PURDUE – MEXICO WORKSHOP ON SUSTAINABILITY

SUSTAINABILITY OF THE PETROCHEMICAL, REFINING, EXPLORATION AND PRODUCTION INDUSTRIES IN MEXICO

EXAMPLES THAT AFFECT IT
SUGGESTIONS TO IMPROVE

ABRAHAM KLIP

APRIL , 2013

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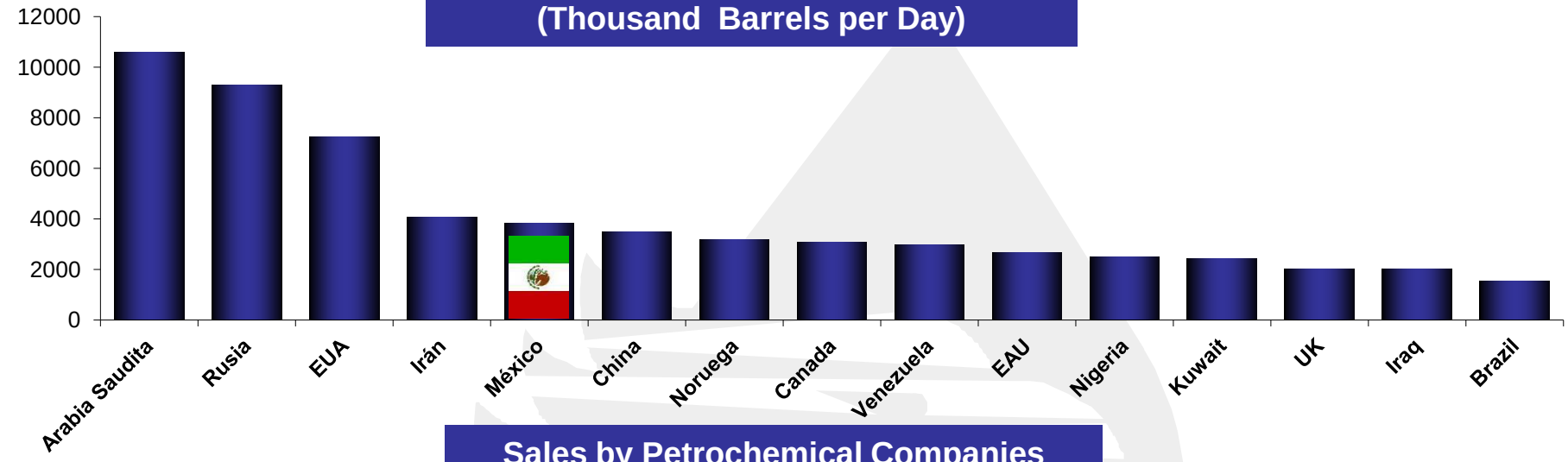
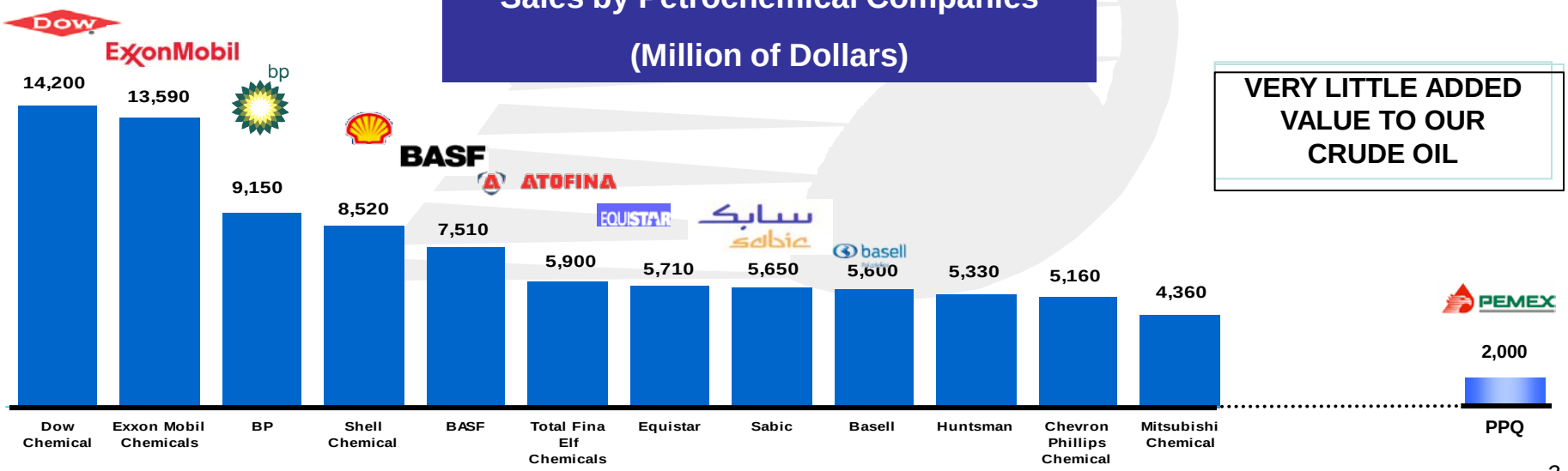
Mexico is a relevant crude oil producer, but not an important manufacturer of petrochemicals

Crude Oil Production by Countries (Thousand Barrels per Day)



Sales by Petrochemical Companies (Million of Dollars)

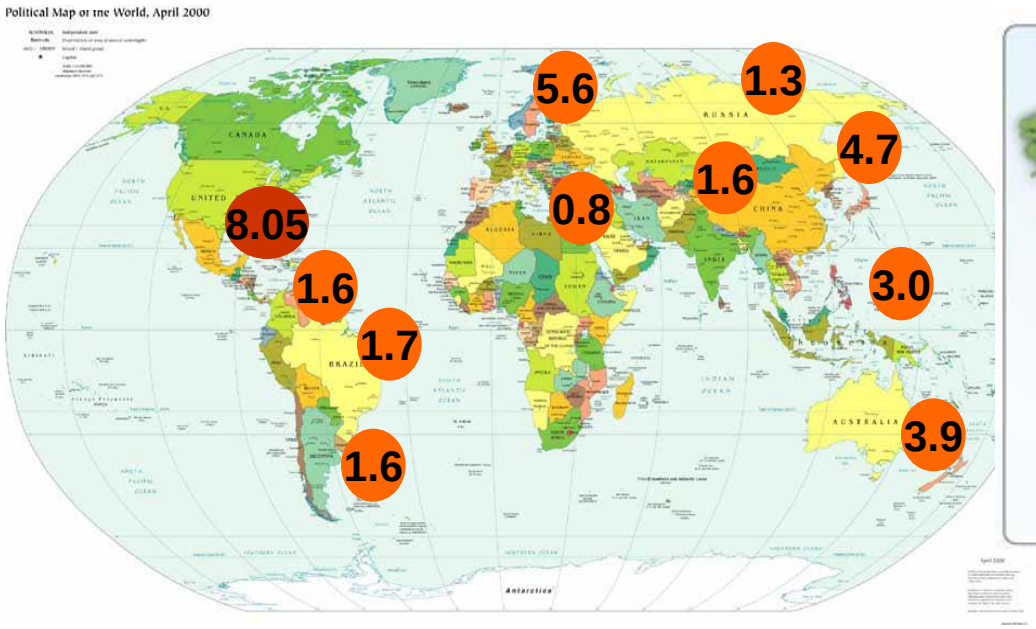


VERY LITTLE ADDED VALUE TO OUR CRUDE OIL

Source: CMAI, Economics & Statistics 06/2005

- **Energy in North America used to be the most expensive in the world. Now is highly competitive.**

