



Worldwide Attacks Against Dams

A Historical Threat Resource for Owners and
Operators

2012



Homeland
Security

Preface

This product is a compilation of information related to incidents that occurred at dams or related infrastructure world-wide. The information was gathered using domestic and foreign open-source resources as well as other relevant analytical products and databases.

This document presents a summary of real-world events associated with physical attacks on dams, hydroelectric generation facilities and other related infrastructure between 2001 and 2011. By providing an historical perspective and describing previous attacks, this product provides the reader with a deeper and broader understanding of potential adversarial actions against dams and related infrastructure, thus enhancing the ability of Dams Sector-Specific Agency (SSA) partners to identify, prepare, and protect against potential threats.

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Distribution Restrictions

This product is available on the Homeland Security Information Network – Critical Sectors (HSIN-CS) Dams Sector Portal. The HSIN-CS Dams Sector Portal allows for secure information sharing between Federal, State, and local agencies and sector owners and operators. For additional distribution information, please contact the Dams SSA at dams@hq.dhs.gov.

Notice

This material is not intended to be an all-inclusive list of physical attacks against dams and related infrastructure. Some incidents may not have been reported or may not have yielded enough credible information to be included in this report. This product is also not an analysis; it contains sourced incidents only and is therefore not intended to suggest future threats on any Dams Sector infrastructure.

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Section I:

Background to Dam Incidents

1.1 Overview

As with most critical infrastructure sectors, the technological and national security environment in which the Dams Sector operates continues to evolve. The purpose of this product is to support an improved understanding of the historical threat profile in order to establish a framework for effective sector security strategies. *Worldwide Attacks Against Dams* provides a snapshot historical overview of attempted and successful attacks against dams around the world. This historical compilation provides examples of attack vectors, which include assault teams, explosive devices, and standoff weapons, among others.

1.2 Dams Sector Risk Considerations

The Dams Sector encompasses dam projects, power plants, navigation locks, levees, mine tailings and other industrial waste impoundments, dikes, hurricane barriers, and other similar water retention and water control facilities throughout the Nation. Dams Sector assets provide water supply, power generation, navigable waterways, flood and storm surge protection, recreation, environmental stability, and many other critical economic, environmental, and social benefits.

The risk profile facing the Dams Sector arises from multiple sources: naturally occurring risks (such as those associated with floods and earthquakes), structural deficiencies, accidents, equipment malfunctions, aging infrastructure, and deliberate aggressor actions (such as those associated with terrorism). In addition, several overarching issues, such as cybersecurity or international border security, constitute potential sources of risk that are contextual in nature, but not necessarily sector-specific. These risk sources could potentially lead to a temporary disruption of critical functions or severe damage to—and even structural failure of—dams, levees, and other types of sector assets.

The sector contains a number of critical assets whose failure or disruption could result in deleterious results, including casualties, massive property damage, and other severe long-term consequences, as well as significant impacts to other critical infrastructure sectors such as energy, transportation, and water. The consequences of a deliberate attack on any of these critical assets could be wide ranging and depend on a number of variables, including: type of facility, failure or disruption mode, critical functions (water supply, hydroelectric power generation, navigation, etc.), system redundancies, downstream population density, regional infrastructure, and seasonal conditions.

Certain characteristics of dams make them an unusually difficult type of asset to protect. While assets in many other critical infrastructure sectors have a relatively small footprint, dams are normally large structures that are often located in remote areas. In addition, many critical

features at dam projects can be approached via land and water, or even by air. These factors pose especially difficult problems in controlling access to dams. However, most dams are designed and built according to well-documented engineering principles and regulated standards, a characteristic that can help in the case of an attack or major disruption. Further, dams are designed to withstand a variety of unusual and extreme conditions, which makes them inherently robust structures.

The vulnerabilities of dams to manmade attacks greatly depend on site-specific conditions and characteristics that could be exploited by potential adversaries to cause structural damage or to disable or disrupt operations or critical functions. Owners and operators of critical dams across the Nation have instituted security programs based on risk-informed management principles, including provisions to increase their security posture during heightened threat conditions.

1.3 Attack Types

Attacks can be carried out by individuals, small teams of a few perpetrators, or larger groups acting in a coordinated fashion. There are an infinite number of possibilities regarding potential combinations of resources, tactics, tools, and weapons that could be employed against Dams Sector assets. For comparative analysis purposes, it is convenient to define a reference set of attack modes and attack types that represent convenient sets of different possible combinations. Table 1.1 presents a notional classification of physical attacks modes and types.

Attack Mode	Attack Type
Land	Vehicle-borne Explosive Device
	Assault Team (with/without Explosives)
	(Man-Portable) Explosive Device and/or Incendiary Device
	Stand-off Weapons
	Mechanical Equipment
	Small Arms
Water	Water-borne Explosive Device
	Underwater Explosive Device
Air	Aircraft Impact

Table 1.1 Reference Attack Modes and Types

Each attack type could be further divided into feasible attack vectors, representing different severity levels (e.g., depending on the amount of explosives, the size of the attack force, and the sophistication of the attack planning process). The attack vectors could be defined to span a feasible range of capabilities, from simple attacks to more elaborate operations. For example, assault teams could range from a small cell to a large assault force with a demolition component.

In addition, attack types could be further categorized based on the assumed characteristics of the adversary. For example, some types of attacks may be conducted by adversaries with limited resources who may discontinue operations if they are compromised during initial phases. The use of small arms or man-portable explosive devices could be associated with these types of adversaries. However, other types of attacks could be conducted by well-trained adversaries with access to significant resources and backing from State-funded terrorist organizations. These

“high level” attacks could involve adversaries fully committed to gaining access to the target with intent to cause significant damage. Vehicle-borne or water-borne explosive devices could represent potential examples of the types of attacks that more sophisticated adversaries might attempt.

Section II: Incident Index

This product provides an overview of 25 attacks on dams between 2001 and 2011. These events, which represent attacks on impoundments, power-generation equipment, control facilities, and appurtenant structures, are summarized in the following table.

