

# THE DUBAI INITIATIVE

## برنامج دبي

*Policy Brief*

### Addressing the UAE Natural Gas Crisis: Strategies for a Rational Energy Policy

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# **Addressing the UAE Natural Gas Crisis: Strategies for a Rational Energy Policy\***

Dubai Initiative – Policy Brief

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## 1. Introduction

Although it seems inconceivable, the United Arab Emirates (UAE) is facing an enormous energy shortage. Much of the world views the UAE – and the rest of the Gulf countries by extension – as an inexhaustible reserve of hydrocarbons. However, as with many of the other Gulf countries, the UAE confronts a potentially far reaching energy crisis. Despite increased energy production and imported Qatari gas through the Dolphin natural gas pipeline, UAE domestic gas demand substantially exceeds available supply.<sup>2</sup> This disparity created a shortfall met by an increasing use of fuel oil, natural gas liquids, and in certain circumstances, coal. But it is natural gas that continues to be the UAE's most important domestic energy source.

This policy brief explains the origins of the UAE energy crisis, forecasts developments for 2010-2020, and posits recommendations for overall sector rationalization. If Emirati authorities take a proactive stance and address the structural elements of the natural gas shortage, the more extreme elements of the crisis would be mitigated without lasting damage to Emirati economic growth. As the UAE has prodigious natural gas reserves, slight modification of the natural gas pricing and the power sector tariff structures would be able to resolve the most serious issues facing the UAE in its drive towards industrialization and diversification.

## 2. Overview of the Emirati Gas and Power Shortage

The UAE has massive natural gas reserves. After the Russian Federation, Iran, Qatar, and Saudi Arabia, the UAE holds the fifth largest proven gas reserves in the world, namely 3.5 percent of the total global reserves. Estimated at 6.43 Trillion cubic meters (Tcm) at the end of 2009, Emirati reserves should last another eighty-five years at 2009 rates of production.<sup>3</sup> The bulk of Emirati gas is located in the capital of the UAE, the Emirate of Abu Dhabi, which holds approximately 5.62 Tcm of the UAE's total reserves, or more than 90 percent of Emirati gas (see Table One).

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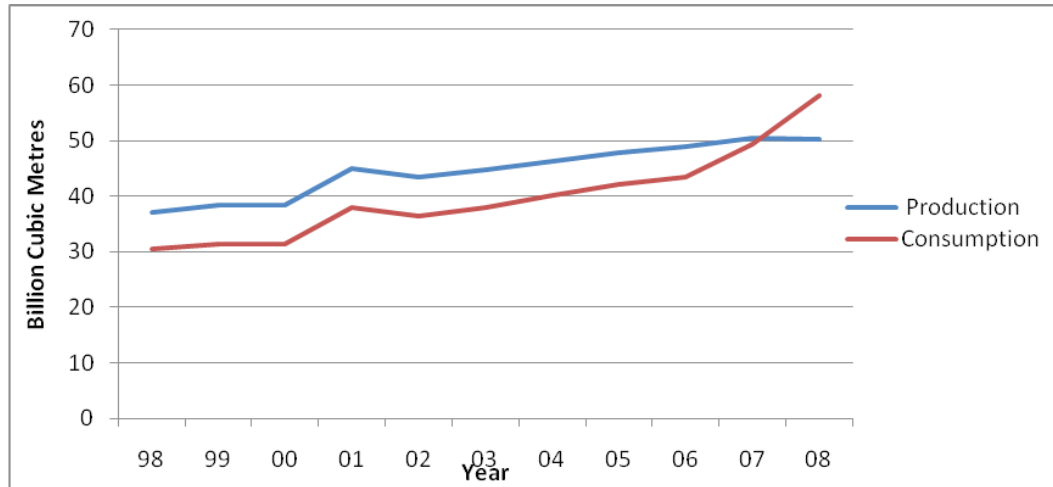
**Table One: UAE Gas Reserves (2009)**

