GODEC

Green Opportunities for Developing Economy Conference

4-6 October 2019

İMO

Sustainable Energy Opportunities: Moving from Zero to Hero

Sam McCloskey

Director, Centre for Advanced Sustainable Energy, Northern Ireland

s.mccloskey@qub.ac.uk

CASE Centre For Advanced Sustainable Energy

Partners:

Mimarlar Odası, Yerbilim Mühendisler Odası, ZMO, BMO, Çevre Mühendisleri Odası, EMO, Şehir Plancıları Mühendisler Odası, Makina Mühendisleri Odası

Funded by:

Project: Awareness Raising for Civil Engineers on Green Economy
Grant Program: EU Funded *INNOVATION AND CHANGE IN EDUCATION*
Grant Contract number: 2016/373-593

OVERVIEW

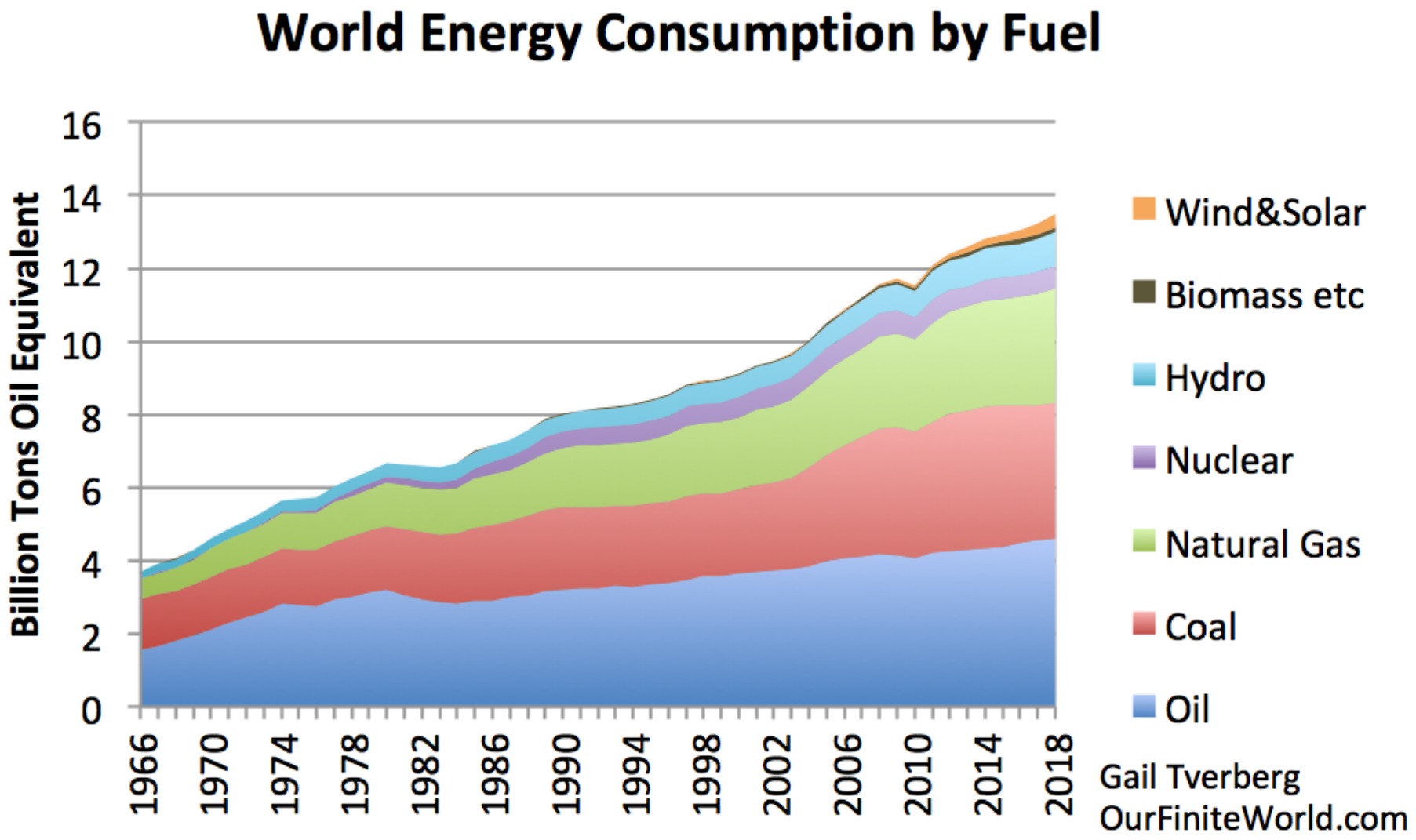
- Global Energy Position
- Situation in Europe
- Northern part of Cyprus
- Other 'islanded' energy systems (eg. Northern Ireland)
- Opportunities
- Challenges & Support Mechanisms
- Re-cap: key messages

