Design Considerations for a Shock-Hardened Deepwater Drilling Rig, and Plausibility Argument For the Loss of the Deepwater Horizon Drilling Rig

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Background: *The author has a unique design experience background of over 40 years as both a design engineer of Naval combat weapons systems, as well as drilling rigs, piping systems (ships and submarines, oilfield processing, nuclear power plant, industrial), offshore oil platforms, as well as fate and transport of underwater and airborne plumes and developing blast protection coatings/windows for the Air Force's Force Protection Branch at Tyndall AFB. There are validated designs which can withstand very high conventional air blast loadings as well as protective blast coatings (blast coatings applied to decks/walls). The author also supported the Saturn-Apollo space program and structural design of C5-A fuselage in the late 1960s.*

WWII resulted in many ships (naval surface combatants, subs and commercial tankers) being totally disabled by non-contact underwater explosions and/or air blast loadings (near miss). Also systems on one end of the ship were being knocked out by a bomb hitting another part of the ship, due to the severe shock loadings (think earthquake "g" loads multiplied by a factor of 10X, 50X or 100X). As a result, research in underwater explosions was intensified, and in December 1946, the Underwater Explosions Research Division (UERD) was established by Dr. Alfred Keil (the Division's First Director). Dr. Keil came from Wood's Hole Oceanographic Institute, and wrote the classical paper on Underwater Gas Bubble Dynamics (gas bubbles that form underwater from an explosion, and can attach themselves to a ship's hull and cause huge damage or sink the ship). This explains why we are using so much dispersant to dilute the huge methane gas bubbles. It is necessary to protect the surface ships such as Discovery Enterprise. Also, huge methane gas bubbles under a ship can cause a sudden buoyancy loss causing a ship to list suddenly, or worse). Think of equipments being hit on the bottom by a large, fast moving sledge hammer and still having to work. Literally nothing in a home is designed to these standards (not required and high cost). In a war zone, you need all the

protection you can get against blast loadings as we have seen from IEDs in Iraq and Afghanistan.

Therefore, the total safety design of a 'deepwater drilling system' must take into account the shock/blast hardened design of the subsea well head piping/BOP (need a standardized worldwide industry design). Well hub connectors need to be completely redesigned to protect against both casing blowouts and the BOP being simply pulled-off by a displacement of the drilling rig. The stub piping at the seabed to hold the wellhead hub may need to have some type of energy absorbing material/design to resist vertical casing movements (something totally other than cement needs to be done) and shock loading by piping being blow-out. The BOP needs to be redesigned against well head blowouts and piping/casing being blown-out thru the center of the BOP, breaking of internally machined parts/shoulders, hydraulic connectors, shear/blind rams and valves (need for independent marine armored cabling/electrical connectors need to be redesigned), shock test qualification of BOP, (either new or refurbished) needs to be conducted (not just steady state pressure applications, but transient pulses).

Executive Summary:
Since deepwater drilling rigs operate in "harm's way" in a manner similar to naval surface combatants which can be subjected to underwater explosive loadings, it is proposed that the **lessons learned over decades by the U.S. Navy** in shock testing, shock qualification and shock mounting of all types of naval shipboard equipments (piping, electrical, motors, storage tanks, antennas, propulsions systems, fans, generators, winches, cable systems, deck edge elevators, control systems, etc) be applied in all future designs of deepwater drilling rigs, and that there be a "QPL" (Shock Qualified Parts List) developed in the future as to only Mil-type certified equipments being used in all future deepwater drilling rig worldwide.

There is also **an immediate payoff** in using naval shock test machines (including tailoring shock test protocols as well as the Office of Naval Research's Lightweight and Heavyweight Shock Test Machines – see MIL Std 901-C for Shock Qualification of Equipments) as well as Floating Shock Test Platforms (barges) and special structural design codes (called Dynamic Shock Analysis) to **initiate an aggressive equipment shock qualification program of all onboard deepwater drilling rig equipments.** It is possible that the initial water/blast loading (from casing coming thru the drill deck

floor or well bore gas coming up thru the BOP and riser piping) could have caused an immediate failure of some or all BOP circuit breakers, electrical switches/controls, broke hydraulic lines (at connectors), shorted motors/pump armatures, cracked valve bodies either at the drill rig floor and/or seabed. None of the equipment on a drilling rig has ever been designed for shock/explosive loadings because there is no Federal Standard.

