Part I

The Atlantic Basin on the Global Energy Map

Chapter One

An Introduction to the Future of Energy in the Atlantic Basin

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The Atlantic Energy Renaissance

A new Atlantic Basin is emerging, and energy is one of its principal driving vectors.[1] Indeed, an Atlantic energy renaissance has already been underway, unobtrusively, for nearly a generation. Only in the past few years, however, has the full potential force of such an underlying structural strategic change become perceptible.

New players and technologies have recently emerged to notably alter both the Atlantic Basin and global energy maps, as new conventional and unconventional fossil fuel sources and new alternative low carbon energies come online—and as opportunities for pan-Atlantic energy cooperation begin to emerge. This transformation of the Atlantic energy space is now unfolding across sectors and segments, among public and private actors, and all along the energy value chain. Most importantly, this Atlantic energy renaissance is emanating from both the old North and South Atlantics—not just from the United States, where it has been most loudly trumpeted for its assumed potential to finally secure national energy independence.

In the Northern Atlantic, the shale revolution is indeed radiating out from an increasingly less import-dependent North America.[2] As

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1. Along with economic (trade, investment, and finance), human security, sustainable development, ocean/marine, and other cultural and governance dynamics. For more on these other Atlantic drivers, see the Eminent Persons Group of the Atlantic Basin Initiative, "A New Atlantic Community: Generating Growth, Human Development and Security of the Atlantic Hemisphere: A Declaration and Call to Action," a White Paper of the Atlantic Basin Initiative, Center for Transatlantic Studies, School of Advanced International Studies, Johns Hopkins University, March 2014. See: http://transatlantic.sais-jhu.edu/events/2012/Atlantic%20Basin%20Initiative/Atlantic%20Basin%20Initiative.

2. Elizabeth Rosenberg, et al., *Energy Rush: Shale Production and U.S. National Security, Center for a New American Security*, February 2014, and Center for Strategic and International Studies (CSIS), *New Energy, New Geopolitics: Balancing Stability and Leverage*, April 2014.

recently as early 2013, the International Energy Agency (IEA) expected the United States to overtake Russia in 2015 as the leading producer of natural gas, and to overtake Saudi Arabia in 2017 as the world's leading producer of oil. However, the latter is happening this year, in 2014, and the former is about to occur. By 2019, the IEA projects the Unites States will be producing over 13.1 million barrels per day (mbd)[3]. Already, the United States has become a major net exporter of refined petroleum products.[4] Meanwhile, natural gas production is up 40% in the United States since 2005. In 2012, shale gas accounted for 37% of U.S. natural gas supply, up from only 2% in 2000[5]. By 2040, upwards of 50% of U.S. natural gas production will be unconventional.[6]

The implications have quickly rippled across the Atlantic energy space to Europe, where displaced U.S. coal has been backing out renewable energy and competing downward, to some extent, the price of Russian gas for Europeans.[7] The paradoxical result, at least so far, has been a relative undermining of Europe's vital role in the parallel low carbon revolution, which it has led for two decades from its position in the northern Atlantic. This recent Atlantic Basin dynamic has intensified the energy dilemmas perceived by the EU—whose member states are, on the one hand, relatively import-dependent (particularly on Russia, Central Asia, and the Middle East),[8] but also, on the other hand, relatively environmentally conscious (particularly of climate change, but also of the potential dangers of fracking).

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3. Grant Smith, "U.S. Seen as Biggest Oil Producer after Overtaking Saudi Arabia," Bloomberg, July 4, 2014. (http://www.bloomberg.com/news/2014-07-04/u-s-seen-as-biggest-oil-producer-after-overtaking-saudi.html).

4. Energy Information Administration (EIA), "U.S. Petroleum Products Exports Exceeded Imports in 2011," (March 7, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=5290 (EIA 2012b).

5. Steven Mufson, "Shale Gas Reshaping the U.S. Industrial Landscape, *Washington Post*, November 15, 2012.

6. Center for Strategic and International Studies (CSIS), *New Energy, New Geopolitics: Balancing Stability and Leverage*, April 2014 (CSIS, 2014).

