

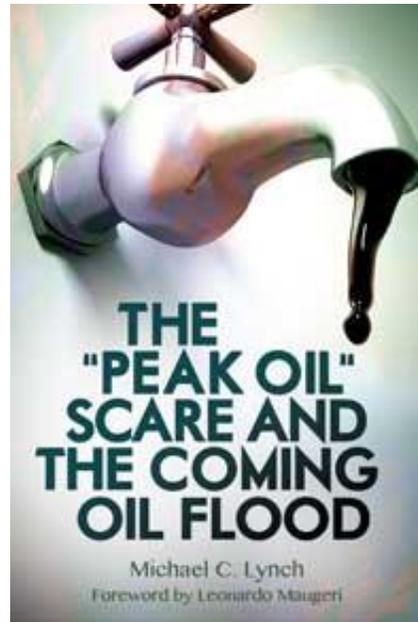
COPING WITH RISK IN THE LNG BUSINESS

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THE BOOK IS FINALLY HERE! (JULY 2016)

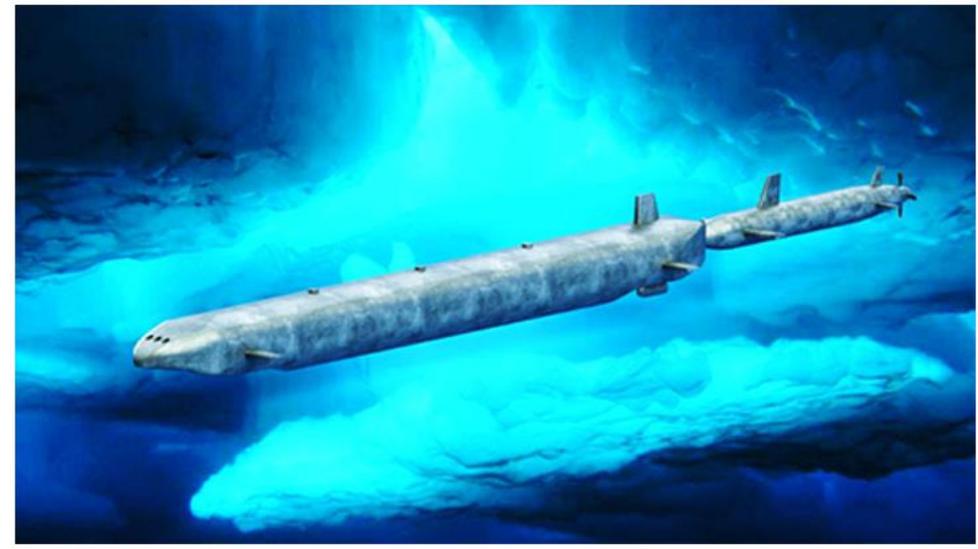


THE GOOD NEWS

- ▶ DEMAND POTENTIAL IS ENORMOUS
 - ▶ GAS IS CLEANEST FOSSIL FUEL
 - ▶ BILLIONS HAVE NO ACCESS TO RELIABLE POWER/COMMERCIAL ENERGY
 - ▶ HUGE AMOUNTS OF COAL CONSUMED FOR POWER
 - ▶ BUT PRICE MATTERS
- ▶ RESOURCE IS ENORMOUS
 - ▶ EVEN WITHOUT U.S. SHALE
 - ▶ PRODUCTION COSTS CHEAP
 - ▶ MOST REQUIRES EXPENSIVE TRANSPORT

EXTRAVAGANT FAILURES

- ▶ NORTH STAR/SIBERIA
- ▶ ALASKAN NORTH SLOPE
- ▶ ALGERIA-US
- ▶ DOME PETROLEUM
- ▶ ENRON-DABHOL



Plans to export LNG from Alaska and Siberia in the 1970s, including by submarine, never went far; the Algeria contracts with the U.S. were cancelled by FERC order; Dome Petroleum's plan to send gas from the Canadian Arctic to Pacific customers failed, and Enron's Dabhol contract, intended to sell clean, reliable but expensive electricity to India, failed. Although they had a contract which they thought meant a guarantee, politicians forced a renegotiation.

RISKS



Politicians, regulators, and
Activists of various kinds
All create risks for buyers
And sellers of LNG.





RISKS CAN BE MITIGATED, BUT NEVER ELIMINATED WHILE PEOPLE ARE INVOLVED.

