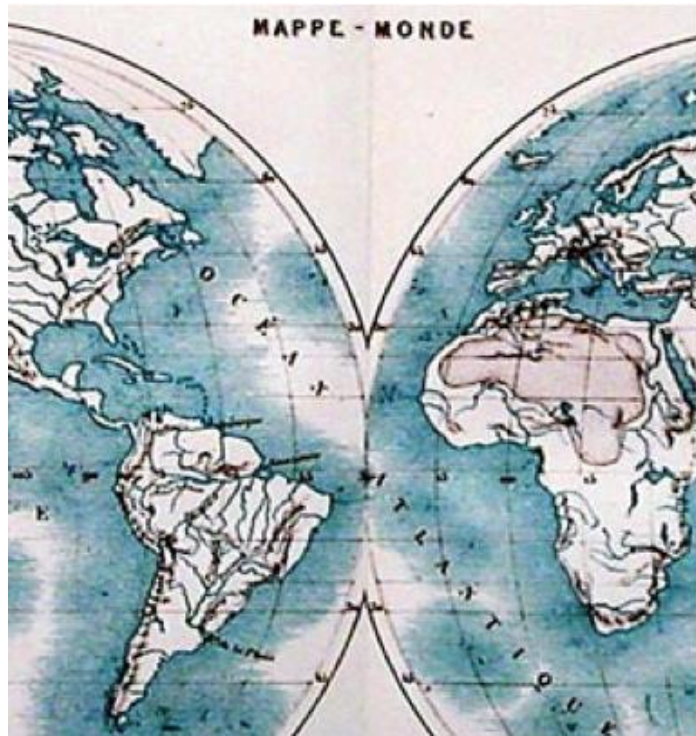




# From Two Hemispheres to One Basin

## The Co-Transformation of Energy & Transport: Outlook for the Wider Atlantic

R. Andreas Kraemer



Vuillemin (1868): Description des  
phenomènes de la vie de Globe



Gaston & Morse (1857): Chart of River Basins



# Summary

## ▶ Hypotheses

- ▶ The **Pan-Atlantic is a Biophysical Reality**, and not merely an abstract of international relations.
- ▶ The **Pan-Atlantic** is a meaningful space for diplomacy, cooperation, policy coordination and joint governance
- ▶ The **Pan-Atlantic** is a useful unit of analysis for energy and transport transformations and consequences for trade and security

## ▶ Approach (and Content of this Presentation)

- ▶ Overview of Energy Transformation in the **Pan-Atlantic**
- ▶ Overview of Transport Transformation in the **Pan-Atlantic**
- ▶ Exploration of Co-Transformation of Energy and Transport in the **Pan-Atlantic**
- ▶ Exploration of Impacts on Economies, Trade, and Security in the **Pan-Atlantic**



## The Pan-Atlantic Biosphere

- ▶ The Atlantic Ocean has **Distinctive Features** and Elements, e.g.:
  - ▶ Hydrologically "**semi-enclosed**" (of a sort)
  - ▶ **Gulfstream** warms Northern Europe
  - ▶ Large **Ice Mass** on Greenland
  - ▶ Atlantic meridional overturning **circulation (AMOC)**;  
Strong Deep North-to-South Cold Water Flow  
(oxygenated water, deep Calcium compensation)
  - ▶ North Atlantic **Oscillation (NAO)** between Azores & Iceland
  - ▶ **Highly Productive Coastal & Delta Ecosystems**  
(Chesapeake Bay may be world's most productive)
  - ▶ Intra-Basin **migrations** of whales, fish, sea mammals, turtles, ...
- ▶ **The Atlantic is a Connector** among the Countries around the Basin



## Pan-Atlantic Challenges: **Climate Change and Energy**

- ▶ **Climate Change is Caused by "Atlantic Lifestyle"**
  - ▶ **Production and Consumption Patterns**
  - ▶ **Dominant & Unbroken Fossil Energy Systems**,  
much intra-basin trade in technology & carriers
  - ▶ "Atlantic Nations" are also leaders in  
**climate policy** and **renewable(?) energy**;  
with promise of **additional infrastructure links**
- ▶ **Atlantic is Home to the Worst Offenders**  
and **Most Vulnerable Victims**
- ▶ **Climate Change May Impact Circulations**  
and **Oscillations** in the Atlantic Basin(s)
- ▶ Atlantic may become **more open to Arctic**
- ▶ **Impacts** will be similar across basin(s),  
e.g. **coastal flooding, rivers backing up** etc.



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<https://www.bloomberg.com/news/articles/2016-06-13/we-ve-almost-reached-peak-fossil-fuels-for-electricity>

# Inspired by Amory Lovins

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1975 with US President Jimmy Carter

2016 with German Order of Merit



**Lovins, Amory B. (1976):  
“Energy Strategy:  
The Road Not Taken?”,  
Foreign Affairs (October)**

Energy Strategy:

The Road Not Taken?

