

Ready for nuclear?

An assessment of capacities, imperatives
and uncertainties for nuclear newcomers

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James Hansen, Kerry Emanuel, Ken Caldeira and Tom Wigley

Nuclear power paves the only viable path forward on climate change

Thursday 3 December 2015 13.00 GMT

“Nuclear will make the difference between the world missing crucial climate targets or achieving them.”

entirely decarbonise the global electricity system by building 115 reactors per year to 2050

“We know that this is technically achievable because France and Sweden were able to ramp up nuclear power to high levels in just 15-20 years.”



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“Nuclear will make the difference between the world missing crucial climate targets or achieving them.”

entirely decarbonise the global energy system by building 100 new reactors per year to 2050

“We know that this is technically feasible. Sweden were able to ramp up production in 15-20 years.”



Wednesday 16 December 2015
15.38 GMT

There is a new form of climate denialism to look out for – so don't celebrate yet Naomi Oreskes

“The only country in the world that has ever produced the lion's share of its electricity from nuclear is France...

and they've done it in a fully nationalized industry – a model that is unlikely to be transferable to the US”

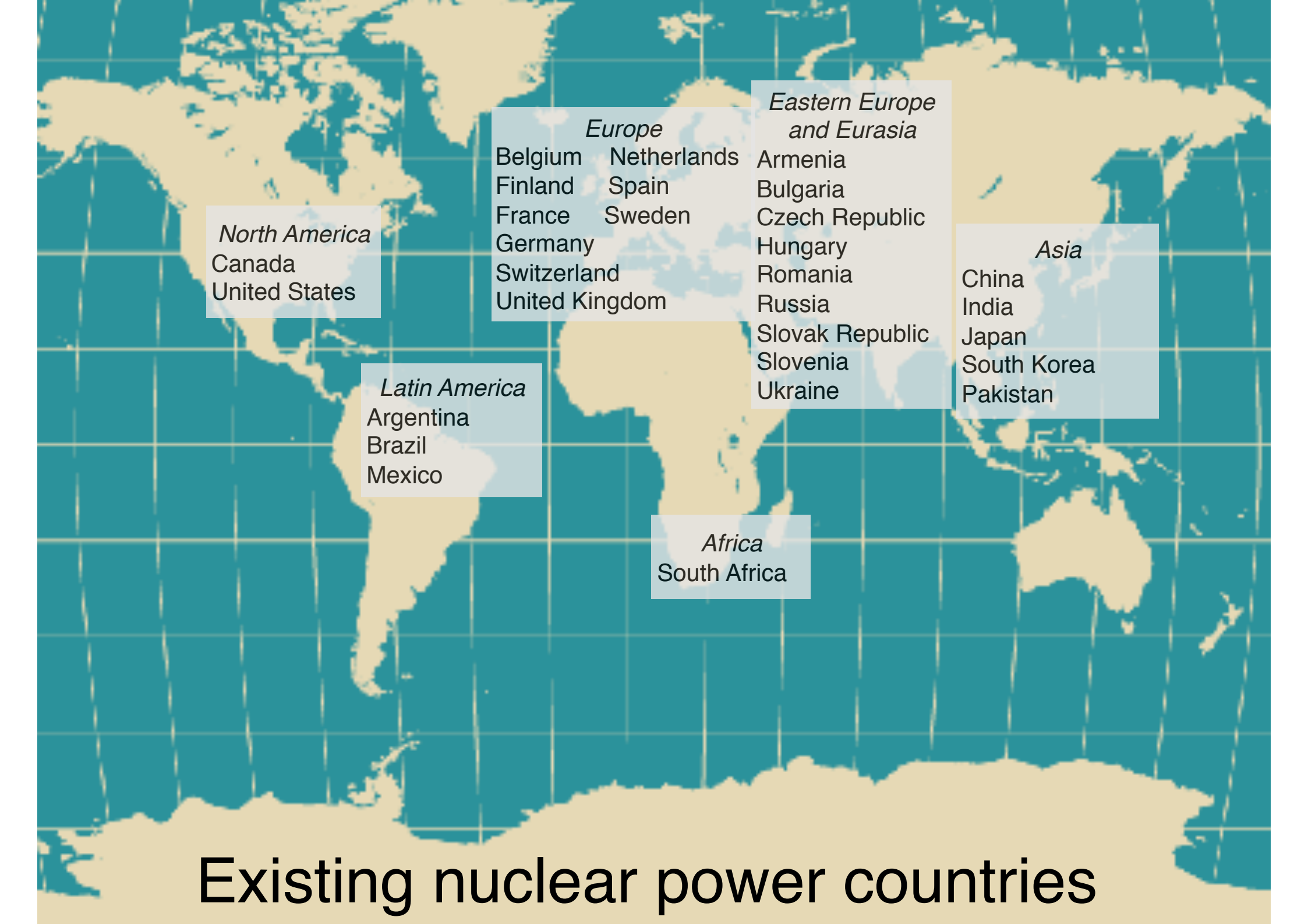




Newcomer countries

from Rogner 2013

from Jewell 2011



North America
Canada
United States

Latin America
Argentina
Brazil
Mexico

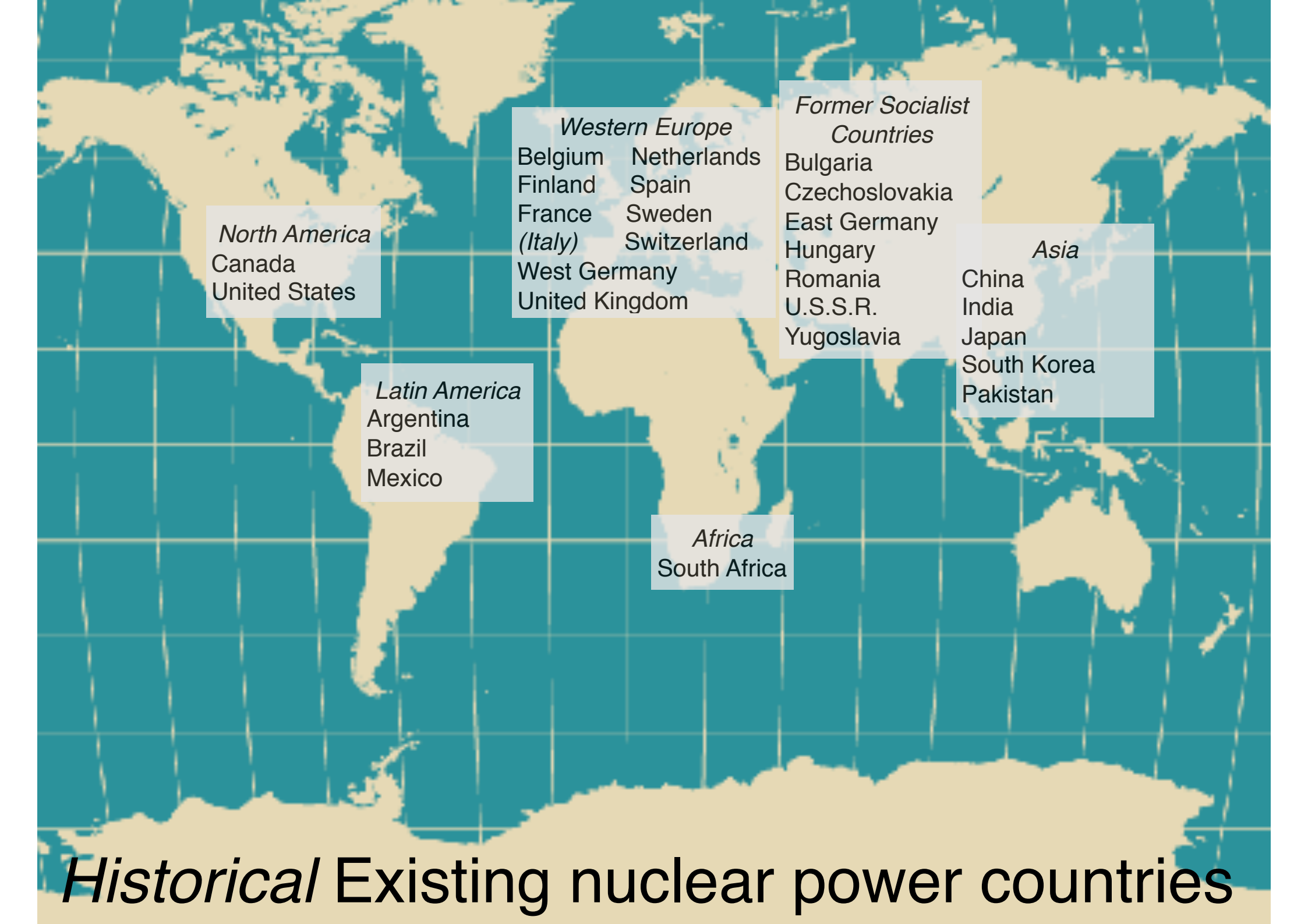
Europe
Belgium Netherlands
Finland Spain
France Sweden
Germany
