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Future Electricity Systems

The “three” Story

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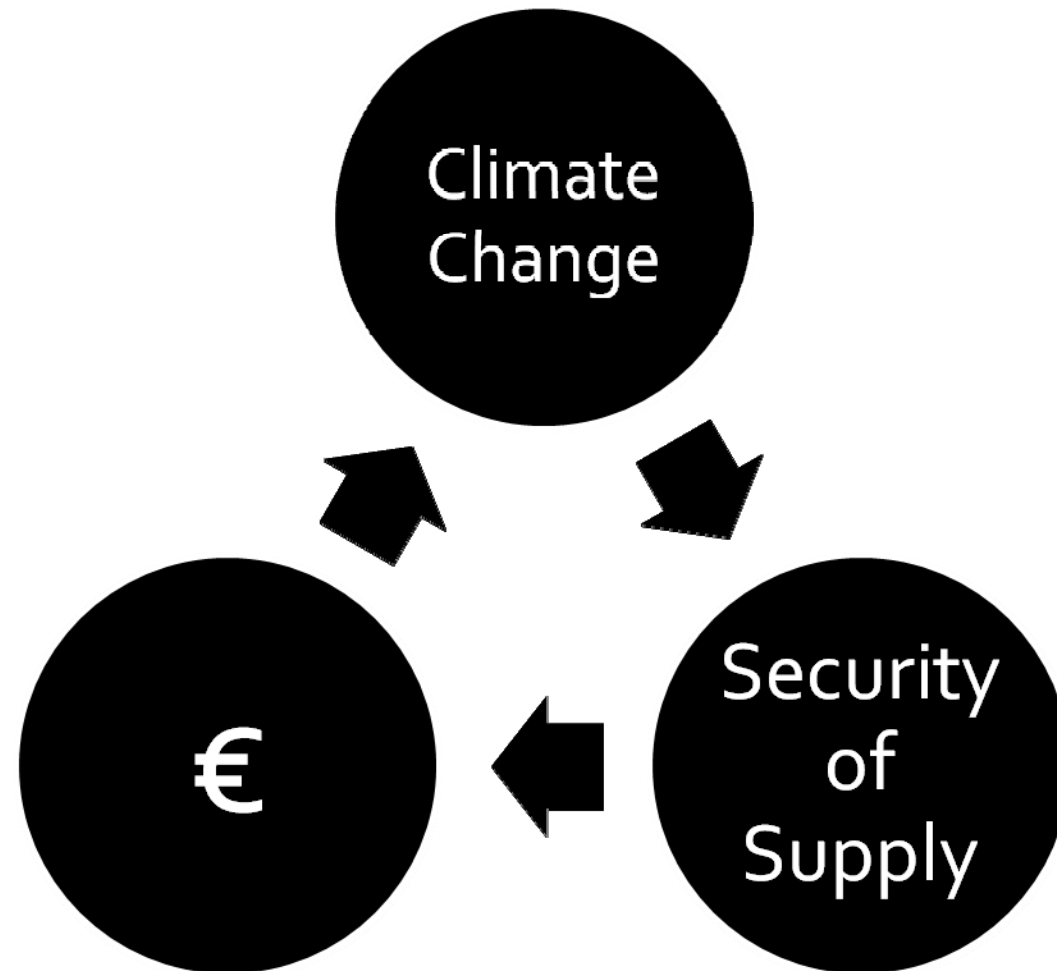
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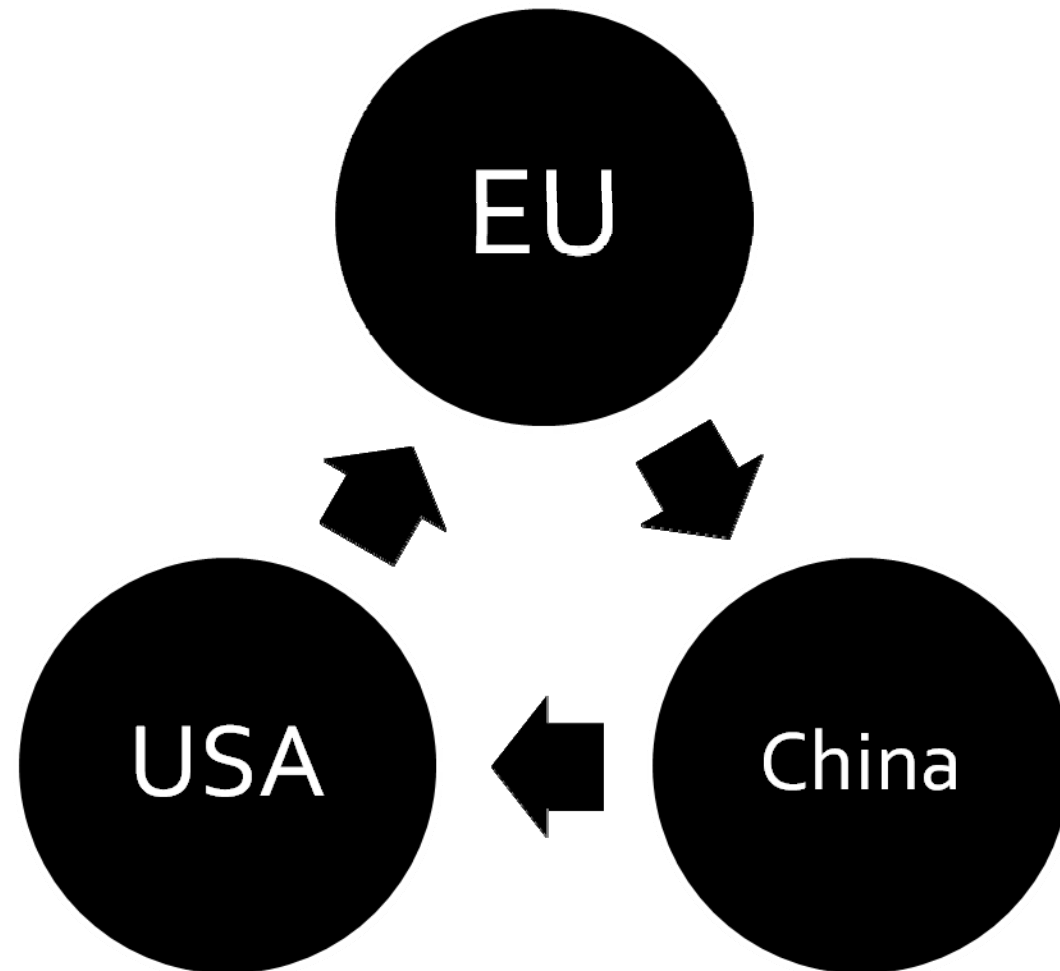
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Three drivers