7. Steven Mufson, "Turning the Tankers Around, *Washington Post*, December 9, 2012, p. G1. (Mufson 2012).

8. Directorate-General for Energy, "Key Figures," Market Observatory for Energy, European Commission, June 2011. (EC, 2011) and British Petroleum, *Annual Statistical Review of Energy* (Database) 2013 (BP 2013a).

However impressive the shale revolution in the Northern Atlantic has been, the deep-water offshore boom in the Southern Atlantic preceded this North American contribution to the Atlantic energy renaissance, and continues to rival it. Catalyzed by pre-salt discoveries in Brazil (by themselves potentially as high as 50 to 200 billion barrels) and the development of the deep offshore in Angola and elsewhere in the Gulf of Guinea and along the West Africa Transform Margin, the offshore revolution has embraced nearly all of Africa and most of Atlantic Latin America.[9]

Over the last decade, investment in offshore oil exploration and production (E&P) has generated something akin to a Southern Atlantic oil ring with offshore E&P on the rise from Namibia to Morocco in the East, and from Argentina to the Gulf of Mexico in the West. Of the 210 billion U.S. dollars in expected capex investment in global offshore hydrocarbons between 2011 and 2015, over 80% will take place in the Atlantic, and over two-thirds of that in the Southern Atlantic. Already, Southern Atlantic offshore oil reserves (130bn barrels) dwarf those of the Arctic (90bn barrels).[10] In fact, the Southern Atlantic could become the key new region at the margin for increases in global oil production, as well as the most critical regional supplier of oil at the margin to Asia-Pacific (see more on this below).

At the same time, through its myriad public, private, and civic actors, the Atlantic Basin is currently spearheading (however insufficiently) global technological and governance efforts to provide sustainable, low emissions energy access for all (as in the United Nations SE4All Initiative), and to avoid the worst aspects of climate change (as in the United Nations Framework on Climate Change Convention's goal of defending the 2-degree guardrail). The first full blooming of the low carbon revolution has unfolded within the Atlantic Basin, where two-thirds of renewable energy generation now takes place and where a similar share of global installed renewable capacity is currently located. Although much of this has been deployed in the Northern Atlantic, renewable energy is now finding more fertile terrain in Latin America and Africa,

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9. Paul Isbell, *Energy and the Atlantic: The Shifting Energy Landscapes of the Atlantic Basin*, Washington, D.C.-Brussels, The German Marshall Fund, 2012. (Isbell 2012a).

10. IFP Energie Nouvelle, "Panorama 2012: A Look at Offshore Hydrocarbons," 2012 (IFP Energie Nouvelle 2012).

where global institutions and the regional development banks are now placing the priority for their low carbon, energy access, and sustainable development goals. Nevertheless, continued growth of low carbon energy has been at least partially undermined by the recent boom in unconventional fossil fuels. Indeed, business-as-usual projections see Atlantic Basin oil accounting for nearly two-thirds of the growth in global oil production to 2030, even as the Atlantic is now projected to de-carbonize its energy mix at a slower rate than the rest of the world, particularly the Asia-Pacific region.[11]

The Shifting Global Energy Flow Map and the New Atlantic Center of Gravity

The Atlantic energy renaissance is not occurring in a vacuum; nor is it completely free of contradictory tendencies. The sometimes competing or colliding energy revolutions of the Atlantic energy renaissance—shale, offshore, low carbon—have contributed to a redrawing of the global energy map. In stark contrast to the expectations of the reigning conventional wisdom—still adhering to a once valid, but now increasingly obsolete, global energy map of the past—the Atlantic energy renaissance is now beginning to challenge the long-held assumption that the global center of gravity for energy supply, particularly in the fossil fuel realm, would remain firmly rooted for the foreseeable future in the Middle East, Central Asia, and Russia—what we call the Great Crescent on our new global geopolitical, governance, and energy maps. As Atlantic hydrocarbon reserves and production continue to increase over the coming decades, and as Asian energy demand continues to grow, the respective centers for global energy supply and demand are shifting, such that global energy flows will continue to be significantly altered.