Switzerland
United Kingdom

Africa
South Africa

*Eastern Europe
and Eurasia*
Armenia
Bulgaria
Czech Republic
Hungary
Romania
Russia
Slovak Republic
Slovenia
Ukraine

Asia
China
India
Japan
South Korea
Pakistan

Existing nuclear power countries



A world map with a grid overlay. Countries are color-coded: light blue for historical nuclear power countries and light yellow for existing nuclear power countries. The map includes labels for various regions and their constituent countries.

North America
Canada
United States

Latin America
Argentina
Brazil
Mexico

Western Europe
Belgium
Finland
France
(Italy)
West Germany
United Kingdom
Netherlands
Spain
Sweden
Switzerland

Former Socialist Countries
Bulgaria
Czechoslovakia
East Germany
Hungary
Romania
U.S.S.R.
Yugoslavia

Asia
China
India
Japan
South Korea
Pakistan

Africa
South Africa

Historical Existing nuclear power countries



Existing Nuclear Power Countries

capacity

- Size of a country's economy (GDP)
- Wealth of a country (GDP/capita)
- Political instability (PITF database)

motivation

- Electricity demand growth
- Pursuit of nuclear weapons



Existing Nuclear Power Countries

capacity

- Size of a country's economy (GDP)
- Wealth of a country (GDP/capita)
- Political instability (PITF database)

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Nuclear Newcomers

capacity

- Size of a country's economy (GDP)
- Wealth of a country (GDP/capita)
- Political instability (PITF + World Bank Political Instability Index)
- Electricity grid and interconnections

motivation

- Electricity demand growth
- Pursuit of nuclear weapons
- Energy security (electricity diversity and dependence)