Table 2.1 Dam Attacks Summary: Incident Chronology

Dam Attacks Summary				
Facility	Country	Date	Attack Type	Attacker Type
Lhokseumawe Reservoir	Indonesia	August 17, 2001	Explosive Device	Separatist (Suspected)
Panauti Plant	Nepal	November 24, 2001	Explosive Device	Communist Insurgent-Maoist (Suspected)
Kidapawan Reservoir	Philippines	March 19, 2003	Standoff Weapons (Rockets)	Islamic Insurgent (Suspected)
Kajaki Dam	Afghanistan	May 2, 2003	Standoff Weapons (Rockets)	Islamic Insurgent
Gomal Zam Dam	Pakistan	September 21, 2004	Assault Team	Islamic Insurgent
Zelenchuck	Russia	September 21, 2004	Assault Team	Islamic Separatist
Dumarao	Philippines	December 15, 2004	Explosive Device	Communist Insurgent (Suspected)
Selaghat Dam Project	Nepal	December 19, 2004	Explosive Device	Communist Insurgent-Maoist (Suspected)
Mirani Dam	Pakistan	May 18, 2005	Explosive Device	Unknown
Haditha Dam	Iraq	August 2, 2005	Explosive Device	Unknown
Haditha Dam	Iraq	September, 2005	Standoff Weapons (Rockets)	Islamic Insurgent
Kajaki Dam	Iraq	September 17, 2005	Explosive Device	Islamic Insurgent
Hlaingbwe Dam	Burma	May, 2007	Explosive Device	Separatist (Suspected)
Hlaingbwe Dam	Burma	May 2007 and September 2, 2007	Standoff Weapons (Mortar)	Separatist (Suspected)
Waeng Station	Thailand	August 1, 2007	Explosive Device	Islamic Separatist (Suspected)
Kajaki Dam	Afghanistan	March 30, 2008	Explosive Device	Islamic Insurgent
Tipaimukh Dam	India	April 26, 2008	Assault Team Explosive Device	Unknown
Mosul Reservoir Dam	Iraq	May 1, 2009	Explosive Device	Unknown
Balimela Power Station	India	December 19, 2009	Incendiary Device	Communist Insurgent-Maoist (Suspected)
Myitkyina Dam	Burma	April 17, 2010	Explosive Device	Ethnic Separatist
Thawt Yin Kha Dam	Burma	April 27, 2010	Explosive Device	Ethnic Separatist
Black Rock Dam	United States	July 4, 2010	Incendiary Device	Unknown
Baksan Power Plant	Russia	July 20, 2010	Assault Team Explosive Device	Islamic Separatist (Suspected)
Machlagho Dam	Afghanistan	July 18, 2011	Assault Team	Unknown
Thawt Yin Kha Dam	Burma	July 20, 2011	Standoff Weapons (Rockets)	Ethnic Separatist (Suspected)

1.2 Event Types

Explosive devices, including improvised explosive devices (IEDs), were the most common attack type for events recorded during this period. Small arms and standoff weapons, including rocket-propelled grenades and mortars, were also common modes (figure 2.1). Events may include more than one attack mode.

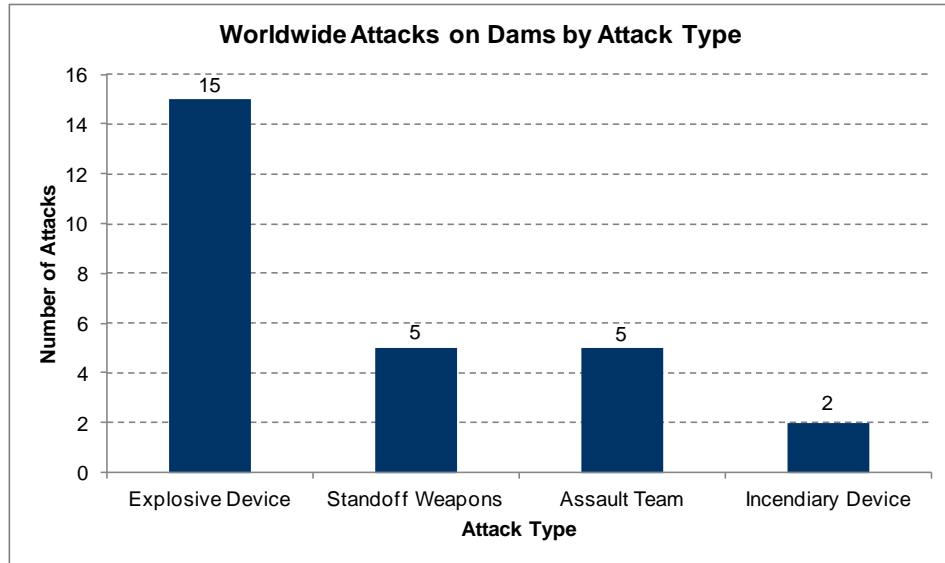


Figure 2.1 Incidents by Type

1.3 Frequency of Attacks

The annual frequencies of attacks have varied over the years, resulting in an average of 2.3 attacks per year over the period considered (figure 2.2).

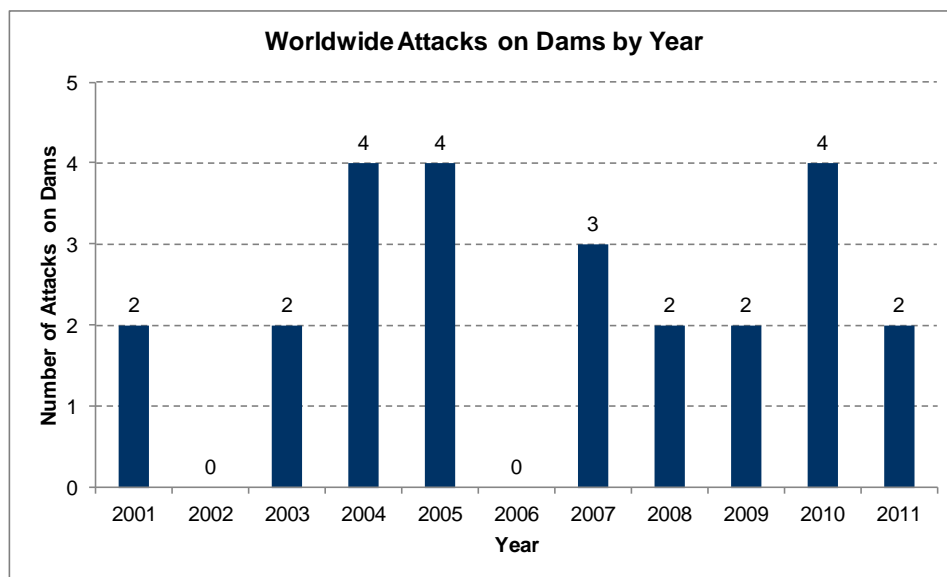


Figure 2.2 Incidents by Year

1.4 Attack Locations

The Incident Snapshot (table 2.2) includes attacks by the country in which the recorded attack took place. Attacks on dams in Afghanistan, Burma, and Iraq were recorded more frequently than in any other country. Events included in this document may not represent all attacks on dams during the period analyzed.

