Historic Issues and Treaty Interpretation

Professor Philippa Webb

Indus Waters Western Rivers Arbitration (Pakistan v. India)
PCA Case No. 2023-01

Hearing for the Second Phase on the Merits

2 February 2026

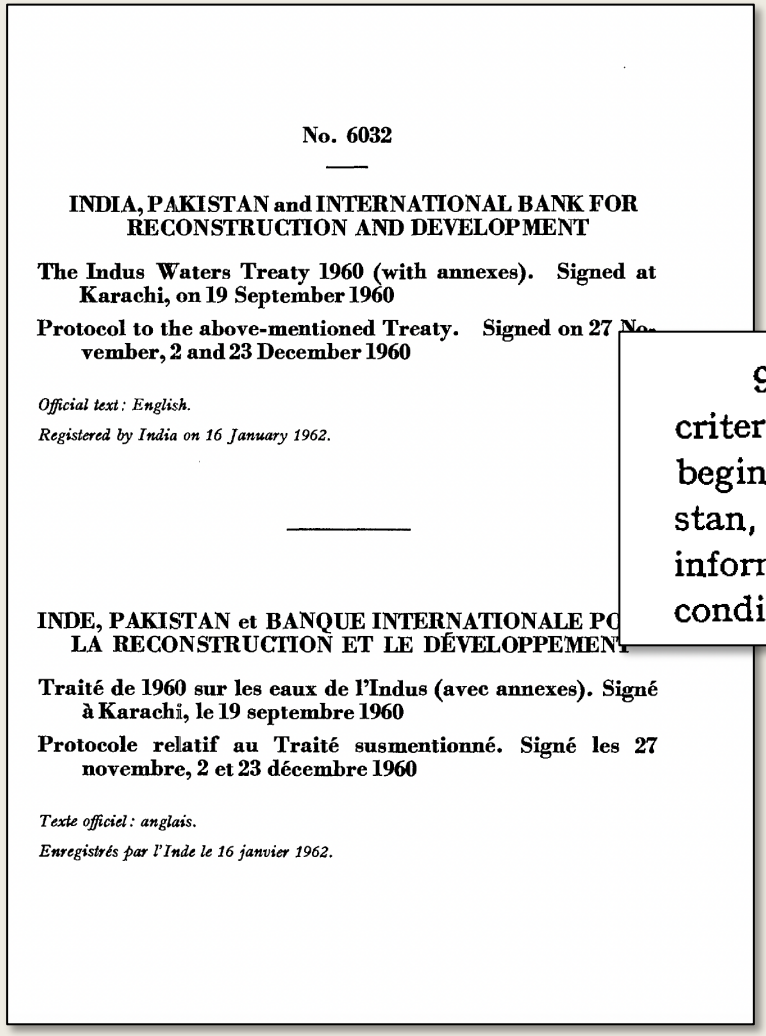
Five Take-aways

- Installed capacity – Firm Power and Secondary Power
- “Hypothetical” load curve vs actual anticipated load
- “Load factor” – full installed capacity
- Weekly loading schedule
- Resistance to providing details of calculations

Outline

1. Data on capacity, load, calculation of maximum Pondage
2. Discussions on capacity, load, calculation of maximum Pondage
3. Observations on India's approach
4. Treaty interpretation issues

Paragraph 9, Annexure D



No. 6032

INDIA, PAKISTAN and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

The Indus Waters Treaty 1960 (with annexes). Signed at Karachi, on 19 September 1960

Protocol to the above-mentioned Treaty. Signed on 27 November, 2 and 23 December 1960

Official text: English.

Registered by India on 16 January 1962.

INDE, PAKISTAN et BANQUE INTERNATIONALE PO
LA RECONSTRUCTION ET LE DÉVELOPPEMENT

Traité de 1960 sur les eaux de l'Indus (avec annexes). Signé à Karachi, le 19 septembre 1960

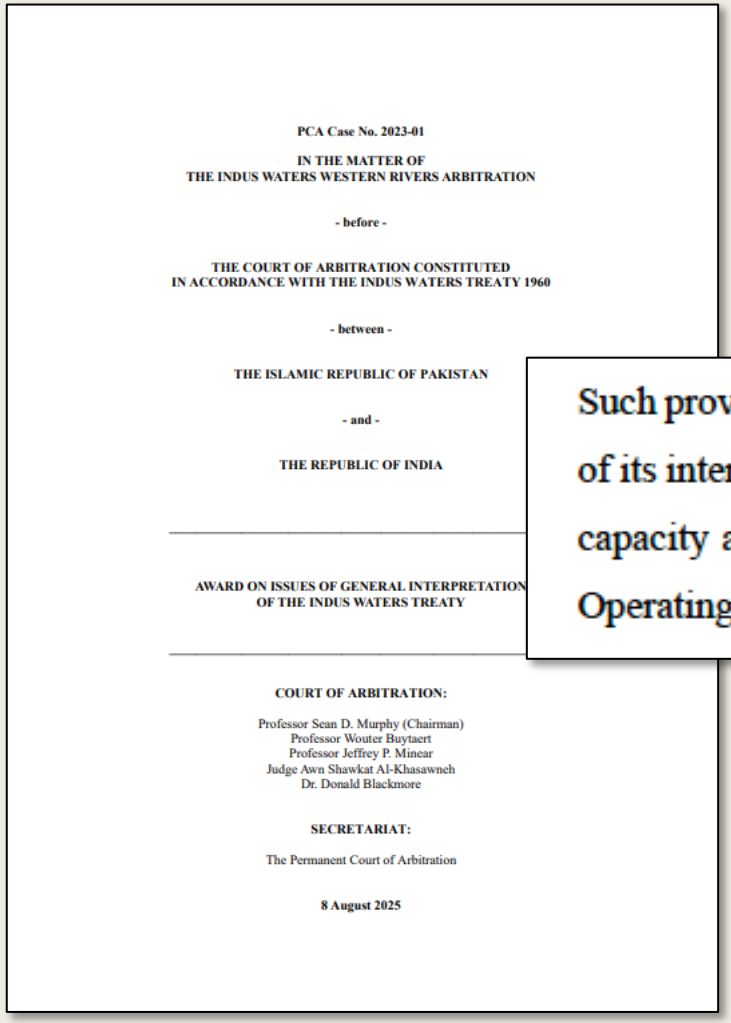
Protocole relatif au Traité susmentionné. Signé les 27 novembre, 2 et 23 décembre 1960

Texte officiel : anglais.

Enregistrés par l'Inde le 16 janvier 1962.

9. To enable Pakistan to satisfy itself that the design of a Plant conforms to the criteria mentioned in Paragraph 8, India shall, at least six months in advance of the beginning of construction of river works connected with the Plant, communicate to Pakistan, in writing, the information specified in Appendix II [1] to this Annexure. If any such information is not available or is not pertinent to the design of the Plant or to the conditions at the site, it will be so stated.

