Energy Value Chain Model for Ghana.

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Natural resources in general and oil in particular are often considered as curse. No country has succeeded in avoiding oil curse. Norway is often mentioned as a poster child for avoiding such a curse. Still even that rich country had suffered on account of oil resources though in small ways.
Ghana has been trying hard to avoid or at least minimize oil curse. It may succeed like Norway thanks to the involvement of civil society in monitoring the energy sector. One very powerful tool to help the civil society in such an activity is what I referred to as Energy Value Chain Model (EVCM).

While working as USAID consultant in Georgia in 2002, I had developed EVCM for oil sector of that country[2]. I was able to show leakage of government on a large scale. Georgian government was able to collect only 20% of the total revenues from the oil sector. It clearly showed the leakage of revenues on a large scale. It was the time when the country did not have credible data on oil consumption. The EVCM showed where the government was losing money and what needed to be done to plug the leakage. These efforts finally succeeded in helping the Georgian government to increase revenues from oil sector by more than 70%.

While studying human resources requirement for Ghana's oil and gas sector as part of a~~n~~ USAID project in 2010, I had developed an Oil Value Chain model for Ghana's energy sector. It was presented to Energy Commission. Such a model gives an estimate of the total value generated in Ghana's upstream, midstream, refining, marketing and power sectors. It also gives the total government revenues from these different energy sectors.

Such a model helps the Energy and Finance ministries to assess the efficiency of different pricing policies (what price to pay for gas, oil prices to be paid to producers, oil prices to be charged to refiners, impact of subsidies on different petroleum products, price to be charged to different.

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[1] Former board member of Georgian National Oil Company

[2] http://pdf.usaid.gov/pdf_docs/pnacr424.pdf

power sector users etc) and also to find out the quantum of revenue leakages. Information on the latter helps the government to plug the leakages and help improve government revenues from energy sector. From just one page, it is possible to learn about the cash flows of different energy sectors (see Appendix -1).

An oil value chain model can help the government to improve transparency of energy sector. It shows how much revenues should be generated on a normative basis and what actually is generated. Such a comparison will show revenue leakages and will force the ministry or department concerned to remedy the problem. The model also helps the regulatory bodies to assess the economic consequences of their decisions and help them to improve their operations.

For Civil Society, Oil or Energy Value Chain Model can be of great help. It will help the NGOs involved in oil sector to monitor government revenues and to raise issues when the actual revenues differ from the potential ones. For example, let us take the current topic of ExxonMobil contract signed by the government. Even if one gets the actual contract with the latest agreed terms, it is not possible to assess that the government has succeeded in getting the best terms for the country or not. One can always claim that the government could have got more. In an extremely risky and relatively virgin

Table -1. Key statistics from energy value chain model.

	Total Revenue (in billion $)	Income Tax (in billion $)	Value Generated (in billion $)	Public Sector (in billion $)	Total Govt Revenues (in billion $)
Upstream Oil	$12,828	$2,948	$12,828	$0	$3,980
Upstream Gas	$0	$0	$0	$0	-$6
Total Upstream	**$12,828**	**$2,948**	**$12,828**	**$0**	**$3,974**
Midstream Oil	$0	$0	$0	$0	$0
Midstream Gas	$32	$5	$32	$32	$16
Total Midstream	**$32**	**$5**	**$32**	**$32**	**$16**
Refining	$1,244	$20	$89	$89	$67
Marketing	$3,309	$46	$1,242	$0	$1,057
Gas Use	$378	$321	$378	$378	$352
Power	$623	$85	$177	$177	-$255
Total Downstream	**$5,554**	**$473**	**$1,886**	**$644**	**$1,220**
Total Oil & Gas Sector	**$17,967**	**$3,341**	**$14,464**	**$394**	**$4,959**
Total Energy Sector	**$18,413**	**$3,426**	**$14,746**	**$676**	**$5,210**

territory what is the right terms is difficult to assess especially when there was no competitive bidding. However, when the exploration succeeds in finding oil, production commences and government starts getting revenues. Through the oil value chain model, it is possible to compute potential and actual revenues and assess if the terms were favorable to the country or not.