GLOBAL ENERGY POSITION

The World View

International Energy Agency March 2019

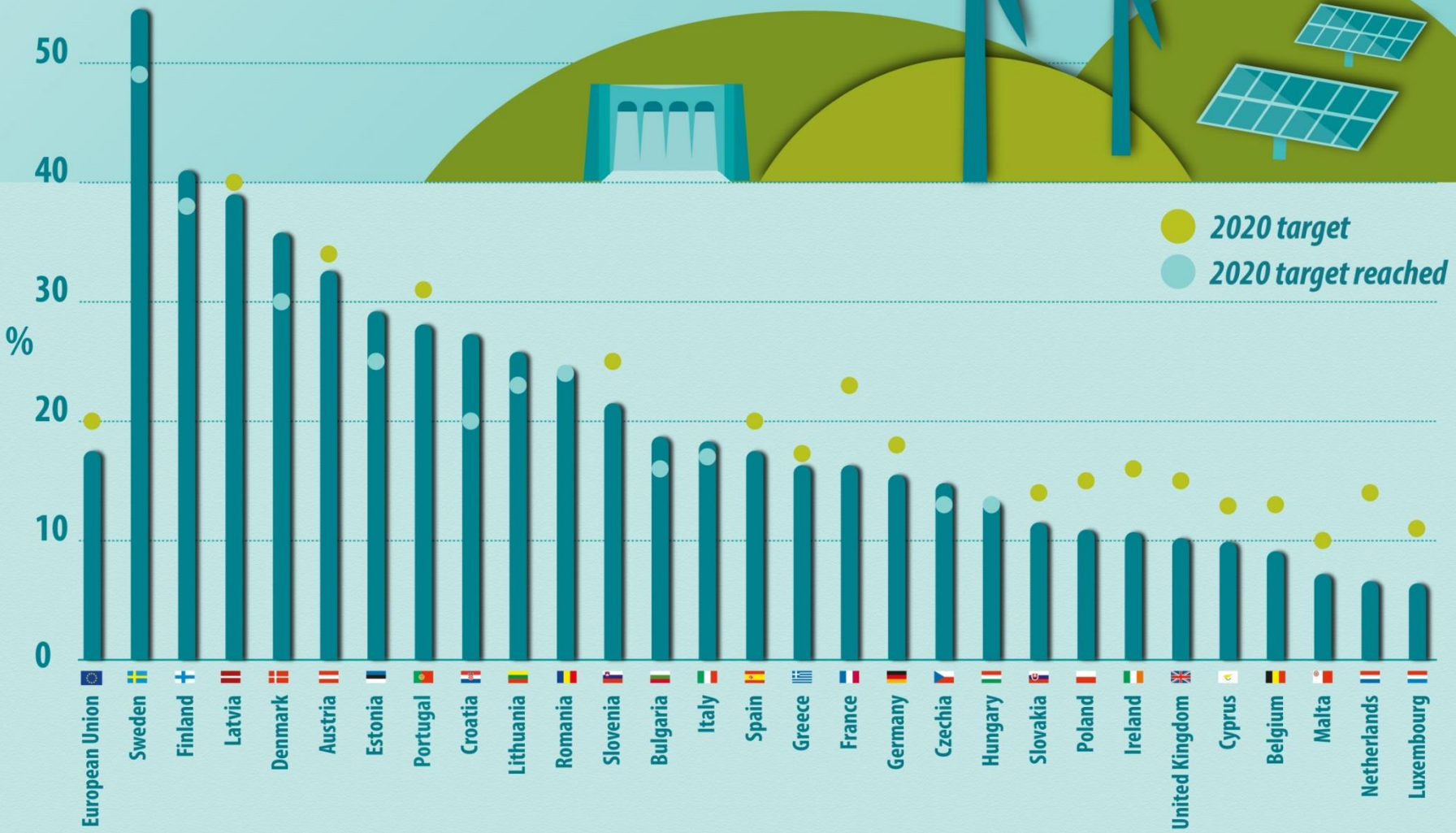
- Demand rose by 2.3% last year
- Energy related CO2 emissions up by 1.7%
- Natural gas = fuel of choice
  - USA and China with biggest growth in gas
- Fossil fuels = 70% of total
- Solar & wind growth at double digit pace
  - Not enough to meet the higher demand
- Electricity – ‘fuel of the future
- 1/5th of extra demand for heating & cooling
  - As climate change affected temperatures around the globe


