



Computing Fully Burdened Costs of Energy – Fuel (FBCE-F)

2013 ICEAA Conference

New Orleans, LA

June 18-21, 2013

**Office of the Deputy Assistant Secretary of the Army – Cost and Economics
(ODASA-CE)**

Technomics, Inc.

Walt Cooper, WCooper@technomics.net, 571-366-1459

Richard Lee, RLee@technomics.net, 571-366-1447



Presentation Outline



- Background
- Purpose
- Petroleum Operational View in Theatre
- Computational Framework
 - Compute Assured Delivery Cost (ADC)
 - Tactical Delivery Assets
 - Security
- Application to Army AoAs
 - FBCE-F workbook demo
- Conclusions
- BACKUP

Background



- Today's operating forces rely significantly on energy – especially fossil fuels.

Fuel delivery convoy in Afghanistan clearly shows a huge operational risk.



- Several years ago, recognizing this risk, the Defense Science Board made a number of recommendations to the Secretary on reducing our reliance on fossil fuels.
- More recently, the Congress passed legislation requiring the DoD to explicitly address energy in its trade studies, and establishing the Office, Assistant Secretary of Defense (Operational Energy Plans and Programs) (OASD (OEPP)).
- The ASD recently published explicit guidance on how to integrate consideration of energy in AoA's. The guidance included specific instructions on how to compute the fully burdened cost of energy for AoAs. Now formalized at the highest level, this is a requirement our community must be prepared to address.



Purpose



- Develop suggested methods for computing FBCE-F for AoAs based on advice and guidance from the US Army Combined Arms Support Command, the Office, Assistant Secretary of Defense (Operational Energy Plans and Programs), and the Unit Mission Costing Division within the Office of the Deputy Assistant Secretary of the Army for Cost and Economics (ODASA-CE).
- Develop an Excel workbook that allows the cost analyst to easily and efficiently compute FBCE-F for AoAs.



Petroleum Operational View in Theatre



Figure illustrates the concept for petroleum operations in a notional theatre for HBCTs.

Provided by Capabilities Development Team, US Army Combined Arms Support Command (CASCOM) at Ft Lee, VA in December 2011

#	SRC	SRC Description	#	SRC	SRC Description
1	10416R000	Pipeline and Terminal Operating Battalion	5	10426R000	HHD Petroleum Support Battalion
2	10417R000	Pipeline and Terminal Operating Company	6	55727R300	Trans Med Trk Co (POL, 5K) EAB linehaul
3	10420R000	Petroleum Support Company	6	55728R200	Trans Med Trk Co (POL, 5K) EAB Tactical
	10527RC00	Petroleum Support Platoon (50K bags)		55727R200	Trans Med Trk Co (POL, 7.5K) EAB linehaul
4	63426R000	HHC Combat Sustainment Support Battalion	7	63327R200	FWD SPT CO (COMBINED ARMS) BSB HBCT
9	10426R000	HHD Petroleum Support Battalion	8	63327R400	FWD SPT CO (FA) BSB (HBCT)
			7	63327R000	FWD SPT CO (RECON SQDN) BSB (HBCT)
			9	63327R000	FWD SPT CO (RECON SQDN) BSB (HBCT)



Computational Framework



Application of FBCE-F Calculation to AoA's

*Refer to the icon for the next four slides

Total cost of delivering a gallon of petroleum to units on the battlefield (referred to as Assured Delivery Cost (ADC))

1) Standard price of fuel

2) Tactical delivery assets

3) Security

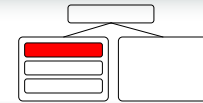
*Calculations by the cost analyst

The number of gallons consumed by a specific force structure in a given scenario

*Values provided by the AoA staff



Standard Price of Fuel



- The standard price of fuel is the rate that the Army pays for fuel at retail points of sale.
- The Defense Logistics Agency – Energy (DLA–E) capitalized cost to purchase, transport, store, and manage fuel to the point of sale at the edge of the scenario battlespace.
- Cost analysts can find the latest standard prices on the DLA–E web site: <http://www.desc.dla.mil/DCM/DCMPage.asp?PageID=722>