General Issues Award, ¶ 689



PCA Case No. 2023-01

IN THE MATTER OF
THE INDUS WATERS WESTERN RIVERS ARBITRATION

- before -

THE COURT OF ARBITRATION CONSTITUTED
IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

- between -

THE ISLAMIC REPUBLIC OF PAKISTAN

- and -

THE REPUBLIC OF INDIA

AWARD ON ISSUES OF GENERAL INTERPRETATION
OF THE INDUS WATERS TREATY

COURT OF ARBITRATION:

Professor Sean D. Murphy (Chairman)
Professor Wouter Buytaert
Professor Jeffrey P. Minear
Judge Awn Shawkat Al-Khasawneh
Dr. Donald Blackmore

SECRETARIAT:

The Permanent Court of Arbitration

8 August 2025

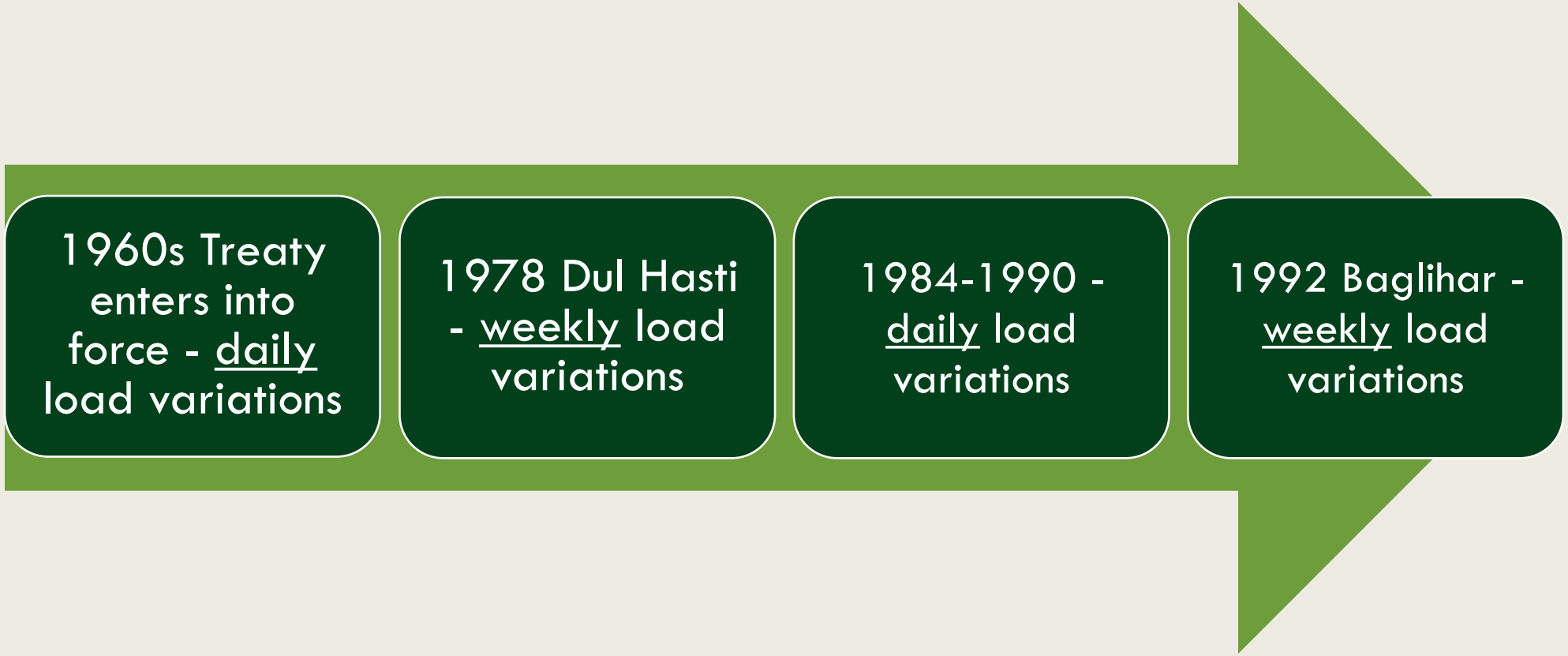
Such provisions are fully capable of being understood as requiring India, when notifying Pakistan of its intention to construct an Annexure D, Part 3 HEP, to inform Pakistan of the plant's installed capacity and anticipated load, given that such information would be necessary to calculate the Operating Pool and would be relevant to the expected variations in the turbine discharge.

PLA-0001 [B.49]

Appendix II, Annexure D

Capacity	Para 4(i)	"[m]aximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power"
Load	Para 4(h)	"[d]ischarge proposed to be passed through the Plant, initially and ultimately, and expected variations in the discharge on account of the daily and the weekly load fluctuations."
Calculations for maximum Pondage	Para 3(b)	"Full Pondage Level, Dead Storage Level and Operating Pool together with the calculations for the Operating Pool."