World Energy Consumption by Fuel
Billion Tons Oil Equivalent
16
14
12
10
8
6
4
2
0
1966
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
Wind&Solar
Biomass etc
Hydro
Nuclear
Natural Gas
Coal
Oil
Gail Tverberg
OurFiniteWorld.com

EUROPEAN SITUATION

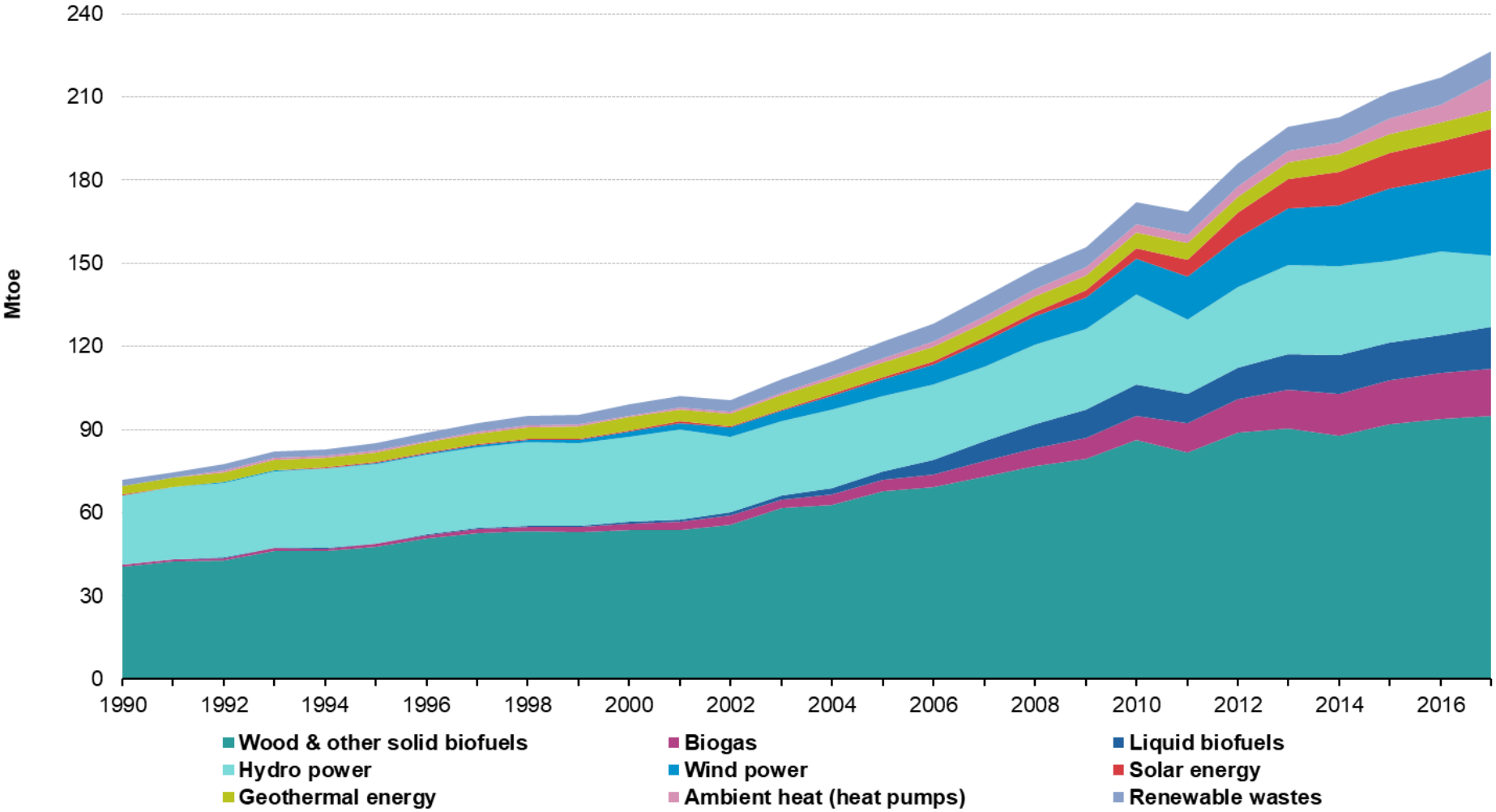
Share of energy from renewable sources in the EU Member States

