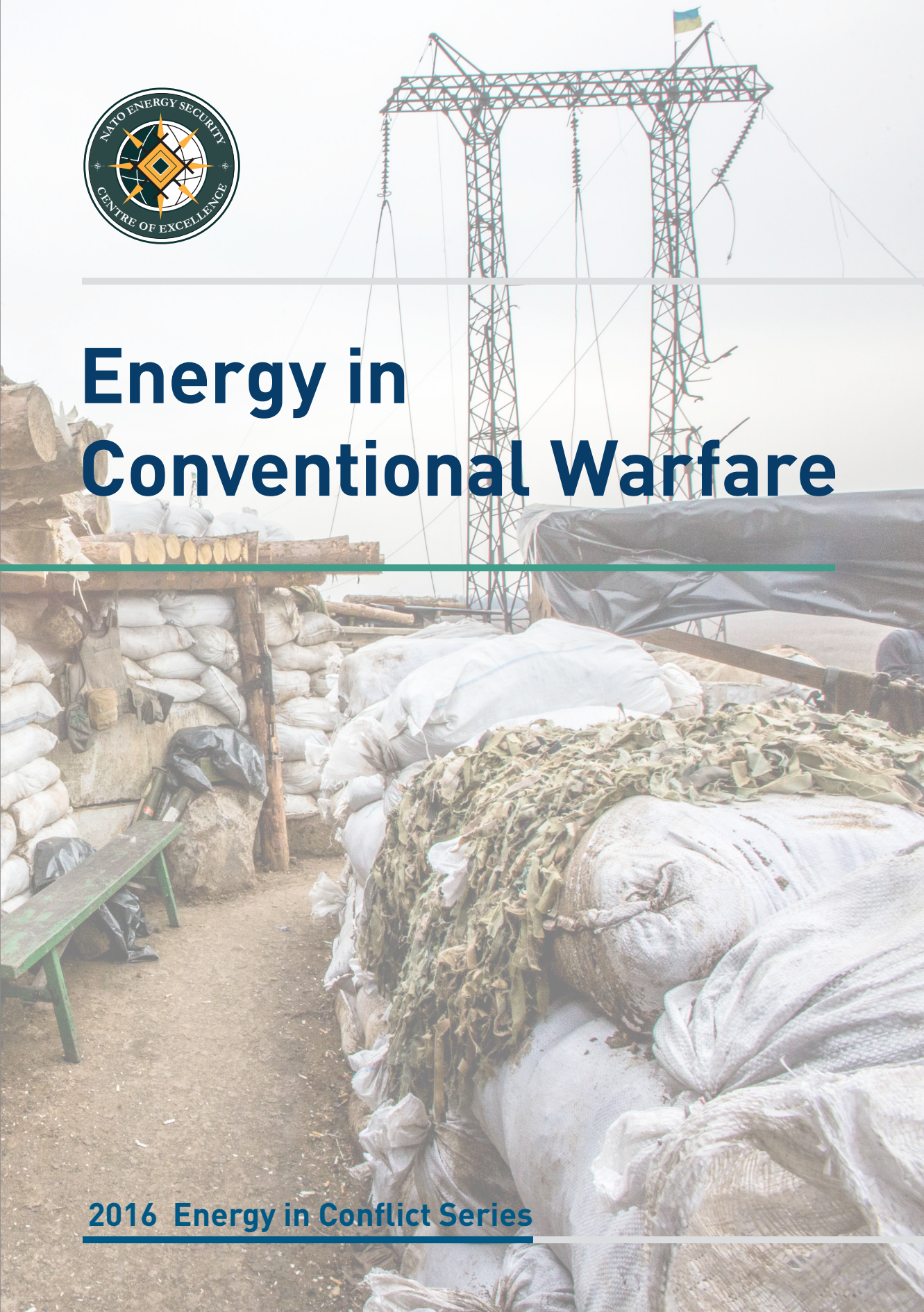

Energy in Conventional Warfare

2016 Energy in Conflict Series

Energy in Conventional Warfare

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2016 Energy in Conflict Series

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Executive Summary

Since the rise of coal in the industrial revolution, and later through petroleum-based products, energy has been both a driver and a key dynamic in conflict. Conversely, conflict has also had a significant impact on energy infrastructure, through its destruction and prioritisation as a target. Understanding the role of energy in conflict is essential to decision makers and military planners.

This paper sets the historical understanding for the "Energy in Conflict" series from the NATO Energy Security Centre of Excellence, which will seek to inform decision makers over emerging energy security challenges and their implications. This paper considers energy in conventional warfare, and should be read in partnership the paper "Energy in Unconventional Warfare".

This paper uses the US definition of conventional warfare – "A form of warfare between states that employs direct military confrontation to defeat an adversary's armed forces, destroy an adversary's war-making capacity, or seize or retain territory in order to force a change in an adversary's government or policies. The focus of conventional military operations is normally an adversary's armed forces with the objective of influencing the adversary's government." (US Department of Defence, 2007).

Through the historical analysis of a number of chronological case studies this paper looks at the different dynamics of energy in conventional conflict; as a driver of conflict, with nations competing for resources; as a strategic aim with in conflict, with militaries seeking to either deny opponents resources, or obtain them for themselves; or as a limiting factor for military operations through energy shortages.

The case studies used also demonstrate the significant impact that conflict can have on energy infrastructure and systems, with implications for energy production, electricity generation, global energy prices, environmental damage and social unrest.

1 Introduction

Critical resources and materials have long been considered a question of national security, especially during times of conflict. In addition to food and water, societies have historically been dependent on different resources for their survival and war fighting capabilities such as iron ore, coal, and saltpeter. Deprived of critical resources, countries have lost wars and societies collapsed.

Saltpeter, between the fifteenth and nineteenth centuries, is good example of a critical resource. Europe's great powers scoured their countries and empires for the compound – a critical ingredient of gunpowder. The evolution of warfare and development of musketry, cannons, battleships and siege trains consumed ever-increasing volumes of gunpowder as Europe's quarrelsome monarchies battled for supremacy over the continent. Concerned about the supply of saltpeter, governments prevented its exports in 1689, stating that the 'the strength of war' depended on saltpeter 'for the defence and safety of this realm' (Cressy, 2011).

But in order for critical resources to be of use, they require the infrastructure which allows them to be produced and distributed. Coal must be mined, transported and burned in power stations to generate electricity or heat. Onshore oil extraction requires drilling rigs, pipelines, tankers and refineries before crude oil is transformed into products commercially saleable to distributors. These factors all contribute to the security of supply of critical resources.

Energy products are the modern critical resource – firstly in the form of coal in the 19th century, and later in petroleum products. These resources allow the generation of electricity, power the vehicles, aircraft and ships essential to modern warfare, and provide the power to the large manufacturing base required. For a country to have a secure supply of energy it requires the entire energy system to be functioning. Without transmission lines, power cannot reach consumers. A malfunctioning crude oil pipeline prevents the refinery from accessing feedstock and eventually affects the end-customer.

History repeatedly displays the role of critical resources in conflict and the impact that disrupting these supplies - often through the targeting of infrastruc-

ture - can have on the course of a conflict.

1.1 RESOURCES, STRATEGY AND CRITICAL ENERGY INFRASTRUCTURE

"[The Strategist's] true aim is not so much to seek battle as to seek a strategic situation so advantageous that if it does not of itself produce the decision, its continuation by a battle is sure to achieve this. In other words, dislocation is the aim of strategy; its sequel may be either the enemy's dissolution or his disruption in battle. Dissolution may involve some partial measure of fighting, but this has not the character of a battle," Liddell Hart (1991).

Critical Energy Infrastructure or CEI is the energy infrastructure that is so essential that its failure or destruction would have far reaching negative effects on economic and social security as well as on the defensive capabilities of the state. According to the most recent definition from the US Department of Homeland Security CEI refers to: (1) energy extraction facilities (oil and natural gas wells, mines); (2) energy transportation infrastructure (pipelines, train and road carriers, oil tankers, electric power lines); (3) energy conversion infrastructure (refineries, power plants) (U.S. Department of Homeland Security, 2015).

The growing complexity and technological advancement of post-Napoleonic war has brought increased focus on the targeting of enemy supply lines, strategic-level logistics and war supporting infrastructure. The advent of rifles, repeating weapons and the combustion engine meant armies required growing supply lines, logistics hubs and manufacturing infrastructure – themselves valuable targets susceptible to attack or interdiction.