India's practice over time

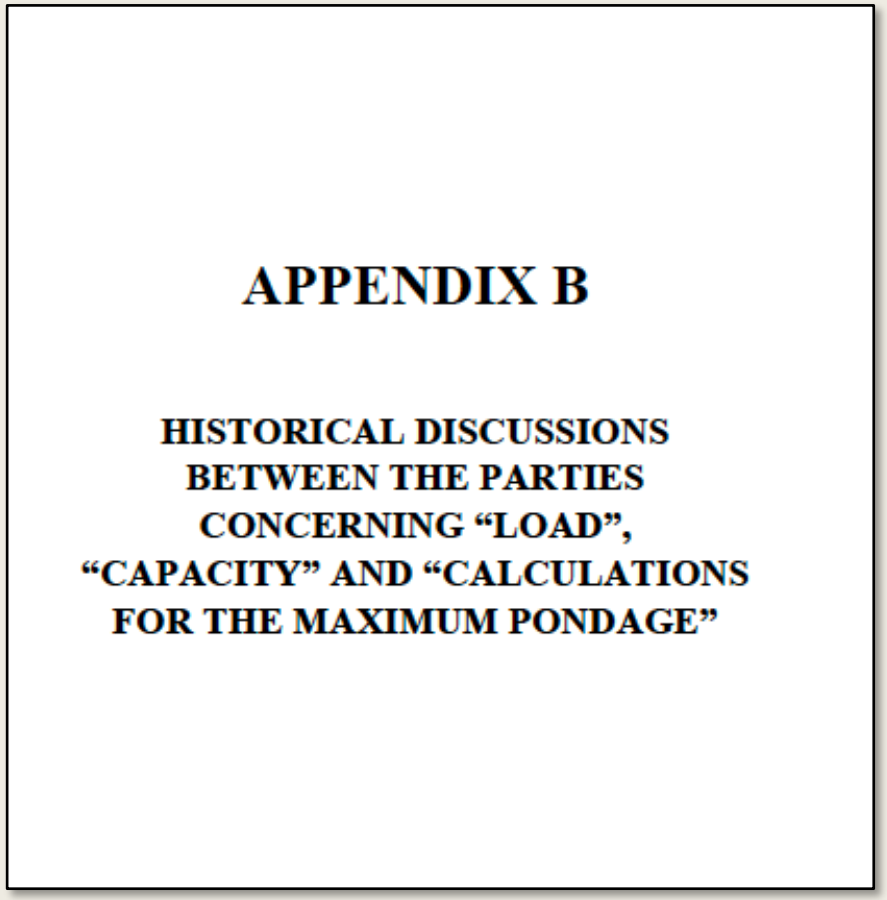


Data for calculation

India provides volume of actual proposed Operating Pool

Pakistan requires detailed calculations for India's claimed maximum Operating Pool

Appendix B, Second Phase Memorial



APPENDIX B

HISTORICAL DISCUSSIONS BETWEEN THE PARTIES CONCERNING "LOAD", "CAPACITY" AND "CALCULATIONS FOR THE MAXIMUM PONDAGE"

Capacity - Stakna HEP (1968-9)

P-0649.0137

PAKISTAN COMMISSIONER FOR INDUS WATERS,
GOVERNMENT OF PAKISTAN
47, LAWRENCE ROAD,
LAHORE.

No.WT(16)/(1201-A)/PCIW Dated........1968.

My dear Ahuja Sahib,

Kindly refer to your letter No.F.4(1)/66-IC dated the 9th September 1968, relating to the proposed hydro-electric Plant at Stakna on the Indus Main.

2. The information received with your letter under reference is incomplete and Pakistan is, therefore, unable to satisfy itself that the design of the Plant conforms to the criteria laid down in the Treaty. For example although in the case of a Run-of-River Plant the maximum Pondage in the Operating Pool is not to exceed twice the Pondage required for Firm Power yet the information supplied neither gives the exact value of Firm Power that can be produced at this particular site under the provisions of the Treaty, nor does it include the calculations for the Operating Pool allowed under the Treaty. Similarly, the plan of the works supplied by you is of no help in ascertaining that the works themselves will not be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design. These examples have been given to illustrate the inadequacy of the information supplied. My detailed observations on the information supplied by you are given in the enclosed statement. It is requested that complete information may kindly be supplied at an early date. Within 3 months of the receipt of complete information specified in Appendix II of Annexure D to the Treaty I shall communicate to you the objections, if any, that Pakistan may have with regard to the proposed design of the said Plant.

Assuring you of my best co-operation at all times and with kind regards,

Yours sincerely,

(Khalil-ur-Rahman)T.Pk.

Shri P.R. Ahuja,
Commissioner for Indus Waters,
Government of India,
Shram Shakti Bhavan,
Rafi Marg, New Delhi.

P-0649.0137 [A2.18]

"… the information supplied neither gives the exact value of Firm Power…"

- 8 -

4(h). The variation of discharge are on the basis of daily load fluctuations and these have already been intimated. It is anticipated that there will not be any variation of weekly load fluctuations than those worked out on daily load fluctuations.

4(i) Under this item, the maximum aggregate capacity of power units for firm and secondary power is only to be given. The installed capacity of each unit and the number of units for Firm Power as well as for Secondary Power already supplied are suffic[ient] for the purpose.

The concrete figures of Firm and Secondary Power are not required to be supplied under this item. Nevertheless these are given below as requested:-

1. Firm Power 2450 KW (4 to 5 units) at 60% Load Factor.
2. Secondary Power 790 KW (1 to 2 units) subject to availability of river flows.

5(b) It has already been intimated that the river works will be completed in four years' time after the date of start which in terms of paragraph 9 of Annexure 'D' to the Treaty would imply about the middle of 1973. The power plant would be commissioned after another one year i.e. by middle of 1974.

(P.R. Ahuja) 24/1/
Commissioner for Indus Waters,
Government of India.

P-0649.0163 [A2.21]

"The concrete figures of Firm and Secondary Power are not required to be supplied under this item. Nevertheless these are given below as requested…"

Capacity - Thirot HEP (1993)

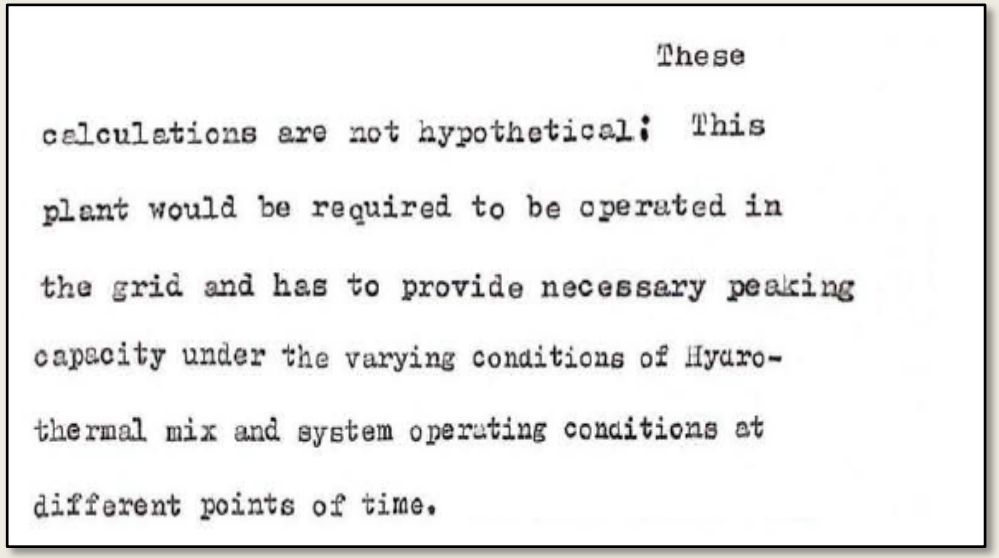
(iv) In the absence of details of the intake, of the penstock it is not possible to determine the water-seal i.e. the Minimum draw-down level and the Pondage provided above that level. These may be supplied.