Table 2.2 Incident Snapshot

Country of Origin	Date of Incident(s)
Afghanistan	<ul style="list-style-type: none">• May 2, 2003• September 17, 2005• March 30, 2008• July 18, 2011
Burma	<ul style="list-style-type: none">• September 2, 2007• April 17, 2010• April 27, 2010• July 20, 2011
India	<ul style="list-style-type: none">• April 26, 2008• December 19, 2009
Indonesia	<ul style="list-style-type: none">• August 17, 2001
Iraq	<ul style="list-style-type: none">• August 2, 2005• September 2005• May 1, 2009
Nepal	<ul style="list-style-type: none">• November 24, 2001• December 19, 2004
Pakistan	<ul style="list-style-type: none">• October 9, 2004• May 8, 2005
Philippines	<ul style="list-style-type: none">• March 19, 2003• December 15, 2004
Russia	<ul style="list-style-type: none">• September 21, 2004• July 21, 2010
Thailand	<ul style="list-style-type: none">• August 20, 2007
United States	<ul style="list-style-type: none">• July 4, 2010

Section III:

Incident Summaries

This section contains summary descriptions of the physical attacks on dams, hydroelectric generation facilities, and other related infrastructure between 2001 and 2011 referenced in this document. The descriptions are listed in chronological order, and facilities may appear more than once. These descriptions derive from print media and other open sources and are unclassified.

Lhokseumawe Reservoir

Facility Details

No facility information available.

Attack Description

An IED was placed at the reservoir and functioned as designed. The incident was blamed on the Free Aceh Movement (GAM).

“Another home-made bomb went off at a small reservoir at Blang Panjang. No one was hurt but the reservoir was slightly damaged’, a military spokesman said.” At least 30 bombs or grenade blasts were heard around the main city in the restive province of Aceh in the run-up to Indonesia’s Independence Day.¹

Results

The attack resulted in minor damage to the facility. No injuries were reported.

Indonesia

August 17, 2001



Geography

Location: Aceh Province, Indonesia

Facility Description

Type: Dam Project

Attack Data

Event Date: August 17, 2001

Attack Type: Explosive Device

Statement of Event

An explosive device was placed at the Lhokseumawe Reservoir.

¹ Bombing spree marks Indonesian independence day in restive Aceh,” Agence France Presse, August 17, 2001. LexisNexis (Accessed November 10, 2011).

Panauti Plant

Facility Details

The Panauti hydropower plant is located in Khopasi in the Kavrepalanchok District of Nepal, near Kathmandu. The type of plant is a run of the river with an installed capacity of 2.4 MW and an average annual generation of 6.97 GWh.²

Attack Description

Suspected Nepal Communist Party (Maoist) members detonated an unknown explosive device at the Panauti hydropower plant during a series of attacks in the region.³

Results

No casualties were reported in the attack, but the damage to the plant was estimated around \$500,000 U.S. dollars (USD).

Nepal

November 24, 2001



Geography

Location: Khopasi near Kathmandu, Nepal

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: November 24, 2001
Attack Type: Explosive Device

Statement of Event

An unknown explosive device was placed at the Panauti hydropower plant.

² "Panauti Hydropower Station," Environmental Resources Group Nepal, accessed November 10, 2011, http://www.erg.com.np/panauti_hydropower.php.

³ "Three more policemen killed in Nepal by Maoist rebels," Agence France Presse, November 25, 2001. LexisNexis (Accessed November 10, 2011).; "3 killed in Nepal bomb explosion," Japan Economic Newswire, November 25, 2001. LexisNexis (Accessed November 10, 2011).

Kidapawan Reservoir Water Plant

Facility Details

The Kidapawan ground reservoir is part of the Metro Kidapawan Water District, which serves 114,882 residents in the Philippines' Cotabato province.⁴ The reservoir is also part of one of the largest water districts in South and Central Mindanao.⁵

The 600 cubic meter capacity ground reservoir project was developed to solve water supply and pressure problems experienced primarily during peak hours in the service area.⁶

Attack Description

Twenty suspected Moro Islamic Liberation Front (MILF) rebels fired two rocket-propelled grenades at a water reservoir plant in Kidapawan, Philippines.⁷

MILF denied responsibility for the attack.

Results

The attack destroyed a main pipeline and disrupted water supply to about 100,000 residents in the city. There were no injuries reported.⁸

Philippines

March 19, 2003



Geography

Location: Kidapawan, Philippines

Facility Description

Type: Dam Project

Attack Data

Event Date: March 19, 2003

Attack Type: Standoff Weapons
(Rockets)

Statement of Event

Rebels fired two rocket propelled grenades at the Kidapawan water plant.

⁴ Southeast Asian Water Utilities Network, "Metro Kidapawan Water District," accessed November 10, 2011, http://seawun.org/index.php?mact=CGUserDirectory,cntnt01,detail,0&cntnt01group=official_members&cntnt01summarytemplate=Official&cntnt01detailtemplate=Official&cntnt01uid=29&cntnt01returnid=111 and Hannah Ira V. Alcosoba and Felipe F. Salvosa II, "MILF back on board for talks," Business World (Philippines), March 20, 2003. LexisNexis (Accessed November 10, 2011).

⁵ Sun Star Davao by Malu Cadelina, "Modern Dam in North Cotabato nearly Complete," August 11, 2010, <http://www.sunstar.com.ph/davao/modern-dam-north-cotabato-nearly-complete>.

⁶ Local Water Utilities Administration, "P252-M Water Project to Benefit Kidapawan City, other Areas in North Cotabato," November 2010, http://www.lwua.gov.ph/news_10/nov_10/kidapawan.htm.

⁷ "Muslim rebels blow up key water pipeline in southern Philippines," Agence France Presse, March 19, 2003. LexisNexis (Accessed November 10, 2011).

⁸ "Rebels blast dam in southern Philippine city," Xinhua General News Agency, March 19, 2003. LexisNexis (Accessed November 10, 2011).

Kajaki Dam I

Facility Details

The Kajaki Dam is located on the Helmand River and is one of two major conventional hydropower plants within Helmand Province in southern Afghanistan. The Soviet Union constructed the dam in 1953; the United States subsequently installed two hydropower plants with a 33 MW capacity.

The facility provides most of the electricity for Helmand Province, as well as the major cities of Kandahar and Lashkar Gah, and provides irrigation for roughly 285,000 acres of farmland.

The facility was damaged during a U.S. bombing campaign in 2001. The U.S. Agency for International Development (USAID) provided funding to repair the dam and expand generating capacity.⁹ When completed, the facility will provide electricity to 1.8 million people.¹⁰

Attack Description

The governor of Helmand Province, Sher Muhammad Akhundzada, said three rockets had been fired at Kajaki Dam on the night of Thursday, May 2, 2003, but that the rockets had missed.¹¹

Results

On May 2, Afghan government forces arrested 60 suspected Taliban in Helmand Province for allegedly attacking the Kajaki dam with rockets and automatic weapons fire.¹²

Afghanistan

May 2, 2003



Geography

Location: Helmand Province, Afghanistan

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: May 2, 2003

Attack Type: Standoff Weapons (Rockets)

Statement of Event

Taliban rebels launched three rockets on the Kajaki Dam.