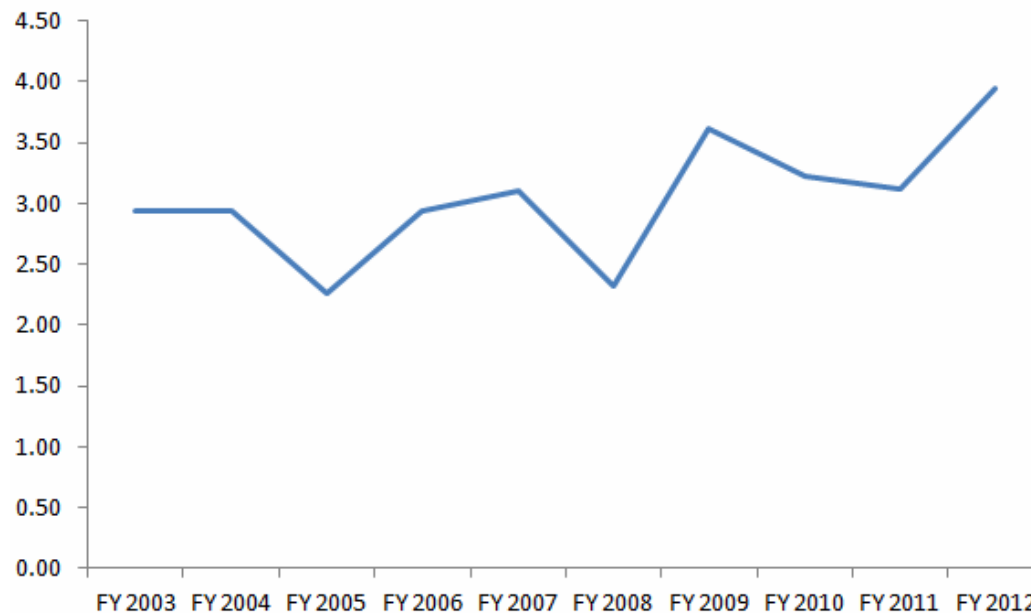
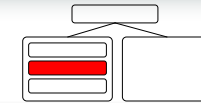


Figure illustrates the volatility of the standard price (\$BY2012) of JP-8, the jet fuel that Army wheeled and tracked vehicles consume, over the past 10 years.



Tactical Delivery Assets



Fuel delivery O&S cost

- Per gallon cost of operating service-owned fuel delivery assets, including the cost of military and civilian personnel dedicated to the fuel mission.

Total Cost

- The Army FORCES model provides estimates of annual peacetime O&S costs for all of the SRCs shown in OV.
- Estimate the daily wartime O&S cost by applying a wartime factor to the peacetime O&S cost.

Amount of fuel delivered

- Determine the capacity of the petroleum units of interest.
- Adjust capacity to account for attrition losses (considered enemy action, reliability).

Divide total cost by amount of fuel delivered



*Operational View (OV) from Slide 4.

Depreciation of fuel delivery assets

- Decline in the value of fuel delivery assets with finite service lives.

Divide total depreciation cost of fuel delivery assets by amount of fuel delivered

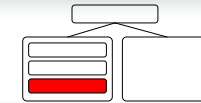
Infrastructure, environmental, and other miscellaneous costs over/above and distinct from the DLA Energy capitalized cost of fuel

- Per gallon cost of fuel infrastructure, regulatory compliance, tactical terminal operations, and other expenses as appropriate.

Most AoAs address tactical scenarios that do not involve infrastructure, environment, and other activities.



Security



- Potential per gallon cost associated with delivering fuel, such as convoy escort and force protection. Includes the manpower, O&S, and asset depreciation costs of the force protection.
- Developed a set of alternatives relating enemy situations with types of security units that might be employed in the battlespace.