The above Table-1 shows total revenues by different sectors and also potential revenues of government for a theoretical scenario of 25 million tons of oil production. The table was developed only for illustrative purpose to convey the concept of a value chain modeling. We did not have the luxury of trying to get actual data to develop the model. From one page it is possible to have an integrated picture of the entire energy chain and to quickly zero in on potential problem areas. Some key observations from the table are as follows. Total revenues of the government from oil and gas sector in 2010 is $5.0 billions. Most of the government tax revenues from oil and gas sector are from the tax collection from the upstream.

Energy Value Chain in Appendix-1Table may look quite complex. However, development of this type of EVCM is not at all complex. Also, it provides an opportunity to study the oil and gas sector in a systematic way to raise relevant issues. This in turn can help the country to minimize the impact of oil curse. Oil sector NGOs should either ask the government to develop an Energy Value Chain Model or develop their own model. Such an exercise will be worth all the efforts as I leant from Georgian experience.

Appendix-1	Energy value chain model for Ghana for illustrative purpose.								
	Product Cost	Total Revenue	Non-income Taxes	Total Costs	Profit	Income Tax	Value Generated	Public Sector	Private Sector
	$MM	$MM	$MM	$MM	$MM	$MM	$MM	$MM	$MM
UPSTREAM									
Oil									
Private		12827.50	0.00	3000.00	9827.5	2948.3	12827.5	0	12827.5
National		0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
Total Oil									
Gas									
Private		0.00	0.00	42.00	-42.0	0.0	0.0	0	0.0
National		0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
Total Gas									
UPSTREAM Total		12827.5	0.00	**3042.00**	**9785.5**	**2948.3**	**12827.5**	**0.0**	**12827.5**
MIDSTREAM									
Oil									
Domestic transportation		$0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transit/Trade		$0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total oil pipelines		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Gas									
Domestic transportation		32.00	0.0	16.0	16.0	4.8	32.0	32.0	0.0
Transit/Trade		0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total gas pipelines		**32.00**	**0.0**	**16.0**	**16.0**	**4.8**	**32.0**	**32.0**	**0.0**
DOWNSTREAM									
Refining									
Private Oil Co	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Oil Co	1154.48	1243.95	0.0	22.5	67.0	20.1	89.5	89.5	0.0
Total Refining		**1243.95**	**0.00**	**22.50**	**66.97**	**20.09**	**89.47**	**89.47**	**0.00**
Marketing									
LPG	59.26	70.4	7.7	10.5	-7.0	0.0	11.2	0.0	11.2
Gasoline	826.45	1424.3	495.9	34.1	67.8	20.3	597.8	0.0	597.8
Distillate	980.53	1577.8	490.3	31.9	75.1	22.5	597.2	0.0	597.2
Kerosene	76.05	78.5	0.0	3.5	-1.1	0.0	2.4	0.0	2.4
Jet Fuel	43.46	58.9	8.7	1.4	5.4	1.6	15.4	0.0	15.4
Residual Oil	53.88	65.2	5.4	2.8	3.1	0.9	11.3	0.0	11.3
Others	26.94	33.7	2.7	1.1	3.1	0.9	6.8	0.0	6.8
Total Marketing		**3308.8**	**1010.6**	**85.2**	**146.4**	**46.3**	**1242.2**	**0.0**	**1242.2**
Gas Use									
Residential	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industry	0.00	377.58	30.2	26.0	321.4	321.4	377.6	377.6	0.0
Power	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Gas Use		**377.58**	**30.21**	**26.00**	**321.37**	**321.37**	**377.58**	**377.58**	**0.00**
Power									
Hydro	0.000	355.22	53.28	17.53	284.4	85.32	355.2	355.22	0.0
Oil fired	285.360	180.73	27.11	374.54	-506.3	0.00	-104.6	-104.63	0.0
Gas fired	0.000	0.00	0.00	0.00	0.0	0.00	0.0	0.00	0.0
Coal Fired	0.000	0.00	0.00	0.00	0.0	0.00	0.0	0.00	0.0
Imports	160.720	87.25	13.09	40.18	-126.7	0.00	-73.5	-73.47	0.0
Total Power		**623.20**	**93.48**	**432.24**	**-348.60**	**85.32**	**177.12**	**177.12**	**0.00**
Total Energy		**18413.0**	**1134.3**	**3624.0**	**9987.6**	**3426.2**	**14745.9**	**676.2**	**14069.7**
Total Oil & Gas		**17967**	**1067.9**	**3566.3**	**9829.9**	**3340.9**	**14464.1**	**394.4**	**14069.7**