	TCM	Share of Total (%)
Abu Dhabi	5.98	92.58
Dubai	.11 (113 Bcm)	1.87
Sharjah	.303 (303 Bcm)	4.99
Ras Al Khaimah	.03 (34 Bcm)	.56
Ajman	----	0
Umm Al Quwain	.01 (14.16 Bcm)	0
Fujairah	-----	0
Total	6.43 (6070 Bcm)	100

The Emirate of Dubai holds two percent respectively (113.3 Billion cubic meters (Bcm), while the emirates of Sharjah<sup>4</sup> and Ras al-Khaima contain the remaining amounts of 303 Bcm and 34 Bcm, respectively.<sup>5</sup> Because the gas fields in those two emirates have matured, their respective production rates have fallen in recent years. The UAE produced 48.8 Bcm of natural gas in 2009, or 1.6 percent of

global natural gas production for that year.<sup>6</sup> However, it consumed 59.1 Bcm that same year, resulting in a shortfall of 10.3 Bcm.<sup>7</sup> Because the UAE is almost totally reliant on natural gas for power generation, its total gas consumption is expected to reach 107.5 Bcm/yr by 2020 (see Table Two Below). Its gas demand has steadily outstripped incremental production increases since late 2006 (see Figure One).

**Figure One: UAE Natural Gas Production and Consumption: Source: BP**



One reason Emirati natural gas demand is so high is because of the disproportionate role it plays in power generation, it accounts for 98 percent, with fuel oil comprising the rest.<sup>8</sup> Additionally, the UAE’s rapid economic and demographic growth caused it to have the second highest consumption rate in absolute terms, after Saudi Arabia, amongst members of the Organization of Arab Petroleum Exporting Countries (OAPEC).<sup>9</sup> In 2010, the UAE National Human Resources Development and Employment Authority (Tanmia) announced that the UAE population doubles approximately every 8.7 years – largely due to expatriate labor – as opposed to every 55 years for the world’s population.<sup>10</sup> In 2010, the population reached 8.19 million and was continuing to grow at a robust rate; despite the global economic crisis. This population growth will increase the demand pressures on scarce natural gas reserves.<sup>11</sup>

During 2009, the UAE imported, through the Dolphin natural gas pipeline, 17.25 Bcm (approximately 47.3 Million cubic meters per day (Million cu m/d)) of natural gas from Qatar.<sup>12</sup> It exported 7.01 Bcm of natural gas in the form of liquefied natural gas (LNG) that same year.<sup>13</sup> Because much of the UAE’s gas is either associated with oil reservoirs or is sour (i.e., sulfurous) gas in non-associated fields, it has focused on increasing production capacity primarily by advancing its technical expertise on sour gas treatment technology, as well as developing oil and gas separation technology. The production limits attached to OPEC’s quota system make future UAE gas production difficult to predict, since associated gas production is determined by oil output and thereby dependent on global economy’s health.<sup>14</sup>

The UAE’s energy situation has interrupted the government’s industrialization, modernization, and environmental conservation plans.



The UAE's energy situation has interrupted the government's industrialization, modernization, and environmental conservation plans. Before the Dolphin gas imports came online in 2007, it appeared that the UAE was heading for an economic implosion, as it was not able to meet its basic energy and power requirements. Rolling blackouts had spread through the various Emirates, and gas shortages, having a decisive impact on power production, had precipitated major project delays and cancellations.<sup>15</sup> To mitigate this crisis, the UAE undertook several innovative approaches, ranging from the promotion of nuclear energy to organizing energy conservation campaigns, in order to mitigate the economic fallout. However, in the absence of a thorough review of the domestic gas and electricity tariff structures, many energy policy adjustments will only have a cosmetic impact and ultimately leave the major structural problems unresolved.