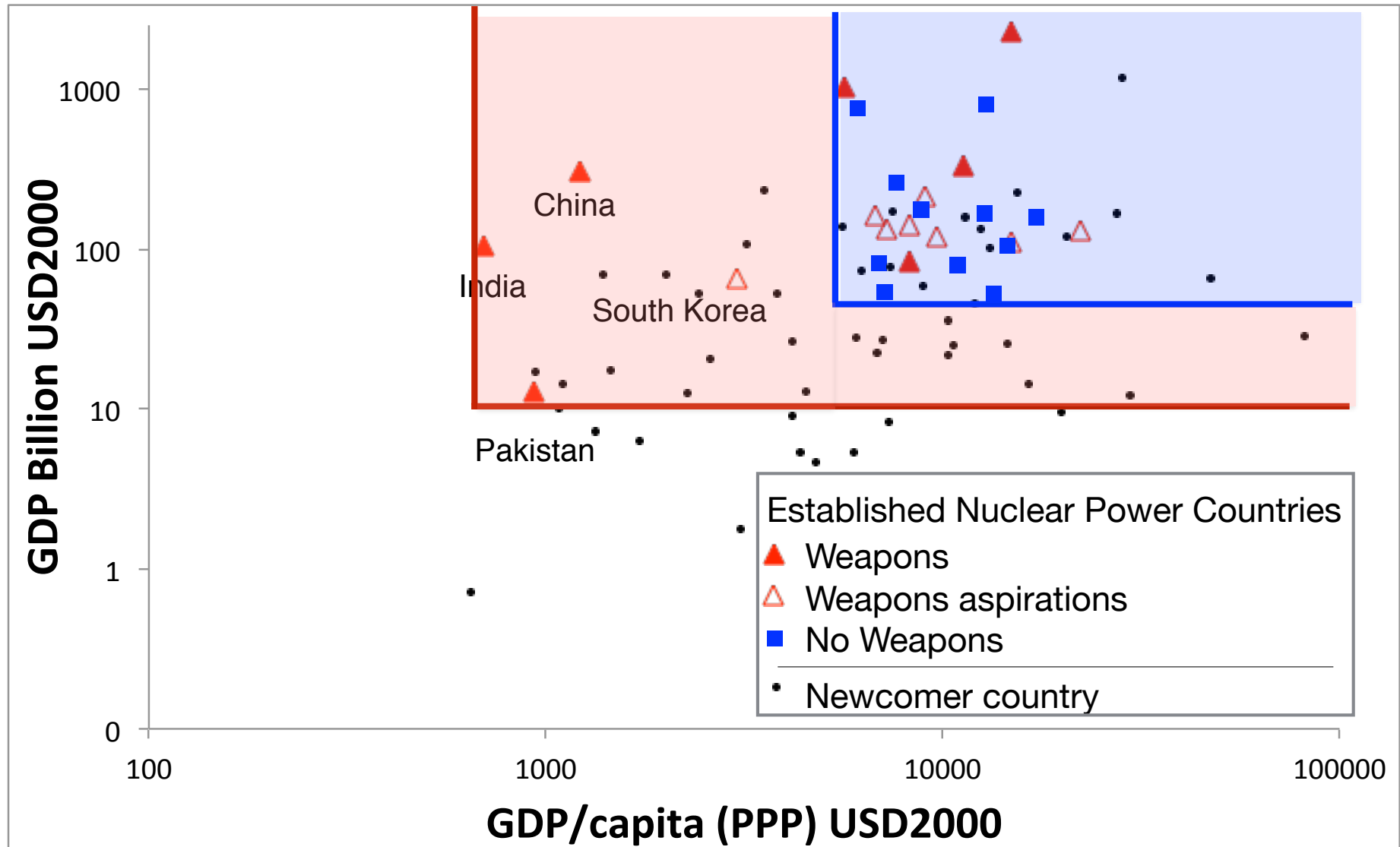
Historically countries built nuclear power...

- during times of high electricity growth ($>6\%$) AND
- with GDP $>$ \$50 bill and GDP/capita $>$ \$6000 AND
- when they were politically stable