President Obama has stated this is a war, and indeed it is. **These very large surface combatants (we call them Deepwater Drilling Rigs) are operating in an explosive environment where they can be both subjected to underwater blast loadings as well as airborne explosions – think of them being in a "war zone."** During the shock loading to the drill deck, the drill pipe that is "racked" can fall over on everything below. There are no systems currently in place to hold any drill pipe in event of shock loading to the deck. We can no longer afford or permit the mentality of "abandon the rig" for deepwater operations if something catastrophic happen. If the drilling rig cannot maintain station-keeping (as in the case of the Deepwater Horizon) during a large explosion event, the rig can capsize. If it moves very far laterally to get out of the burning pool of water it can pull a BOP entirely off the wellhead.

Remarks: (for Navy's Current Shock Test Facility)
Dynamic Testing Inc, Rustburg Va
(http://www.dt.navy.mil/sites/uerd/appliedmechanics.html)

Read the write-ups on Applied Mechanics Branch on current computer code methodologies, see ship models, and envision a total computer structural model of a Deepwater Drilling Rig. The model can be subjected to both wellhead casing coming through the drill deck in a wellhead blowout, to develop deflection/energy absorbing drill decks, as well as determining mission critical failures from explosive methane wellhead blow-outs on drill rigs), as well as developing steel hardened retrofits. (These are called ConFlag Quarters inside the Hanger Deck of our modern Aircraft Carriers, designed to totally protect personnel and to conduct firefighting from hardened position – nothing like this exists in current drill rigs). The "thick windows are special composite" and are hardened to withstand high blast loadings (called ordinance) in case of cook-off of explosives.

Read the write-ups on the Engineering and Testing Branch which include full-scale testing of naval surface combatants (see recent ship shock testing of USS Mobile Bay – prophetic?). Envision that the deepwater oilfield majors would have to eventually build and certify with a full-scale drilling rig subjected to both an underwater shock test (simulating a wellhead blowout), and an air blast test at the drill deck simulating the Deepwater Horizon blast. The mission critical equipments (previously shock designed and already shock qualified) have to remain operational (with whatever redundancy is required) after the event.

We can have the best designed BOP in the world (triply redundant, shock hardened, etc., but if the drill rig floor is also blown-out before it can be activated, and/or cabling to the BOP is severed because the well head casing pipe came out, it accomplishes nothing. It has to be a total safe systems design. At this point, we are literally at the stage of going into a deepwater war with WWII (non-shock hardened) equipments which are totally failing in the initial engagement, because **nobody has ever addressed this aspect of hardening equipments for the war zone (drilling in deepwater).**

Plausibility Argument for Loss of Deepwater Horizon Due to Underwater Shock Waves/Underwater Reflections From Drilling Legs Due to Explosion

The drilling rig such as the Deepwater Horizon has a very unique geometry regarding impinging underwater shock wave(s). It looks like a "floating elephant" with its four large legs penetrating down into the water. Here is what can happen with this very complex geometry when the explosion on the drill rig floor sends a subsequent shock wave back down a large gas column in the water beneath the drilling rig (think of lighting a huge Bunsen burner underwater). We know that a great amount of methane gas is being given off by this blown-out well, and a recent study suggests it may be 8X greater than normal for a Gulf of Mexico well. Therefore, at the time of the blow-out, there was a large methane gas going deep below the surface the Deepwater Horizon which also "exploded" under the water (think of a huge methane chemical plant exploding under the water). The resulting underwater shock wave not only directly hit all four legs underwater with a huge pressure, but it also immediately reflected off the two closest legs back into the two farthest legs from the explosions. Since this all happens in milliseconds, two of the legs of the Deepwater not only received the direct shock wave from the underwater explosion, but also received the reflected

shock wave off the steel legs meaning it was 2X (or worse as there are multiple reflections/cancellations) higher on two of the drilling legs on the same side. This is why the Deepwater Horizon may have started to capsize on one side as there was higher damage to the underwater hull plating and welds. The U.S. Navy requires full penetration welds in steel plates to resist underwater shock loadings. There is no such specification for semi-submersibles and drill ships. Semi-submersible and jack-up drilling rigs are at much greater risk to underwater explosions because they have much greater "hull area" exposed, and they have an unusual geometry. Conversely, a single (mono) hull surface ship does not suffer multiple hits from any reflections of an underwater shock wave.