In strategic terms, the Atlantic energy renaissance is emblematic—even part and parcel—of a number of deeper, globally-reaching tectonic shifts now convulsing the global energy flow map. These global—but also Atlantic shaped and Atlantic shaping—trends include:

11. Based on projections from British Petroleum, *Energy Outlook 2035* (Database) 2015 (BP 2015) and own elaboration.

A westward shift in the global center of gravity for energy supply into the Atlantic Basin, driven by recent, significant expansion in Atlantic energy resources—in particular, shale in the Northern Atlantic and offshore oil and gas in the Southern Atlantic. The Atlantic world already holds over 40% of proven global reserves of petroleum, and upwards of two-thirds of broader (not yet economical) oil resources (including unconventional oil and the deep offshore). The Atlantic also contributes 46% to daily oil production. This share is projected to rise to 49%—as over two-thirds (71%) of the projected growth in global oil production from 2010 to 2035 will take place in the Atlantic Basin.[12]

Beyond 2030, gas will begin to replace oil within the global energy mix and upon the global energy seascape—and by 2050 gas will have almost completely displaced oil to account for 80% of globally traded energy, with most of it transported across the global energy seascape.[13] Because the Atlantic Basin is potentially even more central on the future gas map than oil—with two-thirds of the world's estimated shale gas reserves and nearly half of all technically recoverable gas resources (TRR)—future Atlantic gas production will extend and reinforce the supply-side of currently emerging West-to-East global energy flow circuits (and lending momentum to the overall seascape centers of gravity now slipping into the Atlantic Basin; see Chapter Twelve).[14]

An eastward shift in energy demand into the Asia-Pacific region (but also into the Great Crescent). This trend has been—and continues to be—driven by: (1) structural declines in Atlantic Basin energy demand (from reduced energy intensity and enhanced energy efficiency stemming from economic maturity and technological change); and (2) structural increases in Great Crescent and Asia-Pacific demand, (in part the product of an ongoing, decades-long, eastward shift in the center of gravity for manufacturing output from the northern Atlantic to Asia-Pacific). Nevertheless, global energy demand is projected to more than double by 2050. For its part, the Atlantic Basin will slip from contributing 45% of global energy demand in 2010 to only 39%

12. British Petroleum, *Energy Outlook 2035* (Database) 2015 (BP 2015).

13. IIASA GEA Model Projections Database, 5013, 2014 (http://www.iiasa.ac.at/web-apps/ene/geadb/dsd?Action=htmlpage&page=about) (IIASA, 2014).

14. Energy Information Agency (EIA), "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States" June 2013 (EIA, 2013).

by 2050. Meanwhile, the relatively energy short extra-Atlantic region, particularly Asia-Pacific, is set to increase its contribution to global energy demand from 55% in 2010 to 61% in 2050.[15]

A continual drying up of the traditional post-World War II pattern of net westward global energy flows and their subsequent reversal to become net eastward—or Asia-bound—global energy flows (or West-to-East flows). This is due to the fact that the traditional, historical pattern of Atlantic Basin demand depending on surplus Great Crescent supply is continuing to evaporate. Over time, the Atlantic Basin will become increasingly energy autonomous—in net terms—and Atlantic energy exports, at the margin, will increasingly flow eastward, bound for Asia-Pacific.

These shifts in global energy flows represent a transformation of what could be called the Traditional-Cold War global energy map into the newly emerging global energy flow map of the 21st century. On the Cold War map of the past, for nearly half a century the Northern Atlantic was highly dependent on the Great Crescent for westward energy flows—both land-based and seaborne, but principally and increasingly the latter—with the Strait of Hormuz and the Suez Canal representing the key chokepoints on the map, although with time a growing flow moved out of the Persian Gulf eastward to an early emerging Asia-Pacific, lending the Straits of Malacca their increasing relative strategic significance.[16]

15. IIASA GEA Model Projections Database, 2013, 2014 (http://www.iiasa.ac.at/web-apps/ene/geadb/dsd?Action=htmlpage&page=about) (IIASA, 2014).