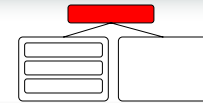
Case	Tactical Situation	Security Force
1	High likelihood of threat activity	<ul style="list-style-type: none"> • 1 route clearance platoon equipped with 6 M1226 Mine Resistant Ambush Protected (MRAP) vehicles • 1 Army aviation detachment consisting of 2 aerial scouts and 1AH-64 attack helicopter.
2	Medium likelihood of threat activity	1 route clearance platoon
3	Little likelihood of threat activity	2 squads from route clearance platoon



Figures illustrate security for fuel delivery convoys in Afghanistan.



Application to Army AoAs



- Obtain fuel consumed for each force alternatives from AoA study team
- Also obtain system-specific fuel consumption if available
- Determine petroleum supply chain, i.e., number of truck convoys and supporting units required
- Compute ADC
- Apply ADC to each force and system-specific alternative

AOA Force Alternatives	ADC (\$/gal)	Fuel Consumed by Force Alternative (gal)	FBCE-F for AOA Force Alternative (\$)	System-Specific Fuel Consumed (gal)	System-Specific FBCE-F (\$)
1 – Base Case – HBCT with current system	5.64	300,000	5,640,000	75,000	1,410,000
2 – HBCT equipped with System A	5.64	250,000	5,076,000	25,000	846,000
3 – HBCT equipped with System B	5.64	350,000	6,204,000	50,000	1,974,000

Table show sample calculations for AOA force alternatives (\$BY2012).



FBCE-F Workbook Demo



Fully Burdened Cost of Energy - Fuel (FBCE-F) Workbook

Beta Version 2.0a
05/07/12

sponsored by
Deputy Assistant Secretary of the Army
for Cost and Economics (DASA-CE)

developed by
Technomics, Inc.

*DISTRIBUTION: Users should not alter any functionality or data in the tool.
Please provide feedback to the points of contact listed below.*

Points of Contact

Tomeka Williams	Tomeka.S.Williams.civ@mail.mil	(703) 697-1576
Len Ogborn	LOgborn@technomics.net	(571) 366-1422
Walt Cooper	WCooper@technomics.net	(571) 366-1459
Richard Lee	RLee@technomics.net	(571) 366-1447



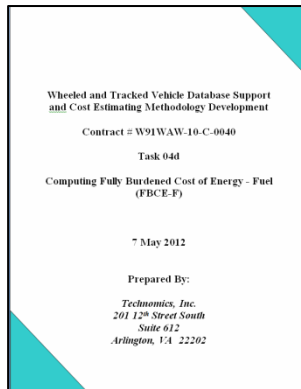
*Refer to backup slides for screen shots of the FBCE-F workbook



Conclusions

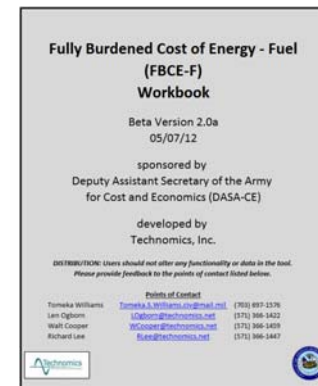


- Continue conversation between the following communities:
 - Supply chain analyst (operational view)
 - Cost analyst (ADC calculation)
 - AoA staff (Gallons consumed by specific force structure)
 - Statute is established to calculate the Fully Burdened Cost of Energy in Analyses of Alternatives (AoAs) and Acquisition Programs
 - Memorandum released on Aug 10, 2012 and signed by Sharon Burke, ASD of OEPP
 - Continue development and refinement of tools relating to consumption of energy to investment costs
 - FBCE-F Manual and Workbook has been developed by Technomics and is currently being used by ODASA-CE for AoAs