However, officials at the Dubai Electricity and Water Authority (Dewa) disputed the use of the term "energy crisis," and instead contended that Dubai did not experience any type of electricity shortage. They argued that Dewa fully satisfied peak demand while still holding approximately 1,200 megawatts (MW) in reserve in 2009, a year of tremendous demand pressure. Other analysts conclude that the main issue may not be a gas shortage *per se*, but rather a distribution bottleneck largely located in the Northern Emirates (Ajman, Fujairah, Ras al-Khaimah, and Umm al-Quwain).<sup>16</sup> These contentions are justifiably disputed, since they focus merely on meeting peak demand; however they neglect the fact that fuel oil and coal, -- which in an Emirati context are much less economical fuels for electricity generation-- were used to meet the significant repressed demand.<sup>17</sup>

Dubai and Abu-Dhabi were spared the brunt of the gas shortage because Dolphin imports enabled them to avoid consuming significant amounts of expensive fuel liquids. Yet, while these two emirates were able to escape crippling blackouts, the gas shortage was most glaring in the Northern Emirates. These Emirates were in the worst position, and had to burn fuel liquids even during off-peak demand.<sup>18</sup>

Dubai and Abu Dhabi will likely not have to grapple with blackouts prior to 2015. Despite the threat of runaway gas demand, Dolphin gas imports will spare the two emirates that fate. However, the less wealthy Northern Emirates will likely face continued blackouts. Dubai and Abu Dhabi have the financial resources to burn expensive fuel liquids and import LNG, while the Northern Emirates do not.

The situation in the Northern Emirates may be symptomatic of the fate that awaits the rest of the UAE if a rational gas development strategy is not pursued. Chronic and unrelenting energy shortages in Sharjah and the Northern Emirates have posed grave economic and ecological threats that heighten the urgency of the crisis. Substantial adverse economic consequences resulted from the twin challenges of persistent electricity shortages and the global recession. Furthermore, the Emirati real estate market dried up as investors and banks stopped funding new development projects due to the lack of liquidity and the collapse of the housing market.<sup>19</sup>

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### 3. Balancing Competing Needs: Solving the Emirati Gas Supply Crunch

Given the massive gas reserves in the UAE, it appears that the major gas deficit predicted by some to take place as early as 2017 is almost entirely self-inflicted.<sup>20</sup> Gas is supplied to the domestic market at close to the wellhead price of \$1 per million British thermal units (Mmbtu). Artificially low domestic prices make gas import through the Dolphin pipeline a more attractive proposition for the UAE than developing the relatively expensive to produce domestic non-associated natural gas reserves. Selling North Field gas at \$1.30/Mmbtu while international LNG prices range from \$6–10/Mmbtu, Qatar incurs a significant opportunity cost that indirectly subsidizes the UAE’s industrialization. Qatar initially agreed to such a low natural gas price to the UAE in a bid to buttress its political influence with its neighbor. However, as of late, Qatar has been much more concerned about its own budget, and securing the best price possible for its natural resources.

The Emirati government is extremely concerned that its prodigious natural gas reserves will be unable to provide for its future power needs. Even though the UAE has increased its electricity generating capacity by twenty-four percent per annum over the last thirty years, this frenetic pace has not been sufficient.<sup>21</sup> On April 20, 2008, the Emirati government explicitly recognized the problem with the release of a white paper, entitled *Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy*, outlining the national energy challenges. The white paper concluded that national annual peak demand for electricity is likely to rise to more than 40,000 MW by 2020, from the current level of around 15,000 MW in 2010. This predicted increase portends a major threat to Emirati economic growth. To meet the expected power demand increase, the UAE developed a plan to construct several nuclear power plants.