During the American Civil War, Union General William T. Sherman developed the strategy of exhaustion, which involved aggressive attacks upon the Confederate's means of waging war. This strategy was first employed on the railroad junction at Meridian, Mississippi, in February 1864. Moving east from Vicksburg, Mississippi. Sherman's troops were able to destroy 115 miles of track, 61 bridges, and twenty locomotives and render the depots and other support facilities at Meridian unusable by the Confederates (Dougherty, 2005).

Sherman's exhaustion strategy culminated with the assault on Atlanta, a city which he noted was 'full of foundries, arsenals, and machine shops,' and whose 'capture would be the death-knell of the Confederacy.' The conquest of Atlanta and the election of Lincoln helped set in motion the final political settlement and Union victory over the Confederate forces of the south.

Since the Napoleonic and American Civil Wars took place before the invention and wide-scale commercial adoption of the combustion engine, petroleum supplies played no role in warfighting or strategic operations. However, as states developed industrially and commercial oil-powered engines proliferated, military arguments for their adoption grew in force. These were finally acknowledged by Winston Churchill - under the advice of Admiral John Fisher – who, as First Lord of the Admiralty, began converting British warships from coal to oil before World War I (WWI) (Dahl, 2001).

Since then, hydrocarbons and their associated infrastructure have come to play an increasingly critical role in both the military and wider society, with governments across the world considering their uninterrupted supply and distribution a question of national security.

The apogee of this idea came to be formalized, perhaps most famously, by the Carter Doctrine enumerated by the President during his State of the Union Address in 1980. Already hard-pressed domestically by the OPEC crisis and the subsequent spike in oil prices, President Carter and his national Security Council were alarmed by the Soviet's unexpected invasion of Afghanistan. Believing that Moscow's Afghan offensive foreshadowed a more sinister intention to become the Persian Gulf's hegemonic force, President Carter issued the Soviets a stark warning:

> *"Let our position be absolutely clear: An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force." (Carter, 1980).*

Here, we find the idea of energy as a critical, or necessary condition for state survival formalized in the vernacular of national security strategy as a vital interest: a concern understood as critical for the functioning of the state and one for which the nation will fight.

2 World War I

"The Allied cause had floated to victory upon a wave of oil." - Earl Curzon on November 18, 1918 (May, 2015)

At the beginning of the 20th century, the Royal Navy was almost entirely dependent on coal for propulsion. While oil was used for some submarines and destroyers, coal remained the dominantly used source of propulsion. The UK was abundant in coal resources and therefore the use of coal was considered strategically safe. However, coal also has disadvantages; it used a lot of storage space and required a lot of manpower. This problem was compounded by the fact that the Royal Navy required coaling stations around the world to maintain its global reach.

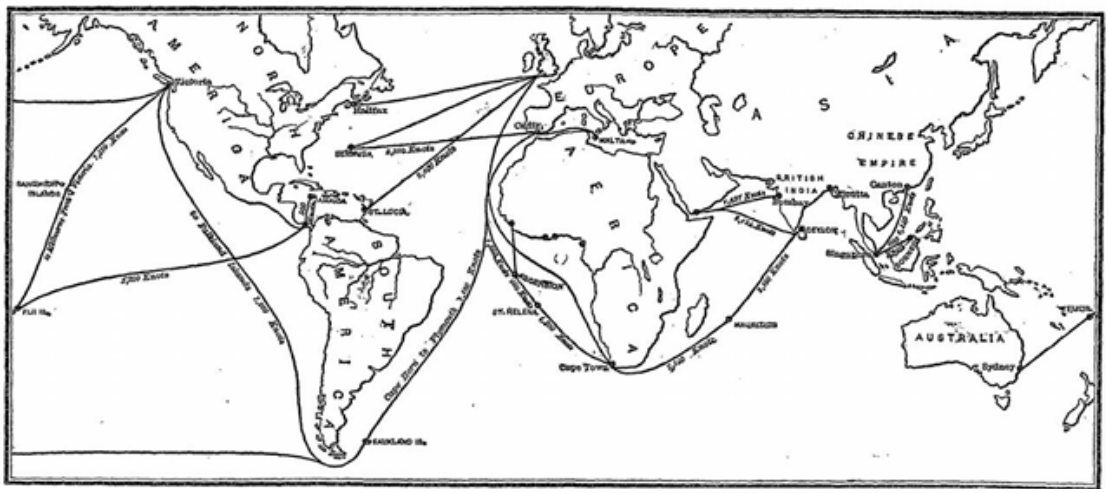

Figure 1 – Royal Navy Coaling Stations in 1892 (image: New York Times)

Oil also has its advantages and disadvantages. Oil can easily be stored on board, is lighter, and has a higher energy intensity. However, at that time, the U.K. did not have any domestic oil production, making it necessary to find foreign sources to secure their supply of oil. The pre-war government oil policy had been to build strategic stocks during peacetime and purchase oil on the open market during times of conflict. Until about 1912 the British government was content

to simply provide British nationals diplomatic support in acquiring oil concessions in a foreign country, and allow private companies to ensure energy security. However, with oil demand soaring during WWI leading to shortages in 1917, this hands-off policy was deemed unsuitable (Gibson, 2012), with the UK and government and armed forces playing an increased role in securing resources as seen in the Middle Eastern example in section 2.1.

Churchill decided that the Royal navy would shift from coal to oil on the eve of WWI and this proved to be a valuable decision. During WWI the true strategic importance of oil was realized by both sides (Gibson, 2012). As a result securing oil resources became a key strategic aim, while attacks on oil infrastructure played a prominent part in the campaigns of both the Allies and Central Powers.

Crude Oil, and later other petroleum-based products, became a strategic asset when they were adopted as a widespread military propulsion fuel. As WWI progressed, the arms race between the Allies and Central Powers led to the deployment of an ever increasing array of equipment dependent on petroleum, ranging from armoured transports to submarines and aircraft. The evolution of this arms race was mirrored by the development of upstream, midstream and downstream industries involved in extraction, refining and distribution of crude oil and its products.

2.1 BRITISH EFFORTS IN THE FORMER MESOPOTAMIA

Given the importance of converting the Royal Navy to oil, national security policy dictated priority to securing oil supplies outside the Empire, since less than two percent of the world's oil production was located within the British Empire in 1913 (Engdahl, 2007). Before the outbreak of WWI, an Admiralty commission investigating Persian oil supplies had concluded that the British Anglo-Persian oil concession in Mesopotamia was capable of supplying the Royal Navy with fuel for a significant period of time (Gibson, 2012). As a result, it was deemed essential that these resources remain in British hands. An agreement between the British government and the Anglo-Persian Oil Company was reached and Britain acquired a 60-year oil concession from the Persian Shah in 1909 (Engdahl, 2007).

At the outbreak of war the UK government successfully used colonial forces in modern day Iraq and Iran to claim oil rich areas from German forces, and even raced to seize Mosul from their allies, the French, days after the armistice was signed (Paul, 2002). While the main battles were being fought on the fronts of Western Europe, the fight for oil in the Middle East was essential for the success of the allies in the war – an early example of the importance of energy in conflict.

Figure 2 – A contemporary map showing the fields North of Basra (image: Norfolk Regiment Official History)

While scholars emphasize that Britain had considerable interests apart from oil in Mesopotamia and hoped to start a second front against the Central Powers there, the region's energy resources and refinery infrastructure played an important part in war planning. The Northern Persian Gulf and lower Mesopotamia were also strategic arenas. Control of these regions was considered es-

sential to defending British oil interests in nearby Persia, notably, as mentioned above, the Anglo-Persian Oil Company's oil fields near Ahwaz and its refineries at the port city of Abadan (Barker, 2009).

2.2 U-BOAT CAMPAIGN (1914 AND 1917) – THE BLOCKADE STRATEGY

The German use of U-Boats is an example of another dimension of energy in conflict - seeking to deny your opponent critical resources. Throughout WWI Britain was dependent on external sources for food, iron ore and oil, with large quantities coming across the Atlantic. In October 1914, German U-Boats began attacking merchant ships, with Admiral Henning von Holtzendorff, the Imperial German Navy's Chief of the Admiralty Staff, believing that a German U-boat blockade could force the British government to its knees in five months. While the campaign was initially successful, it was complicated in 1915 by the sinking of the liner the RMS Lusitania by a German U-Boat (Protasio, 2011). While political pressures meant German U-Boat activities were curtailed in the aftermath, by 1917 unrestricted warfare was reintroduced and the blockade had an even greater impact on Britain's imports (Gibson, 2012). The oil shortage in June 1917, when British naval fuel stocks were dangerously low, showed the success of the campaign. The UK was forced to recognise the fragility and importance of oil supplies and seek alternative sources, including the actions in the Middle East discussed above.