(i) In the statement of calculations for Operating Pool (Appendix-3(b)-IX-8), Pondage has been calculated as Pondage required for maximum aggregate capacity of power units for Firm Power and Secondary Power. It should be limited to the extent required for Firm Power only, as per schema of things incorporated in the Treaty. It may please be appreciated that because of the peculiar nature of the Indus Waters Treaty 1960 under which Pakistan had forefeited its historic rights on the perpetual waters of the Three Eastern Rivers (Sutlej, Beas and Ravi) for reserving the waters of the three Western Rivers for itself with least interference by India and for this reason the generation of hydro-power by India on the Western Rivers has been termed as a Consumptive Use. As such Treaty has placed restrictions on the design of the plants to be constructed by India on the Western Rivers. It is therefore necessary that the design of the Plants on the Western Rivers has to be different from those located on rivers other than Western Rivers. A Revised calculation for Pondage required for Firm Power alongwith the calculations for minimum mean discharge of 0.9 cumecs adopted by India, may be supplied. In their absence it would be implied that the design of the Plant contravens criterion (b) of Paragraph 18 of Annexure D to the Treaty.

Load - Sumbal HEP (1969)

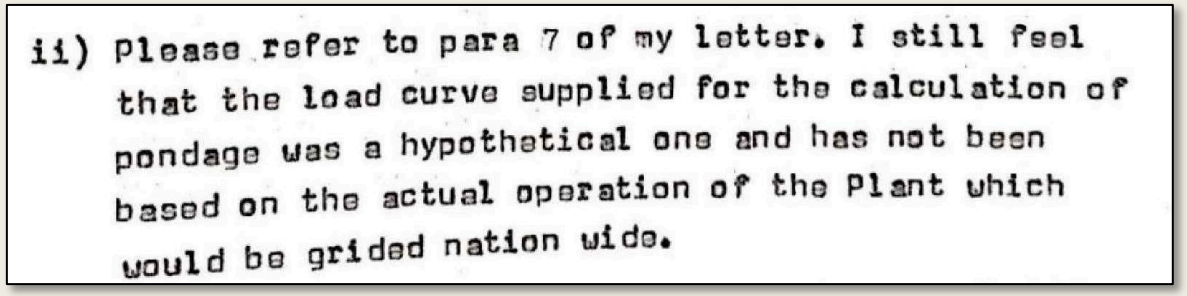
The Live Storage needed for meeting the water requirements of a Plant during the period of the minimum mean discharge would naturally depend on the load curve. To see that the maximum Pondage being provided did not exceed twice the Pondage required for Firm Power, the magnitude of the Live Storage has to be determined from the actual load curve worked out for the proposed Plant and not from any hypothetical load curve. It would be appreciated that the Live Storage required for a plant having a load factor of 30 % could vary considerably with the shape of the load curve.

Dul Hasti HEP (1984)



These calculations are not hypothetical; This plant would be required to be operated in the grid and has to provide necessary peaking capacity under the varying conditions of Hydro-thermal mix and system operating conditions at different points of time.

P-0649.0513 [A2.27]



ii) Please refer to para 7 of my letter. I still feel that the load curve supplied for the calculation of pondage was a hypothetical one and has not been based on the actual operation of the Plant which would be grided nation wide.

P-0649.0833 [A2.37]

Kishenganga HEP (2006)

(2) Non-conformity with Paragraphs 8(c) and (f)

Paragraph 8(c) of Annexure D to the Treaty provides that "The maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power." Notwithstanding the clear mandate of the Treaty, it seems that the "Pondage required for Firm Power" has been computed by India with reference to an arbitrarily determined set of peaking requirements. In Pakistan's opinion, this method of calculation is incorrect and is not in conformity with the provisions of the Treaty. Instead, the "Pondage required for Firm Power" must be calculated as the Pondage necessary to ensure the continuous production of Firm Power during a week when the average inflow is equal to the Minimum Mean Discharge. Twice such Pondage would then equal the maximum Pondage permissible under the Treaty.

P-0056 [A1.2]

been provided sufficient to meet the system load variations. Due to relatively lower demand on Saturday & Sunday, the number of peak load hours has been kept small. The water stored in the operating pool in these two days has been carried forward to the working days of the week to meet peak load requirements, which is permissible in view of the very definition of "Pondage" in Paragraph 2(c).

P-0057 [A1.3]

Ratle HEP (2013)

9. Your objection to the volume of Pondage in Ratle HEP once again rests on Pakistan's view of the determination of Pondage to meet fluctuations in the inflows of the river Chenab over a period of consecutive seven days in which the mean flow is close to MMD. To the contrary, as per Paragraph 2(c), "Pondage" means *"Live storage of only sufficient magnitude to meet the fluctuations in the discharge of the turbines arising due to variations in daily and weekly loads of the Plant"*. The requirement of continuous release of Minimum Mean Discharge (MMD) through the turbine, as you state, is nowhere stated in the Treaty as the basis for the determination of Pondage. Further, the operation rules in Paragraph 15, allow India to hold or release water within a band of 50% to 130% within a period of seven days. Therefore, there can be no objection to the Plant generating power in any pattern, including peaking, so long as it releases water in accordance with Paragraph 15.

Lower Jhelum HEP (1976)

(iii) The generation pattern has to be related to the Operating Pool provided at the site of the Plant. The calculations for the Operating Pool furnished in Encl. 14 of your letter dated 21st November 1974 do not depict the actual variations through the turbines which are proposed to be met with the pondage provided and, therefore, appear to be hypothetical. It may please be appreciated that the capacity of the Operating Pool is to correspond to the Firm Power which can be actually generated at a time when the river is carrying the minimum mean discharge.

Procedural Order No. 17, §2.3.4

2.3.4 In relation to all Annexure D, Part 3 HEPs previously notified by India to Pakistan under the Treaty up to and including the Baglihar HEP:

(a) the basis upon which Pakistan understands India to have determined the installed capacity and anticipated load, as well as how those elements were taken into account in its calculation of maximum Pondage; and

(b) any concerns expressed by Pakistan to India with respect to (a).

[C.58]

Installed capacity: India's approach

62. The Indian side stated that hydro projects in India are generally being planned based on 90% dependable year flow data. The installed capacity of these projects is finalized after carrying out incremental benefit analysis and the optimization studies. Various other factors like exploitation of overall potential available at the site are also considered for finalization of installed capacity. The Pondage requirements are thereafter worked out considering the load factor of operation, design discharge and the flows available. On the other hand, if one were to go by Pakistan's suggestion, it would mean working backwards i.e. determining the Pondage first and then the installed capacity, contrary to the principles of hydro power engineering. Such a procedure is also contrary to the provisions of Annexure D, which require the Pondage to be determined to meet the daily and weekly load variations corresponding to Firm Power that i.e. power generation at Minimum Mean Discharge.

Secretary-Level Meetings Baglihar (2005)

For the designed operation/role of the station in the grid, the Pondage has been worked out and supplied. The operation ensures the releases of waters downstream of the station as per the provisions of the Treaty.