For more details, contact
Walt Cooper
WCooper@technomics.net
571-366-1459

Richard Lee
RLee@technomics.net
571-366-1447





BACK-UP



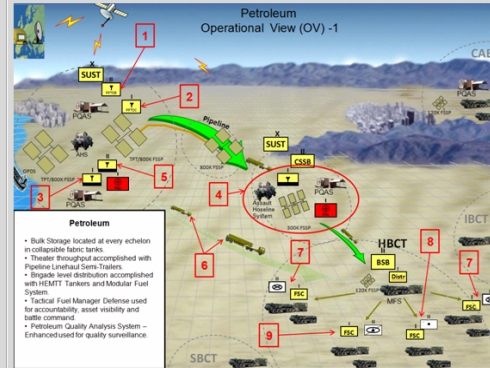
ADC Inputs Tab (Beta V2.0)



ADC Inputs

Standard Requirements Codes (SRCs)

Identify company-size units and quantities for units below.



Number from OV-1	Quantity	Percent of Costs	SRC	SRC Description
1	0	100%	10416R000	Pipeline and Terminal Operating Battalion
2	1	100%	10417R000	Pipeline and Terminal Operating Company
3	1	100%	10420R000	Petroleum Support Company
4	1	100%	10527R000	Petroleum Support Platoon (50K bags)
5	0	100%	63426R000	HHC Combat Sustainment Support Battalion
			10426R000	HHD Petroleum Support Battalion
6	1	100%	55727R300	Trans Med Trk Co (POL, 5K) EAB linehaul
	0	100%	55728R200	Trans Med Trk Co (POL, 5K) EAB Tactical
	0	100%	55727R200	Trans Med Trk Co (POL, 7.5K) EAB linehaul
7	2	15%	63327R200	FWD SPT CO (COMBINED ARMS) BSB HBCT
8	1	15%	63327R400	FWD SPT CO (FA) BSB (HBCT)
9	1	15%	63327R000	FWD SPT CO (RECON SQDN) BSB (HBCT)

Standard Price of Fuel

Standard Price of Fuel in \$BY 2012 (per gallon)	\$3.82
--------------------------------------------------	--------

Delivery

Days to turn-around per delivery	2
Number of training days in a year (days)	242

Wartime Factors

Equipment Factor	2.4
Increase in MILPERS	10%

Average Service Life

	# of years	# of days
Average Service Life (aerial)	20	7,300
Average Service Life (ground)	10	3,650

Attrition Rates

Total number of trucks for each fuel-delivering company	60	Availability Factor	87.5%	Number of trucks after applying availability factor	53
---------------------------------------------------------	----	---------------------	-------	-----------------------------------------------------	----

Select	Condition	Percent of Vehicles Lost Due to Enemy Action	Percent of Vehicles Lost Due to Mechanical Failures	Number of Trucks Lost Due to Enemy Action and Mechanical Failures	Number of Trucks in Convoy Delivering Fuel to the Battlespace
<input checked="" type="radio"/>	High Likelihood of threat activity	5%	5%	3.0	49.5
<input type="radio"/>	Medium Likelihood of threat activity	3%	5%	2.4	50.1
<input type="radio"/>	Low Likelihood of threat activity	1%	5%	1.8	50.7
<input type="radio"/>	Other Condition	0%	0%	0.0	52.5

Security Force Cases for Convoy Escorts

*Security Forces are shown for each delivery SRC.

Select	Condition	SRC	SRC Description	Quantity	Percent of Costs	Days to Secure Fuel Delivery
<input checked="" type="radio"/>	High Likelihood of threat activity	05437G800	Route Clearance Platoon	1	100%	2
		01467G100	Aerial Scouts	1	50%	0.5
		01287G000	Attack Helicopter	1	50%	0.5
<input type="radio"/>	Medium Likelihood of threat activity	05437G800	Route Clearance Platoon	1	100%	2
		01467G100	Aerial Scouts	0	0%	0
		01287G000	Attack Helicopter	0	0%	0
<input type="radio"/>	Low Likelihood of threat activity	05437G800	Route Clearance Platoon	1	50%	1
		01467G100	Aerial Scouts	0	0%	0
		01287G000	Attack Helicopter	0	0%	0
<input type="radio"/>	Other Condition	05437G800	Route Clearance Platoon			
		01467G100	Aerial Scouts			
		01287G000	Attack Helicopter			