2.3 IMPLICATIONS OF WWI

During WWI, the strategic importance of oil was realized. For the first time the effort to secure petroleum supplies was at the centre of military planning. Mechanization of militaries and the required demand for fuel and lubricants—provided by the oil industry—made the supply of petroleum vital to the war efforts. By the end of the WWI, 40 percent of the British naval fleet was powered by oil. Rapid mechanization of the armies of Britain, France and the United States at the end of the war was the result of the development of warfare over the course of the conflict. Britain and the US had put 105,000 trucks and over 4,000 airplanes into service during the war. The final Allied offensives on the Western Front consumed 12,000 barrels of petroleum per day, which put emphasis on securing sufficient supplies to continue with the military operations.

Gaining control of areas that provided oil and protection of supply, and supply routes, became important, as highlighted with the examples of the U-boat blockade on the UK and the efforts of all sides in the Middle East.

3 World War II

During the 1920s and 1930s, the armies of the adversaries of WW I continued their process of mechanization. By the outbreak of hostilities in 1939 all key weapons systems were petroleum-powered: warships (including aircraft carriers), submarines, airplanes (including long-range bombers), tanks, and a large portion of sea and land transport. Thanks to this mass mechanisation global oil demand in 1937 had increased by nearly 400% from the end of WWI, even though it was peacetime (Friedensburg, 1939). The outbreak of WWII lead to further large increases in demand.

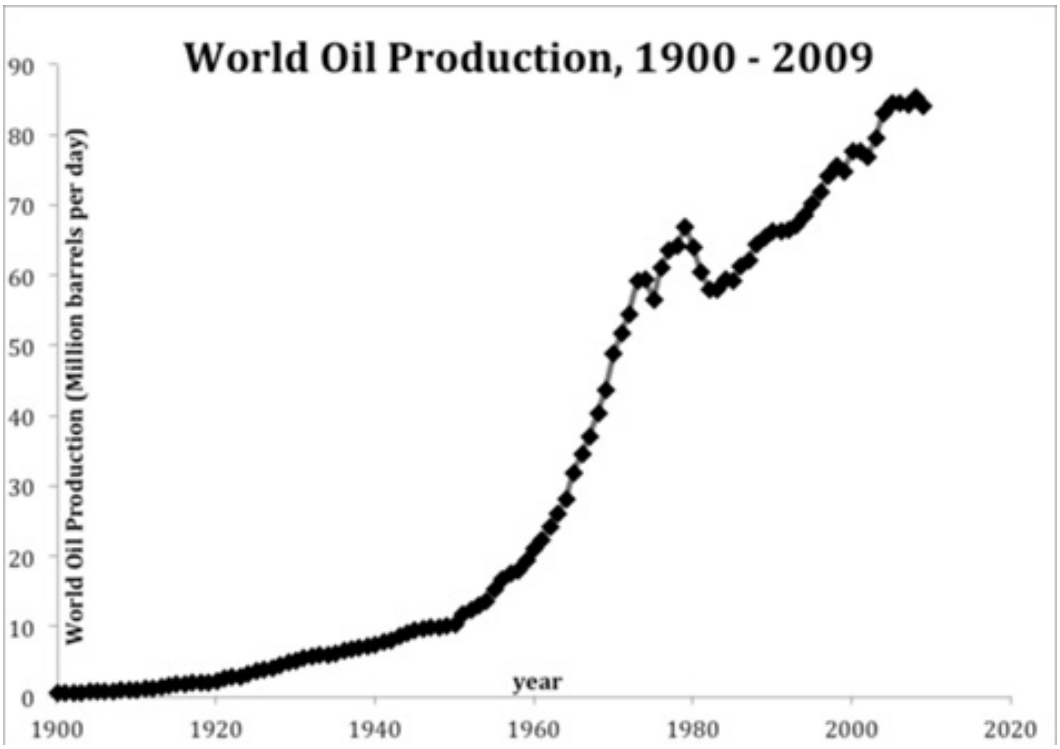

Figure 3 – World oil production by year (image: Peter Evans, Data: Energy Information Administration)

For this reason, energy played a crucial role in the war, both for the Axis and Allied sides. In addition to the needs for transportation, both sides were highly dependent on sufficient petroleum, and coal, supplies to sustain their industrial output. This added to the already vital importance of petroleum to the success of the belligerents.

The large increase in the demand for energy in turn required additional infrastructure to support it. This infrastructure was critical to the supply of energy, and consequently to the war effort. WWII the first time the importance of energy infrastructure in conflict was recognised and targeted on a large scale, in part facilitated by the development of the heavy bomber. WWII was characterised by numerous plans and attacks against hydro-dams, electric grids, oil fields and refineries which were fundamental for the supplying the armies and heavy industries (Lovins & Lovins, 1982). In the following chapter, we look at a number of examples of important operations conducted against CEI during WWII by the both the Allies and Axis forces.

3.1 WAR IN EUROPE

German Fuel Supply

The naval blockade during WWI had shown the risks of being dependent on external sources for vital products. Germany was therefore determined to become independent when it came to energy. Before the war, Germany was highly dependent on external sources of oil as it had almost no reserves of its own, but had plenty of indigenous coal. Germany was already developing synthetic oil in the 1930s. By the beginning of WWII, coal-based synthetic fuels (syn-fuels) accounted for nearly half of Germany's peacetime oil needs. While this gave Germany some degree of energy security, the infrastructure needed for producing syn-fuel was complex, expensive and vulnerable to air attacks. These facilities are an example of the kind of critical energy infrastructure that was a key target of both sides during the conflict (Becker, 1981).

To supplement its syn-fuel production, Germany was importing large quantities of oil from the Soviet Union (U.S.S.R) during the first years of WWII. It also gained access to Romanian oil under the Tripartite Pact. These supplies were, however, still insufficient for German needs, leading Hitler to look elsewhere for more reserves. The German command recognised the potential of Caspian Sea oil reserves in the U.S.S.R. Securing these oil supplies played a decisive factor in the decision to invade the U.S.S.R. in June 1941. Stalin was equally aware of the importance of the Caspian fields, however and prevented the Germans ever gaining control. The weight of effort dedicated by both sides is a testament to the strategic importance placed on their capture. The fields remained strategically important for the U.S.S.R. and its offensives against Germany throughout the war (Becker, 1981; Eichholtz, 2012).

Operation Eisenhammer 1943

Operation Eisenhammer (Operation Iron Hammer) was a planned German strategic bombing operation targeting three USSR hydroelectric power plants in 1943. The architect behind this operation was Professor Heinrich Steinmann, an official at the Reich Air Ministry. The objective of the raid was to destroy hydroelectric and steam power-plants near Moscow, Nizhny Novgorod, and under the Rybinsk Reservoir. If the attacks were successful, the raid could have destroying up to 90 percent of the USSR's motor vehicle production, 50 percent of its ball bearing production and 60 percent of its light assault gun production. Only two smaller energy centres behind the Urals and in the Soviet Far East would have been left intact.

The plan was to use converted Junkers 88 long-range bombers (code-named Mistels) to execute the operation. These would drop specially designed floating mines into the water, which would then be pulled straight into the turbines.

Problems in the development of Mistel between 1943 and 1944, along with poor weather delayed the operation, and by late 1944 Allied advances from East and West changed Nazi priorities, meaning the plan was eventually abandoned (Foryth & Laurier, 2015). These power sources are an example of critical energy infrastructure - their destruction would have had significant impact on the Soviet arms industry and war effort.

Allied Oil Campaign

During WWII, the Allies conducted many different attacks against CEI. The "Allied Oil Campaign" was a series of strategic bombing campaigns conducted by Allied Air Forces against many facilities supplying Germany with petroleum, oil and lubricants (POL) products. Targets in Germany and "Axis Europe" included refineries in Norway and Romania, factories producing synthetic oil, storage depots, and other POL infrastructure targets vital to Germany. The Germans also recognised the importance of the CEI; these targets quickly became some of the best protected in Germany, using anti-air defence and warning systems, concealment and employing rapid repair teams (Dews, 1980). This demonstrates the reverse side of the importance of energy in conflict, the need to identify and protect your own CEI, as well as target your opponents.

