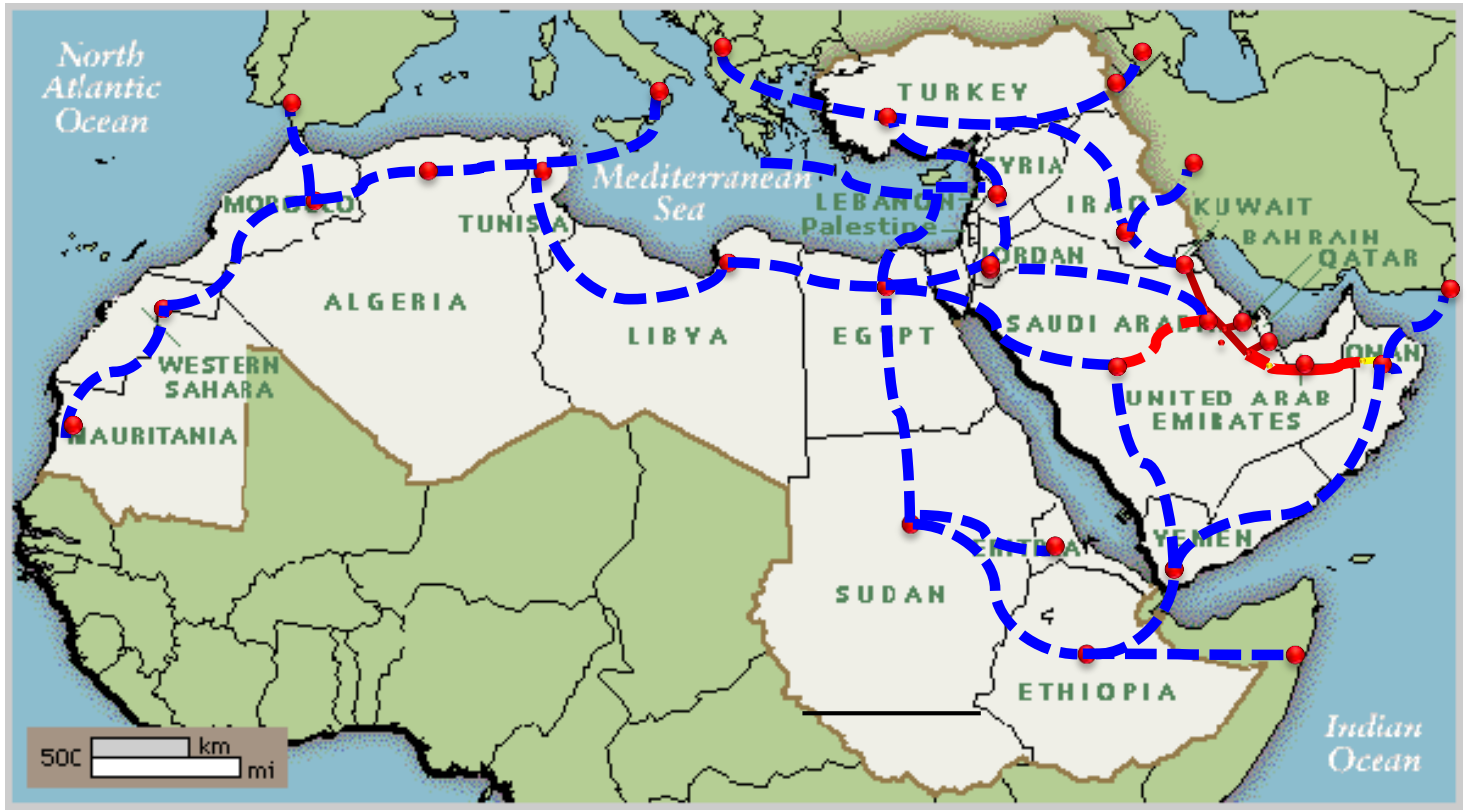
Planning Future Power Grids

Example: Vision of Pan Arab Electricity Interconnections

- **Pan Arab Electricity Market :** being developed at Arab Countries
- **Solid Interconnections** in addition to the market framework are essential
- **GCC Interconnection highway, Saudi Arabia – Egypt Interconnection, GCC-Jordan-Egypt Interconnection**, etc will be main enablers for PAEM success



- *Need for coordinated system reliability through Regional Reliability Coordination Center(s)*

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Vision of an Electricity Highway : GCC – ME - Euro Interconnection