Thus, distinction between the power and the generating capacity of the plant needs to be appreciated.

While flagging the issue of low level weir for further discussions without prejudice to the position taken by the two sides, it was decided to examine the calculations done by India for the design of the proposed plant. It was accepted by India that based on the minimum mean discharge of 125.89 cumecs and the project designed by them, the Firm Power is 130 MW. However, they have designed the plant for 450 MW to meet the peaking requirement. Pakistan side held the view that the Treaty allows for Firm Power to be determined on the basis of mean minimum discharge and the Pondage is meant only to cater for the daily and the weekly loads (in accordance with Annexure D Part 1,Para 2(b)). The daily and weekly fluctuations cannot be construed to be 3.5 times of the Firm Power. As such 450 MW capacity being operated intermittently, cannot be taken as Firm Power for calculation of Pondage.

Anticipated load: Dul Hasti HEP (1984)

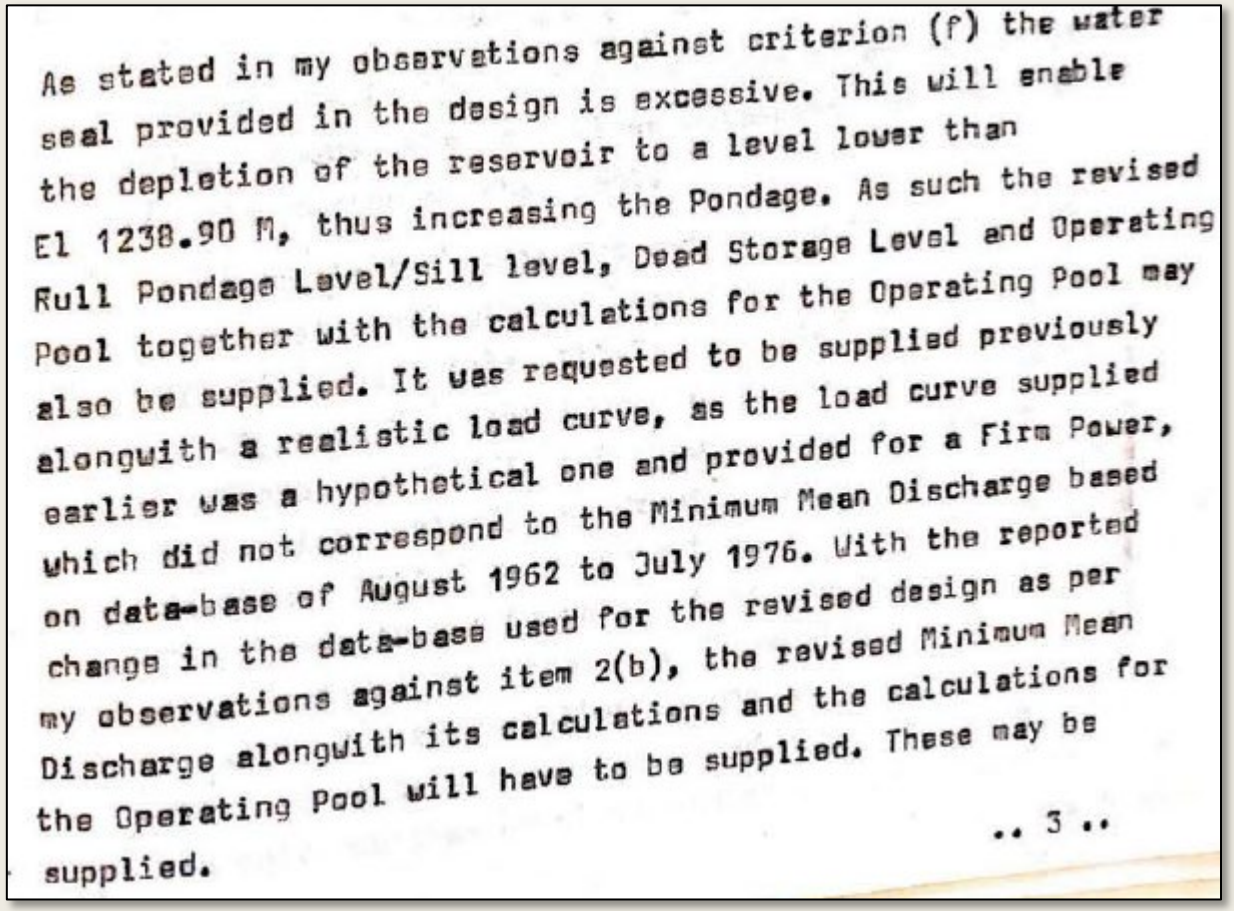
3(b) (iv) Even from what has now been stated, it appears that the calculations given in Appendix II to Shri Kapila's letter dated 3rd July 1978 are hypothetical. As such the same be revised and calculations of actual operation of the Plant be supplied so that Pakistan can know the actual variations in the supplies.

P-0649.0493 [A2.25]

These calculations are not hypothetical; This plant would be required to be operated in the grid and has to provide necessary peaking capacity under the varying conditions of Hydro-thermal mix and system operating conditions at different points of time.

P-0649.0513 [A2.27]

Anticipated load: Dul Hasti HEP (1992-3)

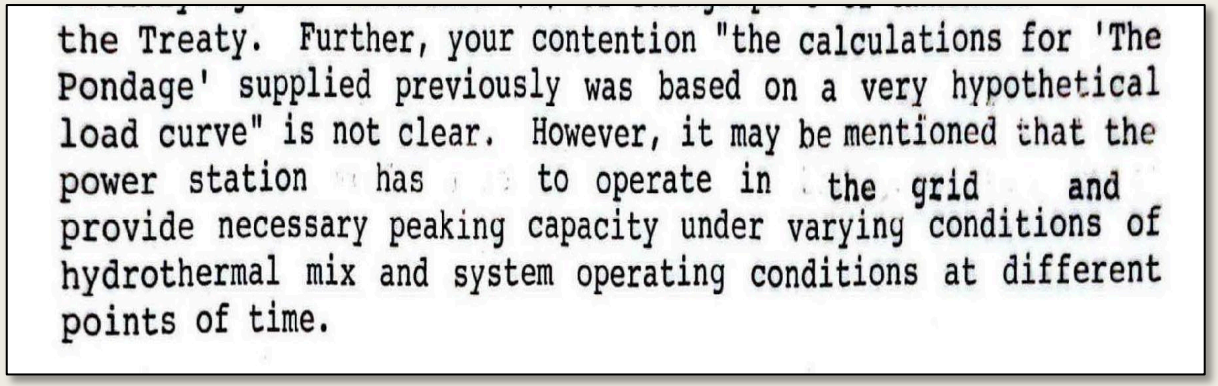


As stated in my observations against criterion (f) the water seal provided in the design is excessive. This will enable the depletion of the reservoir to a level lower than El 1238.90 M, thus increasing the Pondage. As such the revised Rull Pondage Level/Sill level, Dead Storage Level and Operating Pool together with the calculations for the Operating Pool may also be supplied. It was requested to be supplied previously alongwith a realistic load curve, as the load curve supplied earlier was a hypothetical one and provided for a Firm Power, which did not correspond to the Minimum Mean Discharge based on data-base of August 1962 to July 1976. With the reported change in the data-base used for the revised design as per my observations against item 2(b), the revised Minimum Mean Discharge alongwith its calculations and the calculations for the Operating Pool will have to be supplied. These may be

.. 3 ..

supplied.