The British Royal Air Force recognised the importance of German CEI early on, viewing oil as the Axis' "vital centre" (Tedder, 1966). Even before the war the RAF had developed the "Western Air Plan 5(c)", a plan to cripple Germany by cutting off its petroleum supplies (Hastings, 2013). In February 1941 RAF Bomber Com-

mand identified eight primary targets which they believed would reduce Axis' oil production capacity by 80 percent – again excellent examples of how key small numbers of CEI targets were. While the inaccuracy of RAF bombing hampered the success of these operations, oil targets remained a high priority for allied forces.

The first European targets bombed by the US were the Ploesti refineries in Romania on 12th June 1942, an objective the US continued to target until 1944. In March 1944 the "Plan for the Completion of the Combined Bomber Offensive" was put forward by the USAAF. The plan proposed by US General Carl Spaatz, who advocated precision strikes against designated targets, rather than the wide area bombing carried out by the Allies under the instructions of Bomber Command's Commander-in-Chief Arthur Harris. The chances of success were increased by the US carrying out daylight raids, whereas the RAF had so far largely bombed at night (Hastings, 2013). Fourteen synthetic plants and thirteen refineries supplying Nazi Germany were to be the target, aiming to reduce Axis oil production's by 50 percent.

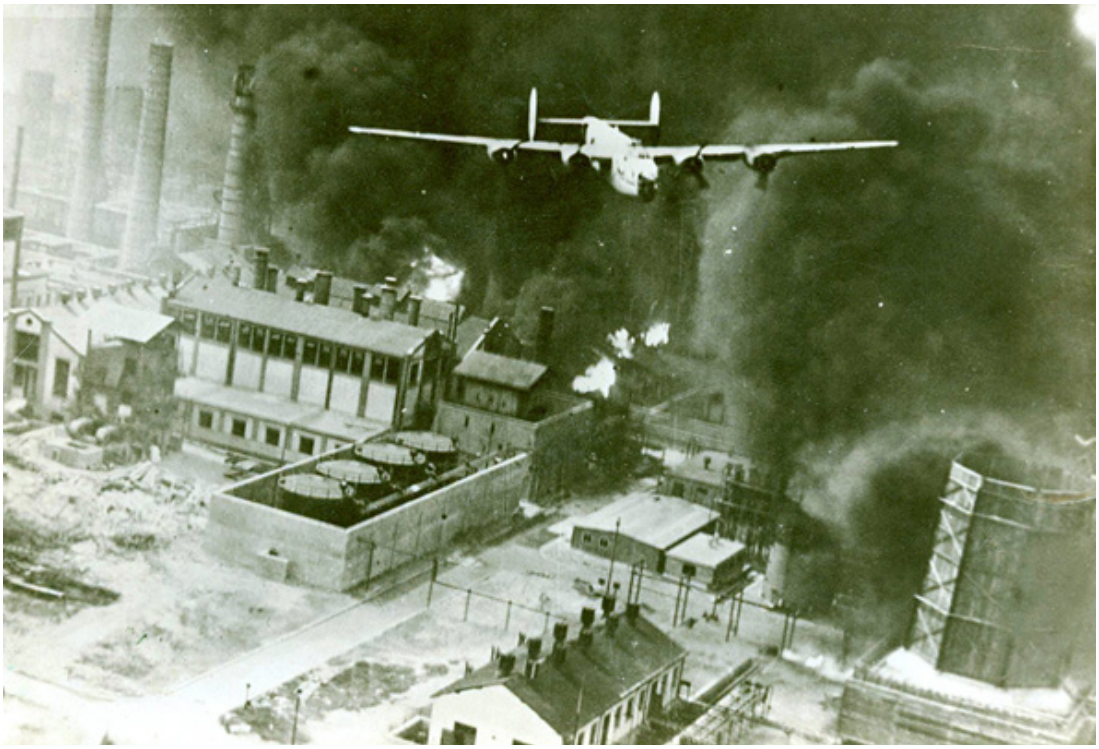

Figure 4 – A USAAF B-24 conducts low-level bombing of a Ploesti refinery (image: 44th Bomb Group Photograph Collection)

These precision attacks were far more successful than previous efforts. As a result of these attacks, "petroleum available to Germany fell from 927,000 tons

in March, to 715,000 tons in May, and 472,000 tons in June. The Luftwaffe's supplies of aviation spirit fell from 180,000 tons in April, to 50,000 tons in June, and 10,000 tons in August. ... By the late summer of 1944 the Luftwaffe lacked the fuel to fly anything like its available order of battle" (Hastings, 2012). Reich Minister for Weapons, Munitions, and Armaments Albert Speer writing in 1970 said that the Allied oil campaign "meant the end of German armaments production" (Speer, 1970), whilst Luftwaffe General Adolf Galland stated that the Allied oil campaign was "the most important of the combined factors which brought about the collapse of Germany" (Becker P. , 1981).

Operation Chastise (16-17 May 1943)

Another military plan directed at German energy during WWII was Operation Chastise, better known as the Dam Buster Raid. Operation Chastise was a military plan to destroy German dams that were considered important strategic targets providing hydro-electric power, water for steel making and drinking water supplies. The main concepts of Operation Chastise were already considered and planned before 1943; as early as 1937 the Air Ministry of the UK was considering the Ruhr dams as a possible target to stop the Nazi expansion. Several studies, research and proposals, such as the high altitude precision bombing, were undertaken during the three years between 1938 and 1941 but none of these proved feasible.

Early in 1940 the Royal Air Force and the Air Ministry asked to a team of engineers and researchers to do a feasibility study on a plan of precision bombing of dams. In 1942, the team, headed by engineer Barnes Wallis, designed a special heavy depth-charge known as the "bouncing bomb" or "upkeep". If dropped at a sufficiently low altitude at the correct speed, with the bomb spinning backwards at over 500 rpm, the weapon would skip a significant distance over the surface of the water in a series of bounces before reaching the dam wall. Here its residual spin would run the bomb down the side of the dam to its underwater base. Using a hydrostatic fuse, an accurate drop would bypass the dam's defences and have it explode near the dam wall at a depth calculated to cause maximum damage (Dixon, 2013; BBC, 2013).

On the 26 February 1943, the Royal Air Force decided to target some of the strategic dams in the spring with the 'Upkeep' bomb as its main weapon. The attack was carried out by Royal Air Force on the night of the 16th of May. The Möhne and Edersee Dams were breached and a catastrophic flooding of the Ruhr valley and of the villages in the Eder valley lead to loss of life, power and industry. Two main power stations with capacity of 5.1 MW connected with the Möhne dam had been destroyed and seven more dams had been damaged. All this lead to

power outages in factories and in many households in the region for two weeks. The resulting wave of water from the breach of the dam's flooded coals mines, destroyed several factories and every bridge for 30 miles below the breached Mohne dam. In May 1943, following the raid, German coal production dropped by 400,000 tons, while steel production dropped by about 180,000 tons in the month that followed (Rowley, 2013).

However, some experts argue that the entire operation did not achieve the military results that everyone had hoped for. By June 27th 1943 the domestic water output was completely restored, mainly through an emergency pumping scheme, and the electricity grid had been restored to full capacity. The dams were rebuilt after 5 months of intense labour and Germany regained the energy capacities it needed to continue its activity (Rainey, 2011).

Figure 5 – Aerial photo showing the damage to Mohne Dam, 17th May 1943 (image: NCAP)

This case study therefore demonstrates two things. Firstly, the impact of precision targeting of identified CEI, which at least in the short term had significant impacts on the German war effort. Secondly, it demonstrates the priority the Germans gave the restoration of its CEI. The dams which took five years to build, were repaired by armies of forced labourers working around the clock in just five months. This pulled vital resources away from projects such as the "Atlantic Wall", and are in total are estimated to have cost Germany the equivalent of £5.9 billion (€7.6 billion) in today's currency (Snow, 2013).

3.2 WAR IN THE PACIFIC

Japan's Dependence on Foreign Oil and Pearl Harbour

"The stoppage of oil imports. Without them Japan could not survive." - Vice Admiral Hoshina - Chief of the Naval Affairs Bureau (US Department of Defence, 1947)

Fifteen years after the Japanese Imperial Navy had destroyed the Russian fleet at the Battle of Tsushima in 1904, Japan had followed in the footsteps of Great Britain and moved its primary warships from coal to oil (Keegan, 1946). However, also like Great Britain, the island-nation faced potentially harmful strategic shortages of oil in the case of conflict, as Japan had virtually no domestic oil reserves. Japan had invested heavily in its navy in the interwar period and military fuel demand had increased exponentially. Japan used strategic storage to provide limited protection against supply disruptions.