Three gorillas



- In **Europe** the Climate Change and Energy Package requires:
 - 20% reduction in greenhouse gas emissions based on 1990 levels
 - 20% of final energy consumption to be produced from renewable energy resources (this translates into around a 35% share for RES power in total electricity)
 - 20% improvement on energy efficiency
- 3rd Energy Package (market liberalisation and cross border market integration)

USA: Policy Context

- In the **United States** the new administration is working to pass the American Clean Energy and Security Act (passed the U.S. House of Representatives (219-212)). This legislation is designed to:
 - Integrate clean energy technologies
 - Increase energy efficiency measures
 - Transition to clean energy economy
 - Reduce GHG emissions

It is also important to note that President Obama campaigned on a promise to reduce US greenhouse gas emissions to 1990 levels by 2020 and by a further 80% by 2050.

China: Policy Context

- In **China** the President recently outlined a four step plan that involves
 - reducing carbon intensity of the economy to 2005 levels by 2020,
 - boosting nuclear and renewables to account for 15% of China's power,
 - increasing forest cover, and
 - furthering action to develop a green economy.

The 2005 Renewable Energy Law of the Peoples Republic of China promotes

- the use of renewable energy,
- aims to improve the energy structure and diversify energy supplies,
- Increase energy security and
- protect the environment.

In the 2008-2009 economic stimulus plan China committed approx 350 billion euro to clean energy and energy saving technologies.

In addition, China plans to integrate 100 GW of wind power capacity by 2020 and expand its renewable energy consumption to 40 percent of the energy market by 2050.

By 2020, the State Nuclear Power Development Plan aims at a total installation of 40,000 MW, which would account for 4 percent of the nation's total power capacity.