THERE IS ALWAYS RISK

- ▶ THE ECONOMY AND WEATHER: VOLATILE AND UNPREDICTABLE
 - ▶ HOT SUMMERS/COLD WINTERS CAN SPIKE US PRICES
 - ▶ REVERSE CAN COLLAPSE LNG DEMAND IN EUROPE OR ASIA
- ▶ POLITICIANS/GOVERNMENTS: VOLATILE AND UNPREDICTABLE
 - ▶ OFTEN ANTI-OIL, NOT RATIONAL
- ▶ PRICES: DITTO

THE GOOD OLD LNG DAYS

- ▶ FEW ACTORS (BUYERS OR SUPPLIERS)
- ▶ LONG-TERM CONTRACTS
 - ▶ HIGH TAKE OR PAY
- ▶ PRICE INDEXED TO CRUDE OIL
- ▶ DESTINATION RESTRICTIONS
- ▶ SPOT MARKET ALL BUT NON-EXISTENT
- ▶ MINIMAL COMPETITION
- ▶ OIL PRICE THE MAIN RISK
- ▶ BUT:
 - ▶ DEMAND RESTRICTED BY HIGH PRICES
 - ▶ MANY PROJECTS HAD LENGTHY DELAYS

THINGS THAT DIDN'T WORK THEN *BUT DO NOW*

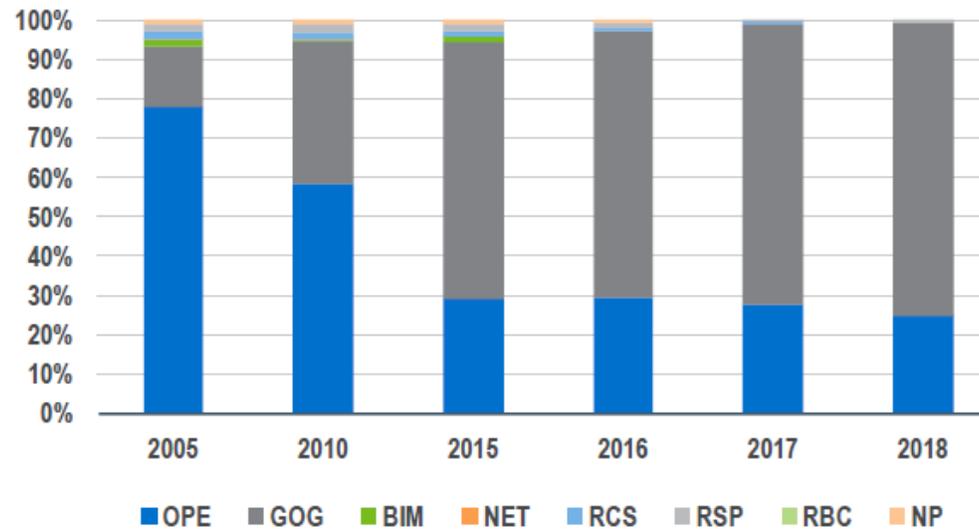
- ▶ ARCTIC/SIBERIAN LNG
- ▶ FLOATING LNG PLANTS
- ▶ FLOATING STORAGE AND REGASIFICATION UNITS
- ▶ MEGA-PROJECTS (SOMETIMES)
- ▶ N. AMERICAN EXPORTS

NOW

- ▶ MANY BUYERS, SELLERS
 - ▶ SMALL-SCALE SALES CAN ADD UP
- ▶ MORE SPOT SALES
- ▶ LESS DESTINATION RESTRICTIONS
- ▶ DECREASING USE OF OIL PRICE INDEX
- ▶ DEMAND RISK GROWING
 - ▶ INCREASING SEASONAL IMPACT
- ▶ **MORE GAS ON GAS COMPETITION**
 - ▶ SPOT LNG
 - ▶ PIPELINE (ESPECIALLY RUSSIAN)
- ▶ MORE COMPETITION WITH CHEAP COAL (CHINA/INDIA)