The primary sources of imports for Japan were from the US and Borneo. Sakhalin Island, then part of the territory of Japan, was not yet the prolific oil province of today. Concerned that dependency on overseas exports could prove a liability, the Japanese Imperial Navy began a program of synthetic fuel production. However, this method proved expensive and produced small amounts of oil relative to total consumption (Wolborsky, 1994).

As Japan considered its position after signing the Tripartite Pact with Germany and Italy in September 1940, access to oil resources weighed heavily on the minds of the political and military leadership. Despite reassurances from the Foreign Minister Yōsuke Matsuoka that Japan could access oil from foreign sources such as the USSR and the Dutch East Indies, some Japanese policy makers remained concerned about oil supplies should the US enter the war against them.

These fears were realised in 1941 when the US enforced an oil embargo against Japan in response to Japans invasion of Indo-China. This was a crushing blow to the country, as they had previously relied on the US for 80% of their oil imports. Japan had strategic stocks estimated to last a year and a half at peace time consumption and considerably less during war (Sugihara, 1997).

This left Japan with two choices, withdraw from China and abandon their conquest of South–East Asia, or to strike rapidly to claim the resource rich region. Abandonment of China was considered politically unacceptable at the time, and so the Japanese developed the now infamous plan to strike Pearl Harbour. The

plan was to remove the American threat from the Pacific theatre, in order to be able to claim the Dutch East Indies, and other oil rich areas. The results are well documented, the attack on Pearl Harbour failed to remove the US Navy from the Pacific theatre and drew both the US and Japan into WWII (Donovan, 2004).

This case study shows that as well as being a factor in conflict, CEI and resources can be a major driver in a nation going to war in the first place. The US failed to appreciate the risk of placing Japan in such a predicament through its embargo, and paid heavily for it at Pearl Harbour.

Strikes against Sumatra (1944)

As the European war drew towards its conclusion, Britain moved its carrier fleets to the Pacific theatre to face the Japanese Imperial forces in 1944.

The war in the pacific had turned decisively in the Allies' favour two years earlier after the stunning defeat of the Japanese Imperial Navy at the Battle of Midway in 1942. After anticipating the ambush, the US sank four of Japan's six aircraft carriers, dealing a devastating blow to the Imperial Japanese Navy from which it never recovered. Despite this loss, it would be three years until Japanese forces accepted unconditional surrendered in 1945.

As the Pacific war raged, Britain's newly created Pacific Fleet was tasked with striking the critical infrastructure which fuelled Japan's Imperial Navy: the Sumatran oil refineries. *"The strategic targets selected were the Japanese oil refineries in Sumatra which, between them, produced by far the largest quantity of aviation fuel available to the enemy. The largest, near Palembang, had been attacked by USAAF high-level bombers in August 1944 but had survived the experience largely intact"* (Hobbs, 2011).

Since strategic bombing had failed to significantly damage the refineries and cut Japan's strategic aviation fuel supplies, the Allies decided to try low-level attacks conducted by fighters and fighter-bombers. The re-equipped British Pacific Fleet chose the small refinery of Pangkalan Brandan as a practice run. Two carriers groups, launched a strike force of 27 Avengers and 28 Corsair and Hellcat fighters on the 20th of December, but bad weather diverted the strike. However, two weeks later Operation Lentil struck the Pangkalan refinery and nearby Edeleanua plant with three carrier strike groups. The central pumping house, power plant, pre-topping plant were all damaged. Meanwhile oil storage tanks were set alight. The attack reduced capacity by a third (Hobbs, 2011).

Operation Meridian (1945)

Four days later, the Pacific Fleet moved against the two Palembang refineries, which had been built before the war by Royal Dutch Shell and Standard Oil. Captured in 1942 by the Imperial Japanese Army, retreating engineers had attempted to disable them before falling into enemy hands. However, the attempt largely failed and the refineries proved vital for Japans war effort, providing 75 percent of Japan's aviation gasoline (Powers, 1951).

In 1945, alerted to the presence of the British by the attack on the Pangkalan refinery, Japanese forces caused significant casualties on the British with defensive fighters, anti-aircraft defences and balloon barrages. Despite these countermeasures, the attack proved a success and the refinery suffered significant damage. After the war, General Asano of the Japanese Army Corps of Engineers in charge of Palembang refineries stated: *"The raid of January 1945 was carried out in a daring and efficient manner in spite of balloon barrage, heavy anti-aircraft fire and fighter opposition. Its effect was infinitely greater than the attack by B-29s in August 1944. I think that the low level bombing tactics of the naval planes contributed largely to the success of the raid. Targets were found and bombs were well aimed."* (Hobbs, 2011). The refineries were unable to regain pre-attack production levels.

Comparative Analysis of Targeting in the Pacific Theatre

The above case studies show how critical energy was to the Japanese war effort. The threat to their petroleum supplies through the US embargo in 1940 was a major factor in forcing Japan into the conflict, whilst its failure to secure it's supplies eventually cost Japan heavily – and was likely a major factor in its' eventual surrender. Takeo Kurita, vice admiral of the former Imperial Japanese Navy, when asked in in 1946 why the Japanese lost the war, simply replied "We ran out of oil" (King, 2006). The success of the bombing campaigns described in the case studies above, combined with the highly effective naval blockade (by the end of 1944 two thirds of all Japanese tankers had been sunk (US Department of Defence, 1947)) meant that in the later stages of the conflict Japan was running very low on petroleum.

This had a marked impact on the Japanese mode of operation. The Imperial Forces could no longer sustain or wage conventional conflict, so had to change tactics. The Imperial Air Force and Navy effectively ceded control of the air and sea to the Allies by 1944, meaning the invasion of Islands like Okinowa in 1945 occurred almost without resistance until US forces met the Japanese army. The

oil shortages also lead to a shift to less conventional tactics by Japanese forces, including the use of kamikaze pilots, who could have a greater impact for far less fuel consumption than conventional bombing (US Department of Defence, 1947).

One of the most interesting aspects of the Pacific War, however, is the comparative analysis between the US and the Japanese approach. As discussed, the US heavily prioritised the targeting of Japanese petroleum facilities, correctly identifying them as a centre of gravity for Japan. The Japanese, however, right up to the end of the conflict, failed to appreciate the importance of targeting an opponent's fuel supply. The Japanese attack on Pearl Harbour is an excellent example of this. The entire fuel supply for the Pacific Fleet was stored in above-ground tanks on the eastern side of the naval base. The Navy had just finished restocking its tanks in Pearl Harbour to their total capacity of 4.5 million barrels of oil.

The total capacity of the Pacific Fleet's oilers was 760,000 barrels of oil. Thus, the fleet was tied to its oil supply at Pearl Harbour. If the Japanese had attacked the oil storage and the associated oilers at Pearl Harbour on 7 December, they would have driven the Pacific Fleet back to the west coast.

Furthermore, Japan didn't learn from that mistake. From December 1941 to October 1942, Japanese submarines attacked just 19 merchant ships between Hawaii and the west coast; 15 of these were in December 1941. Consequently US supply lines were never heavily stressed, meaning they could act with logistic freedom. Admiral Chester W. Nimitz summed up the situation best, "Had the Japanese destroyed the oil, it would have prolonged the war another two years." (Karbuz, 2006).

3.3 IMPLICATIONS OF WW II

WWII marked the dawn of petroleum's direct military importance. Petroleum had become the lifeblood of the modern military machine. All the key weapons systems of WWII were petroleum-powered. Apart from military use of fuel, the economies of the belligerents were highly dependent on sufficient fuel supplies in order to sustain their industrial output.

The Allies recognised the importance of German CEI during the War in Europe early on, as demonstrated by the plans developed even before the war had begun. However, as several of the case studies show, the decision to prioritise other targets, and the ineffectiveness of high level area bombing, often at night,

hampered efforts to significantly impact German CEI.