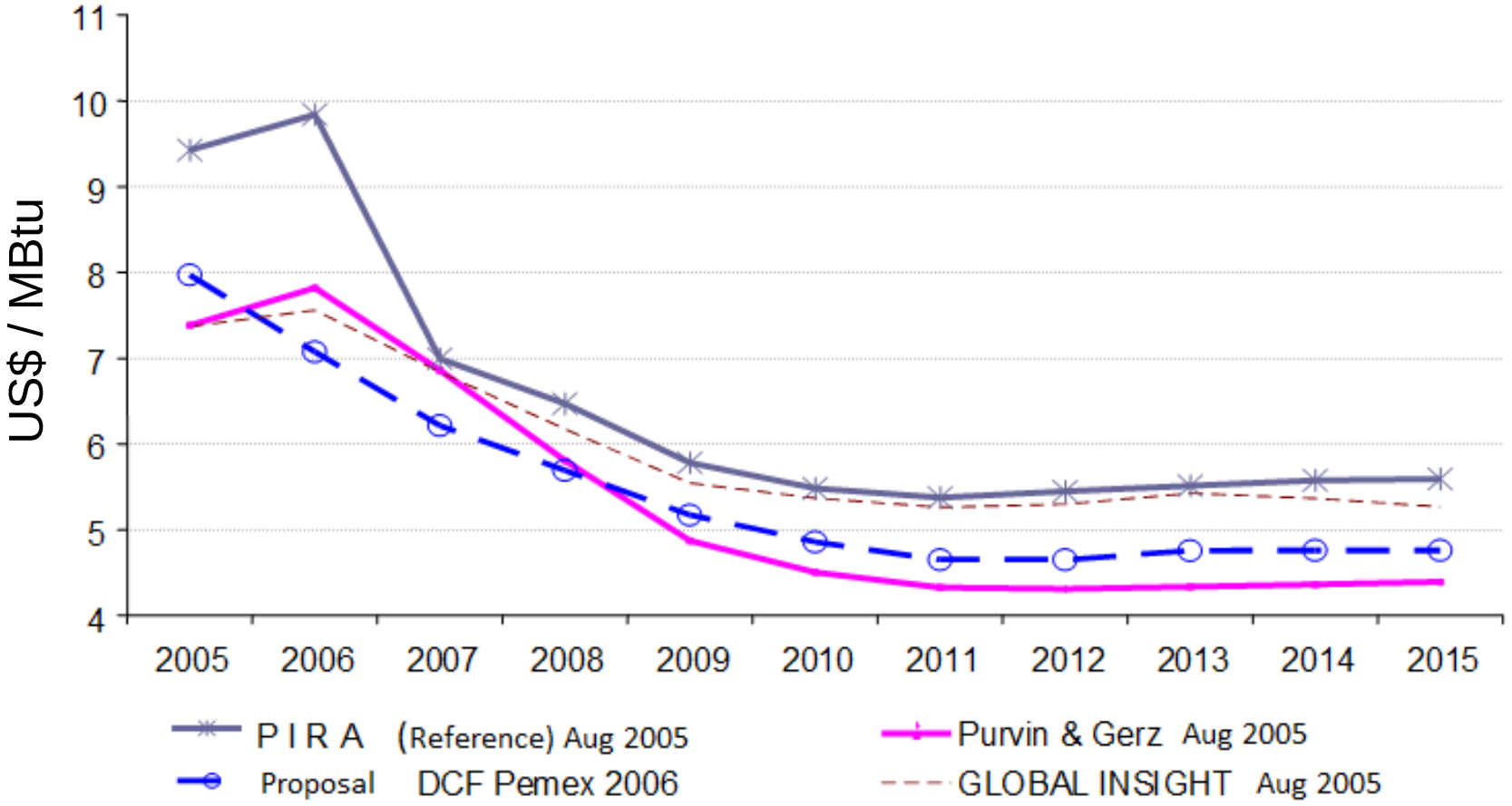
Cost of Natural Gas in 2005
(USD/MBtu)



Note: Cost of natural gas in Texas, October 2005: US$12.65/MBTU

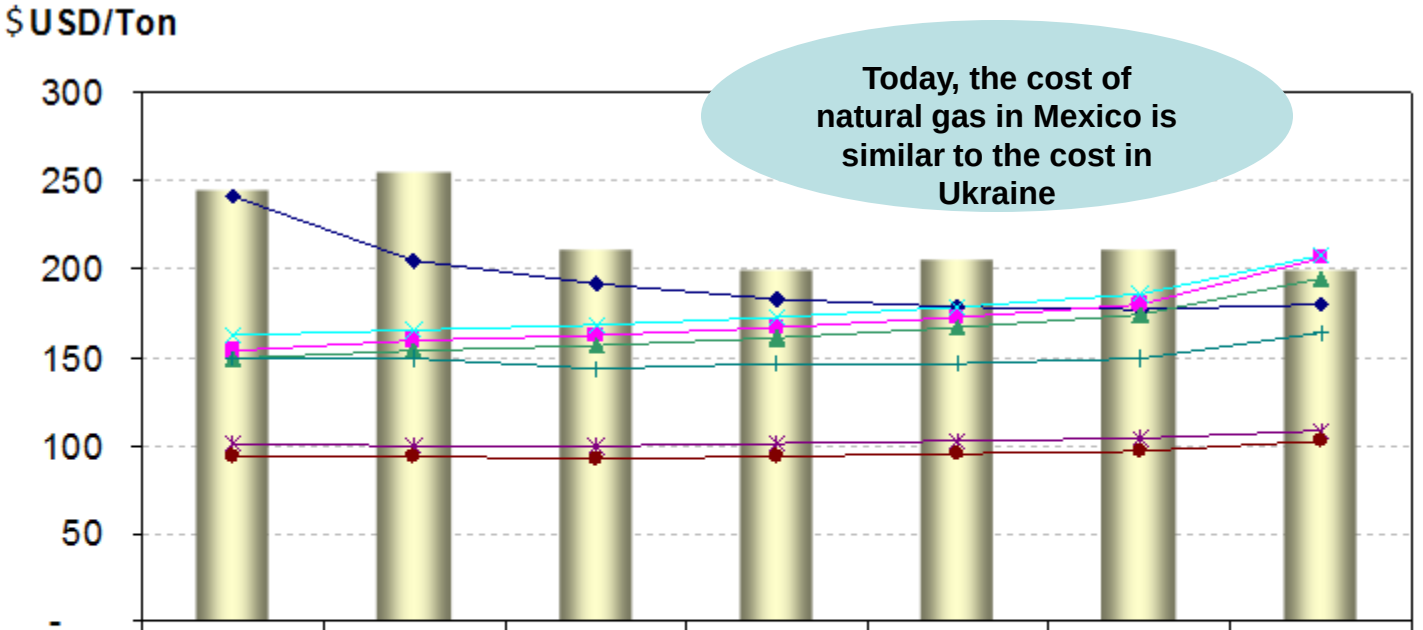
Source: ACC, 2005

Natural Gas Price Forecasts (2006)
(Constant Dollars of 2006)



We assumed that the price of Natural Gas in North America would drop, but we never imagined it would drop to be cheaper than in other regions of the world.