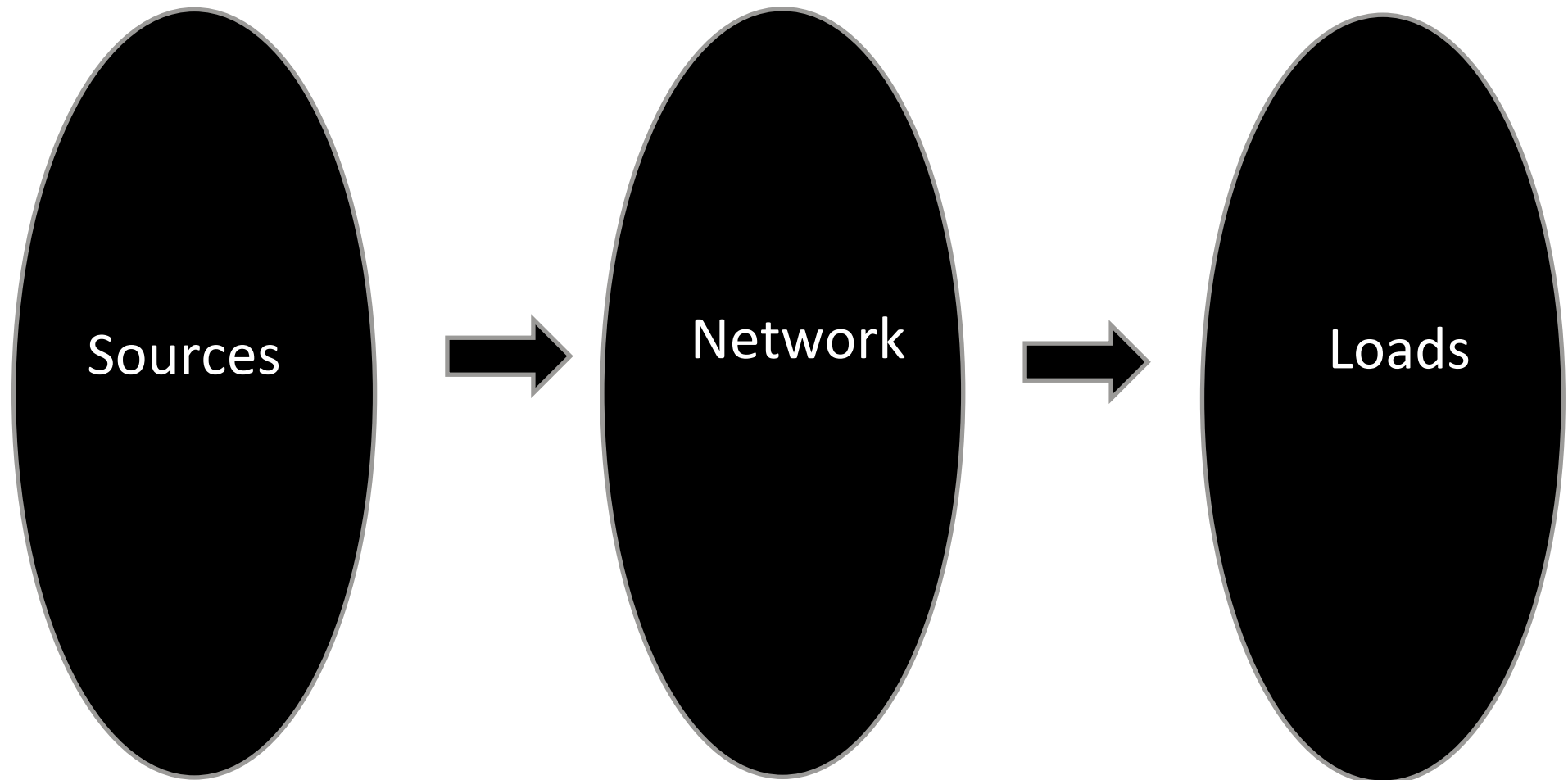
Three points

- Over the last one hundred years, electricity networks have served the need of consumers across the world.

- However, with the advent of policies designed to integrate renewable energy, enhance market liberalisation and ensure a secure and sustainable electricity supply, current grid infrastructure will need to be upgraded.

- Future electricity networks will need to cater for
 - distributed generation;
 - renewable energy sources;
 - demand response & demand side management
 - energy storage.