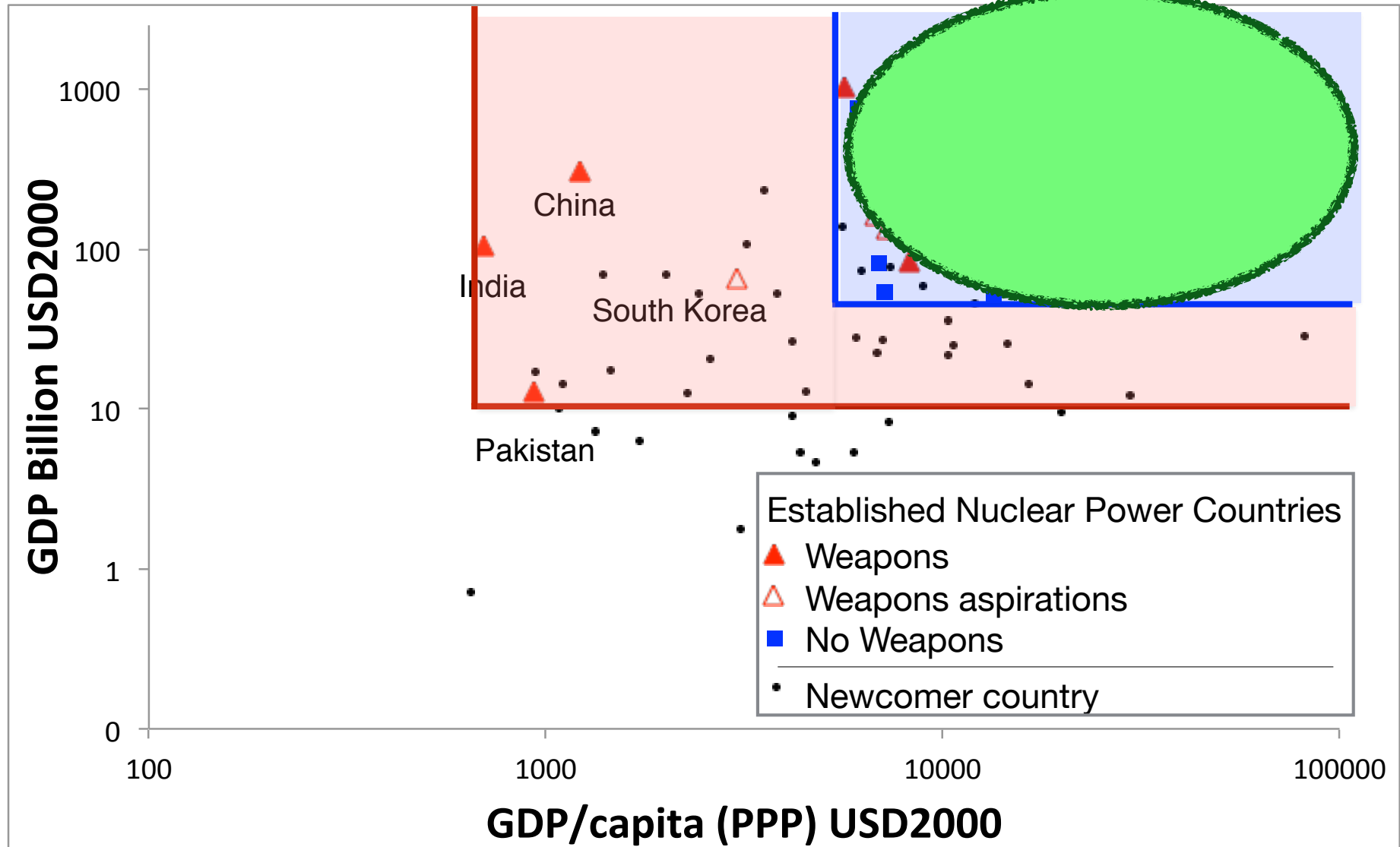
OR

- with or following the development of nuclear weapons

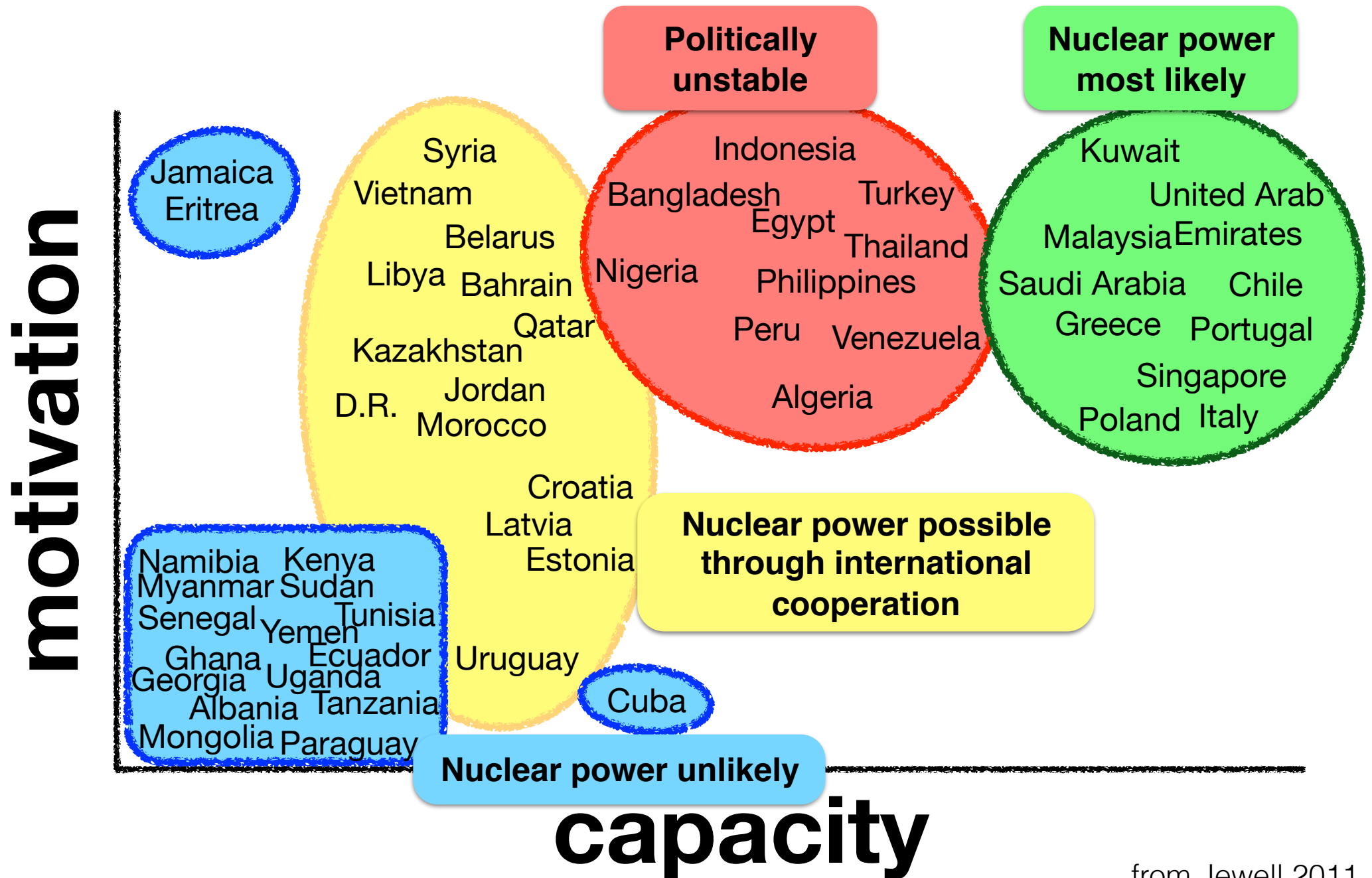
Comparing Existing to Newcomer countries



Comparing Existing to Newcomer countries



Evaluating Newcomers



Evaluating Newcomers

Bangladesh

Nuclear power
ertain

Nuclear power
kely

United Arab
Emirates

Belarus

Turkey

Vietnam

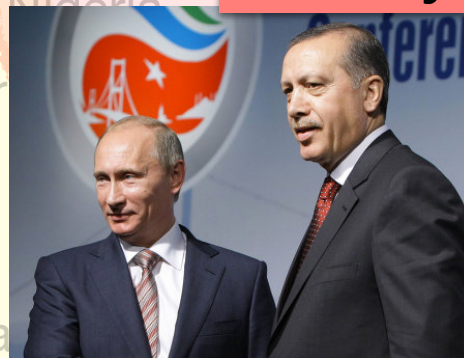
Nuclear power possible
through international
cooperation