Manufacturing cost of ammonia, México vs. other countries, 2005 and forecasts



	2005	2006	2007	2008	2009	2010	2015
Ammonia Price DCF	244	254	211	199	205	211	199
PPQ	241	204	192	183	179	178	180
Russia(Toaz via Yuznhy)	154	160	162	167	172	180	206
Ukraine(Odessa)	150	154	157	161	167	174	195
Ukraine (other plants)	162	166	168	173	178	186	208
Trinidad and Tobago	101	100	100	101	103	104	109
Venezuela	93	93	92	93	95	97	102
Middle East	149	149	144	147	147	150	164

Mexico and North America will once again be able to have a thriving fertilizer industry

Classification of "Basic Petrochemicals"

- **Starting in 1959, PEMEX became the exclusive manufacturer and distributor of "Basic Petrochemicals", (a list of approx.. 90 products). In 1979, the list was reduced to 16 products, but still maintaining an artificial division between "basic" and "secondary" petrochemicals.**

- **In 1992, PEMEX was divided in four subsidiaries:**

  - **Pemex Gas and Basic Petrochemicals (PGPB)**
  - **Pemex Exploration and Production (PEP)**
  - **Pemex Refining. (PR)**
  - **Pemex Petrochemical. (Non exclusive producer of "secondary" petrochemicals).**

- **In 1996 the list of "Basic Petrochemicals" was reduced to nine products. This holds as of today:**

  - **Methane (petrochemical use), ethane, propane, butanes, pentanes, hexane, heptane, raw material for carbon black, *naphtha's*.**

  - ***We maintain an artificial division of products, harming the development of the Mexican Petrochemical Sector*.**

SOWT´S ANALYSIS

Strengths

- Growing Market.
- Geographical location.
- Availability of raw materials.
- Qualified and competitive labor.
- Good infrastructure
- VERY COMPETITIVE PRICE OF NATURAL GAS AND ETHANE

Opportunities

- Investments in methane, ethane and their derivatives as in the rest of North America)
- JV between PEMEX and the private sector
- Integration of petrochemical chains.
- Project "FENIX – ETILENO XXI"
- PETROCHEMICAL REFINERY

Weaknesses

- Disaggregated Industry.
- In definition of the role of Pemex in Petro chemistry (what will it do, what will not do)
- Lack of autonomous administration (i.e. Budget Control)
- CLASSIFICATION OF "BASIC PETROCHEMICALS"
- *PEMEX´s workers union*

Threats

- Integrated companies.
- Stricter environmental regulations (Ammonia without Urea = CO2)

Mexican companies investing abroad instead of Mexico

Lack of a National Energy and Petrochemical long term plan approved by the different political parties

Managers and directors at Pemex feeling threaten by the Company

- **1.2.1 GROWING MARKET**
- **1.2.2 COMPETITIVE PRICES OF RAW MATERIALS**

Per capita plastics consumption is indicative of the industrial development of a particular society

- Example of a silly demonstration in Austria

PER CAPITA PLASTIC CONSUMPTION

MEXICO 50 Kg → USA 200 Kg

Price of gas and ethane → national increment of plastics production/consumption
growth of GNP → lower imports → creation of well paid jobs

NATIONAL PETROCHEMICAL TRADE BALANCE -$12 billion usd.

TOTAL MEXICAN TRADE BALANCE (INEGI, 2010) - $ 3 billion usd.

I.2 PETROCHEMISTRY: SOWT´S, EXAMPLES, SUGGESTIONS

- I.2.1 GROWING MARKET
- 1.2.2 COMPETITIVE PRICES OF RAW MATERIALS

AMERICAN CHEMISTRY COUNCIL, MARCH 2011:

"SHALE GAS AND NEW PETROCHEMICALS INVESTMENT: BENEFITS FOR THE ECONOMY, JOBS, U.S. MANUFACTURING":

ADDITIONAL GENERATION OF THE INDUSTRY BY INCREASING ETHANE PRODUCTION BY 25%

IMPACT ON PRODUCTION:

	BILLION USD
PETROCHEMICALS AND INTERMEDIATES	$18.3
CARBON BLACK	$ 0.2
PLASTIC RESINS	$13.1
SYNTHETIC RUBBER	$ 1.0
FIBERS	$ 0.2
TOTAL	$32.8

I.2 PETROCHEMISTRY: SOWT´S, EXAMPLES, SUGGESTIONS

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IMPACT ON JOBS CREATION (billion usd)

TYPE	JOBS	PAYROLL	PRODUCTION
DIRECT	17,017	$2.4	$32.8
INDIRECT	79,870	$6.6	$36.9
INDUCED	85,563	$4.1	$13.7
TOTAL	182,450	$13.1	$83.4

IT IS ESTIMATED THAT THE USA WILL DOUBLE ITS ETHANE PRODUCTION BY YEAR 2016 (LAST YEARS IT AVERAGED 750 MILLION BI/D)

I.2.3 LACK OF A NATIONAL PLAN FOR ENERGY AND PETROCHEMICALS

- SECRETARY OF ENERGY (SENER) VS SECRETARY OF FINANCE (SHCP). "This is the kind of presentations liked by former president Echeverria "; " SOCIAL IRR"; How we failed to assign a contract to the economist suggested by the Secretary of Finance .
- Example: ALFA GROUP invests (physical hedge) in the USA. (Instead of investing in Mexico)

I.2.4 LACK OF DEFINITION OF THE ROLE OF PEMEX IN PETROCHEMICALS

Production of Intermediates vs. Profit Generation

Shock Plan – Close Unproductive Plants – Do nothing

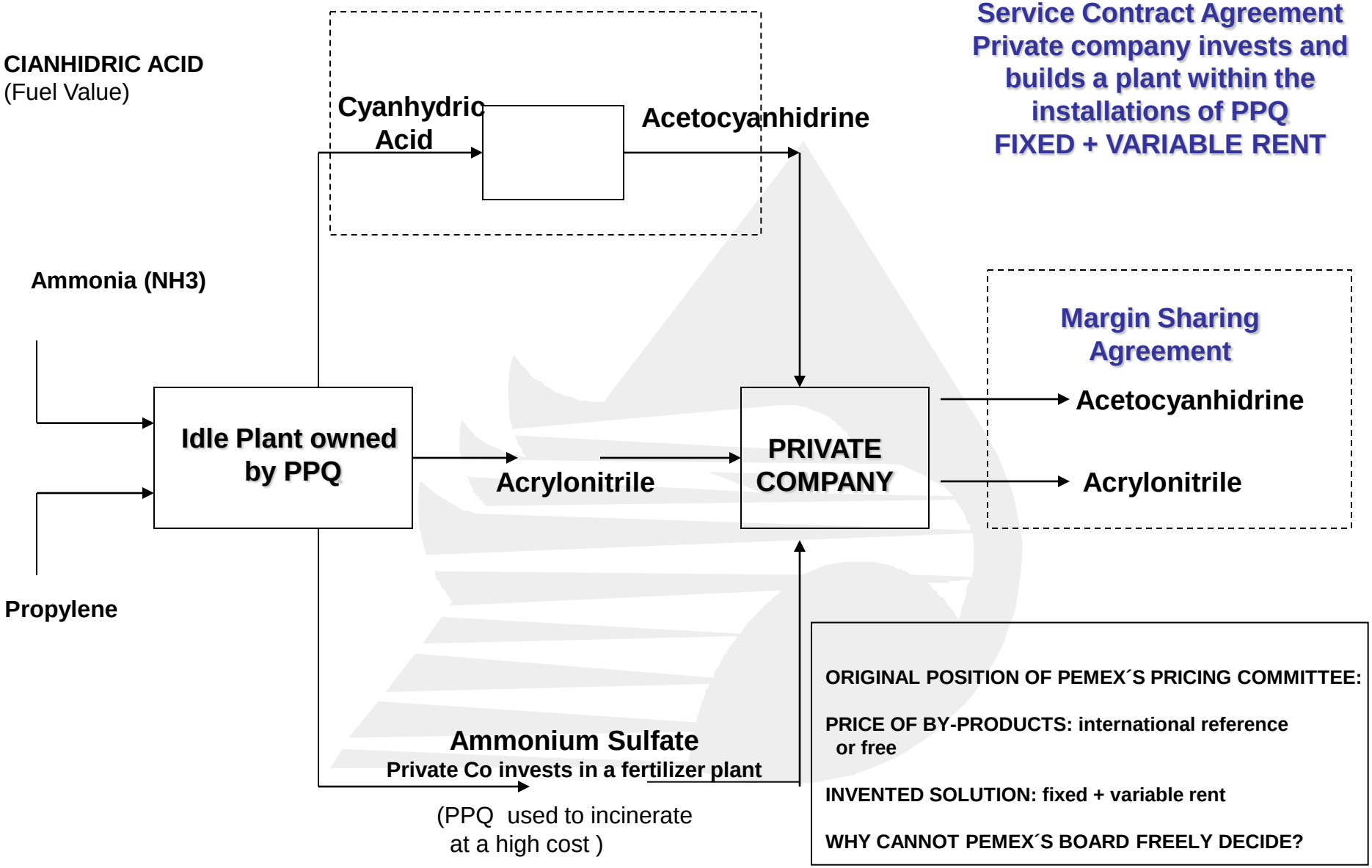
Reality: We do not pitch the ball, we do not catch the ball, we do not let third parties hit the ball