The four 1,400 MW nuclear plants are planned to provide twenty-five percent of the country’s electricity demand by 2020. These four plants, to be built by a consortium led by Korea Electric Power Co. (Kepco), have an estimated construction cost of \$20.4 bn.<sup>22</sup> As with the Abu Dhabi solar project, Shams 1, there are enormous subsidies involved with plant construction and nuclear power generation.<sup>23</sup> Nuclear power plants are notoriously expensive compared with gas-fired power plants (including the full production chain, from construction, enrichment, generation, to decommissioning, etc.).<sup>24</sup> However, while the financial burden will still be quite large, Emirati officials have allowed for financial risk allocation with the development of a Public-Private Partnership where Kepco is in charge of designing, building and operating the nuclear power plant.<sup>25</sup>

The primary impetus behind the UAE’s plan to establish a civilian nuclear program is the expected natural gas shortfall. Although the first nuclear plant is expected to come online by 2017, there will be an interregnum when the UAE will still be highly vulnerable to supply disruptions. Mohamed al-Hammadi, chief executive of the Emirates Nuclear Energy Corporation (ENEC), promised that more nuclear plants could be forthcoming if Emirati electricity demand continues to rise.<sup>26</sup>

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A secondary consideration for the UAE in its nuclear drive is the conservation of its oil for export, as opposed to its inefficient use in power plants. By approximately 2018, if the nuclear plants come online as planned, the UAE could substantially increase its oil export volumes. By reliance on nuclear and other alternative energy sources for power generation, natural gas would also be conserved and made available to the petrochemical sector.

In an effort to diversify its energy imports, the UAE also seeks to develop linkages with energy-rich Central Asian countries. For example, it has shown interest in Turkmenistan's gas fields to supply its own needs.<sup>27</sup> Mubadala Development Company (Mubadala) joined ConocoPhillips Inc. in a bid to develop Turkmen gas fields. The two companies are also planning to jointly drill in the Kazakh portion of the Caspian Sea in the third quarter of 2010. However, without a comprehensive gas swap agreement with Iran, going as far afield as Turkmenistan for natural gas would make little economic sense. Deliveries from Turkmenistan would be just as expensive as domestic UAE non-associated gas production, if not more.

#### 4. Production and Demand Estimates 2015-2020

Even though the global economic crisis weakened natural gas demand growth in the UAE, as the global economy seems poised to return to growth by 2011-2012, it is likely that robust Emirati natural gas demand growth would return soon thereafter. The global economic recovery would also increase global oil demand, which in turn would cause OPEC to increase its production quotas to allow the UAE to drastically boost oil and associated gas production to somewhat meet any Emirati demand growth.<sup>28</sup> Even without global economic recovery, the broad infrastructure development projects planned in the UAE would still drive natural gas demand.<sup>29</sup> The global economic crisis was both an obstacle and a catalyst for sectoral evolution.

While there were significant liquidity challenges for natural gas companies because the international credit market dried up, one benefit was that the many energy project cancellations caused commodity (steel, aluminum, concrete, etc) and construction costs to decline precipitously.<sup>30</sup> In the event that the global economic crisis deepens and spreads due to economic difficulties in the Eurozone, it is possible that the decline in UAE gas consumption from 2008-2009 of 0.4 Bcm could drop further if European and global oil, steel, and petrochemical demand weakens.<sup>31</sup>

While the massive governmental stimulus measures and infrastructure plans could be a major consumer of already scarce natural gas supplies, governmental funds could also be directed to natural gas development. In 2009, the UAE developed a comprehensive plan to pump nearly \$1 trillion into the Emirati economy, building roads, power plants, and the metro system.<sup>32</sup> However, it is extremely likely that Emirati gas demand only temporarily diminished during the peak of the global economic crisis of 2008-2009. Natural gas demand growth may have the same unrestrained increase that typified the hydrocarbon "boom" years of 2002-2008, when natural gas demand grew by 20.2 Bcm. It is estimated that Emirati natural gas demand will continue to grow at approximately seven percent per annum due to the expanding power and industrial sectors, the increase in global

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oil demand, government investment in strategic industrial sectors, and the Emirati stimulus plans.<sup>33</sup>