By Amory B. Lovins



## Energy Transformation in the Atlantic

- ▶ **Costs for Renewable Energy Are Now At or Below Parity ...**
  - ▶ ... and Without Subsidies Can Compete against Subsidized Fossil & Nuclear
  - ▶ ... and Keep Coming Down; also Applies to Storage & Smart Energy Systems
- ▶ **Energy Transformation is**
  - ▶ Self-sustaining, self-accelerating & self-replicating, ...
  - ▶ ... and therefore unstoppable. Coal, Coal & Fossil Methane Gas are Going Out
  - ▶ ... Residual Nuclear Can Survive with Economic Ringfencing to Sustain Military Technology Basis
- ▶ **Old Energies Yield to New, Green Energy Systems, also "Atlantic"**
  - ▶ Fossil Energy Commodity Trade May Cease by 2050, Lifting Resource Curse
  - ▶ New Energy Systems Harvests Ubiquitous & Free Environmental Flows





## North America

### Status:

Grid with weak interconnections, mid-level supply security; high levels of renewable energy; innovator and technology supplier

### Trend:

Nuclear down, coal out, oil declining, fossil methane gas holding up (for a while), renewables up (solar & onshore wind); grid defection in some areas; growth of smart-energy applications and business models

### Outlook:

Accelerating green power shift, rear-guard action by coal lobby and nuclear military-industrial complex; disruption by technical, material and business model innovation in a conservative political environment

## South America

### Status:

Mix of grids & off-grid, weak interconnections, medium & low supply security; corporatism (corruption); Venezuela is first petro-state in collapse; weak on innovation; technology follower

### Trend:

No (new) nuclear; persistence of fossil in corporatist utilities; autonomous electrification in unserved or underserved areas with renewables (solar);

### Outlook:

Persistence of fossil in corporatist utilities, but accelerating electrification with LVDC smart solar.

## Europe

### Status:

Grid with strong interconnections, high supply security; high and rising levels of renewables; innovator and technology supplier

### Trend:

Nuclear going out except France, Russia & UK; coal going out, oil and fossil methane gas declining (maybe except in Russia); renewables up (all & solar; more interconnections, including with North Africa,

### Outlook:

Continuing green power shift, spreading to the East and South-East, rear-guard action by retrograde regimes in some countries (e.g. Poland, potentially Germany), disruption is partly policy induced

## Africa

### Status:

Forget grid, interconnections & supply security; some innovation in business models; technology taker; political power often trumps economic sense

### Trend:

Some utility-scale renewables; residual focus on coal; some interest in nuclear (corruption)

### Outlook:

No (new) nuclear; stagnation in grid areas; first access to off-grid energy with LVDC smart solar; potential conflicts between fossil and solar



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<http://rameznaam.com/2016/04/12/how-cheap-can-electric-vehicles-get/>



## **Transport Transformation in the Atlantic**

- ▶ **Total Cost of Ownership of a Tesla Model S is Below that of Rivals !**
- ▶ **The Car Industry Is on the Cusp of a Radical Transformation**
  - ▶ **Electrification: Pure Electric Vehicles & some Hybrids; Self-Charging at Home**
  - ▶ **Platform & Sharing Economy: More Miles per Car; Fewer Cars Needed**
  - ▶ **Autonomous Driving and Other Functionalities Favor Electric Cars**
  - ▶ **Future Vehicles Will Be Simpler & Much Cheaper to Build; No After-Sales !**
- ▶ **This Started in the Atlantic (well, California), but May Be ...**
- ▶ **Lost to Pacific (mainly China, but also Japan, South Korea, Taiwan)**
- ▶ **Public Transport is on Similar Trajectory**
- ▶ **New Fuels and Drive/Propulsion also for Trains, Ships, Aircraft**
- ▶ **New Materials, New Resource Trade Routes, Lower Trade Overall**
- ▶ **Innovation By New Entrants & Disruption of Incumbents is Atlantic**



## **Energy and Transport Transformation Have in Common**

- ▶ **Economics Is on their Side – And Fossil Subsidies Against Them**
- ▶ **Strong Environmental & Social Value Propositions (Policy Needed)**
- ▶ **Technology Learning is Steep (New Materials in a New Area)**
  - ▶ **Oil & Steel incl. Welding are Down**
  - ▶ **Carbon Fibres & Plastics incl. Adhesives are Up**
- ▶ **Self-Accelerating and Disruptive to Incumbents**
- ▶ **Focus on Cheap & Efficient Low-Voltage Direct-Current Systems**
- ▶ **Mutually Re-Inforcing:**
  - ▶ **More Storage in EV Connected to Grid > Grid Can Use Renewables Better**
  - ▶ **More Renewables in the Grid > Better Carbon Performance of Mobility**
- ▶ **New Systems will Provide Services Far Beyond the Old System**
- ▶ **This Co-Transformation will Extend to Buildings (Solar Roof-Tiles)**



## **Wide Economic, Trade & Security Implications**

- ▶ **Trade Shifts from Energy (for Consumption) to**
- ▶ **Equipment (for Harvesting Ubiquitous Free Environmental Flows)**
- ▶ **Collapse of Trade in Fossil Energy Commodities in Value & Volume**
- ▶ **Mining and Metals Trade Towards Wider Range of Elements**
  - ▶ **Non-Ferrous Metals, Metalloids, and Rare Earths are UP**
  - ▶ **Ferrous Metals are FLAT or DOWN**
- ▶ **Revenues of Petro-States will Collapse (watch Venezuela)**
- ▶ **New Business Opportunities won't compensate**
- ▶ **Total Cost & Capital Needs for Energy & Transport Will Decline**
- ▶ **Services Provided and Environmental & Social Values will Rise**
- ▶ **But those Transformations Still Look Bad in GDP & Trade Statistics**



Kraemer, R. A. (2016). Twins of 1713: Energy Security and Sustainability in Germany. In R. Looney (Ed.), Handbook of Transitions to Energy and Climate Security (pp. 413-429). Abingdon, UK, & New York, NY: Routledge.

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