PEMEX Board Meetings ("Avoid presenting sensitive issues that require our vote"). Contrary to the mission of the Board in the private sector

I.2.5 OPPORTUNITY PRICES

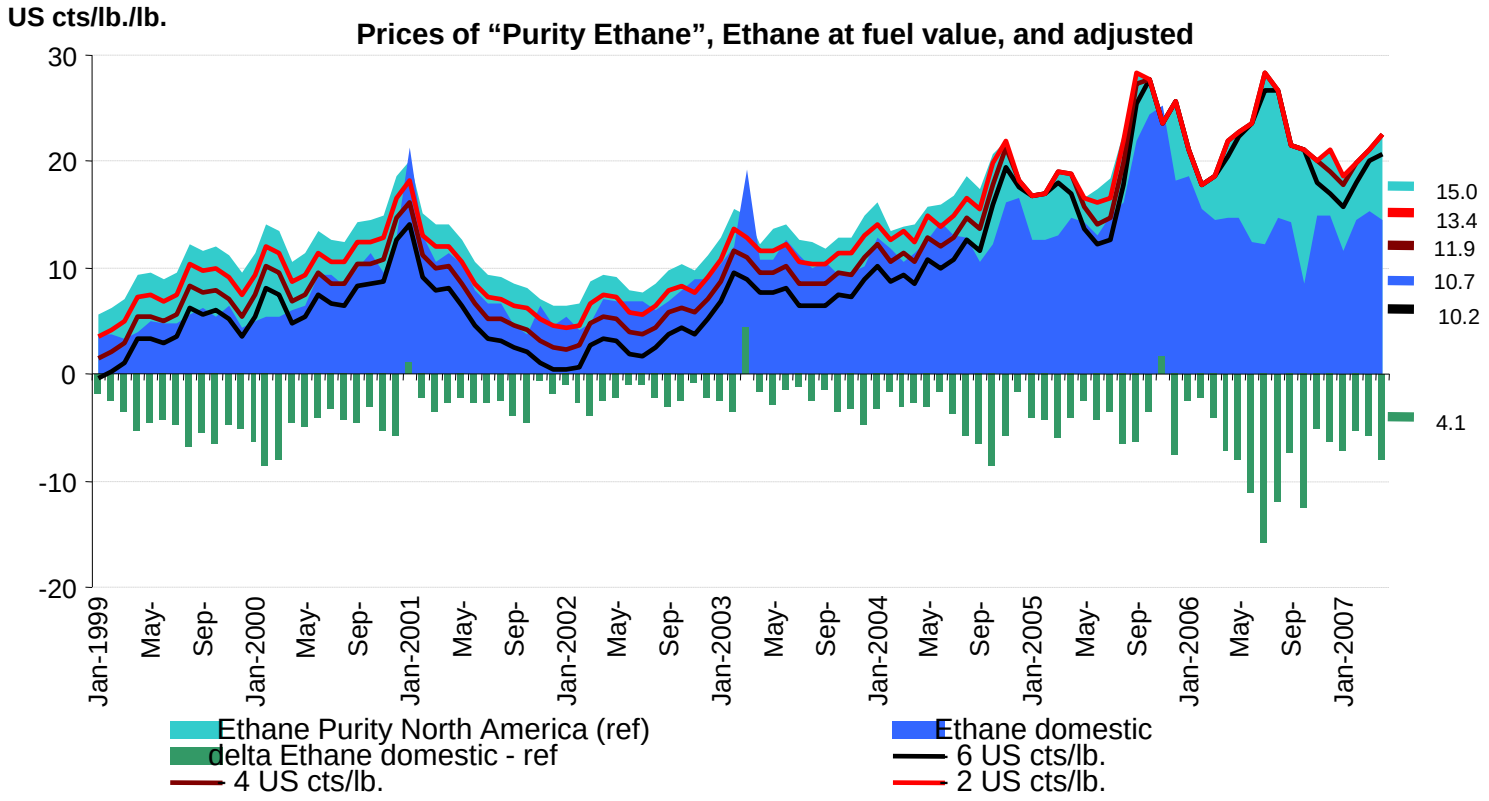
- Inventing prices. Example: Acrylonitrile
- Opportunity Price vs. Risk Formula
- A single man policy and the development of a price formula for ethane

Example: Acrylonitrile; Cost formula based on renting land!



Example: Project “Fenix/Ethylene XXI”- Opportunity Price vs. Risk Formul

- **Even though president Fox officially informed of the initiation of project Fenix, SHCP kept opposing it, indicating that if ethane would be sold at a different price than the “opportunity price”, it would become a subsidy costed by the Treasury.**
- **President Calderon’s office in the first year of his administration, accepted our idea of allowing Pemex to sell ethane trough a “risk cost formula” (price could be higher or lower than the opportunity price). SHCP accepted immediately as well.**
- **We lost six years. A National Energy Policy would avoid this kind of issues.**



- **I.2.6 AUTONOMOUS ADMINISTRATION**
  - INVESTMENT AND OPERATIVE BUDGETS (Any money you do not spend, you do not get it back next year). Example: Katrina and a maintenance project in PPQ)
  - PRICING COMMITTEE vs. BOARD OF DIRECTORS (Example: Styrene Exports)
  - SHCP: PEMEX´s profits before taxes in 2011: $784,532 million pesos. But it paid $876,015 million pesos in taxes. Mexico needs a FISCAL REFORM so that SHCP stops depending on Pemex. Only then will PEMEX be able to have an autonomous administration. (One third of the Government Revenues come from PEMEX).
  - MANAGERS AND DIRECTORS OF PEMEX fear to take decisions and eventually be sued or fired (loosing their pensions). Most of them buy an expensive insurance policy to protect them against a possible claim from Pemex for having “damaged the nation”

- **I.2.7 DEFINITION OF “BASIC PETROCHEMICALS”**
  - PENTANE***S:*** **(Separated from NGL´s or “Natural Gasoline”)**
  - ***NAPHTHA'S:*** Loosing integration with a BTX plant
  - **EXAMPLE: SHALE GAS AND NGL´S: How can the private sector participate?**

- **I.2.8 MERGING PPQ, PGPB, PR IN A SINGLE COMPANY**
  - THE PETROCHEMICAL REFINERY
  - EXAMPLE: AN UNFORTUNATE NAME?