capacity

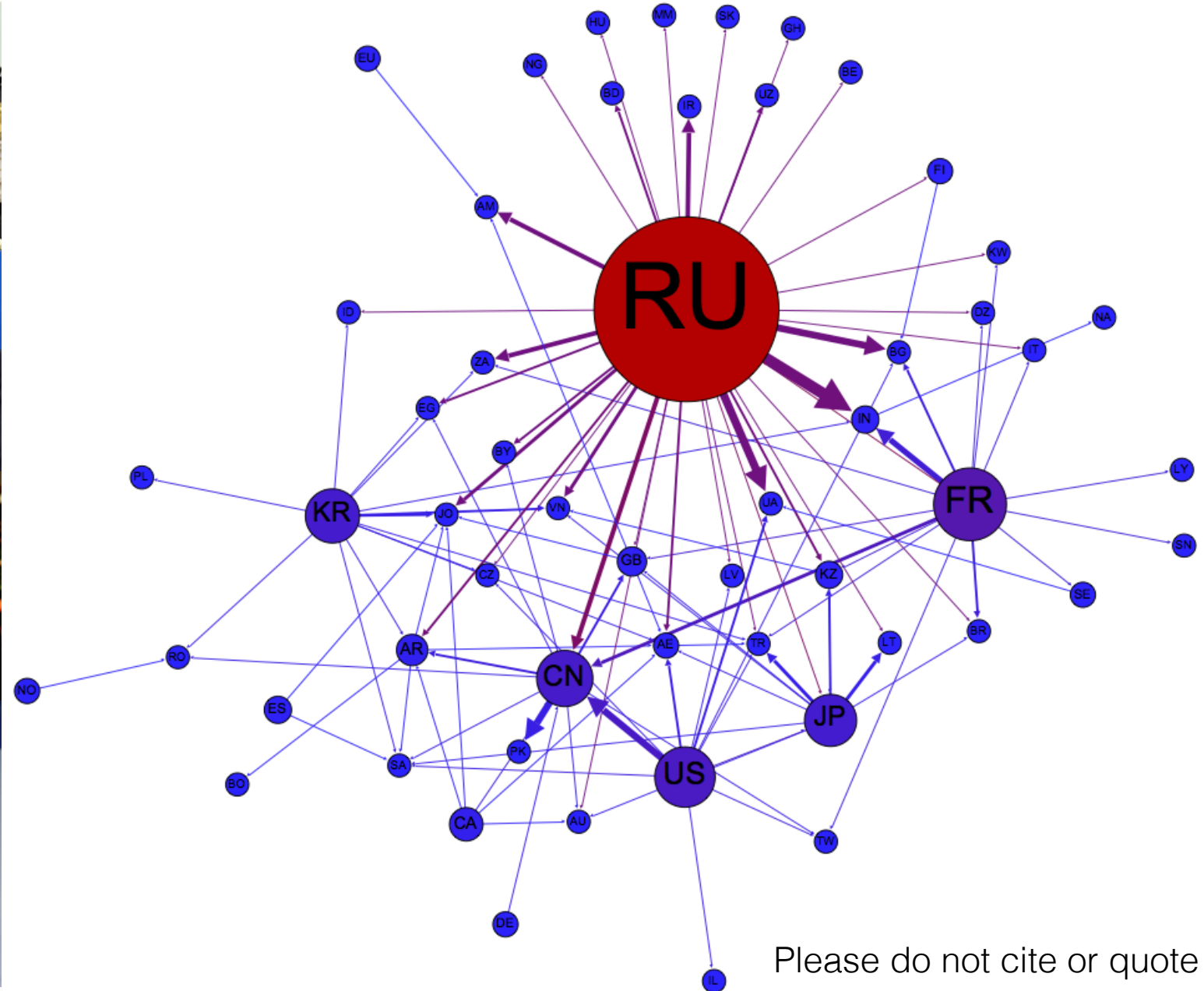
motivation

Jamaica
Eritrea

Namibia
Myanmar
Senegal
Yemen
Ghana
Georgia
Albania
Mongolia

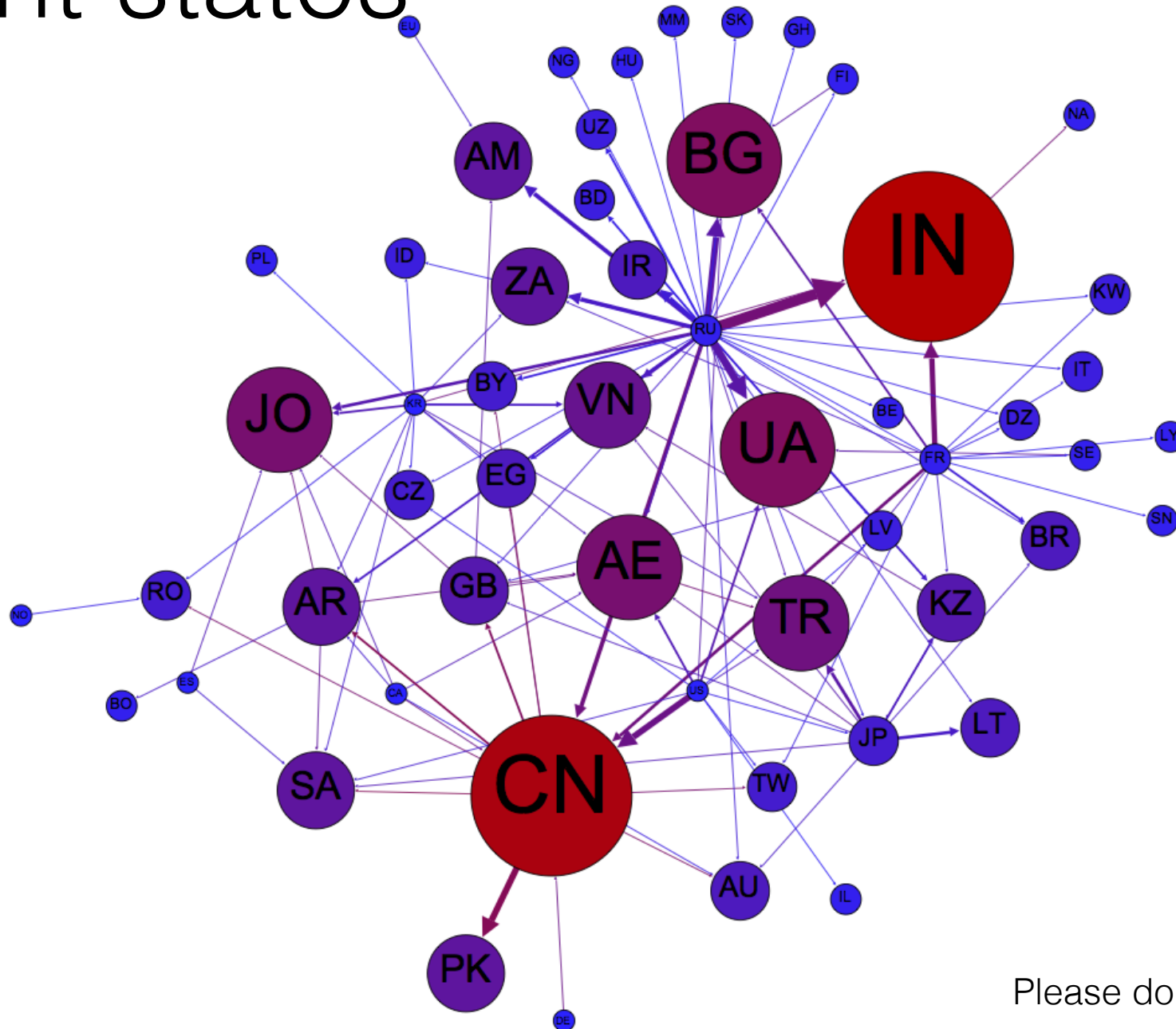