HVDC link from GCCIA back-bone grid to Jordan then Egypt

+ HVDC Saudi Arabi - Egypt ➔ Egypt Link to Europe

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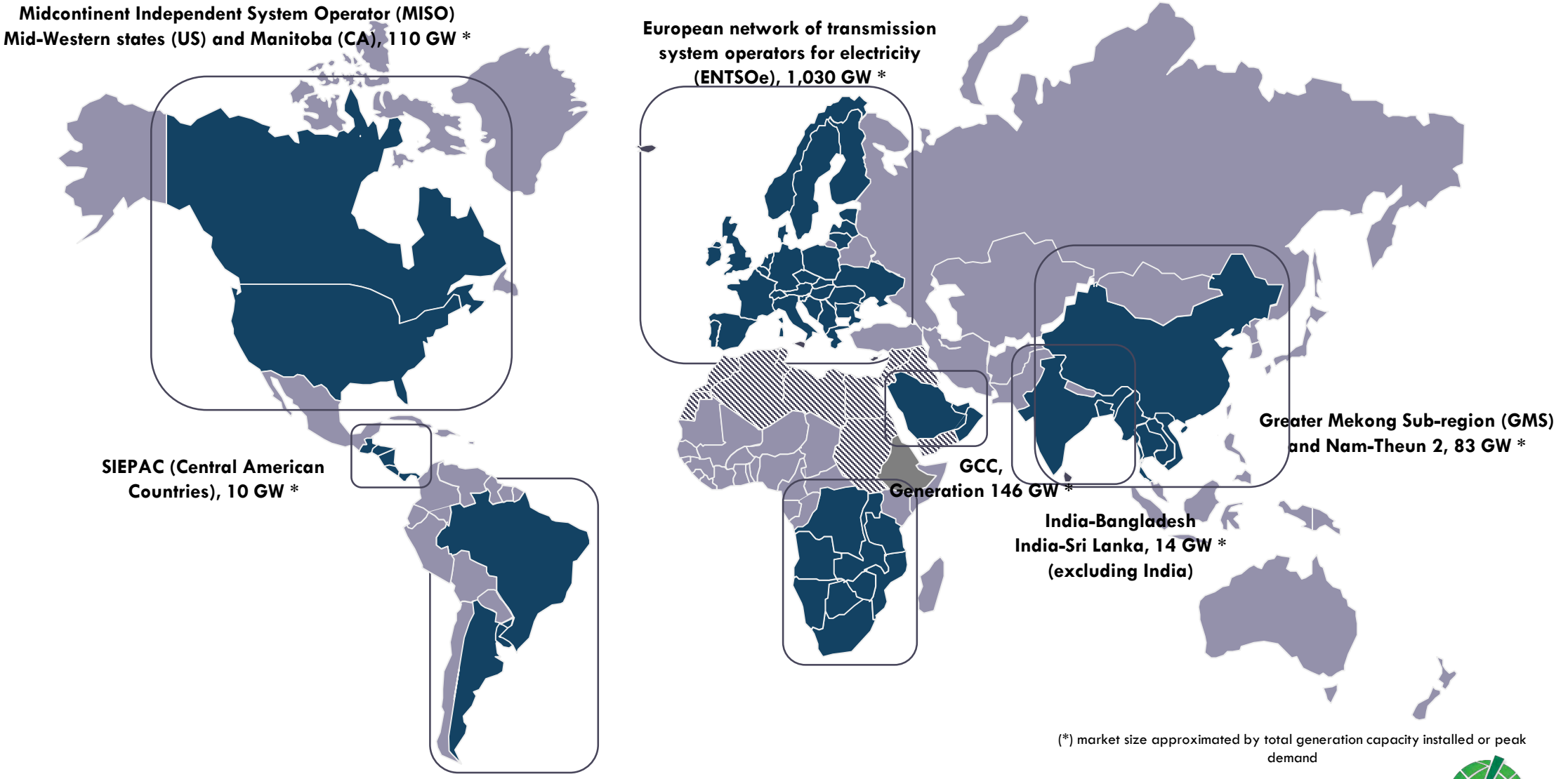
Looking ahead: Regional Interconnections Linking Power Markets



(*) market size approximated by total generation capacity installed or peak demand

GCCIA Vision is to become a global hub in grid interconnections creating a dynamic electricity market for the region and beyond.

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Debate

Changes in Planning and Design of Transmission and Distribution Systems

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