Will electric vehicles break the grid?

T Muneer
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.... not if the grid gets an injection of solar and wind energy generation.

But renewable energy is intermittent!

It is not just the roads that are getting congested ……

The vehicles are also getting a fair share of the load!


www.pak101.com

This one is difficult to tame!

Available online at www.sciencedirect.com
ScienceDirect
Renewable and Sustainable Energy Reviews
11 (2007) 1388–1413
RENEWABLE & SUSTAINABLE ENERGY REVIEWS
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Energy supply, its demand and security issues for developed and emerging economies

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Generation and transmission prospects for solar electricity: UK and global markets

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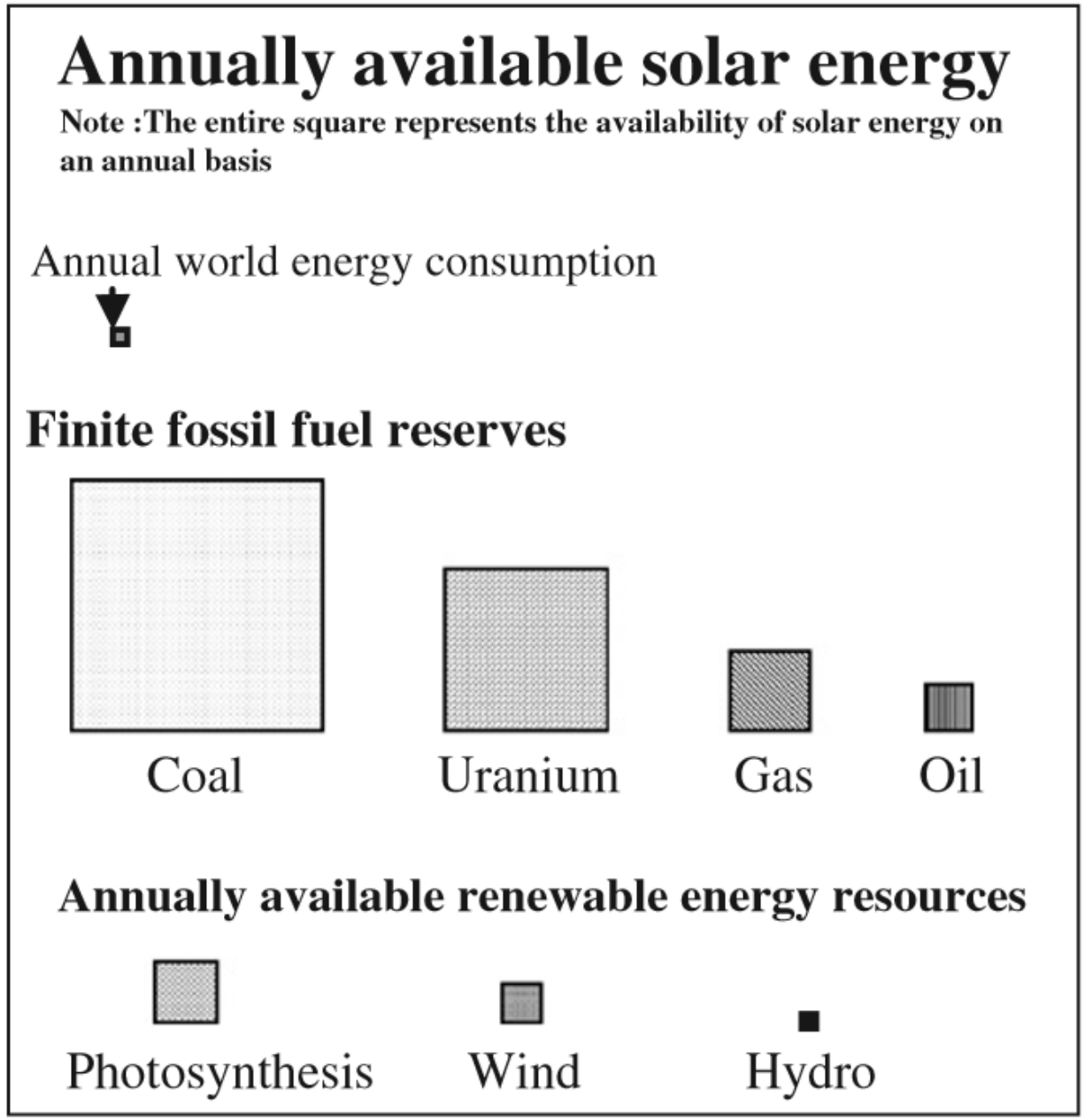


Potential of various renewable energy sources as compared to global energy needs.