(2017, in % of gross final energy consumption)



ec.europa.eu/eurostat

Types of Renewables in Europe



European Trends

Target = 20% share of gross final energy consumption from renewable sources by 2020

- Energy consumption more than doubled 2004 – 2017
- Renewable energy = 13.9% of total EU consumption
- Primary production of renewables in 2017 = 226.5m t's oil equivalent
- Wood & solid bio-fuels = 42%, Wind = 13.8%, Hydro = 11.4% (of total mix)
- Highest levels of production in Sweden, Finland, Latvia, Denmark & Austria
- Lowest levels in Luxembourg, Netherlands, Malta, Belgium, Cyprus & UK
- Significant rises in wind and solar
- 19.5% total energy used for heating and cooling (risen from 10.4% in 2004)
- 7.6% energy used in transport

Energy & Climate Change

- Currently 1 degree higher than pre-industrial levels
- Restricting global warming to 1.5 degrees above pre-industrial levels (not 2 degrees, as per Paris Agreement)
- **11** years
- Cut carbon pollution by 45% by 2030
- Energy sector is the highest contributor to global GHG emissions (IPPC Report)
- Decarbonise energy
- Do nothing = 3 degree rise

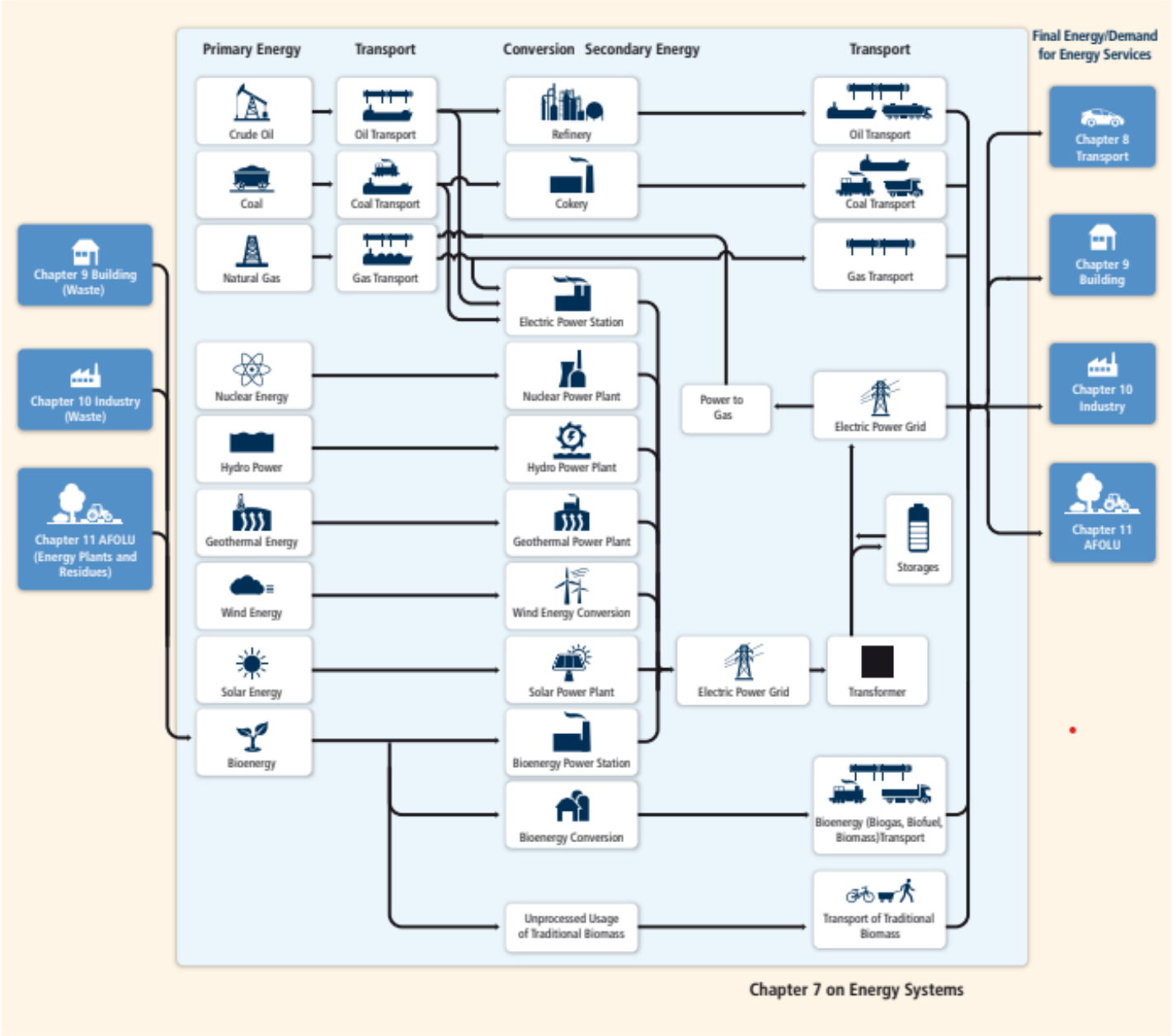