Screen Captures from FBCE-F Workbook



ADC Outputs Tab (Beta V2.0)



Selections from Inputs Tab

Tactical Delivery Assets Annual Peacetime Costs
*Data obtained through FORCES, Version 2011.020112

Quantity	Percent of Costs	SRC	SRC Description	Peacetime				
				Direct Equipment Parts & Fuel Cost in \$BY 2012 (per year)	Personnel Cost in \$BY 2012 (per year)	Indirect Support Cost in \$BY 2012 (per year)	Total Gallons Delivered (60 fuel trucks per SRC)	Acquisition Costs of Equipment \$BY 2012 (per year)
0	100%	10418R000	Pipeline and Terminal Operating Battalion	SRC Not Selected	SRC Not Selected	SRC Not Selected	-	SRC Not Selected
1	100%	10417R000	Pipeline and Terminal Operating Company	\$15,525	\$9,927,030	\$49,368	-	\$19,884,320
1	100%	10420R000	Petroleum Support Company	\$1,197,508	\$4,897,821	\$740,458	-	\$11,244,788
1	100%	10523R000	Petroleum Support Platoon (30K bags)	\$295,328	\$4,483,622	\$225,399	-	\$9,084,898
1	100%	03420R000	HHC Combat Sustainment Support Battalion	\$357,135	\$6,571,704	\$242,280	-	\$9,813,539
0	100%	10426R000	HHQ Petroleum Support Battalion	SRC Not Selected	SRC Not Selected	SRC Not Selected	-	SRC Not Selected
1	100%	10727R000	Trans-Med Trk Co (POL, 3K) EAB (linehaul)	\$790,454	\$11,609,723	\$546,410	300,000	\$23,477,121
0	100%	0528R200	Trans-Med Trk Co (POL, 3K) EAB (airfield)	SRC Not Selected	SRC Not Selected	SRC Not Selected	SRC Not Selected	SRC Not Selected
0	100%	0527R200	Trans-Med Trk Co (POL, 2.5K) EAB (airfield)	SRC Not Selected	SRC Not Selected	SRC Not Selected	SRC Not Selected	SRC Not Selected
2	15%	03327R000	FWO SPT CO (COMBINED ARMS) BSB HBCF	\$563,444	\$3,907,480	\$192,443	-	\$17,048,454
1	15%	03327R400	FWO SPT CO (FA) BSB HBCF	\$131,650	\$1,188,773	\$61,894	-	\$4,244,194
1	15%	03327R000	FWO SPT CO (RECON SQDN) BSB HBCF	\$142,550	\$1,272,135	\$61,418	-	\$4,188,131
TOTALS (per year)				\$3,991,571	\$53,931,288	\$3,589,280	300,000	\$119,007,749

Delivery	Wartime Factors	Avg Service Life	Attrition Rates
Days to turn-around per delivery: 2	Equipment Factor: 2.4	Aerial (days): 7,300	Condition: Medium
# of training days in a year (days): 242	Increase in MILPERS: 10%	Ground (days): 3,650	# of Trucks in Convoy Delivering Fuel to the Battlespace: 50.1

Standard Price of Fuel

JP-8, a kerosene-based jet fuel used by all military departments.