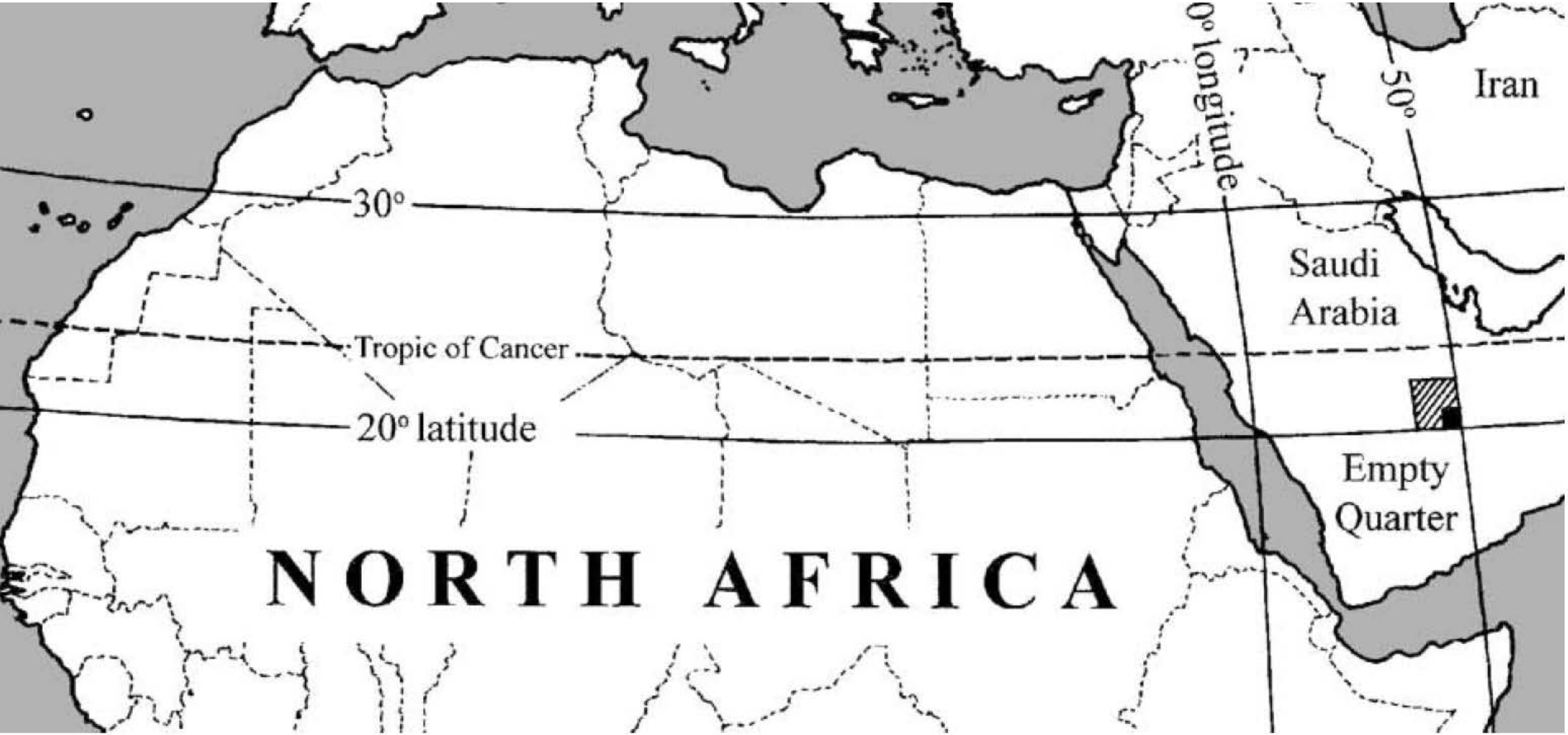


Fig. 7. Map of proposed solar station in an arid region.

Two dimensions need to be considered:

- Temporal
- Transient

Temporal

What is the maximum distance to which electricity can be transmitted?

Note 1: Most major economies are in proximity to arid regions.

Note 2: Nature has blessed the planet with complementarity of solar and wind.