PIPELINE GAS USUALLY NOT OIL PRICE INDEXED

Figure 1.2 Europe Price Formation 2005 to 2018



Source: International Gas Union, Global Gas Report 2018

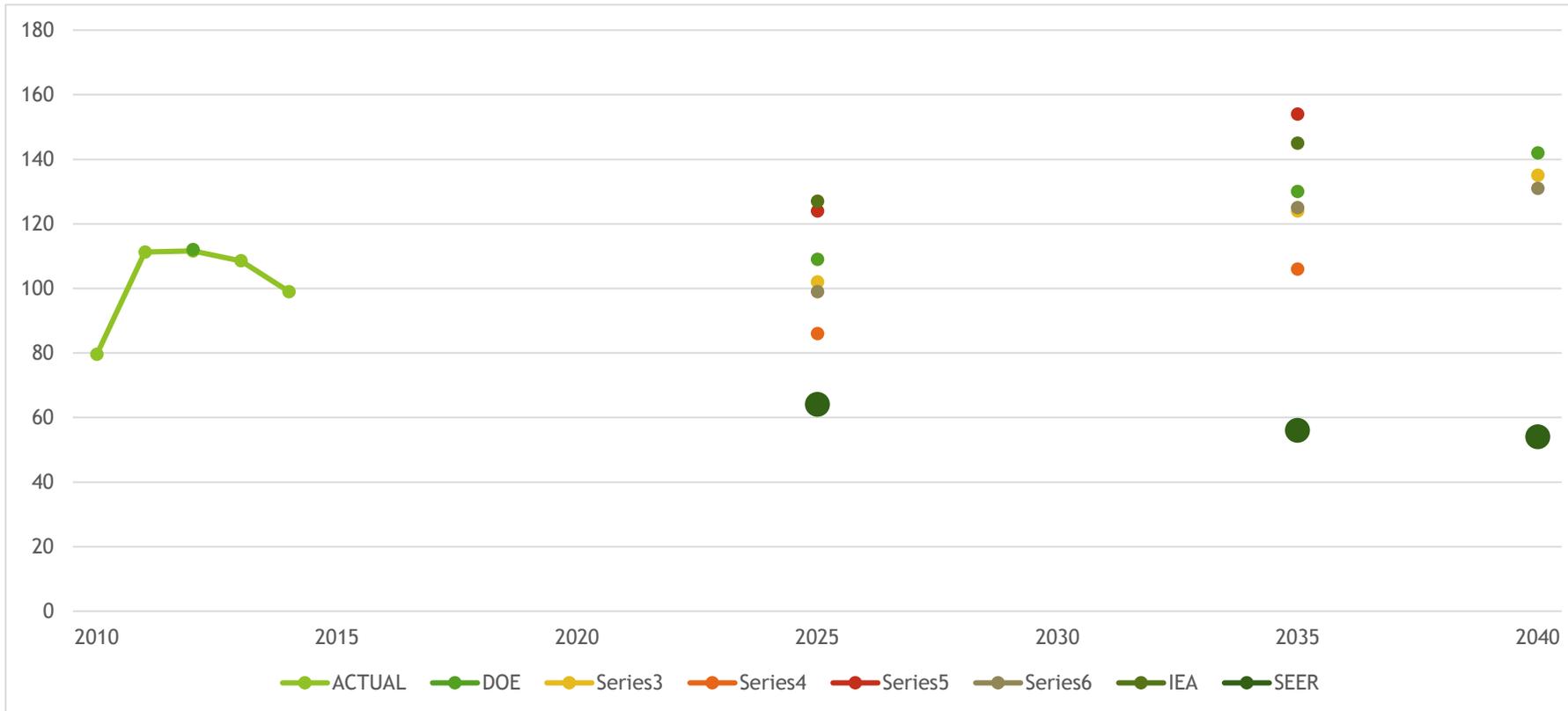
GOG IS GAS ON GAS PRICING

Pipeline gas, as from Russia, is usually more competitive than LNG and now usually is not indexed to oil prices.

IRRATIONAL EXUBERANCE

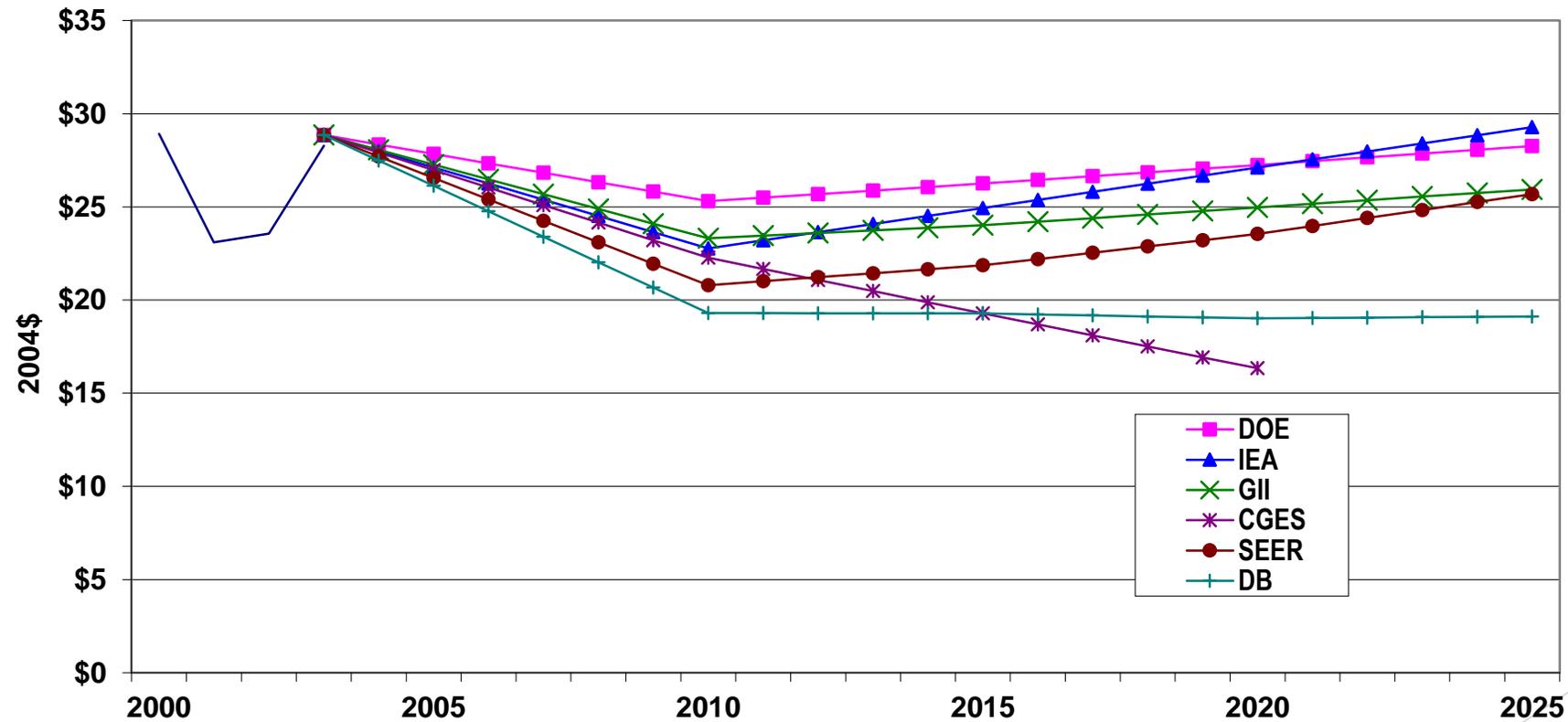
- ▶ CAUSES:
 - ▶ DESIRE TO DO SOMETHING
 - ▶ HIGH PRICES/EXPECTED HIGH PRICES
- ▶ OVERBUILDING
 - ▶ 1970S ERA EXPORT PLANS
 - ▶ US REGASIFICATION BOOM IN 2000S
- ▶ BLIND OPTIMISM
 - ▶ ENRON DABHOL PROJECT