Emirati associated gas production will likely remain constrained, at least until the predicted return to economic growth by 2011-2012 or until OPEC loosens its strict oil production quotas for the UAE.<sup>34</sup> The Abu Dhabi National Oil Company's (ADNOC) stated strategy is to increase oil production by 14 percent by 2014. Although it is uncertain what the OPEC quotas will be at that time, such an increase would boost associated gas production significantly.<sup>35</sup> However, non-associated natural gas production projects are expected to gradually come online from 2012-2016, especially from the smaller natural gas reserves in the Northern Emirates, as well as the Hail Gas and Integrated Gas Development projects. The exit of ConocoPhillips from the Shah field in May 2010 is likely to result in a two-year delay, with production starting up around 2016-2017, under the most optimistic scenario. The UAE may have to contend with a precarious gas supply until 2014-2015, with blackouts plaguing the Northern Emirates during peak summer months (May-August).

In the event that the UAE continues its robust industrialization drive over the next decade with a seven percent annual demand growth, the UAE is likely to face a severe gas shortfall in 2015 (see Table Two) despite additional non-associated gas production, Dolphin natural gas imports, and Shell/QatarGas LNG.<sup>36</sup> Even under the most optimistic scenario that the various domestic non-associated gas fields will come online as planned, there would still be a 29.4 Bcm/yr shortfall by 2020. If the UAE is able to utilize nitrogen or carbon for its enhanced oil recovery operations, that would liberate an approximate 18 Bcm/yr for domestic consumption. Furthermore, since 2007, the UAE has been developing a nascent carbon trading platform, with the expectation of an eventual cap-and-trade system. However, the onset of the global financial crisis in 2008, combined with the lack of a binding global compact at the Copenhagen climate negotiations in 2009, decisively constrained its realization. Nevertheless, the development of a comprehensive Gulf carbon trading platform would have significant benefits for the UAE.

If a Gulf carbon trading platform instituted a credible cap-and-trade system, the carbon caps would forge a type of Darwinian environment, forcing the energy-intensive industries to become more efficient.<sup>37</sup> The energy gains from binding carbon limitations would translate into enormous gains in the natural gas sector, as gas would be utilized more effectively in the industrial and retail sectors.

The above measures, in addition to demand-side energy efficiency and peak demand imports from regional suppliers, should be sufficient to allow the UAE a razor-thin margin to escape from crippling blackouts. If the nuclear plants do come online by 2018 (an extremely optimistic scenario), and the various energy efficiency and renewable energy projects are able to exert significant downward pressure on natural gas demand, the prognosis will not be as dire. Incorporating a robust gas sector rationalization plan would mitigate the future gas shortage. Nonetheless, the foregoing would have a significant impact in only the most optimistic scenarios.

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## 5. Conclusions: The Way Forward

Between 2015 and 2020, the UAE will continue to import 18.61 Bcm/yr of Dolphin gas under the Phase One contract. Since that exceeds exports of LNG from the Abu Dhabi Gas Liquefaction Limited plant (ADGAS is a part of the ADNOC group of companies), the country is already a net gas importer. Since that exceeds exports of LNG from the Abu Dhabi Gas Liquefaction Limited plant (ADGAS is a part of the ADNOC group of companies), the country is already a net gas importer. As discussed above, no additional long term pipeline supply contracts are to be expected from Qatar (Phase Two Dolphin) without a significant reformulation of the pricing schedule. Even then, Qatar is unlikely to want to remain locked into an additional long-term pipeline gas export relationship. Much of Qatar's reluctance depends on whether there is a sustained downturn in the global economy and whether an abundance of global gas continues to depress international gas prices. Nonetheless, a scenario of a protracted downturn in natural gas prices could be the very development to push the UAE and Qatar into a mutually agreeable contract for additional long-term gas sales.