Later in the war, the Allies prioritised the CEI above others. The Ruhr region was full of oil refineries that produced about 70,000 barrels per day (one fifth of Germany's total supply) in 26 syn-fuel plants using coal. The Allied precision bombing campaign lead to the collapse of the regional energy system causing its output to fall by 90 percent in a few months. Some German high ranking officials, like Hermann Goering, stated that if the Allies had started to bomb electrical grids, power stations and refineries early in the war, instead of exerting pressure on population by bombing it, the war would have ended two years earlier.

Both the European and the Pacific Campaign showed the effectiveness of inflicting damage on energy infrastructures, but at the same time showed how difficult is to plan an efficient operation to strike such targets. As the case studies show, many attempts were made by the Allies to hit oil supplies of Japan and Germany and its power system. The fact that Tokyo had its oil refineries suppliers dispersed around its borders and the electrical production was decentralized meant its CEI was partially resilient to strikes. The Allies understood that by blocking refuelling stations, Japan would suffer huge losses of supply. Many attacks took place against the Sumatra refineries but all of these remained intact, showing the difficulty of striking defended CEI. In 1945 British forces inflicted heavy damages to the refineries in Pangkalan, preparing the basis for a Japanese capitulation after years of blockades had also taken their toll.

German and Japanese failure to gain secure access to sufficient oil supplies was an important factor in their defeat. German synthetic fuel production proved barely adequate for wartime requirements, and failure to gain control of the rich oil fields in the Caucasus, coupled with setbacks in the Middle East and North Africa, left the German military vulnerable to oil shortages throughout the war.

The Japanese failed to appreciate fully either the vulnerability of their supply during a protracted conflict, or the importance of the US vulnerability of supply. Consequentially the Japanese missed the opportunity to cause significant damage to US efforts, both in their attacks on Pearl Harbour and later, while their own campaign was in the end dictated by fuel shortages. The comparative analysis between the US and Japanese approaches in the Pacific Theatre is one of the starkest examples of the dominant role of energy in conflict. Energy shortages following the US embargo were one of the primary drivers of the Pacific conflict, whilst Japanese energy shortages at the end of the conflict following allied targeting of CEI lead to their defeat.

4 Cold War Period

As WWII drew to a close, advancing Allied troops met their Soviet counterparts across what was soon to become a divided Europe. Less than a year later, Winston Churchill warned that an Iron Curtain was splitting the continent asunder into Soviet and Western spheres of influence. That split was to last roughly 40 years as the USSR faced off against the North Atlantic Treaty Organization (NATO) in an increasingly tense international environment characterized by the imminent threat of nuclear conflict and bitter proxy wars fought across the developing world.

Rapid economic development after the WWII created an unprecedented demand for energy which eventually culminated in an extensive international coal trade (which in turn lead the European Coal and Steel Community), the rise of OPEC, the commercialization of atomic power, and the birth of the liquefied natural gas (LNG) trade. This demand drove massive infrastructure investment across the globe with energy projects such as the pipelines connecting Russia's Yamal gas deposits to Europe marking some of the largest infrastructure projects ever undertaken (Pipelines International, 2009).

But as societies became increasingly dependent on energy and its attendant infrastructure, detailed plans were hatched in both Cold War camps to weaken their opponents by attacking critical points in their energy networks. This dedicated identification and targeting of critical points in energy infrastructure is a further progression from the developments seen in WWII, from area bombing to precision bombing. While many of these plans were prepared for times of open conflict and were never undertaken, their details show the importance strategic planners placed on energy infrastructure. This section will look at case studies from the Korean, Vietnam and Iran-Iraq wars.

4.1 MILITARY OPERATIONS

Attack on the Sui-ho Dam (Korean War June 23–26, 1952)

Two years into the Korean War United Nations forces had managed to push back the assault of North Korean forces, backed by Russia and China. With conflict reaching a stalemate the United Nations forces, led by the US, sought to find a

way to add impetus to the stalling peace negotiations.

One such example was the operation against the Sui-ho Dam, a series of massive air attacks against thirteen hydroelectric generating facilities, led by United Nations Command Air Forces. The first target was the hydroelectric complex connected with the Sui-ho Dam in North Korea. The Soviet Air Forces, using major anti-aircraft guns, heavily defended the hydroelectric targets. Fighters and fighter-bombers of the US Air Force, US Navy, US Marine Corps, and South African Air Forces jointly conducted these attacks (Futrell & Moseley, 2012).

Approximately 90 percent of North Korea's power-production capacity was destroyed in the operation, with eleven of the thirteen generating plants put totally out of operation, and significantly damaging the remaining two. As a consequence China, which drew power from the North Korea systems, suffered an estimated loss of 23 percent of its electric supply for the North East of the country, and some intelligence officers estimated that industrial output decreased by 60 percent, compromising the production quotas of key industries' production in the Dairen region. For two weeks, North Korea endured a total power blackout. Immediately, both China and USSR sent technicians into North Korea to repair or re-build the damaged generators. For much of the summer of 1952, approximately just 10 percent of former energy production was restored, primarily by its hydro-electric plants. North Korea built new facilities but did not restore its entire previous capacity until the armistice in 1953 (Gooch, 2013).

As demonstrated above, these attacks were clearly a tactical success, with widespread and lasting damage being achieved against North Korea's CEI – but there is some debate about the strategic success of the operation. Some argue that the mission achieved little lasting impact, the Panmunjeom negotiations were abandoned shortly after the raid, and the large-scale destruction of infrastructure lead to criticism in many Western nations, most notably the UK (Gooch, 2013). However, the raids did achieve some strategic impact. In the immediate aftermath of the raids the North Koreans pressured Stalin and Mao to accept the UN armistice agreement. Had it not been for the backing of the two powers, and their unwillingness to back down, the raids may well have been successful in forcing a treaty. The raids also cemented in the minds of North Koreans and their backers the omnipotence of the UN airpower, a factor which did weigh heavily on the communist forces, and contributed to the eventual Armistice in 1953 (Haruki, 2013).

Operation Rolling Thunder (Vietnam War 1965 - 1968)

Operation Rolling Thunder was a strategic bombing campaign conducted by the

US military during the Vietnam War. It aimed to attack targets throughout North Vietnam in order to put military pressure on its Communist leaders and reduce its capacity to wage war in South Vietnam. Operation Rolling Thunder gradually expanded in both range and intensity. Initially, the air strikes were restricted only to the southern part of North Vietnam; however, US leaders moved the target area increasingly northward in order to increase pressure on the Communist government (History, 2015).

The operation was composed of five phases with different scopes aimed to undermine the Vietnamese Socialist party. The third phase, initiated at the end of June 1966, was to target North Vietnamese oil and petroleum facilities. According to US Commander-in-Chief of the Pacific, Admiral Ulysses Grant Sharp, destroying the North's oil facilities would have made it difficult for the North Vietnam to support the war in the South. By autumn 1966, analysts estimated that the seventy percent of North Vietnam's oil and petroleum storage capacities had been destroyed (Tucker, 2001).

Despite the wide scale destruction the bombing campaign had little impact on the North's ability to wage war. The communist government had recognised the importance of energy in supporting operations, and had predicted the way the US would target it. In preparation they had dispersed the majority of their petroleum stocks in 50-gallon drums across the length of the country. The POL (Petroleum, Oil and Lubricant) attacks were halted on 4 September, after US intelligence admitted that there was "no evidence yet of any shortages of POL in North Vietnam" (Morocco, 1984). The failure of the US to sufficiently degrade North Vietnam's CEI, among other targets, through its air campaign, was a major contributing factor to the US failing to bring the Communist side to the negotiating table (Drew, 1986), and demonstrates the evolution of the defence of energy in conflict.

4.2 IRAN-IRAQ WAR

The Iran-Iraq War in the period of 1980-1988 was the longest conventional war in the 20th century. It had erupted after a long period of tensions and border disputes between the two countries. After four years of fighting, the belligerents reached a near stalemate in land operations. As the conflict dragged on, both sides tried to modify their tactics and started to conduct a war of attrition (Takeyh, 2010).

The so-called "Tanker War" escalated when Iraq launched several attacks against Iranian energy infrastructure in early 1984 attacking an oil terminal and

multiple oil tankers on Kharg Island. Considering the fact that Iraq's oil was being exported by pipeline or through third parties such as Kuwait, Iran chose to retaliate against the countries that were supporting Baghdad. Iranian fighter jets hit several Saudi and Kuwaiti tankers in May 1984. The number of attacks increased with both belligerents attacking oil tankers and merchant ships of neutral nations in order to deprive their opponent of trade (Cordesman & Wagner, 1990). During the period between 1984 and 1987, the belligerents conducted 340 attacks against naval vessels in the Persian Gulf, of which 259 were oil tankers or product carriers (O'Rourke, 1988). Iraq chose to attack the Iranian oil industry for this purpose. With more than 9 000 bombing raids Iraq almost eliminated the seven million barrels daily capacity of the largest Iranian oil terminal on Kharg Island (O'Rourke, 1988).