16. More than 17mbd of oil pass through the Straits of Hormuz, at the mouth of the Persian Gulf—meaning 17 million barrels of oil every day. This is equivalent to 35% of all seaborne oil trade, and nearly 20% of globally produced oil (BP2013a, EIA 2012). More than 85% of it is now going to Asia (India, China, Japan and South Korea), and by 2035 nearly all of it will be Asia-bound. Well over 75% of the oil moving through Hormuz daily also passes through the Strait of Malacca in Southeast Asia. Approximately 15mbd pass through Malacca daily—including the bulk of the Hormuz oil and some additional flows coming from West Africa around the Cape Passage on their way to the Far East. The shut-down of either of these straits—or both—would take more oil off the market than is currently produced by Saudi Arabia (perennially around 9mbd-10mbd). The pipeline links between the Gulf countries and the Mediterranean or Red Sea are minimal—at most 4mbd of spare capacity (EIA 2012)—and would take years and many billions of dollars to build new sufficient excess pipeline capacity capable of fully backing up the Strait of Hormuz.

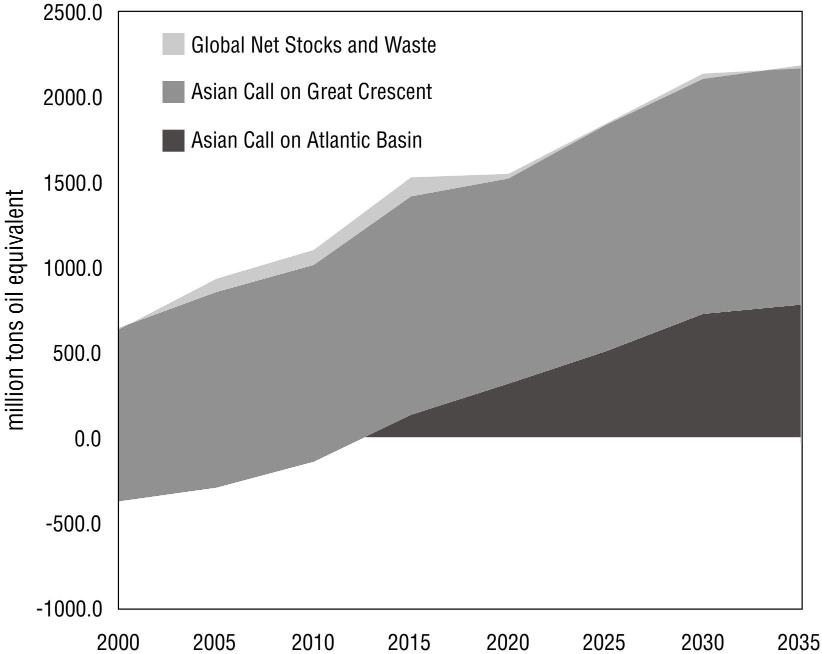
In stark contrast, on the newly emerging global energy flow map, Asia-Pacific is increasingly dependent, at the margin, on eastward (or at least Asia-Pacific bound) seaborne oil and gas flows out of the Atlantic Basin—and increasingly out of the Southern Atlantic. The majority of these growing energy flows follow a flow circuit out of the Southern Atlantic, around the Cape of Good Hope and across the Indian Ocean Basin to India, through Southeast Asia and its multiple straits, and into the contested rim land seas of the Pacific (i.e., the South and East China Seas). While the Hormuz-Malacca energy flow circuit remains crucial, so too now becomes the Cape Passage and the East African sea lanes, while the Suez Canal loses in relative global strategic importance (See Part Three: The Emergence of the Seascape).