Russia dominates nuclear cooperation related to reactor supply and power plant construction



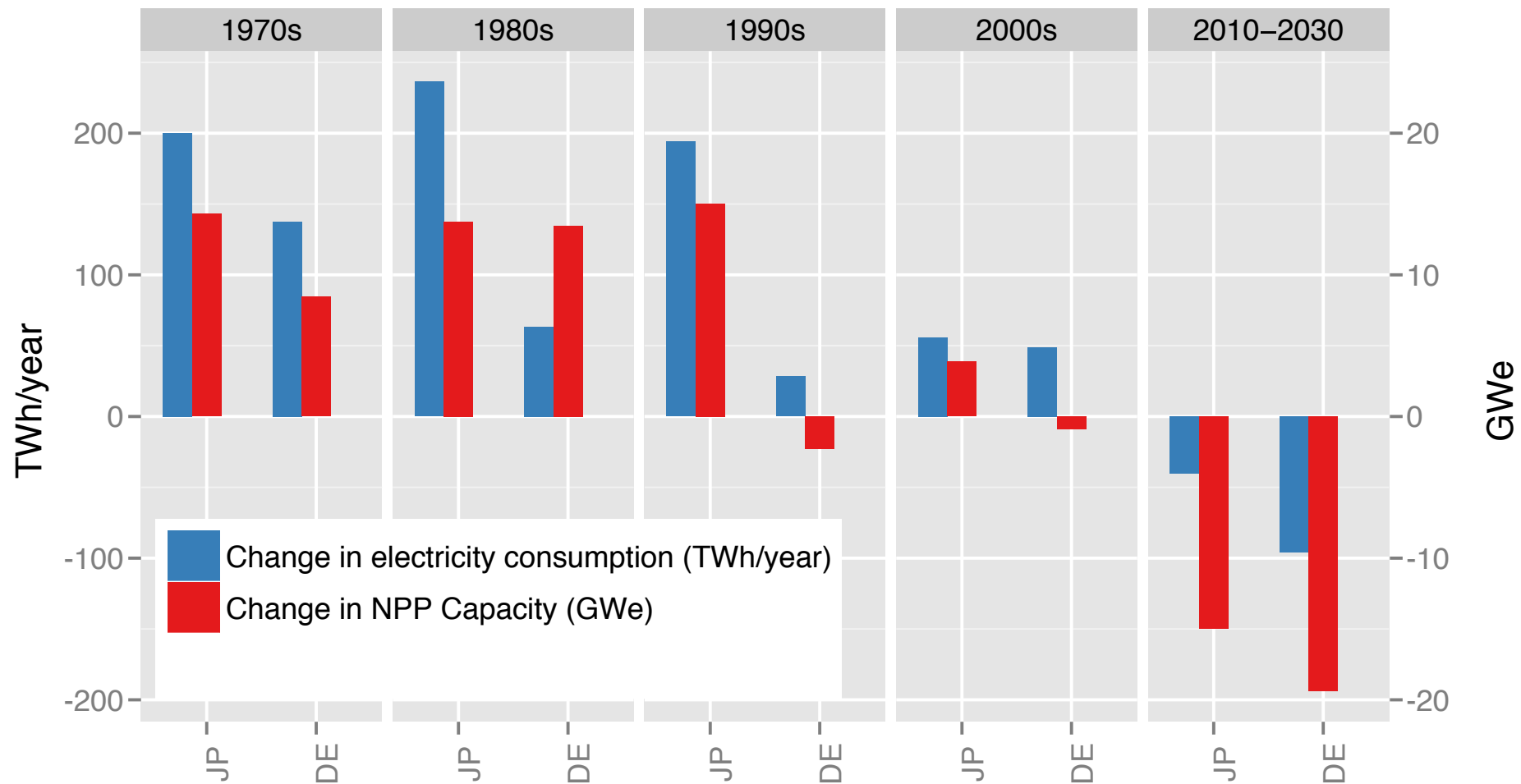
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China and India are the biggest client states