There is no qualified expertise in this area within the oilfield industry, MMS, Dept. of Interior, or Dept. of Energy. This is a very specialized branch of not only underwater shock physics but also structural dynamics, mechanical engineering, HME equipment design and naval architecture design, requiring highly skilled experts to access and come up with possible recommendations.

Proposed Changes to Keep Legacy Drilling Fleet Operational

For the current legacy fleet of deepwater drilling rigs to keep operating, an immediate assessment of the shock hardness of all mission critical equipments (test and evaluation) needs to be done, and immediate replacement of all unacceptable equipments subject to high failure rates is required. The grating on all of the decks needs to have much stronger tie-downs to avoid becoming flying steel missiles during an explosion, as well as leaving gaping holes in possible escape routes off the rig. New shock-absorbing pipe hangers need to be installed on piping runs (also check electrical conduit runs). Shock hardened circuit breakers/electrical connectors probably need to be installed as well as possibly fire monitors and alarms. Isolation of the entire control system of the BOP needs to be assessed with armored cabling and redundant and hardened hydraulic systems, and backup battery systems located in specialized ConFlag Quarters (off the Drill Rig Floor). It may be possible to spray a thin, urethane blast coating underneath large flat plating areas of the rig (including diesel tanks) to try and mitigate the damage from topside air blast (contact Force Protection Branch at Tyndall AFB for details). Blast

windows/portholes need to be installed in quarter's buildings, bridge, etc., as well as selective blast panels.

Proposed Changes to Federal Regulations for New Generation of Drilling Rigs

The design of a shock-hardened drilling rig fleet requires massive changes to the existing Federal Regulations, and it may be in the future that only drilling rigs fabricated and tested to new Federal Regulations for shock-hardened, deepwater systems will be the only ones certified in the next five years to ever drill in deepwater, together with new and shock qualified BOP system. This should be at least considered by all Governments worldwide.

The "UERD Community" is a very small group of highly qualified engineers/scientists (many now retired). It is possible Dr. Chu (Sec. of Energy) does not currently have anybody qualified from this "UERD" area on his team to assess the shock hardness of mission critical equipments. The whole Congress needs to get up to speed with what's really required to go into a war zone with a naval surface combatant (in this case a deepwater drilling rig) and survive. If you don't understand it, then don't vote for changes to deepwater moratoriums until you do.

Bottom Line:

1. The story by Ken Salazar/MMS of "we will recertify" the same "deepwater systems" and/or equipments and tell the public there is an acceptable risk in deepwater drilling should come under close scrutiny by Congress. Where in MMS or Dept. of Interior are there any published "reliability numbers" addressing the current deepwater drilling systems"? The risks associated with a wellhead blowouts in deepwater have not been quantified. Show the public how you can even get to a Reliability of 0.9 for a Cameron BOP/Deepwater Horizon Drilling Rig, much less a Reliability of 0.999999 which may be needed for deepwater drilling. Is deepwater drilling any different than "going to the Moon," in terms of overall system reliability? Guess what NASA required for system reliability for Saturn –Apollo?

2. There have been other events involving BP/Chevron, et al. involving platforms/rigs resulting in "loss of well control" and in some cases abandoning platforms or rigs (some similar to Deepwater Horizon).[1]
3. I totally disagree that the current (Cameron BOP/Transocean Drilling Rig) technology can be certified as safe regarding deepwater drilling operations because there is no functional specification (nor any testing) regarding shock hardening of drill rig equipments and design of a deepwater BOP/equipments to well head casing blowout. As we have seen a deepwater blowout contaminates large bodies of water/coastlines and can threaten oceanic thermoclines. It is possible the Deepwater Horizon was sunk due to the underwater shock loading (i.e. wave) damaging steel plates in the caisson legs of Deepwater Horizon.
4. There are no 3-D (finite element) structural models of deepwater drilling rigs being subjected to either an underwater explosion or