The bottom line, in strategic terms, is that seaborne oil and gas flows will increasingly reverse their overall net direction (Emerson 2014)—from Cold War East-to-West flows to the new 21st century West-to-East flows. As a result, the Atlantic Basin (with the Southern Atlantic potentially playing a key role) will become the strategic hydrocarbons supplier-region at the margin for growing energy consumption in Asia-Pacific.

In this regard, it is striking to note that only a decade ago, nearly all projections of global energy supply and demand (whether from the IEA, the EIA, OPEC or the World Energy Council) foresaw increasing global energy demand at the margin being met entirely by the Middle East (and, in particular, by Saudi Arabia). Yet today, in stark contrast, the Atlantic Basin already supplies a growing portion of that same total, now increasingly concentrated in the Asia-Pacific region—and by 2035 the Atlantic Basin is projected to provide over one-third (see Figure 1). Nothing could more synthetically and emblematically reflect the reality of the Atlantic energy renaissance—both its causes and its effects—than this singular and dramatic shift in the global energy flow map.

This refers to all traded energy, including oil, gas and coal, in million tons of oil equivalent annually. 50 million tons of oil (equivalent) annually is equal to approximately one million barrels a day of flow (or 1mdoe). 500mntoe = 10mbdoe, roughly.

Figure 1. Absorption of the Asian Call on Global Energy by region, Atlantic vs Great Crescent, 2000–2035



Source: *BP Energy Outlook 2035*, January 2015 and author's own analysis.

A New Projection of the Global Energy Flow Map

Provoked by the many of the empirical realities of the Atlantic energy renaissance mentioned above, this analysis of Atlantic energy has been conducted by re-projecting the world map, in general, and the global energy flow map, in particular, into three major regions: (1) the Atlantic Basin, (2) the Great Crescent, and (3) Asia-Pacific.

In this projection, the Atlantic Basin includes Africa, Latin America and the Caribbean, North America, and Europe, incorporating these four Atlantic continents in their entirety, along with their ocean and islands. The Great Crescent groups together the traditional 20th century suppliers of hydrocarbons: Russia, Central Asia (or the ex-Soviet Union), and the Middle East—a region which arcs in a great crescent from Southwest Asia across the northern half of the Asian continent.

Asia-Pacific is already a standard regional categorization—in contrast to the two other new units of analysis—and is comprised of what are commonly referred to as the sub-continental regions of South Asia, Southeast Asia, and East Asia, together with the islands of the Indian and the Pacific oceans, including Australia and New Zealand.

Such an Atlantic Basin projection provides a strategic cartographic tool with which to nudge our currently reigning geopolitical and energy maps away from their overwhelmingly national, continental, and land-based focuses and framings—which allow us to easily see the shale revolution in the U.S., but not necessarily an Atlantic energy renaissance—and towards a more universally-applicable and more fully-fledged ocean basin projection of our global mental maps—one more in line with the emerging characteristics on the actual map (like the emerging Atlantic energy seascape). What the Atlantic Basin projection can reveal (and the current maps cannot) is the totality of the Atlantic energy renaissance, as opposed to just one of its component dynamics (like the Brazilian pre-salt, or African energy boom, or the recent setbacks of renewable energy in Europe, or the shale revolution in the U.S.).

Starting with the same existing national and regional energy data from the same standard international sources (the International Energy Agency, the Energy Information Agency, British Petroleum, and other public and private sources), this Atlantic Basin projection re-cuts (or re-groups) these data into new regional categories, or units of analysis. Much as a new cartographic projection of the world map takes the same data—the geographical and positional facts of the planet—used in previous projections of the map, but then reveals a new world by altering the formulas of its framing and focus, this new Atlantic Basin projection—the equivalent of a new geopolitical cartographic projection of global geopolitical and energy flow maps—reveals a fresh vision of the strategic horizon, spotlighting strategic trends—like the Atlantic energy renaissance—which cannot be readily identified on the currently predominant and land-dominated versions of our global geopolitical and energy maps—simply because their focus and framing do not allow for it.