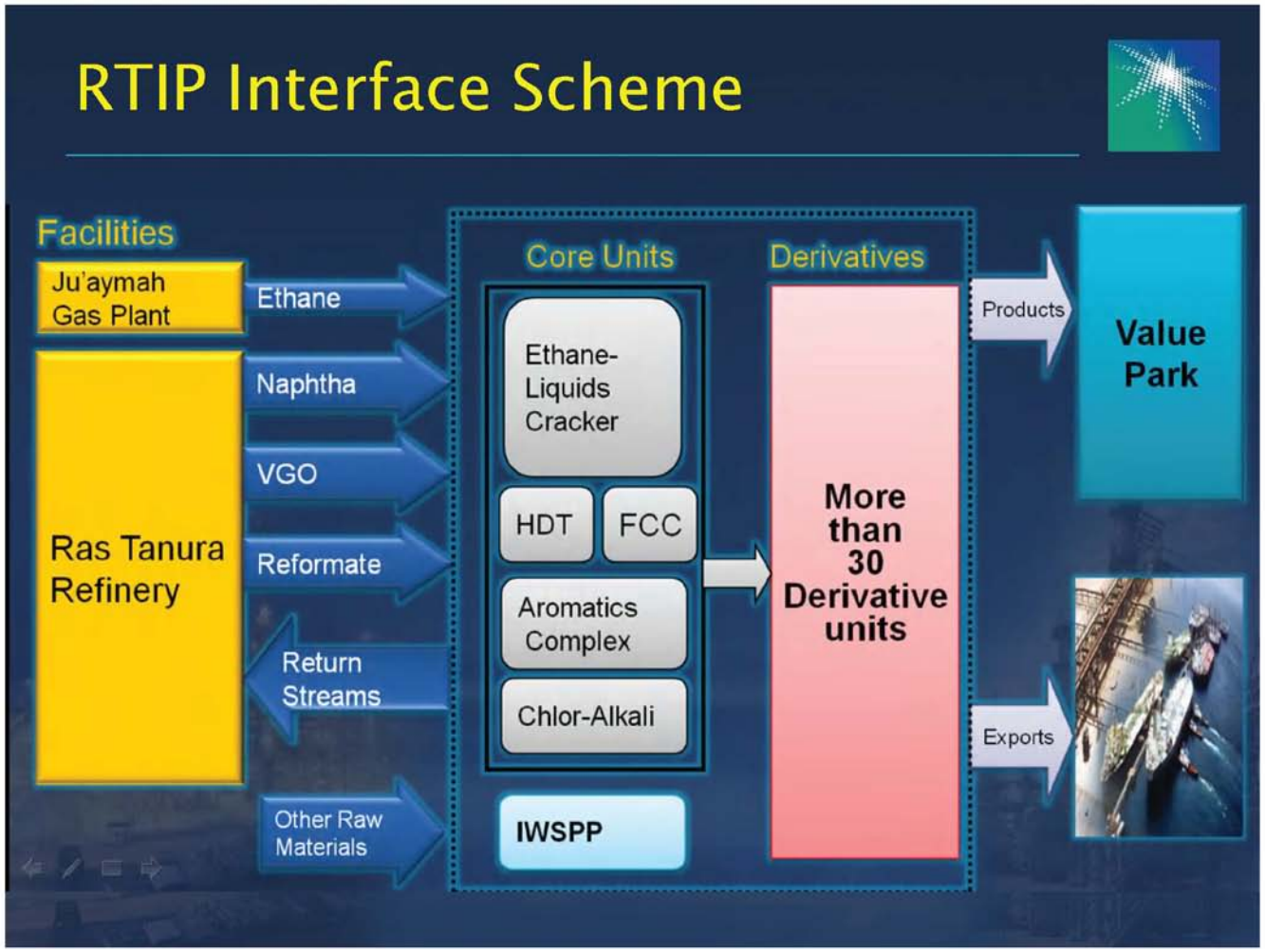
➢ I.2.8 THE PETROCHEMICAL REFINERY

Drivers for Refining and Petrochemical Integration. Saudi Aramco, January 2009

- Reliability of feedstock supply with less transport cost
- Supply chain optimization resulting in faster delivery of products and optimum distribution
- Significant reduction in shared utilities system, less variable cost
- Higher cash margin
- More flexibility in reprocessing, storing, and transporting off specification products
- More outlets for high-value byproducts
- Energy savings in well-integrated hydrocarbon processes
  - Feedstock flexibility to capitalize on available low cost crude oils and intermediates
  - Significant savings in storage requirement
- Centralized support services, engineering, maintenance, laboratory, EH&S, security, etc.
- Independence of feed stocks and supply security

➢ I.2.8 THE PETROCHEMICAL REFINERY

“REFINING AND PETROCHEMICALS INTEGRATION: DRIVERS AND CHALLENGES” Saudi Aramco, January 2009. Petrochemical Refinery in Ras Tanura.

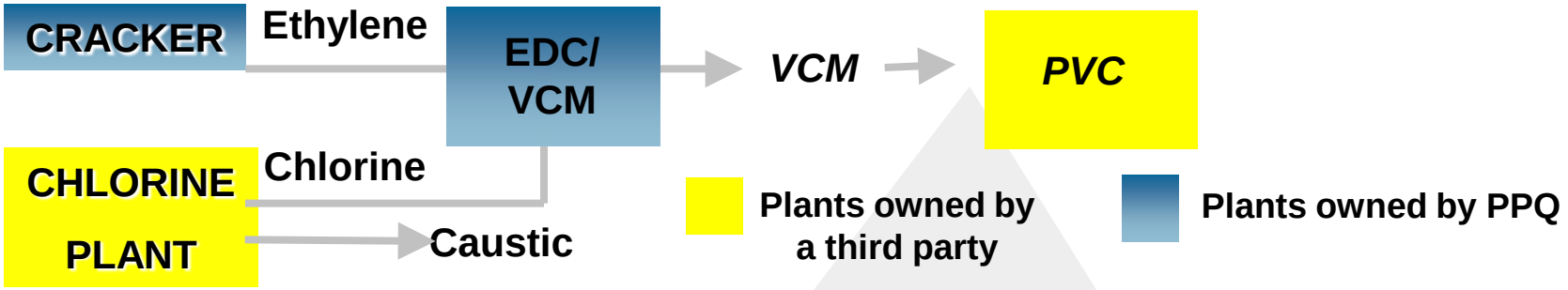


➢ I.2.9 THE POWER AND FEAR TO PEMEX´S WORKERS UNION

➢ **IT TOOK EIGHT YEARS TO CREATE A JV BETWEEN PEMEX (PPQ) AND A PRIVATE COMPANY TO PRODUCE VINYL CHLORIDE MONOMER (VCM)**

EXAMPLE: VCM

SCHEMATIC REPRESENTATION OF THE (LACK OF) INTEGRATION OF VCM AND PVC IN MEXICO



- Worldwide, 93% of VCM is produced from ethylene, 7% from acetylene.
- 98% of VCM is used to produce PVC.

