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Economic Impact of a Salt Dome Natural Gas Storage Facility

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Abstract

In the global economy of today, the United States is losing high paying manufacturing jobs to foreign competition. Fortunately, developments in the natural gas sector of the energy industry has created an opportunity to somewhat offset this trend. Investors are finding it profitable to develop storage facilities located in close proximity to industrial, commercial, and residential users. Salt domes are one type of storage facility that both protects natural gas from the entry of contaminates and safely retains stored gas until it is ready for distribution. This report presents the regional economic impact of one such facility from its construction to its operation. Facilities such as this not only provide excellent employment opportunities themselves, but also help to sustain general business activities and support governments in communities where they are located. Furthermore, their economic impact is not just limited to their direct expenditures, but extends to the indirect and induced effects resulting from an intertwined, interdependent economy.

Keywords: Regional Development, Salt Domes, Economic Impact, Multiplier Effect

1. Introduction

Underground storage of natural gas has long been a staple component of the natural gas distribution system in the United States. The storage facilities have been used to accumulate natural gas during off-peak seasons of gas usage and supplement the daily production of natural gas during peak seasons of gas usage. There are essentially three types of underground storage facilities being used today. They include depleted oil and gas fields, aquifers, and salt domes, each with their advantages and disadvantages (EIA, 2004).

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While salt domes are the most expensive facility to prepare for storage, they provide operational advantages such as high speed injection and withdrawal, low base gas requirements, and the opportunity to complete multiple cycles of injection and withdrawal every year. These advantages make salt domes very competitive when compared with other modes of storage.

The purpose of this paper is to identify the direct and indirect economic impacts associated with developing and operating salt dome storage facilities. Data have been taken from a recently completed facility on the Gulf Coast of the United States.

2. The Facility

The facility under review was built to store natural gas for industrial, commercial, and private household consumption. To create the facility, it was necessary to hollow out caverns in an existing salt dome. The caverns provide an impermeable environment that will prevent entry of contaminates to compromise the quality of stored gas and will safely retain stored gas until it is ready for distribution. This facility compliments area's developing liquid natural gas (LNG) sector.

Functionally, the facility is an integral component in the area's industrial structure and provides a reliable source of natural gas for industrial, commercial, and residential users. As an important side benefit, stored gas in the facility will also help moderate short-term spikes in the price of natural gas which have been occurring in the past several years. Gas stored in the facility is distributed through feeder pipelines connected to the area's well established pipeline network. The feeder lines utilize existing rights-of way, so there was no problem with protracted negotiations or invoking immanent domain.

3. The Impact

Changing employment patterns in the impacted area are presented in Table 1. As revealed in the table, total non-farm employment increased by 18,500 persons between 1990 and 2006. During that period, however, the loss of 4,400 jobs in chemical manufacturing resulted in an overall reduction in manufacturing employment of 2,400. While employment opportunities were being lost in manufacturing, new jobs were being created in wholesale and retail trade and in the business and personal services sectors of the economy.

Using terms of regional economic analysis, employment gains were being made by firms located in what are classified as **"service"** sectors of the economy. While service sectors are an important component of the local economy, they only circulate existing dollars in the income stream; they do not generate new dollars. Activities in the service sectors represent a zero-sum game. A dollar gained by one person is a dollar lost by someone else in the local economy. The income stream itself is not expanded by those transactions.

In contrast, the LNG storage facility represents a "**base**" sector expansion. Rather than simply circulating income, the facility will draw funds from outside the region.

Table 1: Employment by Industry in Impacted Area.1990 & 2006

Industry	Employment	
	2006	1990
Total Non-Farm	160,500	142,000
Mining and Construction	16,400	12,200
Manufacturing	20,800	23,200
Chemical	5,700	10,100
Wholesale Trade	4,400	4,300
Retail Trade	20,300	18,400
Transportation, Warehouse, Utilities	6,700	8,400
Information	2,600	2,300
Finance	5,700	5,900
Professional and Business Services	15,300	9,000
Administrative Support and Waste Management	7,500	4,800
Education and Health	21,600	17,600
Leisure and Hospitality	14,100	10,300
Other Services	6,100	7,900

This will expand the local income stream and increase its standard of living. The result is a positive sum game for the local economy. Furthermore, as the new money ripples throughout the economy, it will have a multiplier effect on the income stream. The value of the multiplier can be determined through an Input-Output analysis (Leontief, 1950; Miller, 2009).