The ever increasing distances to which electricity is being transmitted. Examples:

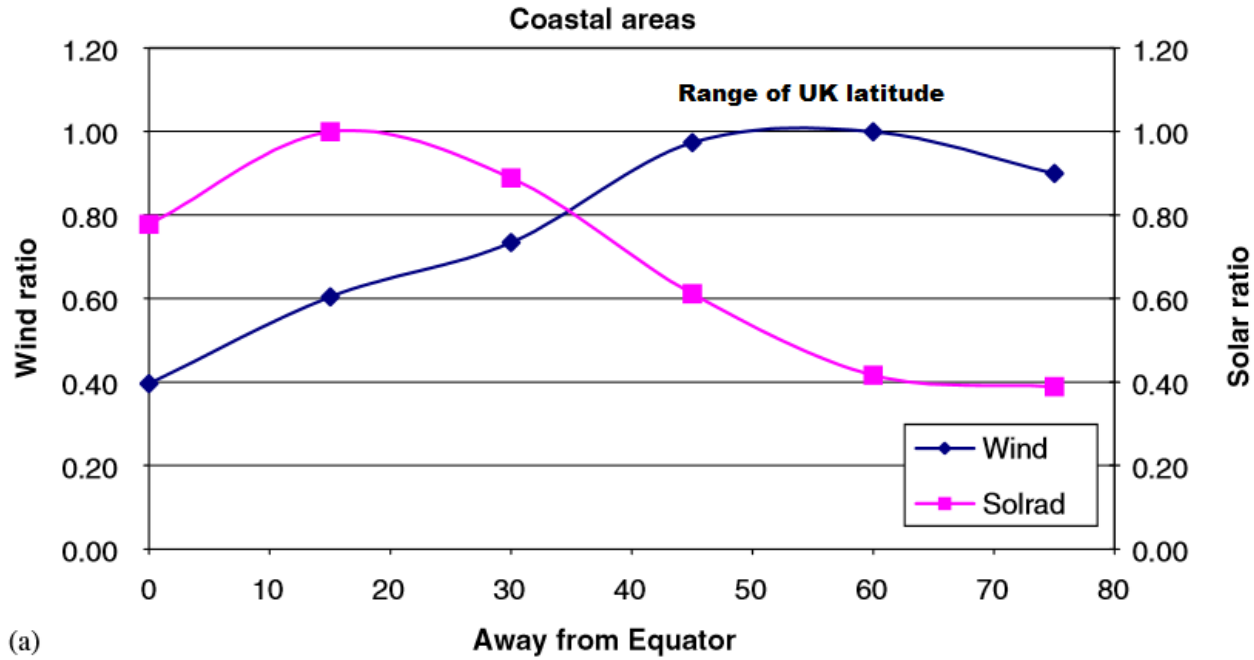
1. 17 February 2014 The Rio Madeira transmission link in Brazil, with an overhead length of 2,385km, is the world's longest power transmission line. The 600kV high-voltage direct current (HVDC) bipolar line was brought into commercial operation in November 2013 and is capable of transmitting 7.1GW of power.
2. June 19, 2014 China's power engineers have become world leaders in ultra-high-voltage transmission systems connecting far-off power sources with cities hungry for electricity carrying power over thousands of km at around 800,000 or even 1 million volts.

Credits: https://www.reuters.com/article/us-china-electricity-grid-kemp-idUSKBN0EU19B20140619

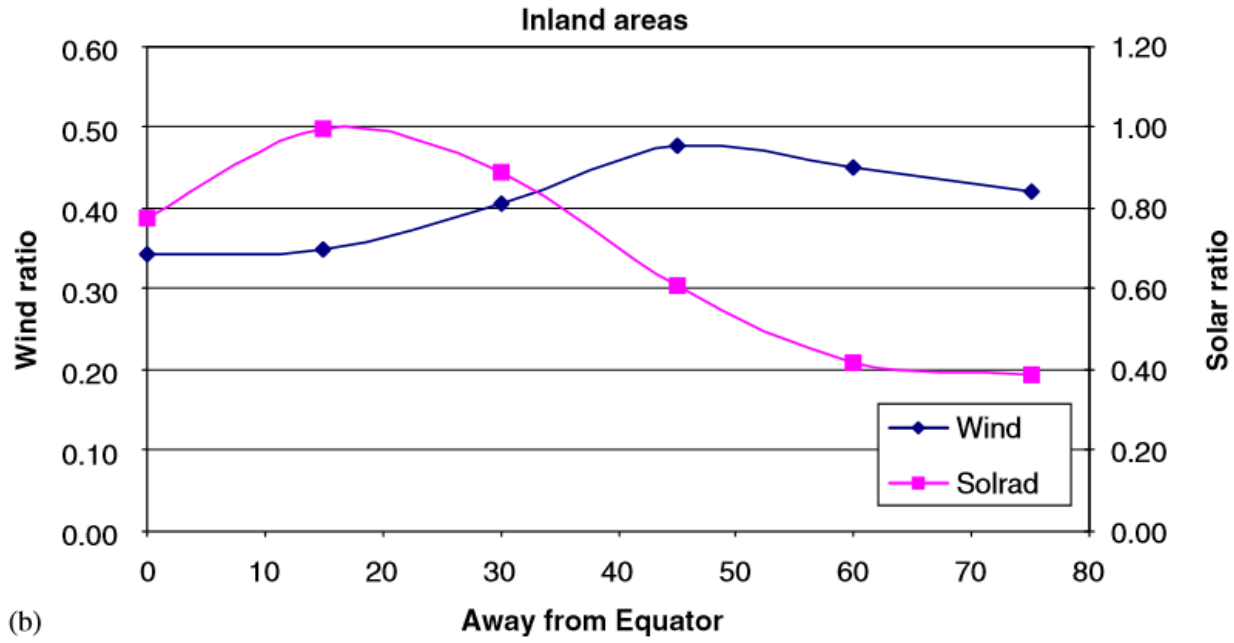
https://www.power-technology.com/features/featurethe-worlds-longest-power-transmission-lines-4167964/