Figure 7.1 | Illustrative energy supply paths shown in order to illustrate the boundaries of the energy supply sector as defined in this report. The self-generation of heat and power in the end-use sectors (i.e., transport, buildings, industry, and Agriculture, Forestry, and Other Land Use (AFOLU)) is discussed in Chapters 8–11.

Sustainable vs renewable energy

Sustainable

- All renewables
- Energy reduction
- Energy efficiency
- Energy storage / system optimisation
- Holistic energy systems
- Circular economy
- Carbon capture, storage & utilisation
- etc

Renewable

- Wind power
- Solar power (thermal, photovoltaic & concentrated)
- Hydro power
- Tidal & wave power
- Geothermal energy
- Ambient heat (pumps)
- Biofuels
- Renewable part of waste

NORTHERN PART OF CYPRUS

How I understand it……

Local Energy Systems

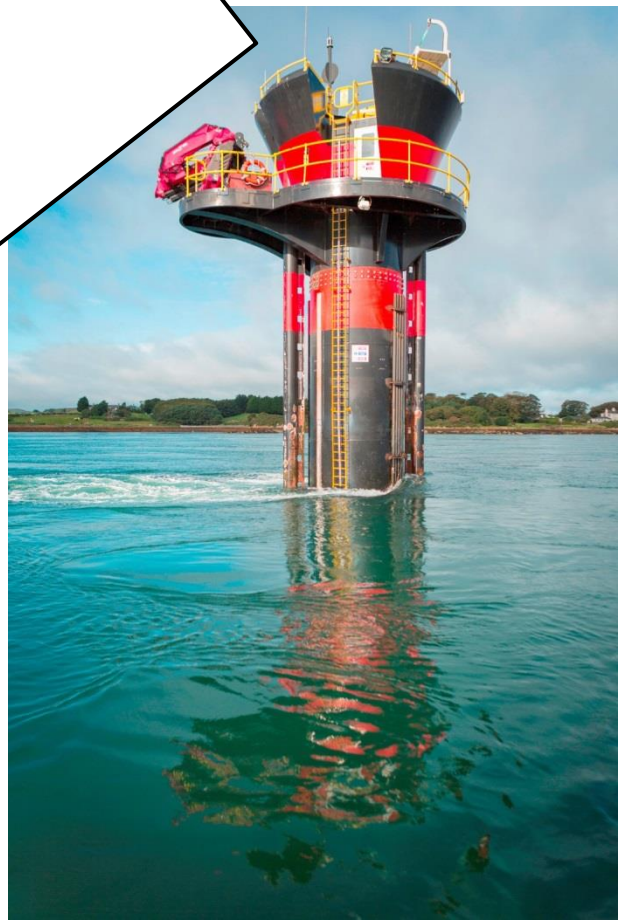
- One electricity utility company (Kib-tek)
- Diesel / steam power generation
- Security of supply issues – additional capacity required
- Increasing energy demand
- Peak demand (summer) 333MW
- RES = 87MW installed solar (mostly small scale)
- Need for interconnection
- Emissions reduction considerations (LNG investment?)