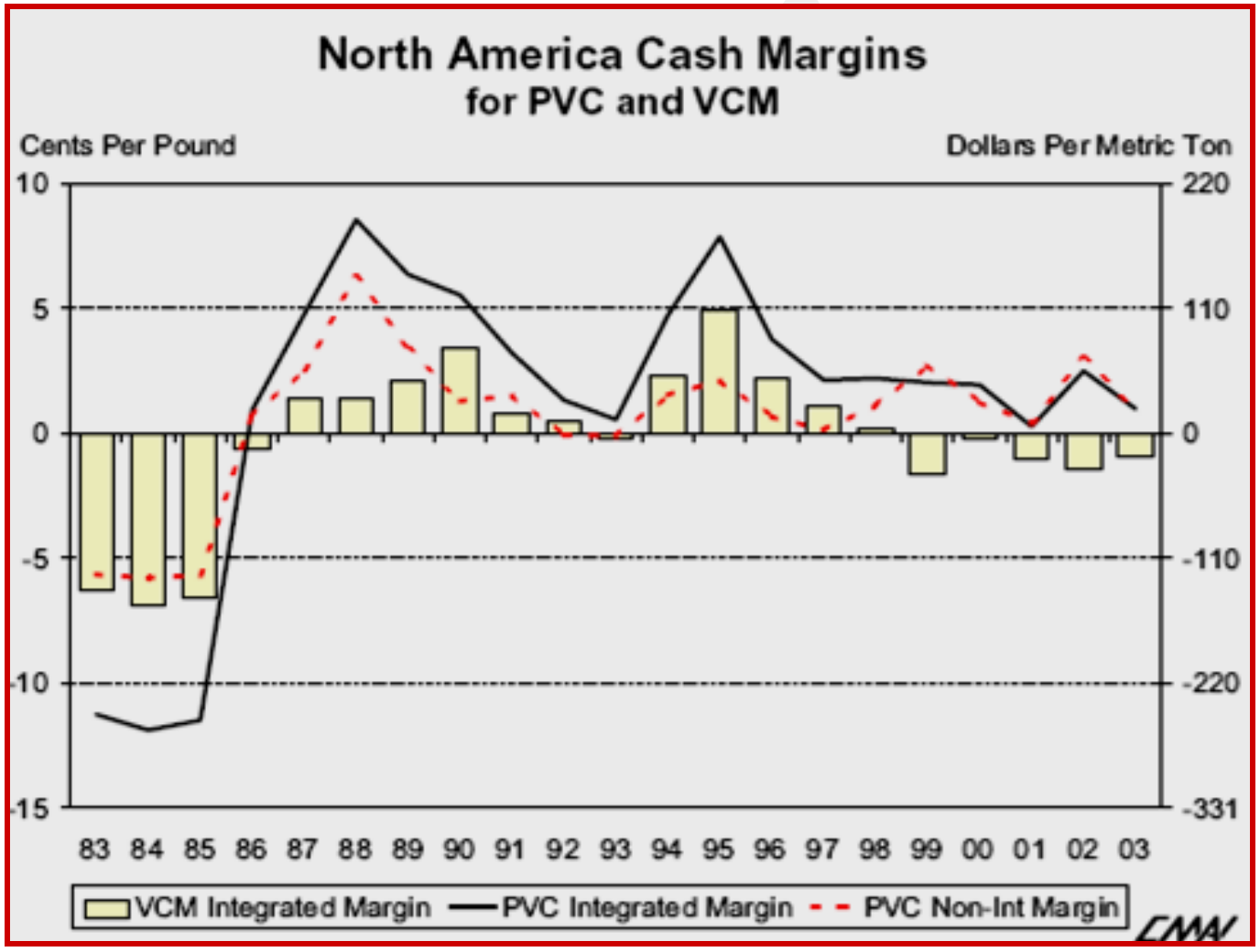
- PEMEX is the only producer of ethylene and VCM in Mexico. Does not produce PVC

- Pemex buys chlorine from a private company and sells them back VCM so they can produce PVC.

- PEMEX sells VCM at a price based in a market reference (not a deep one), that assumes that caustic is also sold by the VCM producer. When the price of chlorine is low (caustic price is high), PEMEX will always take a loss.

Cash Margins for PVC and VCM

Why should PEMEX need the approval of the workers union to do the obvious?



Source: World Vinyl's Analysis 2005, CMAI

II.1 THE SMALL REFINERY

Number of refineries in USA
Exist: 144
Operate: 134
Total Capacity 16.7 Mb/d
Largest Capacity: EXXON, Baytown, TX, 560,500 B/D

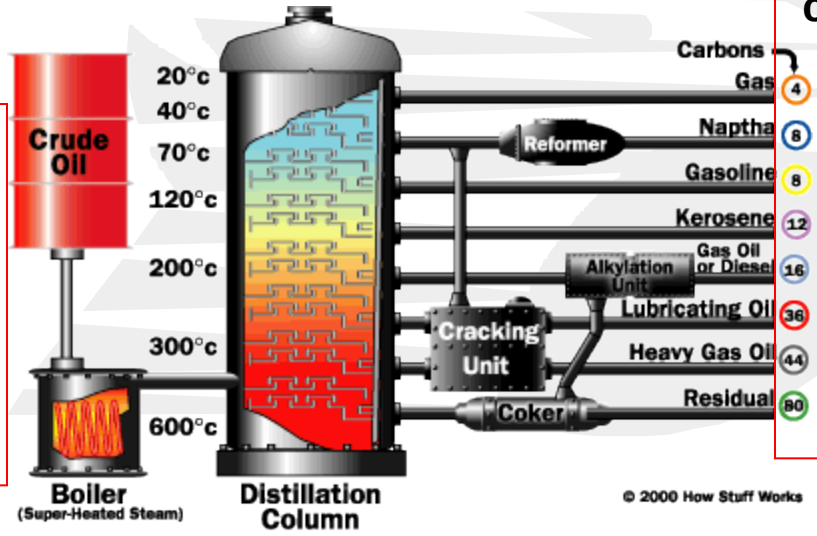
Many refineries with capacities below 30,000 b/d