P-0649.0773 [A2.31]



the Treaty. Further, your contention "the calculations for 'The Pondage' supplied previously was based on a very hypothetical load curve" is not clear. However, it may be mentioned that the power station has to operate in the grid and provide necessary peaking capacity under varying conditions of hydrothermal mix and system operating conditions at different points of time.

P-0649.0795 [A3.34]

Anticipated load: Baglihar HEP (1994)

I also do not agree to the view stating "However, the calculations for the "Pondage"..... was based on a very hypothetical load curve". In a grid of hydro-thermal mix, the load demand curve may assume any pattern which can not be predicted unlike in case of an isolated distribution system. It may also be seen from the Pondage calculation that the provision of 'firm power' has been based on Minimum Mean Discharge only. I, therefore, reiterate that the design of the plant fully conforms to the criterion(c) of Paragraph 8 of Annexure D to the Treaty.

P-0649.0814 [A3.35]

In my view your statement that "in a grid of hydro-thermal mix, the load demand curve may assume any pattern which cannot be predicted unlike in case of an isolated distribution system" is irrelevant in the context of design criteria laid down in Paragraph 8 of Annexure D to the Treaty. I re-affirm that the load demand curve supplied is hypothetical. This has been drawn only to achieve the maximum pondage. As per our calculations the pondage required for firm power is much lower than what has been worked out and actually provided in the design of the plant.

P-0649.0822 [A3.36]

Secretary-Level Meetings Baglihar (2005)

In the grid of hydrothermal mix, the load demand on the plant may have pattern consistent with system needs and generation potential at the plant. The power plant has been designed to cater to the peaking requirements of the power system during the lean flow period which occur in the morning and evening hours. Accordingly, two peaking blocks, one in the morning and the second in the evening hours have been considered. On the above basis, an operation table has been prepared in line with the provisions of the treaty regarding the daily and weekly releases to be made downstream of the project. The Minimum Mean Discharge has been computed adopting the methodology stipulated in the Treaty and the river discharge data, which have already been communicated to Pakistan.

Secretary-Level Meetings Baglihar (2005)

The pondage requirement depends on the load curve and Firm Power. The load curve should show fluctuations over continuous Firm Power. In our view the fluctuation can be ±10% over the continuous Firm Power. The load curve provided by India provides 450 MW generation of electricity for a few hours in a day and periods of zero generation in the remaining part of the day. This in our view does not correspond to the concept of Firm Power and fluctuations in continuous flow of Power over it. When the realistic load curve corresponding to the requirement of the Treaty showing Firm Power and fluctuation is provided by India maximum Pondage can be calculated accordingly.

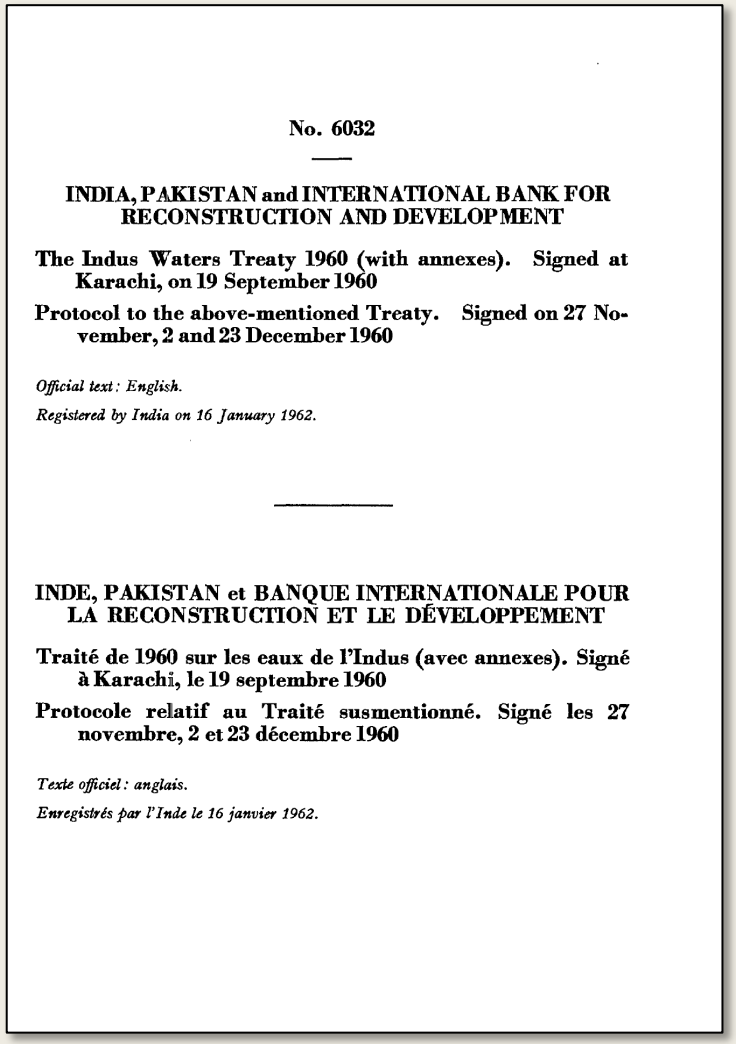
113th PIC Meeting (2017)

31. PCIW elaborated that it was observed in India's Pondage computation that it was so much oriented towards maximizing pondage that even the load curve was not followed in true sense. No hydropower was generated for hours to maximize the difference between cumulative inflow and outflow then plant was operated at peak capacity for many hours to fulfill the criteria of Paragraph 15, and the real load curve of the area i.e. Northern Grid, was compromised. PCIW emphasized that this approach was not consistent with the provisions of the Treaty. Pakistan side explained that value of Permissible Pondage computed as per Pakistan's perspective was sufficient for regular operation of the plant. It had also been estimated that Pondage value greater than Pakistan's estimation provided no extra benefits in terms of total energy and revenue. India might carry out its own analysis in this regard. Then both the countries might sit to discuss the results, in case of any significant differences in their estimates.