EXAMPLES FROM OTHER COUNTRIES

Islanded system: Northern Ireland

- 3 Traditional Power stations
- Peak demand (winter 1800MW)
- 40% target by 2020
  - 44% at June 2019 (83% wind
- Grid constraints (securi
  - Planning delays N/S
  - Compliance wit arawal of capacity at P iroot
  - Moyle In
  - Limit
  - R
- Sing l)
- Electri m – no incentives
- Global fi energy
- 2 Universiti

20 YEARS AGO NORTHERN IRELAND HAD 3 POWER STATIONS AND IT NOW HAS OVER **23,000**



BBC | Sign in | News | Sport | Weather | iPlayer | TV | Radio

NEW

Home | UK

N. Ireland

North
projec

By John Cam
BBC News NI

Home | UK | World | Business | Politics | Tech | Science | Health | Education | Entert

N. Ireland | N. Ireland Politics

Renewa
scheme

5 July 2016 | Nort

Energy: Gr

There is much
increase the se
under Europear
energy. Joined
necessary if the

renewableUK

Enter search criteria...

How we work | Renewables | Membership | Project Intelligence | News | Events | Careers | Book Store | SocialLink

successor Boris Johnson has struck a markedly different tone. The Government are still seeking to leave the EU with a Withdrawal Agreement, however, no deal planning has accelerated across Whitehall.

The Johnson Government now opposes the Northern Ireland Backstop as set out in the existing Withdrawal Agreement and has signalled that it is unwilling to accept a solution to avoiding the Irish border that would entail continued regulatory alignment for Northern Ireland. The UK Government has, however, made clear its committment to maintaining the Single Electricity Market.

Key Issues for the Energy Sector

In 2019 alone, RenewableUK members will commence construction of over 4GW of new renewable energy capacity, in addition to the 3.3GW currently under construction and 20GW of operational wind and marine capacity. Development of the renewables industry, made up of RenewableUK's 400-plus members and the wider sector, is guided by policy covering energy markets, infrastructure, trade, manufacturing and labour and employment issues. Critical issues are:

Interconnection with European markets is an increasingly important part of the electricity market. Net imports of electricity accounted for 4% of the UK's power supply in 2017. Increased interconnection with neighbouring markets can help to enhance the security of our power supply and support investment in low carbon and renewable generation sources.

Northern Ireland is particularly dependent on cross-border electricity trading as it forms part of a Single Electricity Market (SEM/I-SEM) with the Republic of Ireland. The I-SEM has successfully delivered a secure, low cost energy supply for consumers which must be preserved as the UK leaves the EU.

Integrated supply chains across the EU are vital to energy companies and investors in new infrastructure. In offshore wind, for example, there are significant manufacturing facilities in the UK which serve the UK and European markets and utilise components from a domestic and European supply chain. New tariffs, customs procedures or other barriers could disrupt supply chains for manufacturers and risk driving up costs, which would ultimately be borne by consumers.

A robust carbon price signal is required to support continued investment in low carbon technologies needed to meet our domestic carbon budgets and commitments under the Paris Agreement. The UK's current carbon price is made up of the EU Emissions Trading Scheme price of carbon with an additional GB and power-only element set by the UK Government.