Furthermore, the Atlantic Basin projection also allows us to map the empirical realities of the Atlantic energy renaissance in their true global context. In other words, not only does the Atlantic Basin projection allow us to perceive the totality of the Atlantic energy renaissance more clearly than our currently dominant global framings, but it also reveals that the global center of gravity for energy supply is shifting into the Atlantic Basin and that the center of gravity of the global energy seascape is also beginning to overlay with the Atlantic energy seascape. Therefore, the Atlantic Basin projection also begins to reveal the logic and potentials of pan-Atlantic energy cooperation. Such trends and potentials simply cannot be identified clearly on the strategic horizon using the framings of our currently predominant maps (real and mental).

Towards an Ocean Basin Projection

In the end, however, even this Atlantic Basin projection leaves two of its three major regions to be defined primarily by their landmasses (the Great Crescent and Asia-Pacific), and thus still ignores the increasingly binding, connecting, generating and re-generating seas (i.e., the Indian, Pacific, and Arctic oceans) between their landmasses. As a result, this projection only fully captures the potentials of one of the emerging ocean basin regions (the Atlantic Basin and its potential for pan-Atlantic energy cooperation). The partial exception would be Asia-Pacific, which comprises various landmasses separated (and therefore connected) by various seas (unlike the Great Crescent which is comprised of contiguous landmasses), and therefore constitutes something of a hybrid terrestrial-maritime region. As a result, this Atlantic Basin projection (essentially half ocean-basin-based, and half landmass-based) does capture the key maritime trends on the energy seascapes along the maritime rim lands of the Great Crescent and Asia-Pacific (for example, the all-important Hormuz-Malacca energy flow circuit).

However, the ocean basins are not just increasingly the spaces of binding dynamics in trade and other material flows like energy, their seas are also rapidly becoming conceptual binders as well. In fact, the ocean basins are on their way to representing the most relevant geo-economic and geopolitical configuring frames of ongoing globalization, both its promise and its peril. This Atlantic Basin projection therefore remains only partial, demanding a more complete ocean-basin-based cartographic re-mapping of the strategic horizon. Such an ocean basin projection would likely reveal what might be the actual pattern of globalization that has been unfolding for the last 30 years or more through the material expressions of certain dominant initial tracks of ocean-basin based regional cooperation—trade in the Pacific Basin (as in APEC and TTP), energy in the Atlantic Basin (as in the Atlantic Energy Forum of the Atlantic Basin Initiative), security (in its multi-faceted expression) in the Indian Ocean Basin, and ecological and maritime security in the Arctic (as in the agenda of the Arctic Council). While the Atlantic Basin projection reveals the potentials of ocean basin regional cooperation in the Atlantic Basin, an ocean basin projection would reveal the potentials (or lack of them) for ocean basin-based regional cooperation in the other basin regions, as well, including the Indian Basin, the Pacific Basin, and the Arctic Basin.

However, producing an ocean basin projection of the global geopolitical and energy flow map is a task that lies somewhere and sometime beyond the constraints of this paper. It would require an even deeper re-cutting of current data to account for a number of geographical realities of the world's ocean basins. Continental data categories would need to be split between the ocean basins and their shores. This raises the question of how to accurately reflect basin positioning of dual basin countries (with coastlines on more than one ocean basin, like the U.S., South Africa, or Indonesia; and of land-locked countries). Therefore, an ocean basin projection implies a much larger data and methodological challenge than does the Atlantic Basin projection.

Yet even this partial, modified projection of our dominant global maps offered here, the Atlantic Basin projection, still problematizes not only the notion of the Asian century and the foreign policy formulations of the pivot, but also the strategic horizon of the very industry—hydrocarbons—upon which rests the currently emerging global energy flow map. The future ocean-basin map of the future could reveal much more—perhaps even the stepping-stone, labyrinthine pathway through the geopolitical jungle to effective and sustainable global governance. Still, even by partially correcting the framing and the focus, assessing recent changes on the global energy flow map through the lens of a pan-Atlantic perspective reveals a startlingly new picture.