2014 OIL PRICE FORECASTS (SPOT THE DRUNK)



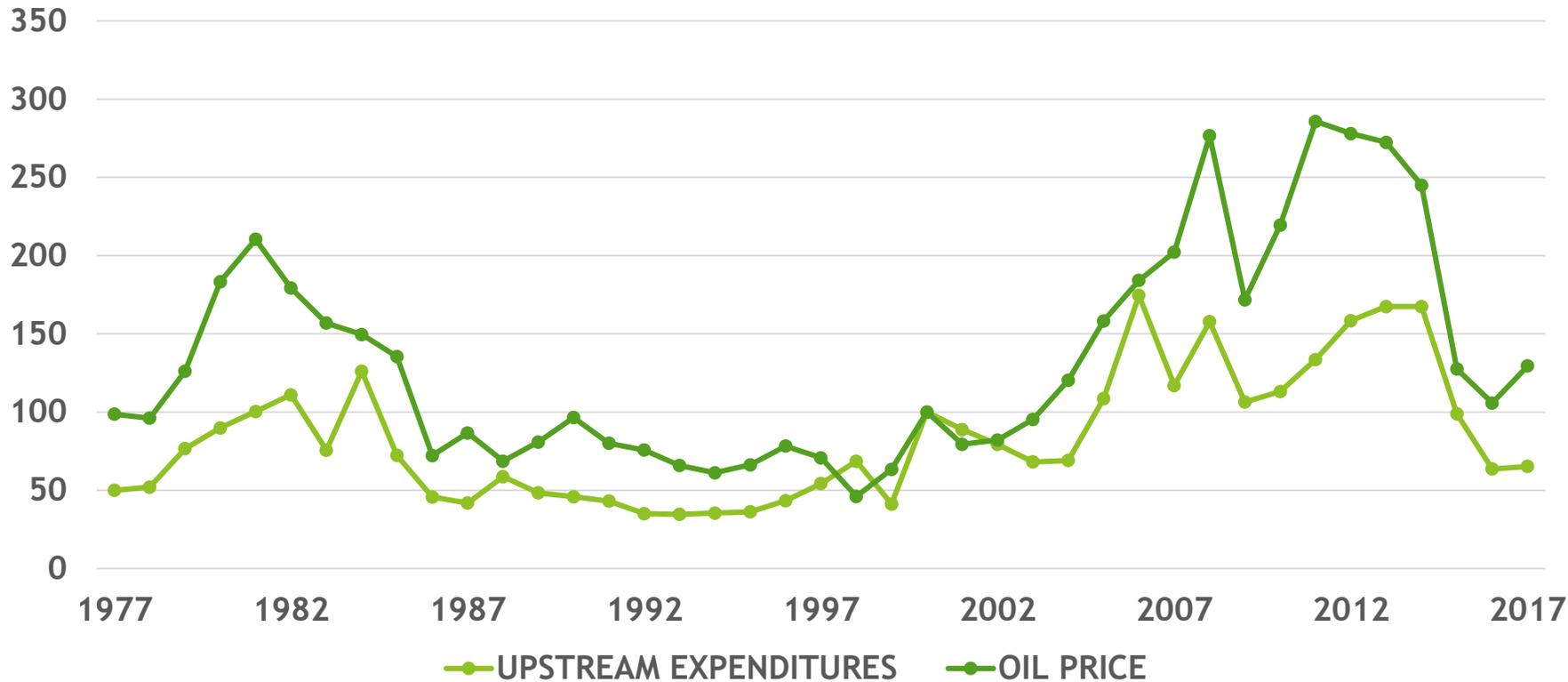
When oil prices were \$100/barrel, there was broad consensus that this was the new floor price, Because the marginal barrel supposedly cost \$100. This was invalid thinking, but those like me With low oil price forecasts were derided as idiots or drunk. 2014 DOE oil price survey