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[1] See series of well blowouts (rigs on fire and abandoned) (http://www.gomr/mms.gov)
MMS 2003-023 (Grand Isle Block 93),
MMS 2004-048 (Loss of well control on Eugene Island Block 107),
MMS 2005-007 Investigation of Loss of Well Control Eugene Island Block 277 Well A-3 BP),
MMS 2004-075 (Loss of Well Control East Cameron Block 23 Feb 2004),
MMS 2005-027 (Green Canyon Block 242 - Deepwater South of Eugene Pass - Equipment Failure),
MMS 2006-021 Loss of Well Control, Eugene Island Block 205, Well D-5, May 2005),
MMS 2006-039 (Loss of Well Control, South Timbalier Block, Well No 6 Dec 2005),
MMS 2006-039 (Loss of Well Control South Timbalier Block 135 Well No 6 Chevron with same problem at 1318 feet with pocket of gas coming up),
MMS 2006-047 (Loss of Well Control South Timbalier Block 230, Well A-7 Nov 2005 - this is about 60 miles due west of Miss Canyon Block 252 and same problems with cementing),
MMS 2006-058 Investigation of Riser Disconnect and Spill, Green Canyon Block 652, July 2005), (also a number of fatalities in separate reports maybe covered up),
MMS 2007-037 (investigation of Fatality and Loss of Well Control High Island Block A466, Well No B-11),
MMS 2008-049 (Well Blowout Eugene Island, Block 28 Well No 4, Dec 2007),
MMS 2008-053 (Blowout. Main Pass Block 91 Platform A, Aug 2007 - high gas pressure breeched 9 5/8 inch production casing and numerous attempts made to kill well without success. Relief well intersected well bore and killed with 523 bbls of mud),
MMS 2008-054 (Loss of Well Control, South Pelto Block 10, Well No 10, Feb 2008 - Apache not able to initially stop escape of natural gas and BP "recompleted well in 1999" - well finally stopped no reason given),
MMS 2009 018 (Fatal Accident North Padre Island Block 969 - platform shut in).
So how safe is this? Where are all the other MMS Reports (not in sequence) and not given on website.

massive air blast to see what the effects at all levels on personnel and equipments ("g" loadings and air blast pressures). There are no acoustic sensors (such as used in North Sea Drilling Rigs) for protection – deemed too expensive and removed as requirement possibly by Mr. Cheney.

5. Mr. Ken Abbott (BP whistleblower) says the engineering drawings are not complete by BP on similar deepwater project called Atlantis. Mr. Abbott is asking (with his lawyer) for a Federal injunction. All GOM projects need to have recertified engineering drawings if this is true and criminal charges investigated.
6. Fund immediate shock test plan/shock testing of all smaller equipments (mechanical/hydraulic/electrical components). and, where possible, use Military Standard (QPL) Parts for substitutes until we get our act together for deepwater drilling.
7. Immediately fund the development of 3-D structural (UERD-type models) for looking at the shock loadings at all levels on a drilling rig, which mission critical equipments are located on those levels, and what can be expected. Mission critical equipments on drilling rigs can be "shock mounted" on some type of elastomeric shock mounts so they will be survivable so as to avoid equipment redesigns. Often there is a need for larger, high-strength bolts for mounting heavy equipments. Any cast iron parts should be immediate candidates for replacement, because the castings will crack under shock loadings.
8. Fund the development of 3-D air blast models to see the most cost-effective approach to protect crew members. There needs to be an actively manned and dedicated firefighting quarters (new business) on deepwater drilling rigs – use best practices from U.S. Navy. One company who are experts in this field (done similar work for Government Agencies) is Applied Research Assoc. (contact Panama City, Fl Office). I think they have also addressed "security issues" associated with deepwater drilling rigs.
9. Initiate a design review of all portholes/windows (blast level capabilities) at all levels of the drilling rig to replace with "embassy-type" blast-hardened window designs (also contact the University of Florida Civil Engineering Dept.). It was found in the Oklahoma City air blast that 80% of all casualties were caused by flying glass from windows (involving several hundred buildings). Similar situation may occur on a drilling rig where there is too much equipment which is not properly mounted for shock loadings and can become flying hazards.