The Iran – Iraq war shows the evolution of energy in conflict. By 1980 petroleum revenue had become so important to both countries that the targeting of CEI caused extensive economic damage as well as military. What's also important to note though, was that by 1980 globalisation of the energy market meant that what would have been an isolated regional conflict had global implications on the world energy markets. Adjusted for inflation, oil prices had never reached the highs of the price spike in 1981, and wouldn't again until the late 2000s. This example demonstrates the importance of understanding energy in conflict – the globalised nature of the world energy market means a seemingly distant conflict can have serious domestic impacts on any developed nation.

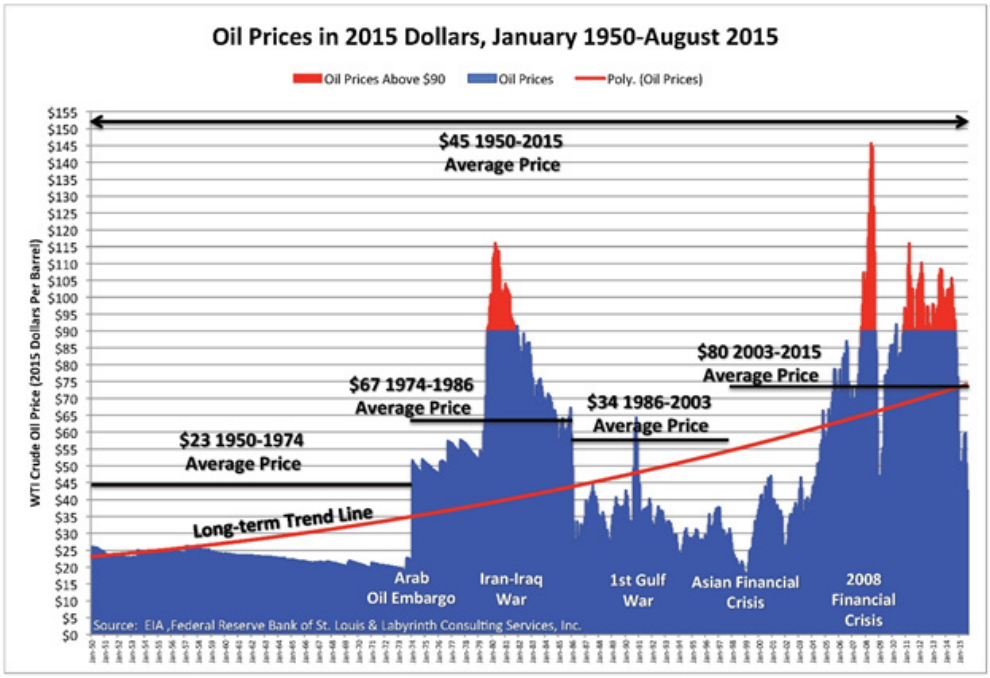

Figure 6 – Oil price spike during the Iran-Iraq War (Image: Art Berman)

4.3 IMPLICATIONS OF THE COLD WAR PERIOD

During the major conflicts of the Cold War period, attacks against CEI were considered one of the priorities. The targeting of oil infrastructure in the Iran-Iran War turned out be a prevalent tactic of both the belligerents, aimed at cutting the enemy's source of revenues and also the external support from third parties. The analysis shows the significance of CEI targeting in a conventional conflict between major energy producers and also sheds light on potential involvement of third parties in these conflicts.

Apart from the Iran-Iraq war, two military operations – the attack on Sui-ho dam and Rolling Thunder - were discussed in this chapter. These military operations display the importance of CEI targeting and protection in external interventions in internal or international conflicts. This approach to CEI targeting was later replicated in the major conflicts that erupted in the Post-Cold War security environment.

5 Post-Cold War Period

With the end of the Cold War, the emergence of a new "unipolar system" suggested that a new era of peace and prosperity would follow. However, new conflicts erupted in many regions. The strategic role of energy, and also the issue of CEI, as a military target continued to be prominent. We analyse the role of CEI targeting in two major military operations of the era – Operation Desert Storm and the Allied bombing of Serbia.

5.1. GULF WAR – OPERATION DESERT STORM (1991)

The Gulf War was one of the most significant conflicts of the post-cold war era. The main reasons for the Iraqi attack against Kuwait were for economic, diplomatic, territorial and energy reasons (Khadduri, 1997). Nonetheless, with the invasion of the Kuwait Saddam Hussein "violated" interests that had been defined in the Carter Doctrine (see Introduction). Kuwait held ten percent of the world oil reserves (estimated at 97.1 billion barrels in 1989 (BP, 2015)) and was the fifth largest oil producer on the globe. The Gulf War damaged Kuwait's production and its economy: its energy infrastructure was gravely damaged and had to be rebuilt, a task which took three years at huge expense to the government.

Coalition bombing of Iraqi infrastructure

Operation Desert Storm started with an extensive aerial bombing campaign on January 17, 1991 targeted against military and civilian infrastructure. The third and largest phase of the air campaign targeted not only military objectives throughout Iraq and Kuwait, but also civilian infrastructure (Naval History and Heritage Command, 2015). Within this phase, the Coalition struck eleven of Iraq's twenty major power stations, 119 substations and all major hydroelectric dams, completely destroying them and reducing electricity production to 4 percent of its pre-war levels. Other facilities, such as nuclear reactors, port facilities, oil refineries and distribution, railroads, and bridges, were also attacked (Husain, 1995).

Iraq's reaction

On 23 January, Iraq reacted by dumping 400 million US gallons (1,500,000 m3)

of crude oil into the Persian Gulf, the largest offshore oil spill in history at that time (Yergin, 2011). It was reported as a deliberate ploy to keep US Marines from coming ashore, as the US aircraft carriers Missouri and Wisconsin had attacked Failaka Island during the war to reinforce the idea that there would be an amphibious assault attempt.

Furthermore, retreating Iraqi forces set 700 oil wells in Kuwait on fire as part of a scorched earth policy while retreating from the country in 1991 after being driven out by the Coalition forces. The fires began in January 1991 with the last one not extinguished until November of the same year. Landmines had been placed in areas around the oil wells, meaning mine clearance was necessary before the fires could be safely managed and extinguished. An estimated six million barrels of oil on average were lost every day (Rostker, 2000). Eventually, privately contracted crews extinguished the fires; the cost for Kuwait was US 1.5 billion dollars. By that time, however, the fires had burned for approximately ten months, causing grave and widespread pollution (Husain, 1995).

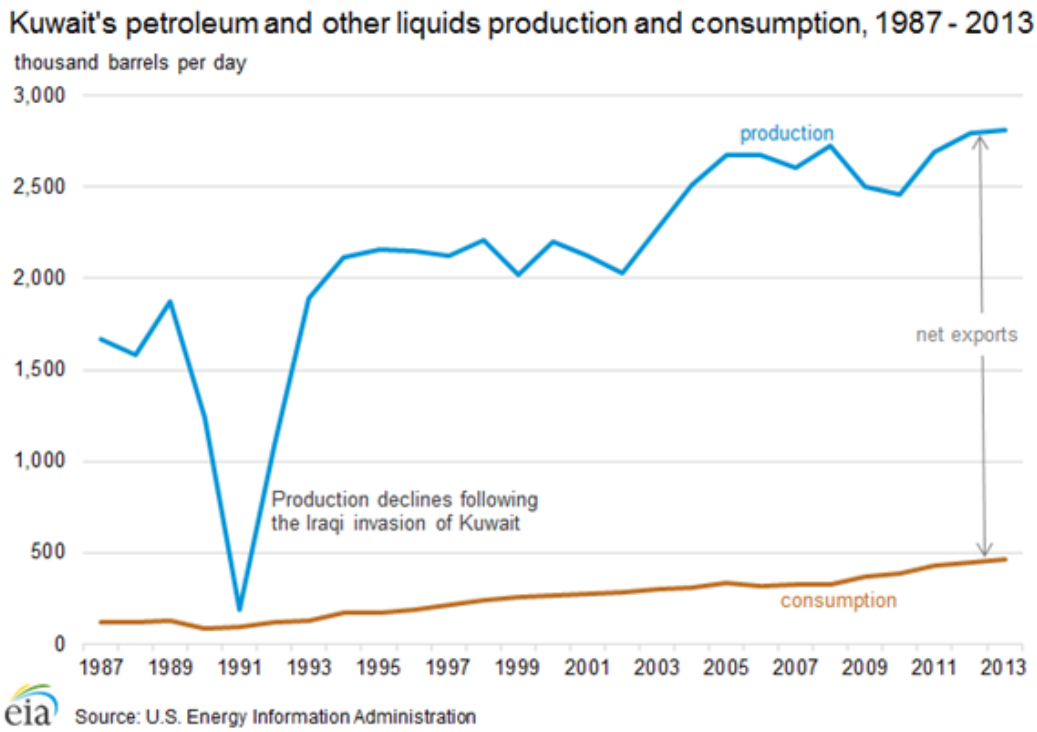

Figure 7– Drop in Kuwait's oil production following Iraqi destruction of Kuwait CEI (image: Energy Information Administration)