PRICE FORECASTS 2004 / 2005



In fact, many of those forecasting \$100+ oil prices thought, a decade Earlier, that prices would stay flat for the next two decades.

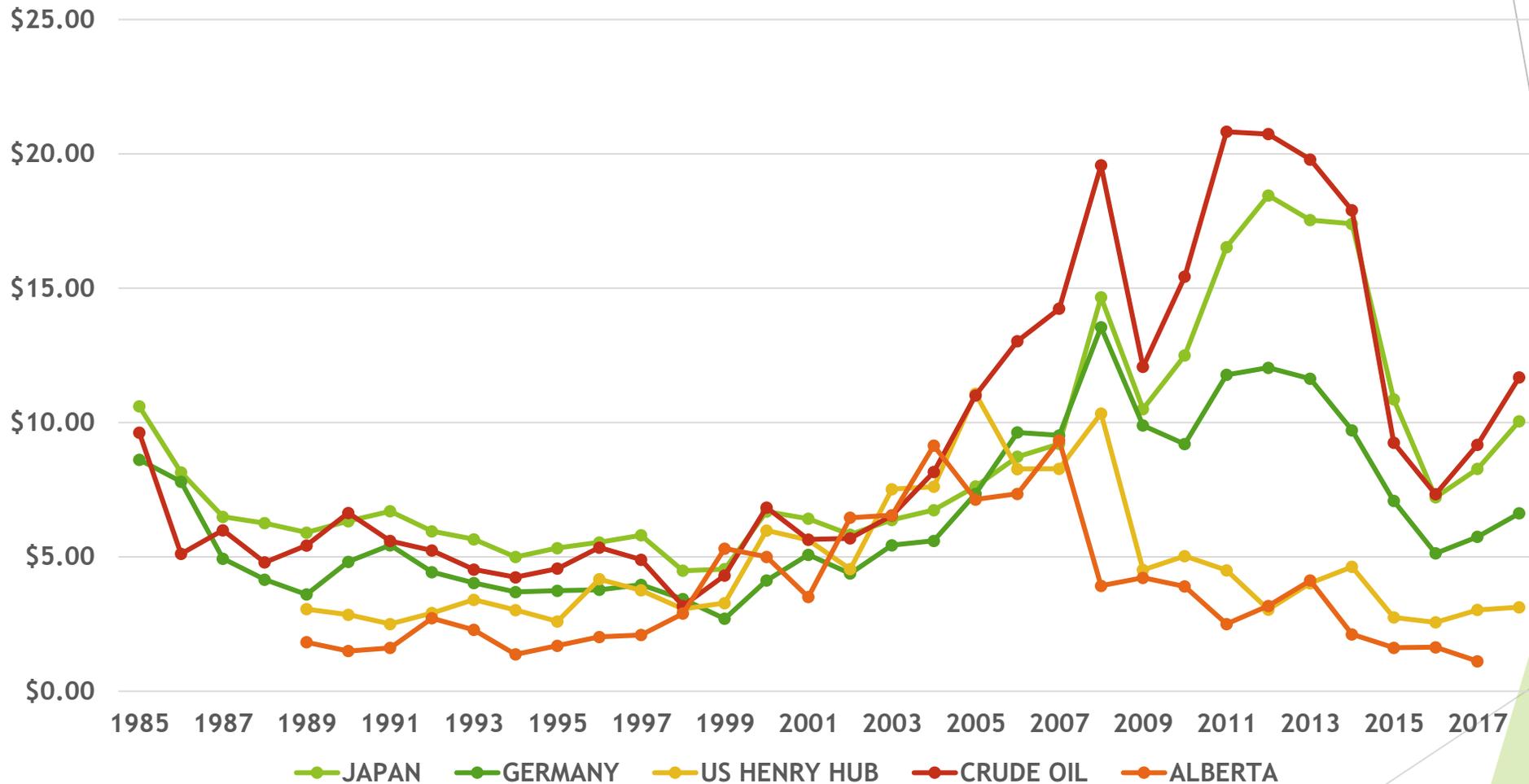
WHAT DRIVES SPENDING?



SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION.

Despite extensive planning, spending closely follows prices and revenue. When prices are abnormally high, this could be considered irrational exuberance.

GLOBAL GAS PRICES 2018\$/MMBTU



See: "Uncertainties Threaten Natgas Development," *Oil & Gas Journal*, 3/4/13.

Much of the recent interest in US LNG exports began when LNG prices in Asia were exceptionally High, but much of that was transient: due to oil supply disruptions and the Fukushima disaster

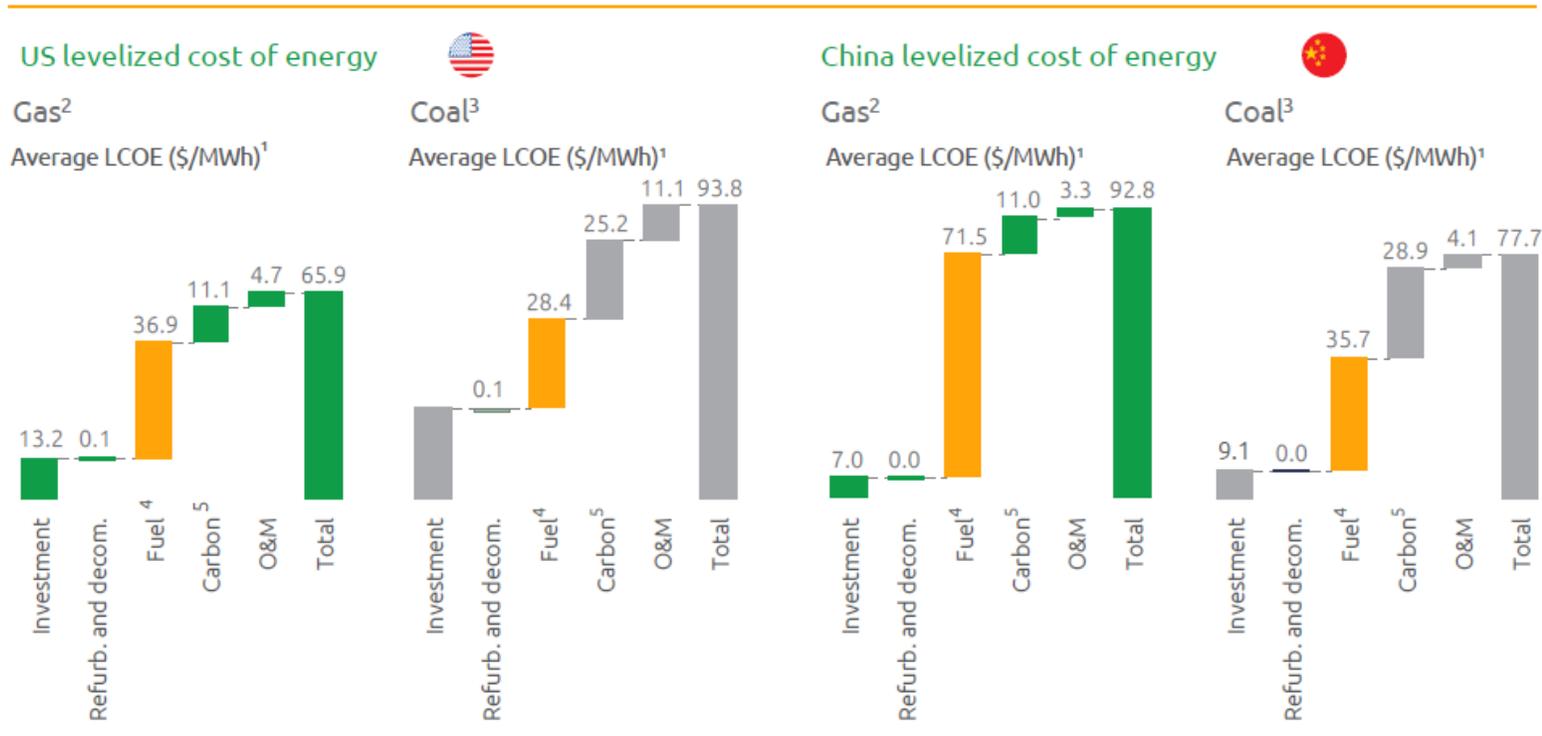
POLITICAL RISKS NOW

- ▶ FRACKING OR FLARING BANS
 - ▶ EXPORT BAN
- ▶ PRICES
 - ▶ MORE MARKETS, MORE PRICES
 - ▶ DIVERGENCE FROM MARKET IS RISKY
- ▶ COAL COMPETITION
 - ▶ CHINA/INDIA ESPECIALLY
- ▶ PRODUCING GOVERNMENT MISBEHAVES
 - ▶ ASSASSINATES DEFECTOR
 - ▶ STARTS TRADE WAR

PRICE MATTERS!