10. Review all naval firefighting equipments used on board aircraft carriers for fighting fires (particularly the hanger deck where aircraft are stored) with regard to potential applications of naval firefighting equipments to deepwater drilling rigs.
11. Review the shock hardened mine sweep gear (and other pumps/motors/bow thrusters) on the MCM-1 Class ships for shock hardening drill rig derricks/cables.
12. The dynamic pipe tensioning system of the drill ship/drilling rig needs to be reviewed/redesigned so that it does not go totally "slack" in the event of large upward motions from an underwater blast loading on the drill deck.
13. The current wellhead hub design is inadequate if casing is pushed into it by hydraulic lift from high pressure gas. The shoulder on the wellhead hub can be broken off and the entire BOP easily dislodged (resulting in major leaks at the well hub/BOP piping interface). This subject needs to be addressed independently by Universities (such As Texas A&M), by Government Labs (NSRDC), as well as Cameron, and a Joint Task Force formed to address major future BOP redesign.
14. The Government needs to develop its own in-house expertise (possibly separate and independent Naval Laboratory) in shock hardened, deepwater drilling rigs/production riser (very similar to the situation where UERD was formed in 1946). The long term goal is develop a safe, deepwater drilling design which becomes the industry standard. Period. Never again should we ever have to rely on any statements made by oil companies.
15. Louisiana needs jobs for skilled workers during Obama's six-month moratorium. Why not put thousands of people to work at Avondale (or other shipyards) building newly designed skimmer boats (different sizes for Gulf, bays, and marshes) as well as manning a new skimmer fleet. We could do this in 90 days in WWII -- can this Administration respond or are we going to hold more hearings? Congress authorizes this on "Emergency Wartime Basis" immediately. We will need all the skimmers we can build and man, and there is a 30,000+ manpower becoming available (from offshore workers) to be put productively to work right now.
16. OTC (Offshore Technology Conference) paper 10968 ("Deepwater High-Capacity Collet Connector (Cameron BOP Subsea Connector) shows in Fig. 7 that a Cameron Deepwater Wellhead BOP can pull entirely off a wellhead hub at the seafloor at an angle of seven degrees. Does not this mean that if the Deepwater Horizon moved 604

ft laterally (Captain thinking the BOP shear rams had closed the wellhead off, and trying to get out of fire) that it could have pulled the BOP entirely off the wellhead connector (ditto when the Deepwater Horizon capsized)? The other possibility is that it was partially pulled off when the Deepwater Horizon sank or was entirely blown-off as stated by Matt Simmons in Bloomberg interview.

17. A recent probability study (scoping) exercise at www.theoildrum.com suggests that one would not expect a Prob = 0.9 of (drilling two relief wells) until 170 days to 200 days after drilling the relief wells. This means the August date for success of the relief wells is probably very optimistic. The probability of any kind of success will not be clear until November? See also possible well bore damage from hydraulic lifting at http://www.theoildrum.com/node/6593#comment-648967.
18. The fact that Top Kill failed trying to pump 50,000 barrels of mud into a well that should have been killed with 5,000 barrels of mud, means that the well bore casing is severely compromised (as well as fractures in seafloor), and if this is the case, it is about time somebody started telling the American people what the real probabilities are for relief wells working.
19. NOAA has air quality codes (plume trajectories) that can predict the levels of various hydrocarbons (benzene, hydrogen sulfide, toluene, methylene chloride) coming onshore from a large oil spill. Also, there are a number of private companies. The names of some of these codes are AIRMAP, CHARM, LSMS, CALPUFF, MESOPUFF, etc. If a significant area of the Gulf of Mexico is covered in oil, let's see the onshore predicted levels from these codes for various evaporation rates assuming average wind speeds and directions by mid-August (assuming low- and high-range cases for well blowout of 60,000 bpd and 150 million cfm of methane going into GOM and 100,000 bpd and 300 million cfm of methane going into the GOM). Codes to be modified as needed when new data available.
20. If it is taking 90 days to drill a relief well to 13,000 ft, that works out to a drilling rate of about 6 ft/hr. I would have expected a drilling rate of at least 30 ft/hr easily but for "safety sake" cut the drilling rate in half again to 17 ft/hr x 24 hrs/day = 408 ft/day. Thus, it should take 13,000/408 = 32 days. Has this relief well been already drilled and is producing oil and gas and this is where the sudden increase in oil production is coming from? Is the relief well expected to produce oil and gas from two pay zones? Have we already hit the first pay zone?