⁹ "FACTBOX: Afghanistan's battleground Kajaki dam," *Reuters*; February 12, 2007, accessed November 10, 2011, <http://uk.reuters.com/article/2007/02/12/uk-afghan-dam-idUKB75964820070212>.

¹⁰ "NATO clears Taleban from around Afghanistan's Kajaki dam," *Afghan Islamic Press*; February 13, 2007

¹¹ "60 Taliban caught," *New York Times*, May 3, 2003, accessed November 10, 2011, <http://www.nytimes.com/keyword/helmand-province>

¹² "Terrorism Project Action Update," *Center for Defense Information*, accessed November 10, 2011, <http://www.cdi.org/terrorism/actionupdate-pr.cfm>

Gomal Zam Dam

Facility Details

The Gomal Zam Dam is located in Chagmali in the South Waziristan region of the Federally-Administered Tribal Areas (FATA) of northern Pakistan. The dam was under construction by Sino Hydro, a Chinese energy firm, at the time of the attack.¹³

Attack Description

A group of armed men kidnapped a Pakistani policeman and two Chinese engineers associated with the construction of the Gomal Zam Dam.¹⁴ The kidnappers transported the hostages to a rural location and communicated through tribal intermediaries to demand the release of two suspected al-Qa'ida members under arrest by Pakistani authorities.¹⁵

Results

Negotiations between Pakistani authorities, the kidnappers, and tribal intermediaries failed to secure the release of the hostages. The Pakistani army's Special Services Group conducted a rescue operation, during which one of the Chinese engineers and five kidnappers were killed.¹⁶

Pakistan

October 9, 2004



Geography

Location: Chagmali, Federally-Administered Tribal Areas, Pakistan

Facility Description

Type: Dam Project

Attack Data

Event Date: October 9, 2004

Attack Type: Assault Team

Statement of Event

Armed militants kidnapped two Chinese engineers at the Gomal Zam Dam construction site.

¹³ Shi Ting, "Militants threaten to kill hostage unless they get safe passage," South China Morning Post; October 12, 2004. LexisNexis (Accessed November 10, 2011).

¹⁴ "Abductors holding Chinese in Pakistan threaten to detonate explosives," BBC Summary of World Broadcasts, October 10, 2004. LexisNexis (Accessed November 10, 2011).

¹⁵ Salman Masood, "Suicide bomber kills 3 others at a Shiite mosque in Pakistan," New York Times, October 11, 2004. LexisNexis (Accessed November 10, 2011).

¹⁶ "Anger and sadness greet death of hostage; Postings on Net a mix of condolences and questions of anti-terrorist policy," South China Morning Post, October 15, 2004. LexisNexis (Accessed November 10, 2011).

Zelenchuk Dam

Facility Details

The Zelenchuck Dam is located on the Kuban River in the Karachay-Cherkessia Republic, Russia. The dam contains a 300 MW hydroelectric power station.¹⁷ The complex accounted for roughly 20 percent of the Republic's electricity at the time of the attack.¹⁸

Attack Description

A group of three armed men attempted to gain access to the water intake area of the dam. Guards at the dam successfully repelled the attack, wounding one attacker.

Results

Guards at the dam detained the attackers for questioning.

Russia

September 21, 2004



Geography

Location: Karachay-Cherkessia Republic, Russia

Facility Description

Type: Dam Project

Attack Data

Event Date: September 21, 2004

Attack Type: Assault Team

Statement of Event

Guards repelled an attempt by three armed men to gain access to the water intake of the dam.

¹⁷ "Guards in southern Russia thwart armed raid on hydroelectric power station," Text of Report by *Radio Russia*; BBC Summary of World Broadcasts, 21 September 2004. LexisNexis (Accessed November 10, 2011).

¹⁸ "Russia: Guards at dam exchange fire with armed group," *Radio Free Europe*; 22 September, 2004.

Dumarao Dam

Facility Details

The facility was an irrigation dam under construction in Dumarao town, Capiz province.¹⁹

Dumarao Dam provides water for both Dumarao district and the Cuartero. The water provided by the dam is the most important resource to residents as it promotes the health of crops, which is the lifeline of Dumarao's people.²⁰

Attack Description

Suspected communists detonated a bomb at the site of a dam construction project.

Results

The bomb blast damaged a crane, but caused no injuries. Authorities recovered and safely detonated a second bomb located under a truck.²¹

Philippines

December 15, 2004



Geography

Location: Capiz Province, Philippines

Facility Description

Type: Dam Project

Attack Data

Event Date: December 15, 2004

Attack Type: Explosive Device

Statement of Event

Attackers detonated a bomb at the facility, damaging a crane.

¹⁹ "Suspected communists bomb irrigation dam project in Philippines," Deutsche Presse-Agentur, December 15, 2004.

²⁰ "Dumarao Dam," Municipality of Dumarao Capiz, accessed November 10, 2011.

<http://dumarao.i.ph/blogs/dumarao/2009/02/26/dumarao-dam/#more-7>

²¹ "Two killed in communist attacks despite truce offer in Philippines," Agence France Presse, December 15, 2004.

Selaghat Dam

Facility Details

Access to dam project information can be obtained via formal request through the Nepal Hydropower Association (NHA), which maintains the Nepal Hydropower Database.²²

Attack Description

During the evening of December 19, 2004, an IED was detonated at the powerhouse of the dam project's hydropower plant. No group claimed responsibility. However, it is widely believed the Communist Party of Nepal (Maoist)/United People's Front was responsible.²³

Another source states Maoist militants detonated a powerful bomb at the hydroelectric project in the Bajura District.²⁴

Results

The explosion cut electricity to the Martadi area, the headquarters of the neighboring Bajhang District, and damaged the 200 KW powerhouse situated at Selaghat in the district headquarters.

Nepal

December 19, 2004



Geography

Location: Selaghat, Bajura District, Nepal

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: December 19, 2004

Attack Type: Explosive Device

Statement of Event

An explosive device was detonated at the powerhouse of the Selaghat Dam.

²² Nepal Hydropower Association, "Database," Accessed November 14, 2011, <http://nepalhydro.org.np/database.php>.

²³ Worldwide Incident Tracking System (WITS), accessed November 8, 2011, https://wits.nctc.gov/FederalDiscoverWITS/index.do?Rd=Country%7C4294966962%7CNepal&t=Records&Rcv=Incident&Nf=p_IncidentDate%7CGTEQ+20041217%7C%7Cp_IncidentDate%7CLTEQ+20041220&N=0.