- ▶ INTANGIBLES ARE RELEVANT
 - ▶ BUT OFTEN SECONDARY
- ▶ CLEAN ENERGY IS GREAT
 - ▶ BUT INDIA MOSTLY PREFERS CHEAP ENERGY
- ▶ DIVERSIFICATION MATTERS
 - ▶ BUT EUROPE HAS LONG HAD A HIGH DEPENDENCE ON RUSSIAN GAS
- ▶ QUESTIONS ALWAYS ARE:
 - ▶ HOW MUCH WILL PEOPLE PAY COMPARED TO MARKET PRICE?
 - ▶ CAN THAT CHANGE?

PRICE COMPETITION WITH COAL IN CHINA

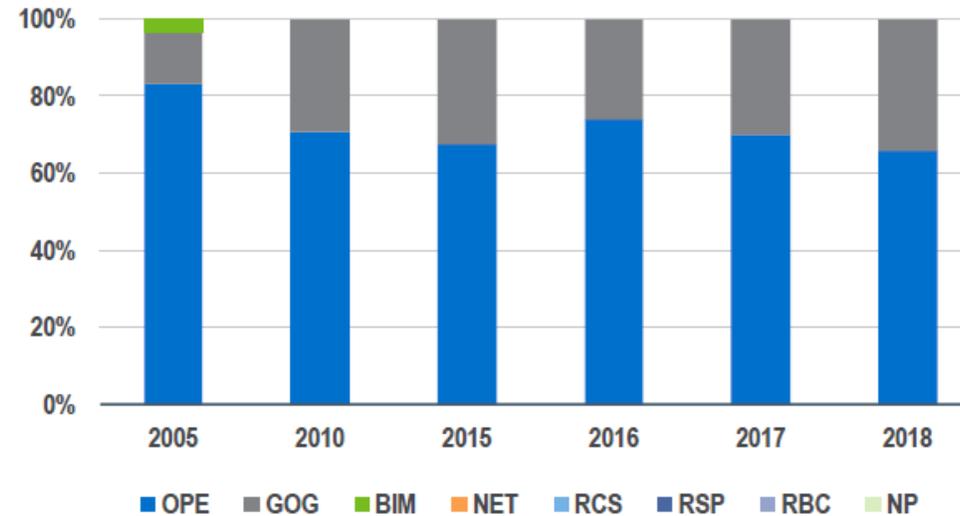


Source: International Gas Union, Global Gas Report 2018

Coal-fired power in China, for example, is still much cheaper than gas-fired power, Especially if carbon costs are excluded.

LNG STILL RELIES ON OIL PRICE INDEXING

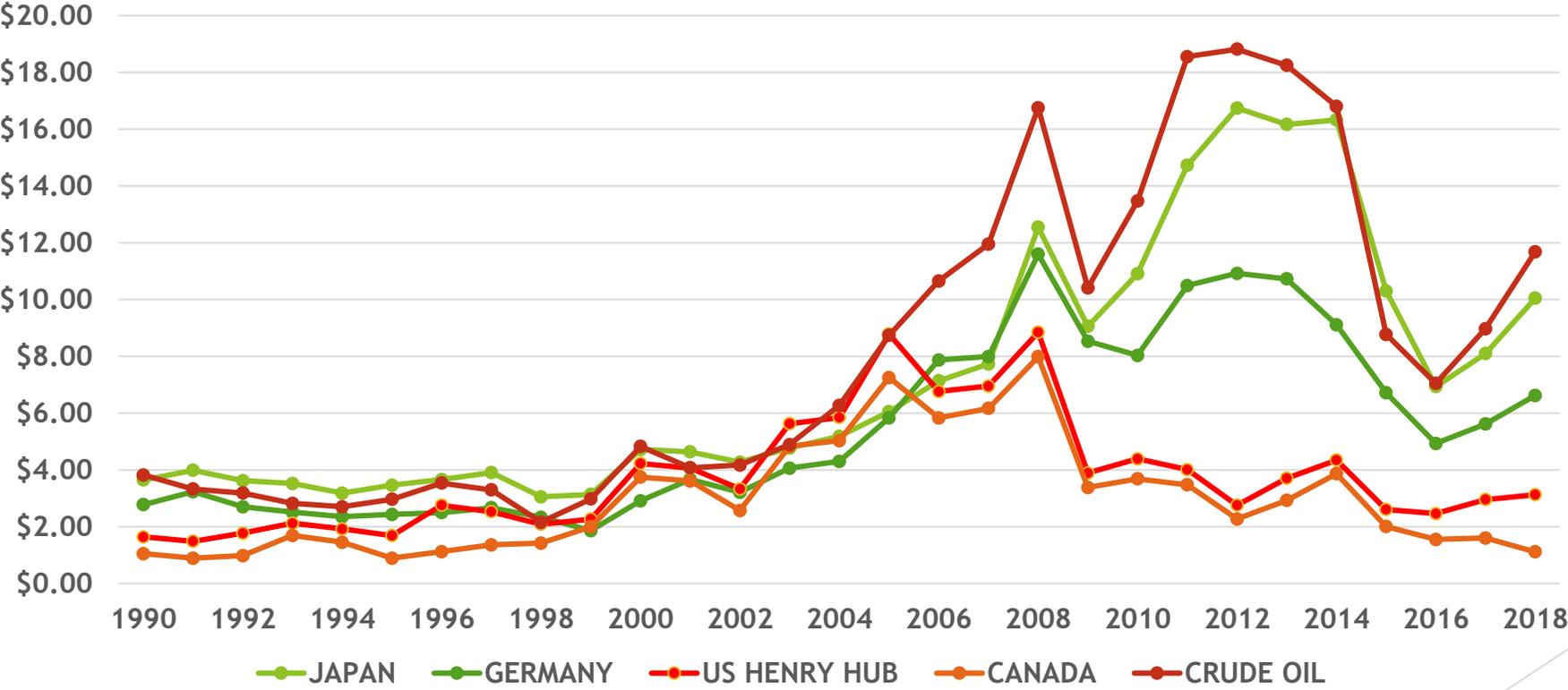
Figure 3.12 World Price Formation 2005 to 2018 – LNG Imports