PEMEX lost in 2011, $22 billion usd operating its refineries

Number of refineries in México

Exist and operate: 6

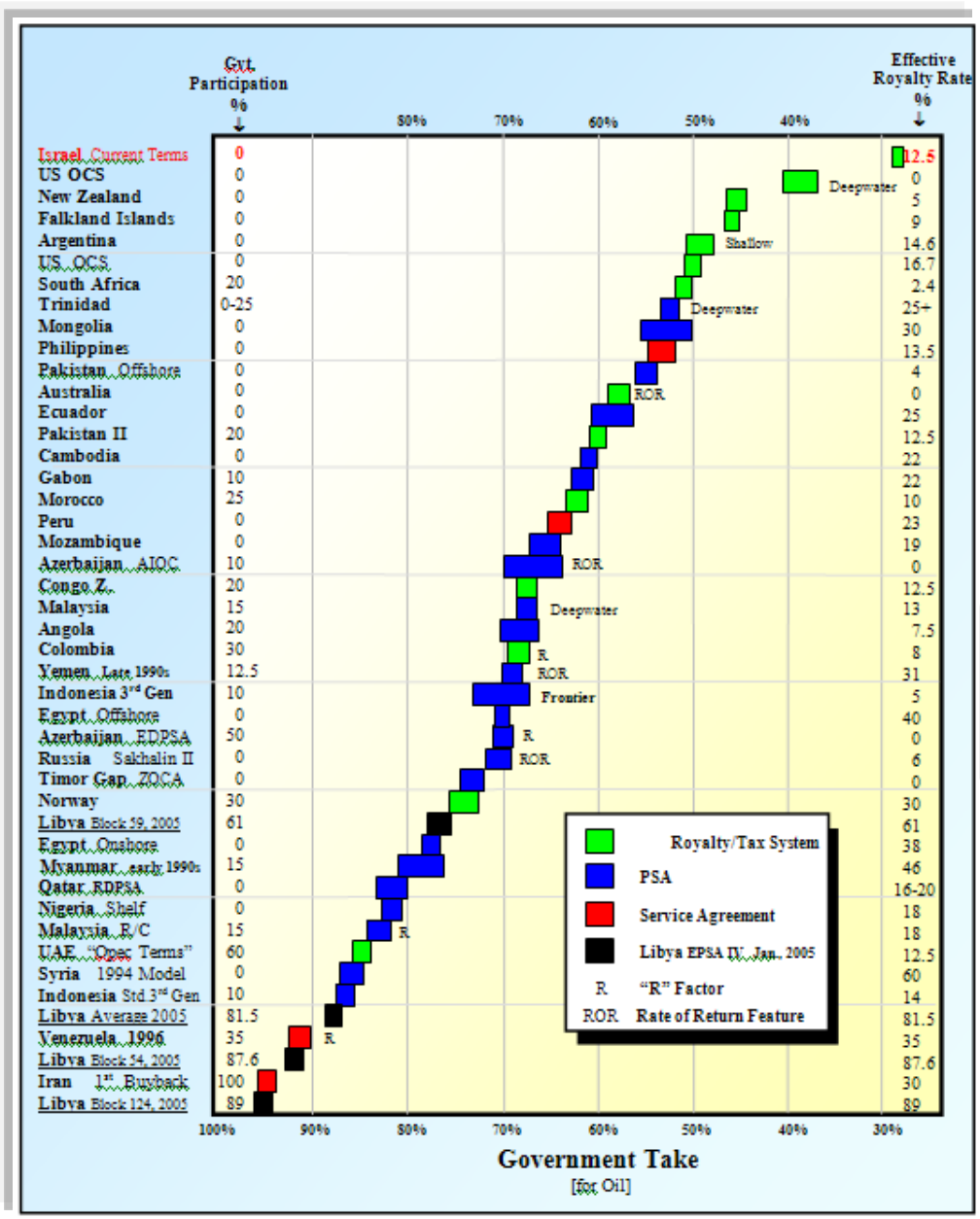
Total Capacity: 1.6 Mb/d



REQUIREMENTS

- CLOSE TO A PIPELINE TRANSPORTING CRUDE OIL, OR CLOSE TO OIL WELLS
- CLOSE TO CONSUMER OF REFINED PRODUCTS
- MODULAR PLANTS OF 10,000 B/D. EASY TO RELOCATE
- PRODUCE GASOLINE, DIESEL, KEROSENE, FUEL OIL. THE REST IS RE-INJECTED TO THE PIPELINE
- TWO DAYS TO INSTALL. ONE OPERATOR TO START-UP IN TWO HOURS
- FULLY AUTOMATIC. DOES NOT REQUIRE WATER, STEAM, AIR
- OPERATES WITH NATURAL GAS, DIESEL, FUEL OIL
- CAN INCLUDE A SYSTEM TO DESALINATE
- OPPORTUNITY FOR THE PRIVATE SECTOR IN MEXICO, LOWERING OPERATION AND LOGISTIC COSTS OF PEMEX. AND TO REFINE PRODUCTS NOT PRODUCED BY PEMEX (WAX, PARAFFIN, SPECIALTIES)

➢ III.1 A SHESHINSKI LAW FOR MÉXICO?



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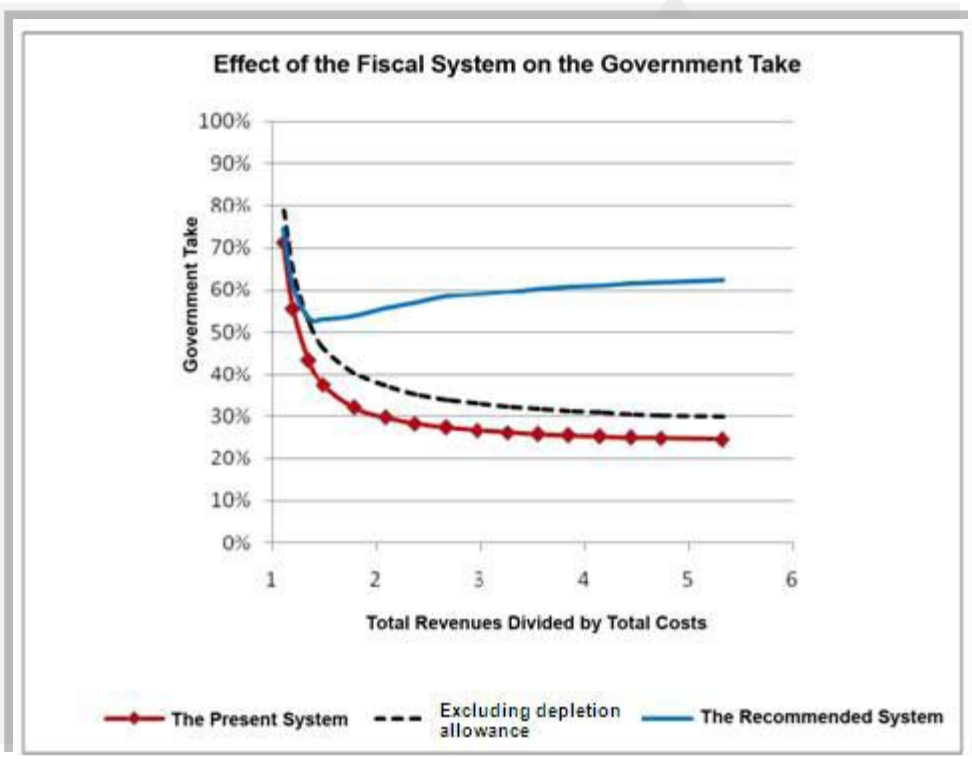

➢ III.1 ¿A SHESHINSKI LAW FOR MÉXICO?

➢ **THE STATE OF ISRAEL USED TO IMPORT ALMOST ALL OF THE NATURAL GAS AND OIL IT CONSUMED**

➢ **RECENTLY ISRAEL FOUND NATURAL GAS IN THE MEDITERRANEAN SEA. THE RESERVOIR MAY REACH CYPRUS**

➢ **ISRAEL MAY BECOME A NET EXPORTER OF ENERGY FOR THE NEXT 100 YEARS**

➢ **ISRAEL DID NOT HAVE FISCAL REGULATIONS TO TAX AN IN EXISTING OIL AND GAS PRODUCING INDUSTRY**

➢ **ISRAEL HIRED EITAN SHESHINSKI TO PROPOSE A WAY TO TAX THIS NEW INDUSTRY AND TO *MAXIMIZE THE STATE´S INCOME UNDER A FREE TRADE AND COMPETITION ENVIRONMENT***

➢ III.1 A SHESHINSKI LAW FOR MEXICO?