²⁴ South Asia Analysis Group by Dr. S. Chandrasekharan, "Nepal: The Maoists go on the Offensive," December 29, 2004, <http://www.southasiaanalysis.org/notes3/note250.html>.

Mirani Dam

Facility Details

The Mirani Dam project lies in Southern Pakistan and borders Iran. The dam has been constructed on the Dasht River, which is non-perennial with river flow depending entirely on rainfall over a catchment area of over 20,600 sq km of dry, hilly terrain.²⁵

The primary purpose of Mirani Dam is to store water from the three rivers during the summer season and flood events so water is available for irrigation purposes throughout the year. The stored water allows 33,200 acres of farmland in Kech Valley to be cultivated. The secondary purpose of Mirani Dam is to ensure a constant supply of clean drinking water to the towns of Turbat and Gwadar throughout the year.²⁶

Attack Description

Two militants attempted to detonate an explosive device at the Merani Dam Project offices. The explosive device detonated prematurely, killing one attacker and injuring the other.²⁷

Results

Local officials apprehended the surviving bomber.

Pakistan

May 18, 2005



Geography

Location: Balochistan Province, Pakistan

Facility Description

Type: Dam Project

Attack Data

Event Date: May 18, 2005

Attack Type: Explosive Device

Statement of Event

Two militants attempted unsuccessfully to detonate a bomb at the Mirani Dam Project office.

²⁵Scott Wilson Group plc, "Mirani Dam Review," November 10, 2011,

http://www.knightpiesold.co.uk/projects/natural_resources/water/mirani_dam_review.aspx.

²⁶"General Manager (Projects) South Wapda House Lahore Project Brief," Pakistan Water and Power Development Authority, November 2007, <http://www.scribd.com/doc/7844273/Mirani-Dam>.

²⁷"Pakistan: Two 'Terrorists' Killed While Planting Bomb Near Dam Office in Turbat," The News (Islamabad), May 19, 2005.

Haditha Dam I

Facility Details

The Haditha Dam was designed in the late 1960s, but construction did not begin until 1977. The Dam's embankment was designed by the Soviet Union's Ministry of Energy while the power station was designed and constructed by Yugoslav firms. It was intended to function as a multi-purpose dam that would generate hydroelectric power, regulate the flow of the Euphrates River, and provide water for irrigation. Construction lasted from 1977 to 1987 and was a joint undertaking by the Soviet Union and Iraq. The cost of the initial construction of the Haditha Dam is estimated at USD \$830 million.²⁸

Attack Description

Assailants detonated a timed IED outside the central transformer room of the Haditha Dam. No group claimed responsibility for the attack.²⁹

Results

No injuries were reported, but the dam did sustain damage from the attack.

Iraq

August 2, 2005



Geography

Location: Haditha, Al Anbar, Iraq

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: August 2, 2005

Attack Type: Explosive Device

Statement of Event

A timed explosive device was detonated outside the transformer room of the Haditha Dam.

²⁸ Nurit Kliot, *Water Resources and Conflict in the Middle East*, (Milton Park: Routledge, 1994).; "Annex III: Main water control structures (dams and water diversions) and reservoirs," *New Eden Master Plan for integrated water resources management in the marshlands areas*, (Iraqi Ministries of Environment, Water Resources and Municipalities and Public Works, 2006).; N. M. Kamnev, N. A. Sonichev, and N.A. Malyshev, "Earth dam of the Al-Haditha hydropower development on the Euphrates River (Translated from *Gidrotekhnicheskoe Stroitel'stvo*)," *Power Technology and Engineering*, Vol. 17, No. 10: 38-41.

²⁹ Worldwide incident Tracking System (WITS), accessed November 8, 2011, https://wits.nctc.gov/FederalDiscoverWITS/index.do?Rd=Country%7C4294966921%7CIraq&t=Records&Rcv=Incident&Nf=p_IncidentDate%7CGTEQ+20050802%7C%7Cp_IncidentDate%7CLTEQ+20050802&N=0.

Haditha Dam II

Facility Details

The Haditha Dam was designed in the late 1960s, but construction did not begin until 1977. The Dam's embankment was designed by the Soviet Union's Ministry of Energy while the power station was designed and constructed by Yugoslav firms. It was intended to function as a multi-purpose dam that would generate hydroelectric power, regulate the flow of the Euphrates River, and provide water for irrigation. Construction lasted from 1977 to 1987 and was a joint undertaking by the Soviet Union and Iraq. The cost of the initial construction of the Haditha Dam is estimated at US\$830 million.³⁰

Attack Description

Insurgents fired a rocket-propelled grenade at Haditha Dam. The grenade struck power lines before detonating on the dam.³¹

Results

There was no damage reported from the incident, and the dam remains heavily guarded.

Iraq

September 2005



Geography

Location: Haditha, Al Anbar, Iraq

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: September 2005
Attack Type: Standoff Weapons (Rockets)

Statement of Event

Insurgents fired a rocket propelled grenade at the Haditha Dam.

³⁰ Nurit Kliot, *Water Resources and Conflict in the Middle East*, (Milton Park: Routledge, 1994).; "Annex III: Main water control structures (dams and water diversions) and reservoirs," *New Eden Master Plan for integrated water resources management in the marshlands areas*, (Iraqi Ministries of Environment, Water Resources and Municipalities and Public Works, 2006).; N. M. Kamnev, N. A. Sonichev, and N.A. Malyshev, "Earth dam of the Al-Haditha hydropower development on the Euphrates River (Translated from *Gidrotekhnicheskoe Stroitel'stvo*)," *Power Technology and Engineering*, Vol. 17, No. 10: 38-41.

³¹ TRIPwire, "Dam profile," accessed November 3, 2011, https://www.tripwire.dhs.gov/IED/appmanager/IEDPortal/IEDDesktop?_nfpb=true&_pageLabel=LOGIN.

Kajaki Dam II

Facility Details

The Kajaki Dam is located on the Helmand River and is one of two major conventional hydropower plants within Helmand Province in southern Afghanistan. The Soviet Union constructed the dam in 1953; the United States subsequently installed two hydropower plants with a 33 megawatt capacity.

The facility provides most of the electricity for Helmand Province, as well as the major cities of Kandahar and Lashkar Gah. The dam also provides irrigation for roughly 285,000 acres of farmlands.

The facility was damaged during a U.S. bombing campaign in 2001. The U.S. Agency for International Development (USAID) provided funding to repair the dam and expand the generating capacity.³² Once the repairs are completed, the facility will provide electricity to 1.8 million people.³³

Attack Description

Twenty suspected Taliban militants accessed the dam and began to lay explosives in an apparent attempt to cause a dam failure.³⁴

Results

NATO and Afghan troops arrested the militants prior to detonation of explosives. Following this event and other attempted attacks at Kajaki Dam, work at the facility ceased in 2006 while NATO forces increased security presence around the area of the dam. In 2007, NATO operations cleared insurgent compounds from around the dam area.³⁵

Afghanistan

September 17, 2005



Geography

Location: Helmand Province, Afghanistan

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: September 17, 2005

Attack Type: Explosive Device

Statement of Event

Taliban militants attempted to detonate explosives on Kajaki Dam.