33. Further, the consumption of energy by industrial or domestic consumers in an interconnected grid can vary could vary from day to day, season to season and from time to time throughout the life of the plant and with the development can assume different pattern in the time to come. With more and more capacity additions envisaged from renewable energy sources which supply variable and intermittent power, the need for balancing power for stabilizing the grid and for successful integration of the renewables, the role of hydro power is increasingly becoming important. As such, operation of hydro projects need more flexibility in operation in order to cater to the varying load demands.

34. Indian side stated that moreover, there is nothing in the Treaty which says that load variations have to be stable throughout the life of the Plant and the concept of load curve, too, is not explicitly provided in the Treaty. The Treaty, however, fixes the limitation of India's control of water from the Western Rivers through Paragraph 15 of Annexure D. India is free to design the Pondage of its Plant within that limitations taking care of possible future scenarios.

Treaty interpretation issues



No. 6032

INDIA, PAKISTAN and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

The Indus Waters Treaty 1960 (with annexes). Signed at Karachi, on 19 September 1960

Protocol to the above-mentioned Treaty. Signed on 27 November, 2 and 23 December 1960

Official text: English.

Registered by India on 16 January 1962.

INDE, PAKISTAN et BANQUE INTERNATIONALE POUR LA RECONSTRUCTION ET LE DÉVELOPPEMENT

Traité de 1960 sur les eaux de l'Indus (avec annexes). Signé à Karachi, le 19 septembre 1960

Protocole relatif au Traité susmentionné. Signé les 27 novembre, 2 et 23 décembre 1960

Texte officiel: anglais.

Enregistrés par l'Inde le 16 janvier 1962.

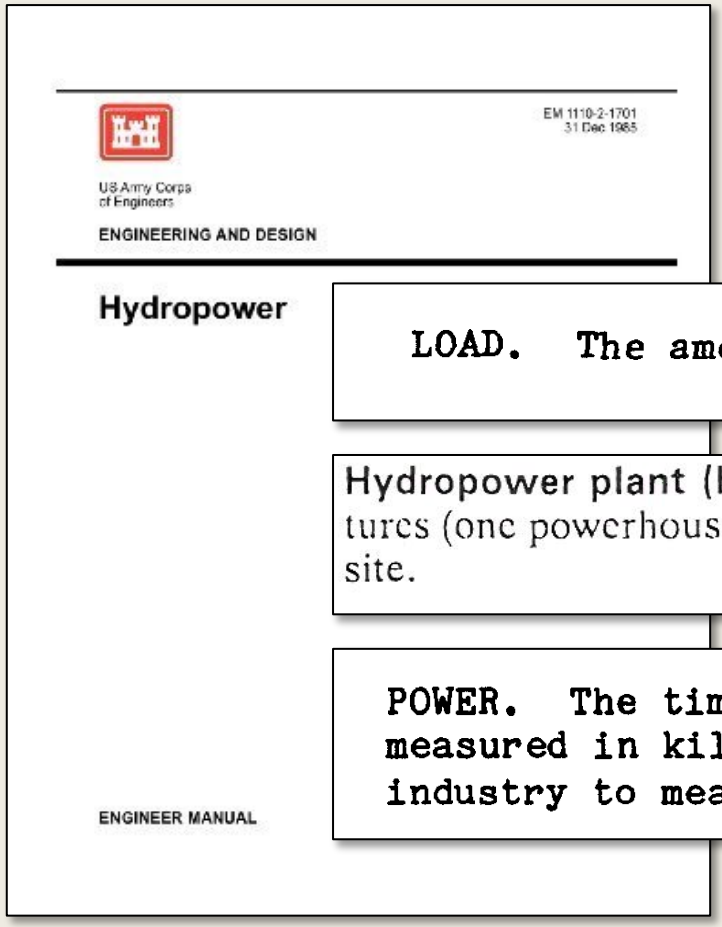
1. Definition of express terms
2. Interpretation of relevant terms in hydropower engineering
3. Interpretation of relevant concepts in hydropower engineering
4. Relevant findings in General Issues Award

Express terms

(*c*) The maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power.

"Pondage"	Para 2(c)
"Operating Pool"	Para 2(f)
"Firm Power"	Para 2(i)
"Dead Storage"	Para 2(a)
"Dead Storage Level"	Para 2(a)
"Live Storage"	Para 2(b)
"Full Pondage Level"	Para 2(d)

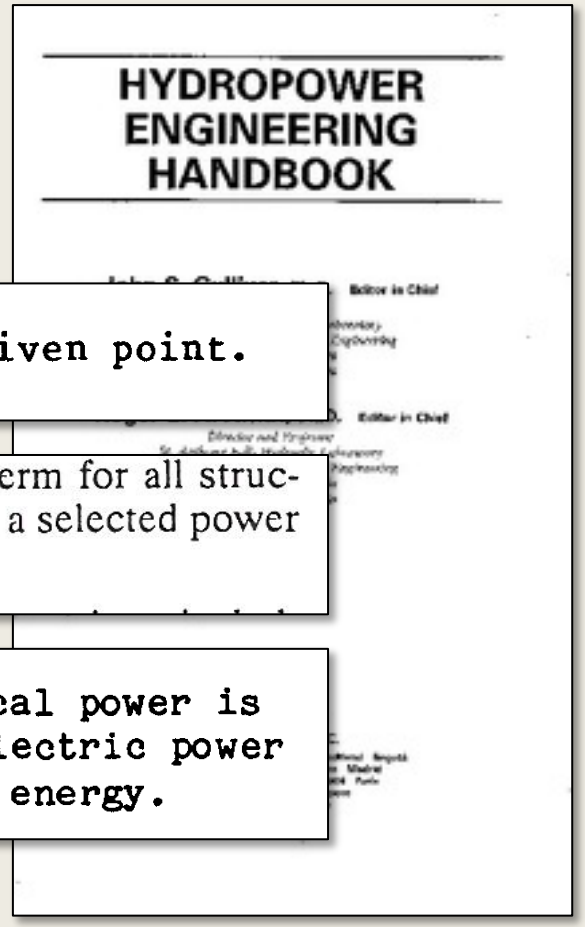
Ordinary meaning of engineering terms



LOAD. The amount of electric power delivered at a given point.

Hydropower plant (hydropower development) The comprehensive term for all structures (one powerhouse and pertaining installations) necessary for utilizing a selected power site.

POWER. The time rate of transferring energy. Electrical power is measured in kilowatts. The term is also used in the electric power industry to mean inclusively both capacity (power) and energy.



P-0302 (resubmitted) [A1.11]

P-0477 (resubmitted) [A2.14]

Ordinary meaning of engineering terms

(*i*) Maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power.