By 2015-2016, natural gas production in the UAE is predicated to increase significantly, by an estimated 14.4 Bcm/yr when several non-associated fields start producing. But this increase will be accompanied by a significant increase in gas demand over the same period (see Table Two). In spite of the gas allocation issues, the UAE's state-owned companies are pressing ahead with diversification into petrochemicals, building additional plants that demand large quantities of gas. At the time of this writing, Abu Dhabi National Chemicals (Chemaweya) is building a large petrochemicals complex in Taweelah, the first phase of which is expected to produce seven million tons per annum (mtpa) of products, such as olefins and aromatics. Additionally, Abu Dhabi Basic Industries Corporation (ADBIC) announced plans to build another such complex in Abu Dhabi by the end of 2010.<sup>38</sup> With such a large projected increase on its natural gas from the petrochemical sector, the UAE is researching the viability of using other types of feedstocks in the production process.

It is likely during the forecast period that the UAE will still be in dire need of "interruptible" gas supplies from Dolphin or additional LNG imports during the peak demand summer months, and perhaps significant imports during the off-peak season. If the UAE is successful in its quest to replace the massive amounts of natural gas for oil field reinjection (18 Bcm/yr) with nitrogen or carbon, additional gas supplies should be liberated for domestic consumption in the industrial and retail sectors.

**Table Two: UAE Natural Gas Production and Demand 2000-2020 (BCM)**

	<b>Production</b>	<b>Demand</b>
2000	38.4	31.4
2008	50.2	58.1
2015 (est.)	64.6	88.5
2020 (est.)	78.1	107.5

Gas import from Dolphin is likely to remain at its Phase One commitments of 18.61 Bcm/yr until the contract expires in 2032. The UAE’s currently net import position is therefore expected to not only continue but increase over the next decade.

The Emirati strategy to increase its natural gas supply and reduce demand will likely be superficial unless power and natural gas prices are increased substantially. The ConocoPhillips withdrawal from the Shah sour gas project in 2010 is a harbinger of events to come unless structural pricing reform is undertaken. It is beyond the scope of this brief to consider the implications of the World Trade Organization’s Agreement on Subsidies and Countervailing Measures (ASCM) on Emirati natural gas pricing reconfiguration, but Emirati authorities should explore the feasibility of adopting a dual pricing formula for the industrial and retail sectors. The retail sector contributes less to economic growth and modernization than the industrial sector does. Therefore, in terms of gas allocation, the industrial sector should be given preferential pricing, perhaps cost-plus, to encourage the development of the horizontal and vertical value-added industries such as petrochemicals, fertilizers, and steel and aluminum smelting. The retail sector should be brought as close as possible to market-based pricing to discourage overconsumption of the UAE’s natural gas patrimony.

However, judging by the lack of political commitment for a comprehensive restructuring of the natural gas and power sector, it does not seem that the UAE will be able to effectively rationalize natural gas supply and allocation within the next decade. A fragmented natural gas and power policy focusing on the promotion of nuclear and renewable energy, gas imports, coal plant construction, and energy efficiency measures, rather than full natural gas price liberalization, is the more likely scenario, at least until 2020.<sup>40</sup>

If the UAE desires to truly liberate itself from its natural gas impasse, it will need to proactively create a viable strategy for increasing natural gas production, while moderating demand for electricity. If the UAE does not undertake a comprehensive restructuring of its disjointed energy policy, it will face enormous challenges in the coming decades to its hitherto successful economic growth model.

If the UAE desires to truly liberate itself from its natural gas impasse, it will need to proactively create a viable strategy for increasing natural gas production, while moderating demand for electricity.