³² "FACTBOX: Afghanistan's battleground Kajaki dam," Reuters, February 12, 2007, accessed November 10, 2011. <http://uk.reuters.com/article/2007/02/12/uk-afghan-dam-idUKB75964820070212>.

³³ "NATO clears Taleban from around Afghanistan's Kajaki dam", Afghan Islamic Press, February 13, 2007.

³⁴ "Twenty militants arrested trying to blow up massive Afghan dam," The Associated Press, September 17, 2005.

³⁵ "British clear area around Afghan dam," UPI, February 6, 2007.

Hlaingbwe Dam I

Facility Details

The Hlaingbwe Dam is located on the Salween River in Burma's eastern Karen State. The project was constructed by the Electricity Generating Authority of Thailand (EGAT), under an agreement with Burma, at the time of the attacks.

The dam is part of a larger, controversial water control system along the Salween River, which will eventually include as many as 18 proposed dams in China and five in Burma.

Attack Description

An EGAT geologist working at the Hlaingbwe Dam was killed by a land mine near the project site.

Results

Thai EGAT employees evacuated the site following the attack.³⁶

Burma

May 2007



Geography

Location: Karen Province, Burma

Facility Description

Type: Dam Construction Project

Attack Data

Event Date: May, 2007

Attack Type: Explosive Device

Statement of Event

A land mine and mortar or artillery fire killed a Thai geologist and a Thai construction worker, respectively, near the site of a dam construction project.

³⁶ "Thai hydro project workers evacuated from Myanmar after shelling kills 1," Associated Press, September 4, 2007.

Waeng Hydro Station

Facility Details

The Waeng Hydro-Measure Station is located in the Narathiwat province of southern Thailand.

Attack Description

Suspected Islamist separatists detonated an explosive at the station.

Results

The explosion damaged the control station, but caused no injuries.³⁷

Thailand

August 20, 2007



Geography

Location: Narathiwat Province, Thailand

Facility Description

Type: Water Control Structure

Attack Data

Event Date: August 20, 2007

Attack Type: Explosive Device

Statement of Event

Suspected Islamist separatists detonated an explosive at a hydro-measure station.

³⁷ "Narathiwat bomb hurts 2," The Nation, August 20, 2007, accessed November 10, 2011. <http://www.nationmultimedia.com/home/Narathiwat-bomb-hurts-2-30045706.html>.

Hlaingbwe Dam II

Facility Details

The Hlaingbwe Dam is located on the Salween River in Burma's eastern Karen State. The project was constructed by the Electricity Generating Authority of Thailand (EGAT), under an agreement with Burma, at the time of the attacks.

The dam is part of a larger controversial water control system along the Salween River, which will eventually include as many as 18 proposed dams in China and five in Burma.

Attack Description

Unknown attackers fired mortars or artillery shells at a worker camp in Hlaingbwe township near the construction site of a Salween River Dam.

Results

The attack killed one Thai national working at the site. Attackers were believed to be members of the Karen National Union (KNU) militant group.³⁸

Burma

September 2, 2007



Geography

Location: Karen Province, Burma

Facility Description

Type: Dam Construction Project

Attack Data

Event Date: September 2, 2007
Attack Type: Standoff Weapons
(Mortar or Artillery)

Statement of Event

A land mine and mortar or artillery fire killed a Thai geologist and a Thai construction worker, respectively, near the site of a dam construction project.

³⁸ "Thai hydro project workers evacuated from Myanmar after shelling kills 1," Associated Press, September 4, 2007.

Kajaki Dam III

Facility Details

The Kajaki Dam is located on the Helmand River and is one of two major conventional hydropower plants within Helmand Province in southern Afghanistan. The Soviet Union constructed the dam in 1953; the United States subsequently installed two hydropower plants with a 33 megawatt capacity.

The facility provides most of the electricity for Helmand Province, as well as the major cities of Kandahar and Lashkar Gah. The dam also provides irrigation for roughly 285,000 acres of farmlands.

The facility received damage during a U.S. bombing campaign in 2001. The U.S. Agency for International Development (USAID) provided funding to repair the dam and expand generating capacity.³⁹ Once completed, the facility will provide electricity to 1.8 million people.⁴⁰

Attack Description

Two British Marines in a patrol vehicle were killed by a roadside bomb near the Kajaki Dam.⁴¹

Results

Both marines were evacuated to a medical facility; one died en route, the other died after arrival.⁴²

Afghanistan

March 30, 2008



Geography

Location: Helmand Province, Afghanistan

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: March 30, 2008

Attack Type: Explosive Device

Statement of Event

A roadside bomb killed two British marines patrolling the Kajaki Dam.

³⁹ "FACTBOX: Afghanistan's battleground Kajaki dam," Reuters, February 12, 2007, accessed November 10, 2011. <http://uk.reuters.com/article/2007/02/12/uk-afghan-dam-idUKB75964820070212>.

⁴⁰ "NATO clears Taleban from around Afghanistan's Kajaki dam", Afghan Islamic Press, February 13, 2007.

⁴¹ "NATO troops killed in Afghanistan ahead of summit," Agence France Presse, March 31, 2008.

⁴² "Three NATO soldiers among 18 killed in Afghanistan," Deutsche Presse-Agentur, March 31, 2008.

Tipaimukh Dam

Facility Details

Tipaimukh Dam is a hydropower plant located at the intersection of the Indian states of Manipur, Mizoram, and Assam. The facility is owned by India's North Eastern Electric Power Corporation (NEEPCO).

The dam was originally designed as an embankment dam to contain flood waters in the lower Barak valley, but a 1500 KW power generation unit was later added to the project. The dam is 390m long and 162.8m high, and stretches across the Barak River. The dam's crest elevation was expected to be at an altitude of about 180 meters above sea level during design with a maximum reservoir level of 178 m.⁴³

Attack Description

An armed group attacked and destroyed machinery. The attackers reportedly used explosives to destroy drilling machinery stationed at the project site on the Barak River bank.⁴⁴

Results

The Hmar People's Convention (HPC), a local militant group, claimed responsibility for the attack. NEEPCO employees and engineers working at the dam evacuated to nearby towns.⁴⁵

Dam security measures were strengthened with paramilitary force personnel deployed to patrol the construction site located close to the Manipur-Mizoram border.