21. If the drill string goes beyond the end of the 9 5/8 “(or any casing), it could buckle and collapse (Euler or Slender Column Buckling – ref see Timoshenko in Buckling of Plates and Shells), and push against the side wall of the casing pipe. Since the drill string piping is stiffer in bending than the casing this could easily crack cement seals at the top of the casing by deflecting the casing against the cement seals. Cement fails easily in shear stress. This could also be a failure mode as to how drilling tools “get stuck” at the bottom of the hole and cannot be retrieved. All drill tools that become stuck in a well bore could damage both cement seals as well as the bottom of the casing pipe if they are buckled against the casing pipe. This needs to be modeled as a failure mode including the cement seals. This is of particular interest in a high pressure well, where the high pressure on the bottom of the bit initiates high bending moments in the drill string, which a driller may not have seen before.
22. When a drill string is pulled up thru a BOP, there is a sudden area transition from 9 and 5/8 inch diameter (inside the BOP piping) to 18 and ¾ inch diameter (inside the BOP), in which case a very high gas pressure would appear to be a “kick” or spike in the wellhead pressure, because it suddenly is pushing on a lot more drilling fluid. Much worse is that once the drill string bit is pulled through the BOP (the cork in the champagne bottle is released), the high pressure can suddenly act on a wide area of mud in the 18 and ¾ inch casing, which, if the mud has been replaced by seawater, can be a disaster. In other words, you can be replacing drilling mud with seawater (drill string not yet past the BOP internal area transition) and everything looks fine with drill bit still down hole, but the second the drill bit goes past the BOP transition, all the gas can start flowing up against a large surface area of seawater and there is no way to sense and react to this situation with current designs. This design transition in the BOP needs to be addressed for high pressure well design.
23. There is no such thing as cement in a 10,000+ psi turbulent (free-flowing) gas/oil jet coming up the well bore, because the jet of oil and gas at these pressures will smash the “cement injection” back into a fine clay/limestone powder (against the inside of the pipe walls as it flows up 13,000 feet of pipe, as well as one particle into another) – ditto for drilling mud which is just a bentonite clay. The flow needs to be stagnated for drilling mud to kill a well, and you would ideally require undamaged well bore casing.

Russian Abiotic Oil and Deep Drilling Programs in Highly Faulted Areas

Sixty-five million years ago, a large incoming asteroid broke into three to ten kilometer pieces and impacted Earth all over the world. The impact crater in the Gulf of Mexico (called the Chicxulub Crater off Mexico) is called the KT extinction event (Cretaceous -Tertiary) event, because it wiped out the dinosaurs in North America. Sandia modeled this impact and found that 5000 degree impact temperatures created pure, white silica sand, which was blasted northward and created the pure white beach sand at Pensacola, Fl. and all along the Gulf Coast Beaches, which is why they are unique in the world. Now what are the other locations in the world where pieces of the asteroid impacted? Nobel-prize winning physicist Luis Alvarez (and a group of colleagues) discovered that worldwide craters (containing fossilized iridium) have been found at the KT -boundary (they all were formed about the same time 65 million years ago all over the world) from multiple impacts of a fragmented asteroidial object at the following locations:

Chicxulub Crater in Gulf of Mexico
Boltysh Crater in Ukraine
Silverpit in North Sea, UK
Eagle Butte in Alberta Canada
Vista Alege Crater (Parana State) Brazil
Wabar Crater (and others) in Ar Rub A-Khali Saudi Arabia.

What all these sites have in common is that they are the sites of world's largest and most prolific oilfields, and after decades they are continuing to produce large quantities of oil! We know from high energy physics that the impact pressures from the meteorite impacts could have been higher than 30 kbars when they hit earth. This is hugely significant to the Ukrainian (Russian) Abiotic Theory as to the origins of deep oil, which states that the huge quantities of the world's oil is produced under the extreme high pressures (> 30 kbars = impact pressures of the asteroids) deep within the Earth's mantle.

In 1951, the abiotic petroleum origins (not from dinosaurs dying off) were stated by Nikolai A Kudryavtsev and other Ukrainian geologists including

Kropotkin, Shakhvarstova, Dolenk, Linetskii, and Anokiev. Oddly, the theory that oil comes from decomposed remains of dinosaurs (and plant organisms) was first proposed by a Russian scholar Mikhailo Lomomsov in 1757! The Russians rejected the fossil origin theory sixty years ago, but the Western Oil Companies and many of their geologists continue to insist on the Peak Oil Theory of fossil fuels. It remains an ongoing argument that the Russians may be winning.