## Endnotes

- \*1 This article is an abstract of a larger work appearing in (ed) Jonathan Stern, et al, *Natural Gas Markets in the Middle East and North Africa*, to be published by the Oxford Institute of Energy Studies in December 2010.
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- 4 Sharjah's most important gas deposits are at the offshore Mubarek field and the onshore Sajaa, Moveyeid and Kahaif fields. *Country Profile: Emirates Sharjah*, Oxford Business Group. Available at <http://www.oxfordbusinessgroup.com/country.asp?country=59>
- 5 There are other smaller amounts spread out in the other Emirates.
- 6 This figure excludes gas which was flared or reinjected. Reinjecting gas accounts for an additional 18 Bcm/yr. Natural Gas, *BP Statistical Review of World Energy* (June 2010) pp.24
- 7 Ibid; 27
- 8 *Demand for Electricity to Increase 6%*, Emirates Business 24/7 (March 2, 2009)
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- 10 *Population Leaps to 8.19 Million*, UAE Interact (May 30, 2010)
- 11 Ibid
- 12 The UAE contracted for amount of Dolphin gas is 18.61 Bcm/yr. However, because of a series of maintenance and inspection programs at a Qatar Gas facility in Ras Laffan during 2009, the exported quantity dropped below its contractual amount. *Qatar's Gas Supply to the UAE will be Down 25 Pct*, Zawya Dow Jones (Feb. 10, 2010)
- 13 Most of the LNG is shipped to Japan, with a lesser quantity exported to South Korea and India.
- 14 For a discussion on the impact of OPEC production cuts on Gulf associated gas production, see Peter Salisbury, *OPEC Faces Up to Cost of Output Cuts* (March 12, 2009)
- 15 Justin Dargin. "Trouble In Paradise – The Widening Gulf Gas Deficit." *Middle East Economic Survey*, September 29, 2008.
- 16 Karen Remo-Listana, *Alternative Energy is an Answer to Dwindling Natural Gas Supplies*, Arabian Business 24/7 (Apr. 6, 2009). Power demand in Ajman is driven by rapid GDP growth, estimated at approximately 27 percent annually, with demographic increases reaching 18 percent per annum. A senior official at the Federal Electricity and Water Authority (FEWA) deflected responsibility, and instead, blamed the lack of adequate development planning on Ajman officials. See *Utilities Supply Crunch in the Northern Emirates*, Emirates Business 24/7 (July 10, 2008). Hassan Abdullah al-Ghasyah, FEWA's executive director of supply, supported this assessment with the statement that, "local government authorities have not coordinated on precise water and power requirements with FEWA." As a result of the alleged lack of coordination, al-Ghasyah stated that poor planning was the primary cause for the shortages and for the need for independent generating capacity. See *UAE Private Supply*, Oxford Business Group (Oct. 8, 2008)
- 17 Karen Maree, *Coal is Dubai's Best Option to Meet Rising Demand*, Middle East Business Intelligence (Feb. 22, 2008); *UAE Cement Firms Turn to Coal*, Arabian Business (June 24, 2007)
- 18 Fuel liquids can refer to diesel, medium fuel oil, crude oil, kerosene, or LPG. Justin Dargin, *Trouble In Paradise – The Widening Gulf Gas Deficit*, Vol. LI, No. 39 (Sept. 29, 2008); Rym Tina Ghazal, *Ajman Hopes to be Next Mini Dubai*, The National (May 17, 2008)
- 19 In the Northern Emirates, the local banks understand that any new projects will not be attached to the grid. Because of the uncertainty of future grid access, they refuse to fund many otherwise viable development projects.
- 20 Greater Supply Deficits Force Middle East to Focus on Domestic Needs, *Alexander's Gas and Oil Connections*. Vol. 12, Issue 9 (10 May 2007)