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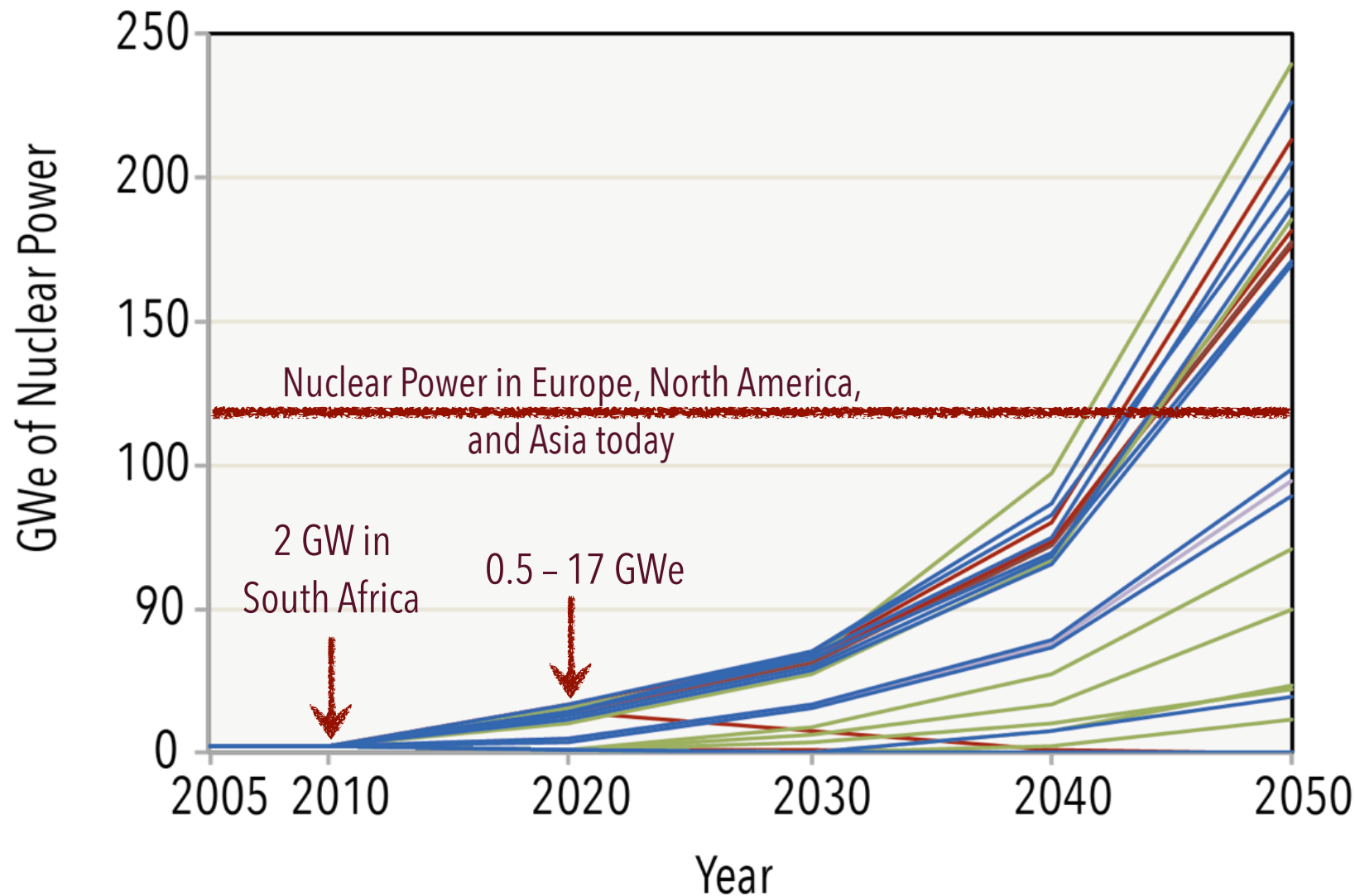
Can electricity demand explain policy changes in operating nuclear countries?