Per Gallon (\$BY 12)	\$3.82
----------------------	---------------

Tactical Delivery Assets

Fuel Delivery O&S Cost

Daily Wartime Costs (per # of training days) in \$BY2012		Number of Trucks in Convoy Delivering Fuel to the Battlespace	
Direct Equipment Parts & Fuel Costs	\$19,586	High	49.6
Personnel Cost	\$245,097	Medium	50.1
Indirect Support Cost	\$13,769	Low	68.7
TOTAL	\$278,452	Custom	62.6
Assuming 2 day convoy operation	\$592,904	Gallons of Delivered Fuel	250,500
\$2.37			

Depreciation cost of fuel delivery assets

Depreciation cost during convoy operations	\$65,210	Gallons of Delivered Fuel	250,500
\$0.26			

Infrastructure, environmental, and other miscellaneous costs
Since most AoA's do not involve infrastructure, environment and other activities, we did not estimate these costs for this sub-element in this workbook.

Security

Security Forces Annual Peacetime Costs
*Security Forces are shown for each delivery SRC.
*Data obtained through FORCES, Version 2011.020112

SRC	SRC Description	Quantity	Percent of Costs	Days to Secure Fuel Delivery Convoy	Total number of truck companies delivering fuel			
					Direct Equipment Parts & Fuel Cost in \$BY 2012 (per year)	Personnel Cost in \$BY 2012 (per year)	Indirect Support Cost in \$BY 2012 (per year)	Acquisition Costs of Equipment \$BY 2012 (per year)
05437G000	Route Clearance Platoon	1	100%	2	\$400,897	\$2,592,081	\$136,484	\$14,235,360
01487G100	Aerial Scouts	1	50%	0.5	\$2,812,509	\$1,679,963	\$56,300	\$41,246,334
01207G000	Attack Helicopter	1	50%	0.5	\$4,548,762	\$1,624,711	\$59,712	\$114,521,881
TOTALS (per year)					\$7,782,188	\$5,896,755	\$252,496	\$171,803,575

Security Force O&S

Daily Wartime Costs (per # of training days) in \$BY2012		Number of Trucks in Convoy Delivering Fuel to the Battlespace	
Direct Equipment Parts & Fuel Costs	\$77,179	High	49.6
Personnel Cost	\$26,463	Medium	50.1
Indirect Support Cost	\$1,148	Low	68.7
TOTAL	\$105,130	Custom	62.6
Assuming 2 day convoy operation	\$210,260	Gallons of Delivered Fuel	250,500
\$0.84			

Depreciation cost of security forces

SRC Description	Service Life of Security Forces	Daily depreciation cost	Depreciation cost during convoy operations	Gallons of Delivered Fuel
Route Clearance Platoon	3,650	\$3,900	\$7,800	250,500
Aerial Scouts	7,300	\$5,924	\$2,962	
Attack Helicopter	7,300	\$15,661	\$7,830	
Total depreciation cost during convoy operations			\$18,593	
\$0.07				

Infrastructure, environmental, and other miscellaneous costs
Since most AoA's do not involve infrastructure, environment and other activities, we did not estimate these costs for this sub-element in this workbook.

Screen Captures from FBCE-F Workbook



FBCE-F Tab (Beta V2.0)



FBCE-F

ADC		
Element #	Cost Element	Amount (\$/gal)
1	Standard Price of Fuel	\$3.82
2	Tactical Delivery Assets	
	Fuel Delivery O&S Cost	\$2.40
	Depreciation of Fuel Delivery Assets	\$0.26
	Infrastructure, environmental, and other miscellaneous costs	
3	Security	\$0.93
TOTAL (\$/gal)		\$7.41

AoA Outputs			
Number	AoA Alternative	Fuel Consumed by Force during AoA Scenario (gal)	System-specific Consumption (gal)
1	HBCT equipped with current system	300,000	75,000
2	HBCT equipped with System A	250,000	25,000
3	HBCT equipped with System B	350,000	125,000
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

FBCE-F			
Number	AoA Alternative	FBCE-F (\$) for AoA Alternative	System Specific FBCE-F (\$)
1	HBCT equipped with current system	2,223,000	555,750
2	HBCT equipped with System A	1,852,500	185,250
3	HBCT equipped with System B	2,593,500	926,250
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Screen Captures from FBCE-F Workbook