Consequences

Iraq was bombed during the Gulf War and this lead to the damaging or de-

struction of 70 percent of Iraq's installed electricity generation, 80 percent of refineries' production capacity had been destroyed, as well as petrochemical complexes, telecommunications centres (including 135 telephone networks) and electric cables (Al-Azzawi, 2013). The first direct victims of the widespread infrastructure destruction during the conflict were the Iraqi population. Still, years after the war, electricity production was less than a quarter of its pre-war level. The total destruction of water treatment facilities caused sewage to flow directly into the Tigris River, from which civilians drew drinking water, resulting in the spread of diseases.

This had long term impacts, including hampering stabilisation efforts in the Second Gulf War. Following the US led-coalition invasion of Iraq in 2003 allied forces became responsible for the provision and maintenance of Iraq's energy sector. Iraq's CEI had still not recovered from the destruction a decade earlier, meaning power losses, attributed to the coalition, were frequent throughout the 2000s. This contributed to public opinion turning against the coalition forces, and the ultimate failure of the stabilisation mission.

5.2. NATO BOMBING OF NOVI SAD AND PANČEVO (YUGOSLAVIA 1999)

During the NATO military campaign in Former Republic of Yugoslavia (FRY) energy infrastructure was one of the main targets of the operation. Significant effort from the NATO bombing campaign was aimed at oil refineries, electrical power plant, water supplies, telecommunications relay stations and any facilities that had potential military uses in the cities of Novi Sad and Pančevo. The Novi Sad oil refinery was targeted twelve times with 255 missiles and was virtually destroyed during April and May 1999. The bombings caused fires, which ignited 70,000 tons of crude oil, releasing toxins and contaminating surrounding soil and water reservoirs. The NATO bombing destroyed or severely damaged all processing units and more than 50 percent of the storage capacity (Dalmacijaa, Ivancev-Tumbasb, Zejakb, & Djurendic, 2003).

There is some debate over the effectiveness of the NATO bombing campaign. Some argue that the widespread destruction of CEI and the associated economic cost forced Yugoslavian President Milosevic to withdraw from Kosovo and led to Kosovan independence in 2008 (Cooper, 2010). Others state that the destruction of civilian infrastructure was far beyond the UN mandate for action, caused civilian deaths, unnecessary economic costs and damaged relations with China and Russia (Mandelbaum, 1999).

What is important about this case study though is that it demonstrates the shift

of the targeting of CEI from being a purely military objective, as it was in WWII, to being a form of coercion. CEI was one of the elements NATO identified as President Milosevic's "centres of gravity", i.e. CEI had become so integral to a nations functioning that it was now a critical vulnerability to the normal functioning of a state.

IMPLICATIONS OF THE POST-COLD WAR PERIOD

Despite the end of the Cold War and the emergence of regional conflicts, CEI remains an attractive target for military operations. During Operation Desert Storm and the retreat of Iraq from Kuwait, CEI played an important role in military efforts. In the case of Allied bombing of Serbian territory during the War in Former Republic of Yugoslavia, the Allied forces heavily targeted Serbian CEI in an attempt to coerce President Milosevic to withdraw his forces from Kosovo. Allied bombing severely damaged Serbian energy infrastructure, specifically refining capacity at refineries in Novi Sad and Pančevo.

These case studies demonstrate firstly how integral CEI has become to modern society, and consequently how CEI targeting can be used to coerce an adversary. In the Gulf War the US punished Saddam by targeting Iraq's CEI, aiming to deter future aggression against its neighbours. In Yugoslavia CEI was targeted in order to weaken public support for Milosevic, and force him to withdraw his forces from Kosovo.

Secondly, it shows an evolution from the blanket targeting of CEI in the World Wars, and later even in Vietnam, to precision strikes against key infrastructure targets, causing far greater impact than the limited impacts highlighted in many of the WWII examples.

6 Conclusions

This report highlights the fact that energy has played an important and evolving role during past conflicts. The case studies demonstrate how energy can trigger conflict, as seen by the Japanese attack on Pearl Harbour, can be a strategic aim in conflict, as the Caucasus were for Germany in both World Wars, can be a major weakness of military planning, as demonstrated by the German blockade of Britain in WWI, how targeting CEI can be a tool of coercion, as it was for the UN and NATO in Korea and Yugoslavia respectively, and how the targeting CEI can have lasting and unintended effects, as seen in the First Gulf War.

The case studies also document the evolution of the targeting of CEI, from the realisation of its importance in WWI, to the extensive aerial bombardment during WWII, to ever increasingly precise targeting as technology, understanding and the pervasiveness of CEI in society increased.

During WWI and the emergence of oil geopolitics the great powers first understood the importance of oil in military operations. Do to the lack of sufficient oil reserves of its own, Germany tried to take hold of the oil in Romania and Caucasus. Also, having recognised Britain's heavy dependence on imports, Germany launched the submarine campaign against the British Isles in order to hamper British military capabilities. A significant number of oil tankers were sunk, leading to an oil crisis in Britain in April 1917. Germany also experienced a naval blockade conducted by the Allied forces, which showed them how import dependent they really were, and what effect that had on their military capabilities. Germany had prided itself in its coal superiority but it had not taken enough measures to secure its oil supplies and was unable to mount a final offensive at the end of the War.

The failure of Germany and Japan to secure sufficient oil supplies and protect their vulnerable CEI in WWII was an important factor in their defeat. German synthetic fuel production aimed at lowering import dependence proved inadequate for wartime requirements, and was also extensively targeted by Allied military operations. In addition, failure to gain control of the rich oil fields in the Caucasus, coupled with setbacks in the Middle East and North Africa, left the German military vulnerable to oil shortages throughout the war. Conversely, the Allies could depend on secure production and refining capacity in the US How-

ever, long supply lines from the US to Europe and Asia were a constant weakness in this system.

The contrast between the relatively unsuccessful high-level bombing of Ploesti compared with the targeted low-level strikes on Sumatra show the advantage of precision bombing in military operations. This lesson was applied and evolved throughout the rest of century, as technology facilitated ever more precise strikes.

The Cold War Period saw military operations take the form of external interventions in internal conflicts. Our analysis focused on the wars in Korea and Vietnam. The analysis shows the importance of CEI targeting in third party interventions to counter aggression and pressure sides into negotiations. CEI targeting was later replicated in external interventions in the Post-Cold War period during the Gulf War and War in the Former Yugoslavia. Coalition military operations against CEI were designed to pressure the enemy to cease with hostilities and engage in negotiations. As energy is essential to modern economies, destroying the CEI and cutting the population off from power supplies can bring any country to a standstill. By destroying the CEI of a nation coalition forces hoped to turn the population against the intervention, and pressure the leaders to the negotiating table.

Besides the external interventions in the internal conflicts of the Cold War we also analysed CEI targeting in the Iran-Iraq War. We argue that CEI represents a highly attractive target in a conventional war between energy producing countries, primarily as a method of cutting a major source of income of the enemy party. We also saw the major ramifications this had on global oil prices.

In conclusion, during major conflicts of the past century, energy and attacks against CEI has played an important role. CEI always has been, and will continue to be, a fundamental vulnerability in any conventional conflict. CEI continues to be an important target of military operations and hence substantial efforts must be made to protect them. Efforts must also be made to understand the implications of targeting CEI, and the broader role energy plays in triggering and steering conflicts.

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