- 21 US Energy Information Administration, Country Analysis Briefs: United Arab Emirates, Electricity Available at <http://www.eia.doe.gov/emeu/cabs/UAE/Electricity.html>
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- 27 Stephen Bierman, et al, *U.A.E. Bid for Caspian Gas May Test Russian Dominance*, Bloomberg Businessweek (May 5, 2010)
- 28 *Adnoc to Lift Curb on Oil Output*, UAE Interact (Mar. 9, 2010)
- 29 Additionally, under the ‘Plan Abu Dhabi 2030: Urban Structure Framework Plan’, Abu Dhabi pledged to spend upwards of \$15 billion until 2012 on massive urban construction.
- 30 Shane McGinley, *Abu Dhabi Construction Costs Down by 30%-TDIC*, Arabian Business (Apr. 17, 2010); Nadim Kawach, *Abu-Dhabi Says Oil Project Cost Slashed 20 per cent*, Emirates Business 24/7 (Jan. 27, 2009); *Building Materials Decline in Cost in UAE*, CityScape Intelligence (Nov. 24, 2009)
- 31 *BP Statistical Review of World Energy* (June 2010) pp.27
- 32 Timon Singh, *Abu Dhabi Invests \$1 Tn into Infrastructure*, Mena Infrastructure (Nov. 3, 2009)
- 33 Himendra Mohan Kumar, *UAE Gas Demand to Touch 15 bcf/day by 2020, Says Expert UAE Gas Demand Rises 7% Annually*, Gulf News (May 18, 2010)
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- 35 *Adnoc to Press Ahead with 5-Year Plan*, Maktoob (June 2, 2009)
- 36 The most pessimistic forecast was announced by Khalid al-Awadi, Gas Operations Manager at Emirates General Petroleum Corporation (Emarat), who calculated that in 2020, Emirati gas demand would reach 155 Bcm/y in 2020. However, al-Awadi was optimistic that increased imports, domestic capacity expansion, nuclear plans and renewable energy would be able to meet the demand increase. Himendra Mohan Kumar, *UAE Gas Demand Rises 7% annually*, Gulf News (May 18, 2010)
- 37 See generally, Justin Dargin, *The Development of a Gulf Carbon Carbon Platform: Mapping Out the Gulf Cooperation Council Carbon Exchange*, Harvard Kennedy School, Working Paper No.1 (May 2010)
- 38 *Second Phase of Al-Khaleej Launched as Domestic Demand Grows*, Business Monitor (May 11, 2010)
- 39 One such alternative feedstock being explored is ethane is liquid petroleum gas condensate. Reem Shamseddine, *Gulf Petrochemical Firms Seek Alternatives to Gas*, Arabian Business (June 9, 2010)
- 40 The UAE attempted to reform electricity tariffs and gasoline prices several times previously. In April 2010, the UAE attempted to liberalize gasoline prices. These incremental movements, combined with the increase in price for Qatari gas and the refusal of IOCs to produce Emirati gas fields for a less than adequate return on investment, e.g., ConocoPhillips, will likely increase budgetary burdens, therefore, spurring greater pricing reform, *UAE Planning to Increase Petrol Prices*, Gulf Daily News (Apr. 19, 2010)





# THE DUBAI INITIATIVE

The Dubai Initiative is a joint venture between the Dubai School of Government (DSG) and the Harvard Kennedy School (HKS), supporting the establishment of DSG as an academic, research, and outreach institution in public policy, administration, and management for the Middle East. The primary objective of the Initiative is to bridge the expertise and resources of HKS with DSG and enable the exchange of students, scholars, knowledge and resources between the two institutions in the areas of governance, political science, economics, energy, security, gender, and foreign relations related to the Middle East.

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DUBAI SCHOOL OF GOVERNMENT

The Dubai School of Government (DSG) is a research and teaching institution focusing on public policy in the Arab world. Established in 2005 under the patronage of HH Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the United Arab Emirates and Ruler of Dubai, in cooperation with the Harvard Kennedy School, DSG aims to promote good governance through enhancing the region's capacity for effective public policy.

Toward this goal, the Dubai School of Government also collaborates with regional and global institutions in its research and training programs. In addition, the School organizes policy forums and international conferences to facilitate the exchange of ideas and promote critical debate on public policy in the Arab world.

The School is committed to the creation of knowledge, the dissemination of best practice and the training of policy makers in the Arab world. To achieve this mission, the School is developing strong capabilities to support research and teaching programs including

- applied research in public policy and management;
- master's degrees in public policy and public administration;
- executive education for senior officials and executives; and,
- knowledge forums for scholars and policy makers.