Three parts of system



Three green machines



Convergence of system



Sources

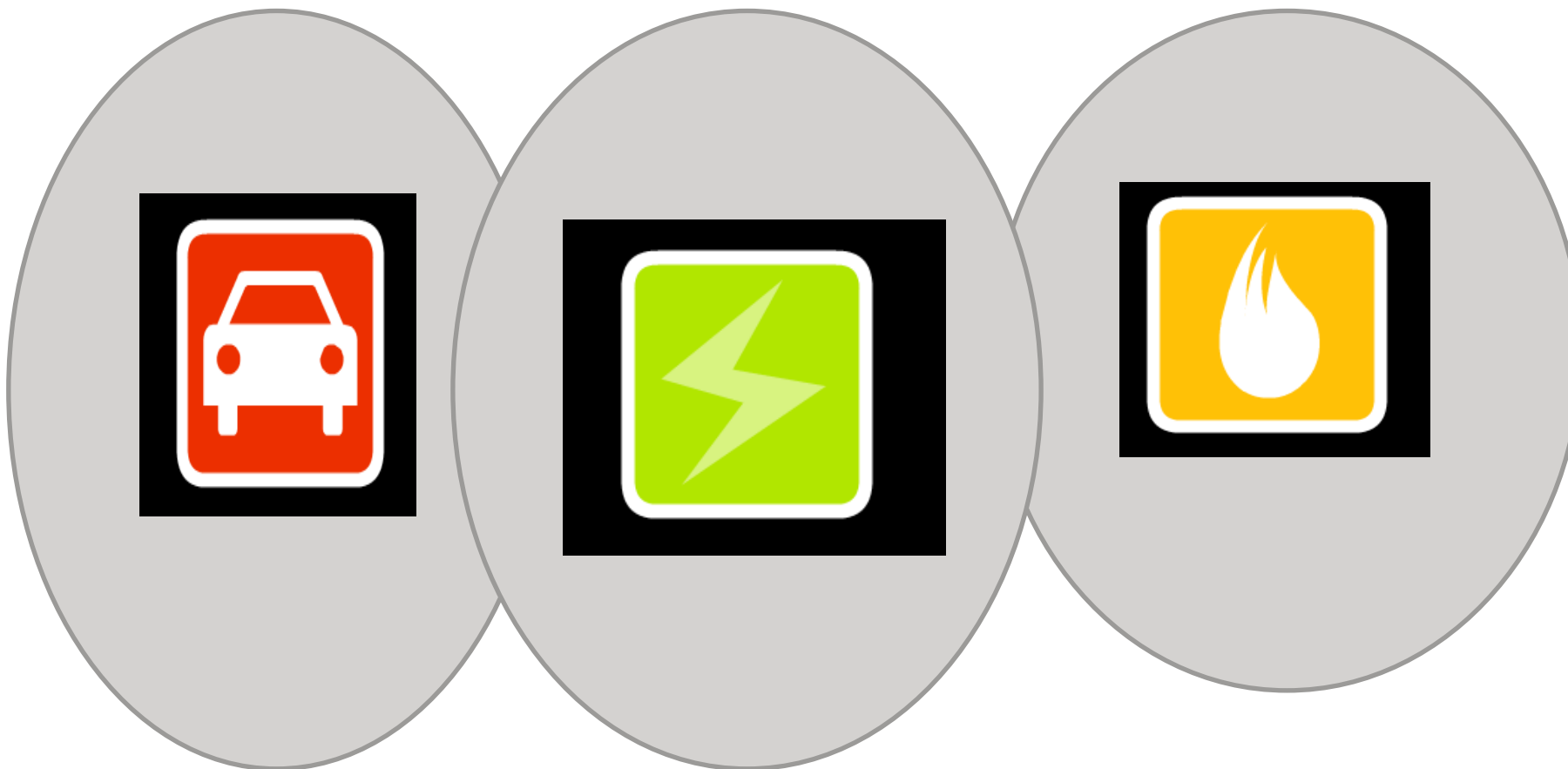
Network

Loads

Three sectors



Convergence of sectors



Three conclusions

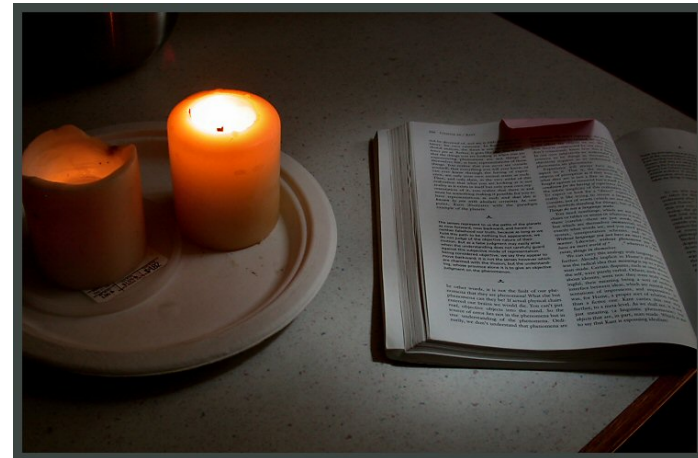
- Energy system will be different
- Convergence – system & sectors
- Electricity network is the key enabler

Finally a research perspective

“Energy is the single most important challenge facing humanity today”

Nobel Laureate Rick Smalley, April 2004

Nature papers by candlelight



Acknowledgements

- Frank Croome & Jonathan O'Sullivan, EirGrid