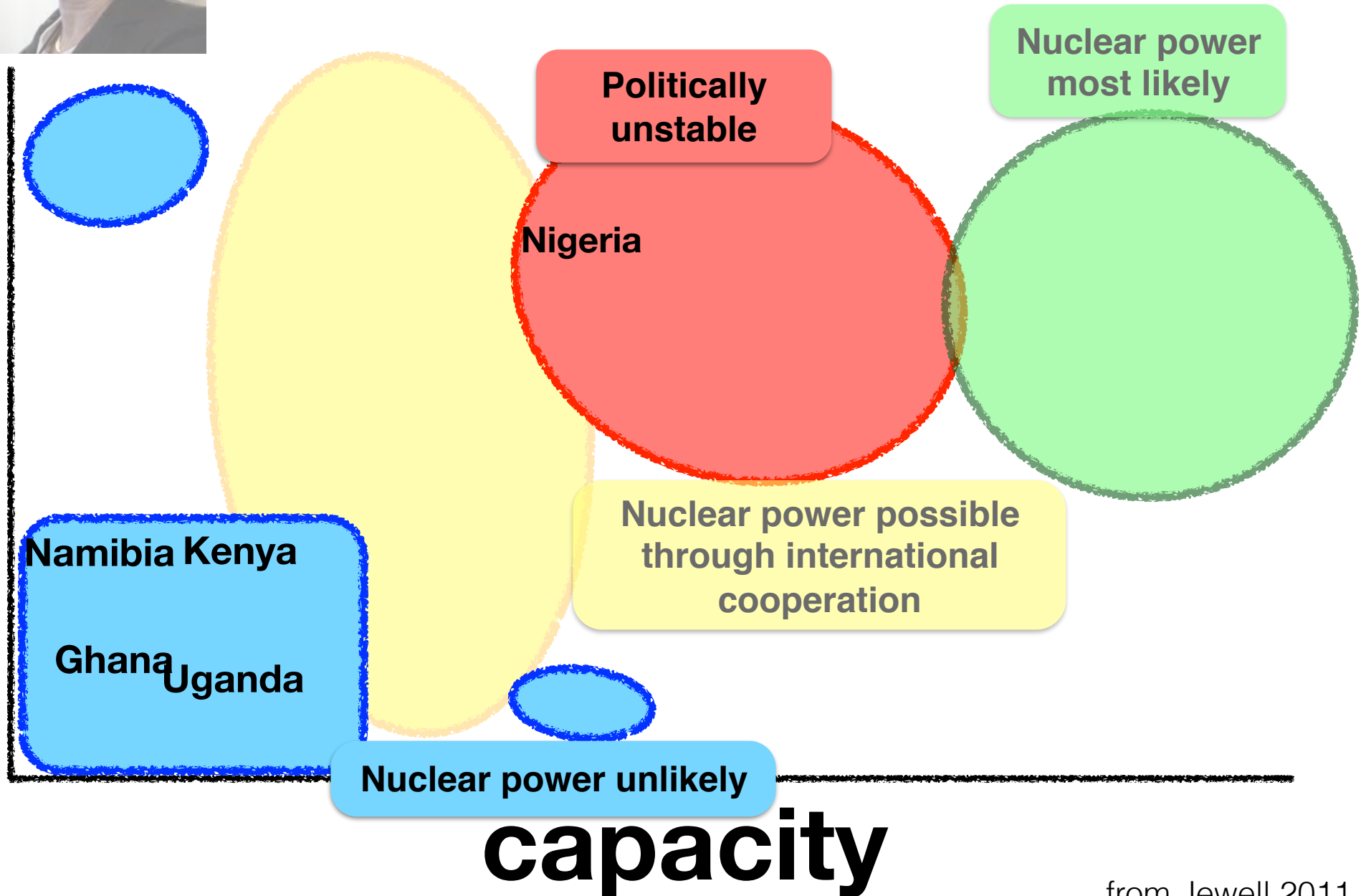
Nuclear in Sub-saharan Africa under GEA





Nuclear Newcomers in Subsaharan Africa

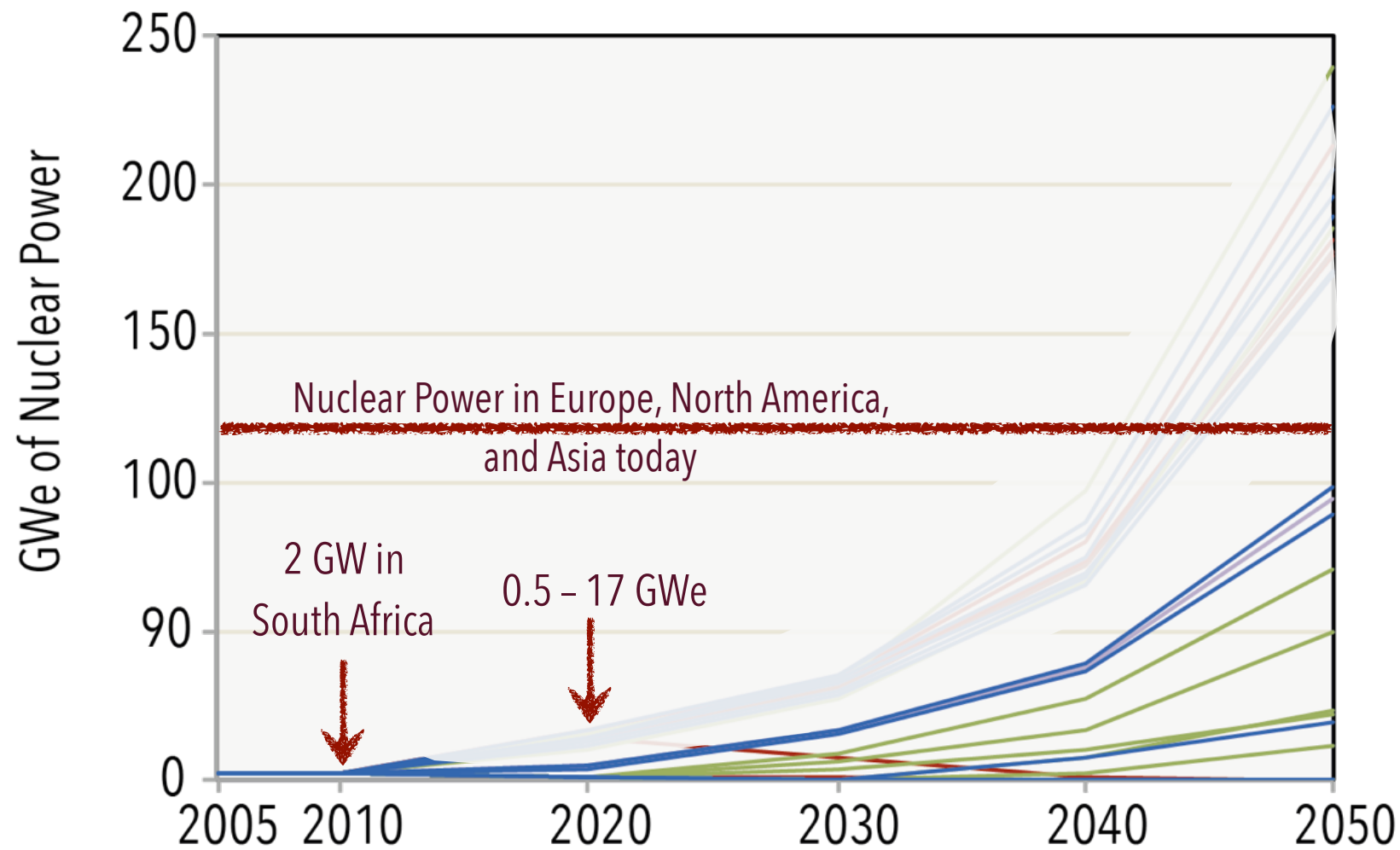
motivation





Bridging:

- past and future
- disciplines
- scales



references

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