Table 6
Arid/semi-arid locations around the globe with potential for installation of hyper PV stations

Energy markets	Arid/semi-arid location
USA, Canada	Nevada, Baja
South America	Atacama (Chile)
OECD-Europe	Southern Spain
Middle East, OECD-Europe	Saudi Empty Quarter
China, CIS states	Gobi
India	Rajasthan
North Africa	Sahara
South Africa	Namibia, Kalahari
Australia	Great Victoria, Gibson, Tanami


Coastal areas
Range of UK latitude
Wind ratio
Solar ratio
Away from Equator
Wind
Solrad
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
10
20
30
40
50
60
70
80

(a)


Inland areas
Wind ratio
Solar ratio
Away from Equator
Wind
Solrad
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
10
20
30
40
50
60
70
80

(b)

Transient nature of renewable energy

To a large extent wind and solar are complementary.

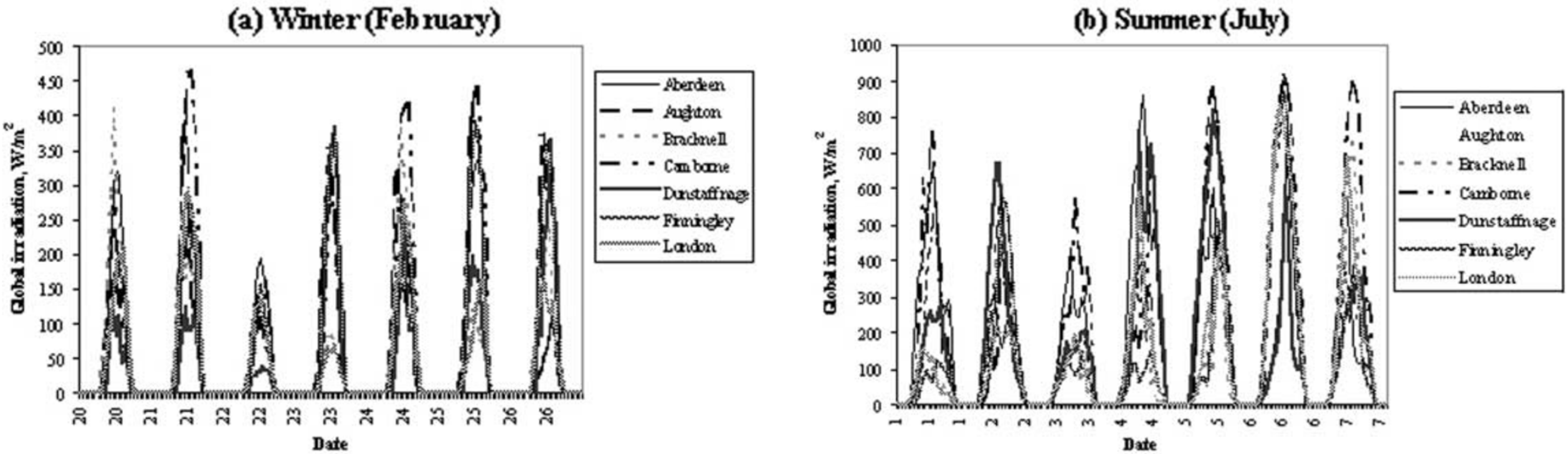


Fig. 4. One week horizontal solar radiation profile for seven locations within the United Kingdom.

Video of road charging of e-vehicles