India

April 26, 2008



Geography

Location: Manipur State, India

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: April 26, 2008

Attack Type: Assault Team

Statement of Event

An armed group attacked the Tipaimukh hydropower site, destroying machinery.

⁴³ NHPC Limited, "Features," Retrieved August 6, 2011, http://www.nhpcindia.com/Projects/English/Scripts/Prj_Features.aspx?Vid=167.

⁴⁴ SIPHRO, "Security tightened after Tipaimukh Sabotage," April 30, 2008, <http://www.siphro.org/2008/04/30/security-tightened-after-tipaimukh-sabotage/>.

⁴⁵ "HPC(D) claims responsibility for destroying dam machinery," Hindustan Times, April 29, 2008.

Mosul Dam

Facility Details

The Mosul Dam, Iraq's largest by reservoir capacity, is a key component in Iraq's national power grid. Built in 1984 on the Tigris River, the dam generates 320 MW daily using four 200 MW turbines. In 2006, the U.S. Army Corps of Engineers warned that the unstable foundation poses a dangerous risk of internal erosion and catastrophic failure.⁴⁶

Attack Description

At about 4:30 pm, a suicide bomber detonated an IED while sitting in a café overlooking the Mosul Dam Reservoir near Daw' al Qamar, Ninawa, Iraq.⁴⁷ No group claimed responsibility for the attack.

It is unknown whether the attack was directly or indirectly targeting the Mosul Dam.

Results

The attack killed between five and 10 Shiite Turkomans, wounding six others and damaging the café.

Iraq

May 1, 2009



Geography

Location: Daw' al Qamar, Ninawa, Iraq

Facility Description

Type: Dam Project

Attack Data

Event Date: May 1, 2009

Attack Type: Explosive Device

Statement of Event

A suicide attack was carried out in the vicinity of Mosul Dam.

⁴⁶ "Iraq dismisses Mosul Dam warnings," BBC News, October 31, 2007, accessed November 10, 2011. http://news.bbc.co.uk/2/hi/middle_east/7070706.stm

⁴⁷ "Attack kills five in Northern Iraq," RTT News, May 1, 2009.

Balimela Power Station

Facility Details

The Balimela Power Project is the second stage of a two-stage development of Machkund - Sileru River, the first stage being the Machkund Project. The water released from Machkund Powerhouse and the inflow from intermediate catchment between Machkund-Balimela Dam is impounded by an earth and rock combination fill at Chitrakonda known as Balimela Dam. Balimela Dam is a joint project between the Orissa and Andhra Pradesh Governments, and the inflow into Balimela Reservoir is shared between the two states.

The 510 MW Balimela Station is run by the Odisha Hydro Power Corporation.⁴⁸

Attack Description

Suspected Maoists set fire to the power station valve house at the Balimela plant, damaging equipment and water intake tunnels. The attackers tied facility staff to a pole during the three hour incident; no injuries were reported.⁴⁹

Results

The attackers left posters claiming that the attack was retaliation for the failure of the government to provide electricity and communications utilities to local villages.⁵⁰

India

December 19, 2009



Geography

Location: Orissa State, India

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: December 19, 2009

Attack Type: Incendiary Device

Statement of Event

Suspected Maoist attackers set fire to part of the Balimela Station hydropower plant.

⁴⁸ <http://www.ohpcLtd.com/balimela/index.asp?type=index>

⁴⁹ "India: Orissa plant damaged by Maoists," Right Vision News, December 22, 2009.

⁵⁰ "Maoists damage valve house of Malkangiri power project," The Pioneer (India), December 21, 2009.

Mytikyina Dam

Facility Details

The Mytikyina hydropower plant is located at Kyinkan Longan in Burma's northern Kachin state. The dam is located near the confluence of the May Kha and Malika Rivers, which forms the Irrawaddy River. This facility is also known as Myitsone Dam.

The plant, which includes a 4,100 MW generating plant, is a joint venture between the Burmese company, Asia World Construction, and China Power Investment Corporation.⁵¹

Attack Description

Attackers detonated explosives at the plant, killing four Chinese workers and injuring roughly 20 other Chinese and Burmese workers. The attackers were suspected members of the Kachin Independence Organization (KIO).⁵²

Results

Authorities sealed the area around the dam and identified several unexploded IEDs in areas near the workers' living quarters. In October of 2011, Burmese President Thein Sein officially suspended construction of the facility indefinitely.⁵³

Burma

April 17, 2010



Geography

Location: Kachin State, Burma

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: April 17, 2010

Attack Type: Explosive Device

Statement of Event

Attackers detonated explosives at the Mytikyina hydropower plant, killing four workers and injuring 20 others.

⁵¹ "Myanmar: Explosions reported at hydropower project in northern Myanmar," Tenders Info, April 19, 2010.

⁵² "More bombs in Burma," States New Service, April 18, 2010.

⁵³ "Burmese regime suspends controversial China-funded dam," The Vancouver Sun, October 10, 2011.

Thawt Yin Kha Dam I

Facility Details

The Thawt Yin Kha Dam (alternatively, Thaukyegat) is a hydropower plant, which is located on the Thawt Yin Kha River in Taungoo District, Bago Division, in southern Burma. The plant, which is currently under construction, is located 220km to the north of Yangon, the former capital.⁵⁴

The facility, part of Burma's Ministry Electric Power, will generate 140 MW upon completion.⁵⁵

Attack Description

Karen National Liberation Army (KNLA) militants conducted grenade attacks on the facility's construction site, injuring at least four people. Officials of the separatist Karen National Union claimed that the KNLA conducted the attack with the intention of destroying the plant.⁵⁶ The attack followed a series of separatist bombings throughout Burma at other hydropower facilities and religious festivals.⁵⁷

Results

Burmese State Peace and Development Council (SPDC) troops and dam security officials repelled the attack. At least ten SPDC troops and four dam workers were wounded during the attack.⁵⁸

Burma

April 27, 2010



Geography

Location: Taungoo District, Bago Division, Burma

Facility Description

Type: Dam Construction Project

Attack Data

Event Date: April 27, 2010

Attack Type: Explosive Device

Statement of Event

KNLA militants conducted grenade attacks on the Thawt Yin Kha Dam construction site.

⁵⁴ "4 injured in grenade attacks on hydropower project in Myanmar division," Xinhua General News Service, April 27, 2010.

⁵⁵ "A hydropower dam site in Pegu attacked," The Irrawaddy, June 20, 2011, accessed November 10, 2011. http://irrawaddy.org/article.php?art_id=21529.

⁵⁶ "Burma: Karen liberation army claims attacking dam with 'rocket,' 'heavy weapons,'" BBC Monitoring Asia Pacific, April 29, 2010.

⁵⁷ "4 injured in grenade attacks on hydropower project in Myanmar division," Xinhua General News Service, April 27, 2010.