➢ **EITAN SHESHINSKI: ECONOMIST BY THE HEBREW UNIVERSITY OF JERUSALEM. PhD AT MIT. RESEARCHER AT STANFORD, HARVARD, PRINCETON, COLUMBIA, BROWN. ADVISOR OF SEVERAL COMPANIES.**

➢ **HONORS BY THE ECONOMETRIC SOCIETY, CAMBRIDGE, AMERICAN ECONOMIC SOCIETY. ADVISOR IN ECONOMICS FOR THE STATE OF ISRAEL, (MEXICO, 1986), MALAYSIA, BOLIVIA, RUMANIA.**

➢ **HAS PUBLISHED 4 BOOKS, 89 ARTICLES.**

➢ **HIS STUDY IN ISRAEL LED TO SUGGESTIONS TO THE GOVERNMENT AND EVENTUALLY BECAME LAW (SHESHINSKI LAW):**

- ➢ **LOW TAX RATES TO COMPANIES THAT EXPLORE AND PRODUCE NATURAL GAS/OIL DURING THE FIRST YEARS OF THE PROJECT.**
- ➢ **THIS LEADS TO A FASTER RECOVERY OF THE INVESTMENT AND IT IS EASIER TO FINANCE**
- ➢ **FISCAL CREDITS ACCORDING TO THE RISK AND DEPLETION OF THE PROJECT**
- ➢ **WITH TIME, TAXES ON PROFITS INCREASE AGGRESSIVELY. EVENTUALLY, THE STATE KEEPS MOST OF THE PROFITS OF THE PROJECT. (NO NEED TO EXPROPRIATE… AND BESIDES, PRIVATE COMPANIES OPERATE BETTER THAN THE GOVERNMENT)**

➢ III.1 A SHESHINSKI LAW FOR MÉXICO?

➢ **DURING THE LAST PRESIDENTIAL CAMPAIGNS IN MEXICO, WE PRESENTED THE SHESHINSKI STUDIES TO SENER, SHCP, AND THE THREE PRINCIPAL POLITICAL PARTIES**

➢ **LEFT WING LEADERS LIKED SOME IDEAS OF THE SHESHINSKI LAW, BUT WERE CONCERNED THAT PRIVATE COMPANIES WILL CHEAT AND DECLARE LOWER PROFITS THAN REAL. (WE ARE TALKING ABOUT CORRUPTION, BOTH IN THE GOVERNMENT AND IN THE PRIVATE SECTOR AS WELL)**

➢ **PROPOSAL: ESTABLISH MECHANISMS TO ASSURE TRANSPARENCY AND ALLOW THE PRIVATE SECTOR TO PARTICIPATE IN THIS INDUSTRY, AIMING TO INCREASE THE STATE´S INCOME**

➢ **ANOTHER CONCLUSION OF SHESHINSKI´S STUDY: HAVE THE GOVERNMENT INVEST THE PROCEEDS OF THE PROJECT ABROAD (AVOIDING OVERVALUATION OF ITS CURRENCY) AND PROHIBITING USING THESE FUNDS TO PAY ITS CURRENT EXPENDITURES UNTIL THE PROJECT HAS CEASED TO PRODUCE.**

IV.- CONCLUSIONS

- **NORTH AMERICA WILL BECOME A NET ENERGY EXPORTER IN THE NEAR FUTURE. JUST A FEW YEARS AGO WE ANALYZED INVESTMENTS TO IMPORT LNG.**

- **THE PETROCHEMICAL INDUSTRY IN NORTH AMERICA NOW HAS THE POTENTIAL TO GROW DRAMATICALLY, GENERATING ADDED VALUE TO NATURAL GAS AND ETHANE, WHILE CREATING MANY WELL PAID JOBS.**

- **MEXICO WILL NOT BE ABLE TO TAKE ADVANTAGE OF THIS OPPORTUNITY SIMPLY BECAUSE SHE IS LOCATED IN THIS REGION OF THE WORLD. WE NEED DEEP CHANGES AT PEMEX. WE NEED A LEGISLATIVE REFORM TO OUR ENERGY SECTOR, AND NOT JUST THE " ATTAINABLE POLITICAL REFORM"**

- **FIRST, A FISCAL REFORM IS NEEDED. OUR I.R.S COLLECTS LESS TAXES, AS A RATIO TO OUR GNP, THAN ANY COUNTRY IN CENTRAL AMERICA. THIS IS BEING USED BY THE LEFT WING PARTIES TO INSIST THAT PRIVATE COMPANIES SHOULD NOT PARTICIPATE IN THE ENERGY SECTOR, INSTEAD OF ESTABLISHING TRANSPARENT AND TIGHT FISCAL AUDITS.**

- **SECOND: WE SHOULD GRANT PEMEX AN AUTONOMOUS ADMINISTRATION, FREE FROM THE SECRETARY OF FINANCE.**

IV.- CONCLUSIONS

- **THE PETROCHEMICAL, NATURAL GAS AND REFINING ORGANISMS OF PEMEX SHOULD BE MERGED INTO A SINGLE COMPANY, ATTAINING SYNERGIES THAT TODAY ARE LOST.**

- **WE SHOULD ONCE AND FOR ALL ELIMINATE THE DEFINITION OF "BASIC PETROCHEMICALS" AND ALLOW THE PARTICIPATION OF THE PRIVATE SECTOR IN ANY PETROCHEMICAL AND OIL REFINING BUSINESS. WE CANNOT ACCEPT TO HAVE PEMEX LOOSING BILLIONS OF DOLLARS WHILE OPERATING ITS REFINERIES.**

- **PEMEX SHOULD BE FREE TO PARTNER WITH ANY COMPANY THAT CAN HELP HER INCREASE ITS PROFITS, REDUCE RISKS, ATTAIN BEST PRACTICES OF THE INDUSTRY.**

- **IMAGINE HOW RIDICULOUS IS IT THAT, BEING MEXICO LOCATED IN THE REGION OF THE WORLD WITH THE CHEAPEST NATURAL GAS , WE HAVE TO FORCE OUR INDUSTRIES (AUTOMOTIVE, STEEL, ELECTRICITY) TO OPERATE AT LOWER RATES BECAUSE PEMEX CANNOT SUPPLY ENOUGH NATURAL GAS. WELL IT HAS ALREADY HAPPENED.**

- **LET´S OPEN OURSELVES TO NEW IDEAS. LEARN FROM THE EXPERIENCE OF OTHERS. AT LEAST TO LISTEN TO EXPERTS IN THE FIELD, AND STUDY OTHER WAYS TO OPTIMIZE THE GOVERNMENT REVENUES FROM OIL EXPLORATION AND PRODUCTION IN A FREE COMPETITION ENVIRONMENT.**

- **CHALLENGES ARE OBVIOUS: CRUDE OIL PRODUCED IN USA AND CANADA IS LIGHTER THAN IN MEXICO, MORE ATTRACTIVE FOR THE REFINING INDUSTRY; OUR LOW COST LABOR ADVANTAGE IS INSIGNIFICANT COMPARED TO THE NATURAL GAS COST DIFFERENCE. WE URGENTLY NEED MORE INEXPENSIVE NATURAL GAS. MEXICO COULD END UP WITH OIL BUT WITHOUT ITS INDUSTRIES.**

- **OUR POLITICIANS DO NOT REALIZE HOW MUCH WE NEED TO HURRY.**