Because regional economies are not self-contained, multiplier expansion is limited by spending leakages. Some of the new dollars that originally flowed into a local economy will eventually be lost because of tax payments to state and federal governments, payments for goods and services purchased from outside the local area, money spent on vacations, and so forth. Input-Output models employ a double entry bookkeeping system to trace the amount of money flowing into a local economy and the amount flowing out, as well as the monetary flows among various sectors within the local economy in a given year. As a result, it is possible to determine how much one sector buys from all other sectors and how much it sells to all other sectors. These relationships are gathered together and placed in what is technically called a transactions matrix. Mathematical manipulation of the transactions matrix permits multipliers to be calculated by tracing the ripple effect of initial direct expenditures through the economy.

3.1 Construction Phase: Private Sector

Prior to construction, approximately $15 million was spent on preliminary assessment, planning, and design cost to obtain approval and licensing from the Federal Energy Regulatory Commission (FERC). After receiving the required licenses, actual site work was initiated to develop two salt dome caverns. Table 2 identifies the capital expenditures that were required for the complete project. As identified in the table the finished facility had preconstruction and capital expenses of approximately $180 million. Because most of the equipment and materials for construction were not available locally, a significant component of those expenses went to businesses located elsewhere and had no had no impact on the local economy. Labor for the project, however, had to be obtained locally, which provided a boost to the local labor market.

Table 2: Capital Expenditures by Year

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
First Cavern	$42,709,549	$23,772,397	$23,772,397			$90,254,343
First Cavern Pad Gas			$16,019,000			$16,019,000
Second Cavern			$12,622,250	$13,778,484	$13,778,484	$40,179,218
Second Cavern Pad Gas					$18,331,000	$18,331,000
Totals	$42,709,549	$23,772,397	$52,413,647	$13,778,484	$32,109,484	$164,783,561

Table 3 identifies the number of construction workers that were employed during the five year that it took to complete the project. As a compliment to Table 3, Table 4 identifies the total amount paid to labor during the construction period. As shown, over $10 million was paid to workers.

This money rippled through the economy as workers bought groceries, housing, utilities, clothing, and other consumer goods and services. Quantitative estimates of increased income in retail sectors is in Table 5.

Table 3: Employment Data

		Project A		Project B			Project C			
Year		Const	Leach	Const	Leach	Gas Op	Const	Leach	Gas Op	**TOTAL**
1	**1Q**	70								**70**
	2Q	70								**70**
	3Q	70	6							**76**
	4Q	12	6							**18**
2	**1Q**				6	10				**16**
	2Q			120	6	10				**136**
	3Q			120	6	10				**136**
	4Q			120	6	10				**136**
3	**1Q**							6	10	**16**
	2Q							6	10	**16**
	3Q							6	10	**16**
	4Q							6	10	**16**
4	**1Q**							6	10	**16**
	2Q							6	10	**16**
	3Q							6	10	**16**
	4Q							6	10	**16**
5	**1Q**							6	10	**16**
	2Q						75	6	10	**91**
	3Q						75	6	10	**91**
	4Q						75	6	10	**91**
									11	**11**

Table 4: Payrollduring Construction

Year	Payroll
1	$2,173,568
2	$3,938,430
3	$594,480
4	$594,480
5	$2,684,489
Totals	$10,394,111

Data for service sectors are also contained in Table 5. The estimates are based on structural models contained in Implan software (MIG, 2004).

Because of the temporary nature of construction activities, the ripple impacts identified in Table 5 will not be permanent, but were quickly be dissipated when those activities ended..

Table 5: Annual Expenditures for Selected Sectorsfrom Construction Payroll

Sector	2008	2009	2010	2011	2012
Retail Trade					
Food and beverage	$135,366	$245,278	$37,023	$37,023	$167,183
Health and personal care	$69,181	$125,354	$18,921	$18,921	$85,442
Gasoline stations	$44,670	$80,941	$12,217	$12,217	$55,169
Clothing and clothing accessories	$73,802	$133,726	$20,185	$20,185	$91,148
General merchandise	$123,631	$224,015	$33,814	$33,814	$152,689
Miscellaneous retailers	$55,175	$99,975	$15,091	$15,091	$68,143
Telecommunications	$107,278	$194,384	$29,341	$29,341	$132,493
Personal Services					
Home health care	$50,353	$91,238	$13,772	$13,772	$62,188
Child day care	$29,133	$52,788	$7,968	$7,968	$35,981
Food services and drinking places	$353,587	$640,687	$96,708	$96,708	$436,695
Automotive repair and maintenance	$118,067	$213,933	$32,292	$32,292	$145,817
Personal care	$23,214	$42,062	$6,349	$6,349	$28,670
Religious organizations	$5,119	$9,276	$1,400	$1,400	$6,322
Total	$1,188,575	$2,153,656	$323,080	$325,080	$1,467,940

In addition to the new construction employment opportunities associated with developing the salt domes, it is possible to identify other traceable impacts on the economy during this period. Because the storage caverns were created through "solution mining," large amounts of electricity and fresh water were required. Those commodities were purchased from local firms. Table 6 identifies the revenue received by those firms during the construction period.