⁵⁸ "Burma: Karen liberation army claims attacking dam with 'rocket,' 'heavy weapons'," BBC Monitoring Asia Pacific, April 29, 2010.

Black Rock Dam

Facility Details

The Black Rock Dam is an embankment dam located in the Black Rock State Park at the Black Rock Pond in Thomaston, Connecticut. The dam is managed by the U.S. Army Corps of Engineers.⁵⁹

Attack Description

Local police officials discovered the remains of two devices that had detonated on an access road near the dam. Police identified the devices as Molotov Cocktails—IEDs made from gasoline-filled bottles.⁶⁰

Results

Officials determined that the devices did not cause any injuries or damage to the facility. Police did not identify parties responsible.

United States

July 4, 2010



Geography

Location: Thomaston, Connecticut, United States

Facility Description

Type: Embankment Dam

Attack Data

Event Date: July 4, 2010

Attack Type: Incendiary Device

Statement of Event

Unknown persons detonated incendiary devices near Black Rock Dam.

⁵⁹ “Town’s merchants fear “no swimming’ means no business,” New York Times, May 15, 1983.

⁶⁰ “Molotov cocktails found at Black Rock Dam,” Thomaston Express, July 14, 2011.

Baksan Power Plant

Facility Details

The Baksanskaya, also known as the Baksan Hydropower Plant, was built on the Baksan River in Kabardino-Balkaria between 1930 and 1936. The station laid the foundation for the development of the hydraulic power industry in the Republic, as well as in Russia's Stavropol region. The station was built by Russian specialists and local residents.

The 25MW station was built very quickly despite the use of primitive construction technologies. The first power-generating unit was launched in September 1936; the station started full operation in 1939.

The Baksanskaya Hydropower Plant is now a structure of RusHydro's division in Kabardino-Balkaria.⁶¹

Attack Description

Four gunmen attacked a police station outside the dam's perimeter before proceeding to the dam structure. The gunman killed two facility guards and detonated four explosives, destroying two generators. A fifth explosive was later neutralized.⁶²

Results

Police responded to the scene and reported an explosive may have been placed on a third generator during the attack. The Dam Operator suspended power generation and opened the dam's spillway gates.⁶³

Russian investigators identified and killed two members of the Baksan Dzhamaat terrorist group on July 25 2010. Baksan Dzhamaat was believed to be responsible for the attack on the Baksan Dam.⁶⁴

Russia

July 20, 2010



Geography

Location: Kabardino-Balkaria, Russia

Facility Description

Type: Hydropower Plant

Attack Data

Event Date: July 20, 2010

Attack Type: Assault Team

Statement of Event

Attackers fired on and killed two security guards at the Baksan Hydropower Plant and later detonated explosives at the site.

⁶¹ "Terrorist Explode Hydropower Plant in Russia's Northern Caucasus," Pravda.Ru, July 21, 2010, accessed November 10, 2011. http://english.pravda.ru/news/hotspots/21-07-2010/114304-hydropower_plant-0/

⁶² "Attackers blow up 2 generators at hydropower plant in N. Caucasus," Russia & CIS Energy Newswire, July 23, 2010.

⁶³ "Russian power plant attack kills two," The Statesman (India), July 21, 2010.

⁶⁴ "Russian police kill militants linked to Baksan hydro plant attack," RIA Novosti, August 5, 2010.

Machlagho Dam

Facility Details

The Machlagho Dam is a conventional hydropower facility currently under construction located in Ahmadabad district of Paktia Province, Afghanistan. Upon completion, the dam is expected to provide electricity generation and irrigation to the area.⁶⁵

Attack Description

Unknown gunmen attacked security guards near the construction site. Attackers killed one guard, injured a second guard, and kidnapped three others.

Armed militants attacked security posts of Machlagho dam of Ahmadabad district of Paktia province, abducted three policemen and killed two others. According to local officials, another policeman had been injured in this event. Abdul Ghafar Safi, Police chief of Paktia, reported two guards were killed, one injured, and three were abducted by the militants.⁶⁶

Results

The location of the attackers and missing guards remains unknown. No organization claimed responsibility for the attack.⁶⁷

According to the Police Chief, construction work continued at and around Machlagho dam project site; five security posts were created by local people. The Governor of the Ahmadabad district of Paktia said that two local soldiers were wounded and a bodyguard had been killed in the event. The Police Chief of Paktia ensured security for the Mashlagho dam staff and adopted security measures.

Afghanistan

July 18, 2011



Geography

Location: Ahmadabad District, Paktia Province, Afghanistan

Facility Description

Type: Dam Construction Project

Attack Data

Event Date: July 18, 2011

Attack Type: Assault Team

Statement of Event

Unknown gunmen attacked the Machlagho Dam construction site.

⁶⁵ "This year's good news," Weesa (Kabul), June 21, 2010. LexisNexis (Accessed November 10, 2011).

⁶⁶ "Paktia (BIA) armed militants attacked on security posts of Machlagho power dam last night," Bakhtar News Agency translated by Suraya-Yarzada, July 19, 2011.

⁶⁷ "Security guard of dam killed, three go missing in Paktia," The Frontier Star, July 19, 2011. LexisNexis (Accessed November 10, 2011).

Thawt Yin Kha Dam II

Facility Details

The Thawt Yin Kha Dam (alternatively, Thaukyegat) is a hydropower plant, which is located on the Thawt Yin Kha River in Taungoo District, Bago Division, in southern Burma. The plant, which is currently under construction, is located 220 km to the north of Yangon, the former capital.⁶⁸

The facility, part of Burma's Ministry Electric Power, will generate 140 MW upon completion.

Attack Description

On July 20, 2011, unknown assailants fired eight rocket-propelled grenade rounds or mortar shells at a dam construction site on the Thawt Yin Kha River. No injuries were reported following the attack.

Results

Officials suspect that the ethnic Karen rebel group, the Karen National Liberation Army (KNLA), was responsible for the attack. The KNLA is one of several rebel groups—including the Kachin Independence Army and Democratic Buddhist Army—that have conducted violent anti-government attacks in southern Burma.⁶⁹

Burma

July 20, 2011



Geography

Location: Taungoo District, Bago Division, Burma

Facility Description

Type: Dam Project

Attack Data

Event Date: July 20, 2011
Attack Type: Standoff Weapons (Rockets)

Statement of Event

Rocket-propelled grenades, or possibly mortar shells were fired at the Thawt Yin Kha Dam construction site.

⁶⁸ "4 injured in grenade attacks on hydropower project in Myanmar division," Xinhua General News Service, April 27, 2010.

⁶⁹ "A hydropower dam site in Pegu attacked," *The Irrawaddy*; June 20, 2011, accessed November 10, 2011. http://irrawaddy.org/article.php?art_id=21529