Maintaining access for skilled labour as the UK exits the European Union will ensure we have the skills we need for short-term construction projects and enable continued export of our talent across the EU.

Coordination of environmental standards between the UK and EU allows for knowledge and products to be traded whilst maintaining high standards and consistency.

- While the Moyle Interconnector capacity is currently limited to 250 MW due to a cable fault, efforts are being made to restore it to full capacity of 450 MW before 2018. This will improve the adequacy situation in Northern Ireland.

Belfast Telegraph.co.uk

News Sport DebateNI Business Opini

Home Northern Ireland

Wind power
42% of Nor
needs on

Renewable indus

by the Ut

The inves
the electr
infrastruc

The regulator
boost to the ex
renewable sou

Home

News

Northern I
digestion p
million inv

01 July 2016

The Foresight
Recycling and
which UK Gree
(GIB) is a com
today commit
anaerobic dige
Northern Irela

RAW has invested £8
investment of £4.4m f
Ireland and £1.5m fro
procurement and con
contracts for the proje

Fir
sta
20

The
from
offi
and

Depa
for Bu
Innova

M
C
T

A S

SeaGen The world's first commercial scale tidal energy turbine deployed in Northern Ireland

BBC Sign in News Sport Weather iPlayer Sounds

NEWS

Home UK World Business Politics Tech Science Health Family & Education

N. Ireland N. Ireland Politics Local News

Two fifths of NI electricity from renewables

By Conor Macauley
BBC NI Agriculture & Environment Correspondent

6 June 2019 Share


GETTY/KEN JACK

Almost 40% of the electricity generated in NI last year came from renewables, according to government statistics.

Power from about 82 wind farms in Northern Ireland was the main source.

nergy

emissions
eceiving a

unding
is
g carbon
nergy.

Comparisons TRNC & NI

- Islanded system
- Imported fossil fuel dependent
- Requirement for / reliance on interconnection
- Available renewable energy resource
  - TRNC solar?
  - NI – wind, biomass feedstock
- Policy gaps
- Opportunities for expansion

Developing RES: South Africa

- Monopoly energy supply company (ESKOM)
- Cheap coal dominant
- Historical civil unrest
- Challenging climatic conditions
- Low levels of RES
- Poor social acceptance of renewables
- New policy – realistic?

THE OPPORTUNITIES

Sustainable Energy Generation in TRNC

Research & Development

Types

- PhD level – early stage research supporting industry - Industrial Doctorate research centres for sustainable energy eg. Bryden Centre
- Industry led – contract or funded research closer to commercialisation eg. CASE
- Collaborative – academia / industry collaborations with partners in TRNC, Europe and internationally
- Funding local, European (eg. INTERREG, PEACE and H2020) and international

Areas

- Resource type
- Technology – design, fabrication, mobilisation, installation
- Energy systems & grid balancing & RE integration
- Economics
- Environmental impacts
- Social acceptance
- Policy
- Carbon reduction & Climate change

Diversification - examples

Agricultural / farming → Anaerobic Digestion Plants

Construction /Civil Engineering → Marine energy foundations

Fishing fleet → Ocean energy support vessels

Roofing contractor → Solar roofing panel designer

Engineering consultancy → Environmental impact

Development – site & technology

CHALLENGES & SUPPORT MECHA NISMS NEEDED

What challenges may there be?

- Infrastructure capacity
- Resource restrictions
  - Just solar? Wind? Bio-energy crops?
- Regulation constraints
  - Planning, environmental, licencing?
- ‘NIMBY’…..ism
- Insufficient subsidy / policy support
- Investment attractiveness
- Academic / industrial willingness or capability

What does ‘great’ look like?

- Available RES resources – whole system integration
- Supporting infrastructure
- Capacity & capability (industry & academia)
- R&D funding
- Regional / Local RES Policy
- Energy Agency or Body
- Willing DNO / TSO – with an innovation fund
- Stakeholder engagement & acceptance
- Access to finance

RE-CAP
Key Messages

"We are the first generation to feel the impact of climate change and the last generation that can do something about it."

-Barack Obama

THANK YOU

s.mccloskey@qub.ac.uk