Table 6: Electricity and Water Expenditures

	Year 1	Year 2	Year 3	Year 4	Year 5	Totals
First Cavern						
Electricity Costs	$941,138	$1,882,277	$1,882,277			$4,705,692
Water Costs	$97,558	$195,115	$195,115			$487,788
Second Cavern						
Electricity Costs			$1,093,246	$2,186,492	$2,186,492	$5,466,230
Water Costs			$107,557	$215,115	$215,115	$537,787
Totals	$1,038,696	$2,077,392	$3,278,195	$2,401,607	$2,401,607	$11,197,497

3.2 Construction Phase: Public Sector

Along with increased payrolls and sales revenues to merchants in the private sector of the local economy, state and local governments also benefited from construction activities. The new construction expanded the area's property tax base, resulting in an increase of approximately $3.5 million in property taxes. Additionally, increased payrolls resulted in an increase in the purchases of items subject to sales taxes. Estimates of sales tax revenues received by state and local governments are contained in Table 7.

Table 7: Estimates of Sales Taxes

Year	State	County	City
Year 1	$166,359	$13,309	$39,926
Year 2	$301,438	$24,115	$72,345
Year 3	$45,500	$3,640	$10,920
Year 4	$45,500	$3,640	$10,920
Year 5	$205,461	$16,437	$49,311

3. 3 Operations Phase: Private Sector

At the end of the construction period, eleven permanent, full-time employees were hired for operations. The initial annual payroll was approximately $550,000. Because operations will be continuous, there will be a future multiplier effect of about 1.35 associated with this payroll. Therefore, once operations were established, income in the local area was boosted by $742,500. The new income, in turn, expanded sales of retail and service sector firms in the area. Utilizing models from Implan, the distribution of new sales in shown in Table 8. Furthermore, unlike the transitory nature of construction activities, these sales will be permanent, occurring year after year because of the ongoing operations.

Table 8: Increase in Annual Expenditures for Selected Sectors from GTS Permanent Employees

Sector	Direct New Spending	Multiple New Spending
Retail Trade		
Food and beverage	$34,253	$46,242
Health and personal care	$17,506	$23,633
Gasoline stations	$11,303	$15,259
Clothing and clothing accessories	$18,675	$25,211
General merchandise	$31,284	$42,233
Miscellaneous retailers	$13,961	$18,848
Telecommunications	$27,146	$36,647
Services		
Home health care	$12,741	$17,201
Child day care	$7,372	$9,952
Food services and drinking places	$89,472	$120,787
Automotive repair and maintenance	$29,876	$40,332
Personal care	$5,874	$7,930
Religious organizations	$1,295	$1,749

3.4 Operations Phase: Public sector

Continuing operations of the LNG facility will benefit the public sector's revenue sources through property taxes and sales taxes. The basis of property taxes consists of two parts: (1) the value plant and equipment at the site of operations and (2) the value of stored gas. This division is important only for purposes of tax liability. As the owner of the Property, GTS will be liable for the site component of property taxes. Because title to the stored gas will not be transferred to GTS, owners of the gas will be liable for property taxes.

Using the value of capital expenses identified in Table 2 as the assessed value of the property, taxes paid yearly to all local tax levying authorities amounts to about $4.5 million. The assessed value of natural gas stored in the facility will obviously vary depending on the actual quantity of gas in storage. Because the facility has a capacity of 12 billion cubic feet (Bcf) of gas, the upper limit for property taxes, using the current price of natural gas, is about $2.2 million.

In addition to property tax revenues, state and local governments will also experience increases in sales taxes. Neglecting any purchases and taxes paid by the storage firm, Estimates of sales taxes paid by employees on their personal consumption expenditures is about $55 thousand per year.

4. Conclusions

In the global economy of today, with the United States losing high paying manufacturing jobs to foreign competition, the emergence of facilities such as the LNG storage facility is a welcomed addition to the national economy, generally, and to local economies, specifically. Facilities such as this not only provide excellent employment opportunities themselves, but also help to sustain general business activities and support governments in communities where they are located. Furthermore, their economic impact is not just limited to their direct expenditures, but also to the indirect and induced effects resulting from an intertwined, interdependent economy.

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