Russian theoretical experiments show natural petroleum cannot evolve spontaneously at pressures of less than approx 30 kbar (which correspond to the depths of the earth). Also, the Russians conducted an experimental demonstration of the foregoing theory (long time ago) when they subjected a mixture of laboratory-pure solid marble ($CaC0_3$), iron oxide (FeO), wet triple-distilled water up to pressures of 50 kbars and temperatue of 2000 C spontaneously generate the same hydrocarbons found in deepwater oil. Great, now it was time to prove to Stalin that they really could find/produce oil and gas from deep within the Earth's crust.

Nuclear Devices:
In 1946, Stalin wanted new major sources of oil and gas to fuel Russia's expansion, because the Baku fields were all declining. So, after the key Russian findings that they could find and produce oil and gas deep down, the Russians began a huge "underground" atomic test program which could serve two purposes: (1) to fracture the rock above the reservoirs by blasting open big fissures deep underground to develop the massive and deep Siberian (and Caspian) oil and gas, and (2) develop larger yield atomic weapons. In any event, the Russians were succeeding beyond there wildest imaginations in fracturing deep oil and gas fissures (still paying off big-time today, as Russia is now the world's largest oil and gas producer).

The problem for the Russians at the time was that there was so much high pressure gas coming up from deep wells they did not initially have the values and piping and infrastructure to contain it (sound familiar to BP today?), and they had huge gas blowouts. In fact, they had to snuff out the big gas well blowouts with nuclear devices down-hole (ref: Milo Nordyke and Lawrence Livermore Report 238468 (UCRL-ID-124410 Rev 2 entitled "The Soviet Program for Peaceful Uses of Nuclear Explosions").

US Counter Oil Strategy

The U.S.A. countered by sending U.S. Navy Task Force (Aircraft Carrier USS Salerno Bay) from 1947 thru 1950 on three world cruises both to evacuate Chiang Kai-shek's Army from China to Burma (and the entire Ming Dynasty treasure of China to caves in Taiwan), the Chinese Bankers went to Malaysia (see Twin Banking Towers today), and to establish military protection for Saudi Arabia's oil fields in return for pricing the world's oil in US Dollars and refining the oil for Western countries (brilliant move).

The western oil companies took control of Mid-East oil fields, but Russia had to produce its own massive oil and gas for both itself and Asia. By 1974, OPEC had taken control of its own destiny and relegated the Western oil companies to refining ops which enabled OPEC (and Russia) to reset the world's energy prices. The balance of oil power was shifting to the Middle East. At the same time, the U.S.A. peaked in onshore oil production (timing by OPEC was very good), and so the world went to "crisis mode." The electric car development was stopped at Ford, all credits for solar power development elapsed with Congress/States and a nuclear power plant suffered a meltdown at Three Mile Island (not explained, is why both main feedwater pumps failed).

U.S. Deepwater Oil Locations

In the 1950s, the Soviet physicists began deep drilling experiments (gas wells) along fault lines on the basis that they were predicting oil and gas is produced deep within the Earth's crust (perhaps continuously deep in the crust of the Earth's Mantle) and migrates up towards the surface in between the cracks. A Russian Professor (Vladimir Kutcherov) from the Royal Institute of Technology in Sweden and Russian State Univ. of Oil and Gas. It was realized later the place to drill (and where the elephant oil fields from the 1940s and 1950s were found) were along these highly faulted lines, where possibly relatively large asteroids had impacted earth 60 million to 1,000 million years ago.

The problem for the U.S.A. is that our asteroid hit the Gulf of Mexico (asteroid hit off Mexico's Yucatan Peninsula called KT-Event) while Russia's asteroid hit land in Siberia. Thus, to find deep oil (how can oil at 18,000 to 40,000+ feet below the seabed be a fossil fuel at all?), the U.S.A.

is required to drill into highly faulted structures in deep waters. such as Mississippi Canyon and beyond. If we have hit a deep well that is somehow connected to oil channels in the Earth's mantle well in the Gulf of Mexico, then could not deep oil continuously flow from the Earth's crust, based on what the Russians have stated?.

If any of this is true, the evolving event is exactly the type of crisis described in the book "Fourth Turning" by Strauss and Howe. It will change the U.S.A. and the world forever, and in ways which cannot be foreseen.

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