Source: International Gas Union, Global Gas Report 2018

Most LNG sales continue to rely on contracts with oil-price indexing, meaning the projects are subject to the vagaries of the oil markets, not their own economics.

GLOBAL GAS PRICES \$/MMBTU



NOT PERFECT SOLUTIONS

- ▶ IRON-CLAD CONTRACTS GOOD
 - ▶ BUT THINGS RUST
- ▶ GOOD POLITICAL RELATIONS
 - ▶ POLITICIANS AND GOVERNMENTS CHANGE
- ▶ MONOPOLY CUSTOMERS
 - ▶ SUBJECT TO POLITICS
- ▶ CHEAP RAW MATERIAL IS BEST

THE ROLE OF CONTRACTS

- ▶ PROVIDE SOME PROTECTION
- ▶ PROVIDE HIGH DEGREE OF CERTAINTY
 - ▶ DEPENDING ON MARKET CONDITIONS
- ▶ ALLOCATE RISKS

TAKE OR PAY CAN BACKFIRE



The Fourth Crusade failed because The Crusaders agreed to a 100% take or Pay contract with the Venetians, who Transported them. When many Crusaders Took alternate routes, the remainder couldn't Cover the contract and instead helped the Venetians conquer (and sack) Constantinople.

COPING WITH PRICE RISK

▶ BUYER:

- ▶ INDEX TO COMPETITION
 - ▶ NOT CRUDE OIL
- ▶ RE-OPENERS

▶ SUPPLIER

- ▶ HAVE CHEAP GAS
 - ▶ GUARANTEED PURCHASE PRICES
- ▶ SELL TO MONOPOLIES
- ▶ RE-OPENERS (FOR FEED GAS)

SUPPLIERS:

- ▶ DIVERSIFY CUSTOMERS BY:
 - ▶ LOCATION
 - ▶ TYPE
 - ▶ COMPETING FUELS
- ▶ INCREMENTAL ADDITIONS BETTER THAN LARGE GREENFIELD
- ▶ LOCK IN BUYERS
 - ▶ BUT NOT TOO TIGHT
- ▶ BE FLEXIBLE

BUYERS

- ▶ DIVERSIFY SUPPLIERS
 - ▶ NO ONE IS COMPLETELY TRUSTWORTHY
 - ▶ COMPETITION GOOD FOR BUYERS
- ▶ KEEP PRICES COMPETITIVE
 - ▶ IF YOU CAN'T PASS THROUGH AND MAYBE IF YOU CAN
- ▶ MAINTAIN FLEXIBILITY
 - ▶ STORAGE
 - ▶ AVOID DESTINATION RESTRICTIONS
 - ▶ CONTRACT RE-OPENERS

AVOIDING IRRATIONAL EXUBERANCE

- ▶ RESIST TEMPTATION TO JUST DO SOMETHING
- ▶ DON'T INVEST BASED ON CURRENT PRICE
 - ▶ THEY FLUCTUATE
 - ▶ COMPETITIVE FUELS AS WELL
- ▶ DON'T EXPECT OTHERS TO DO WHAT YOU WANT
 - ▶ ESPECIALLY DON'T ASSUME NO PRICE COMPETITION
- ▶ THE IMPOSSIBLE KEEPS HAPPENING
 - ▶ US NATURAL GAS EXPORTS
 - ▶ OIL PRICES BELOW \$100
- ▶ RELIANCE ON INTANGIBLES IS RISKY

▶ MEASURE TWICE, CUT ONCE