Generic meaning (USACE)

CAPACITY. The load for which a generator, turbine, transformer transmission circuit, apparatus, station or system is rated. C

Installed capacity (USACE)

Installed Capacity. The sum of the capacities in a powerplant or power system, as shown by the nameplate ratings of similar kinds of apparatus, such as generating units, turbines, or other equipment (see also Section 6-1b(4)).

PLA-0001 [B.49]
P-0302 (resubmitted) [A1.11]

Ordinary meaning of engineering terms

(*i*) Maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power.

USACE

GENERATING UNIT. A single power-producing unit, comprised of a turbine, generator, and related equipment.

Firm Power. Power intended to have assured availability to the customer to meet all or any agreed upon portion of his load requirements.

Firm Energy. Electric energy which is intended to have assured availability to the customer to meet any or all agreed upon portion of his load requirements (see also Section 5-2c).

PLA-0001 [B.49]
P-0302 (resubmitted) [A1.11]

Engineering concepts

Installed capacity (para 4(i), Appendix II, Annexure D)

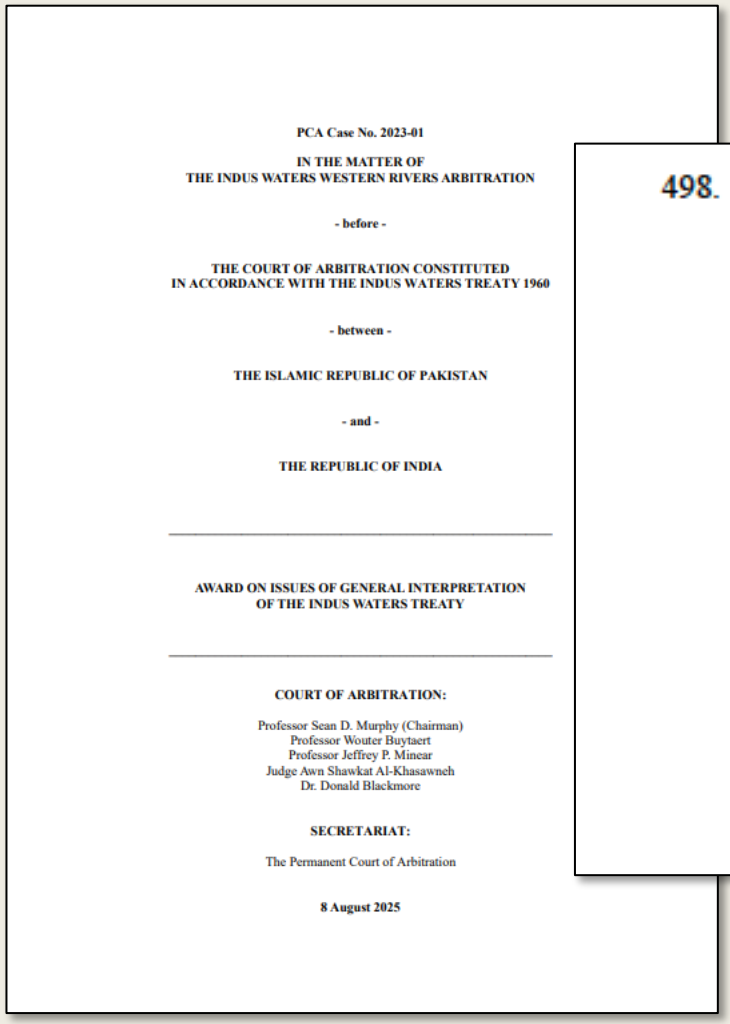
(*i*) Maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power.

Anticipated load

LOAD CURVE. A curve of demand versus time showing in chronological sequence the magnitude of the load for each unit of time of the period covered (see also Figures 2-2 and 6-1).

PLA-0001 [B.49]
P-0302 (resubmitted) [A1.11]

The Court's General Issues Award, ¶ 498



PCA Case No. 2023-01

IN THE MATTER OF
THE INDUS WATERS WESTERN RIVERS ARBITRATION

- before -

THE COURT OF ARBITRATION CONSTITUTED
IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

- between -

THE ISLAMIC REPUBLIC OF PAKISTAN

- and -

THE REPUBLIC OF INDIA

AWARD ON ISSUES OF GENERAL INTERPRETATION
OF THE INDUS WATERS TREATY

COURT OF ARBITRATION:

Professor Sean D. Murphy (Chairman)
Professor Wouter Buytaert
Professor Jeffrey P. Minear
Judge Awn Shawkat Al-Khasawneh
Dr. Donald Blackmore

SECRETARIAT:

The Permanent Court of Arbitration

8 August 2025

498. The foregoing addresses engineering concepts and terminology regarding the design and operation of run-of-river HEPs as they exist outside of the specific context of the Treaty. By elucidating these concepts and terminology drawn broadly from authoritative hydro-engineering reports and texts, including those available to the Treaty drafters,[832] this Part provides necessary background for interpreting Annexure D, Part 3, given that it regulates the design and construction of run-of-river HEPs. Thus, to the extent that Annexure D, Part 3 leaves unstated certain fundamental concepts pertinent to the operation of any run-of-river HEP, or uses undefined terms (such as "hydro-electric power", "storage", "loads", "uncontrollable", "discharge of the turbines", "outlet", "gated spillway", "bottom level of the gates", or "intakes"), the ordinary understanding of such concepts and meaning of such terms must be considered as they are typically used for the design and operation of run-of-river HEPs, and especially as they were used at the time the Treaty was adopted.

PLA-0001 [B.49]

PCIW-ICIW Correspondence (1984-96) and PIC Meetings (2010, 2017)

ICIW notes that "Firm Power corresponds to the power generated when the river is carrying the minimum mean discharge" and that India's calculations are "not hypothetical. This plant would be required to be operated in the grid and has to provide necessary peaking capacity under the varying conditions of Hydro-thermal mix and system operating conditions at different points of time" (pp. 5-6).

P-0649.0513 [A2.27]

PCIW reiterates that "calculations for the pondage supplied previously has been based on a hypothetical load curve which did not take into consideration the Firm Power corresponding to the Minimum Mean Discharge" and "the load curve supplied for the calculation of pondage was a hypothetical one and has not been based on the actual operation of the Plant which would be grided nationwide" (pp. 2, 4).

P-0649.0833 [A3.37]

PCIW responds that it is "irrelevant in the context of design criteria laid down in Paragraph 8 of Annexure D […] the load demand curve supplied is hypothetical. This has been drawn only to achieve the maximum pondage. As per our calculations the pondage required for firm power is much lower than what has been worked out and actually provided in the design of the plant" (p. 2).

P-0649.0822 [A3.36]

ICIW reiterates his earlier response to Pakistan's "hypothetical load curve" objection, stating again that "in a grid of hydro-thermal mix, the load demand curve may assume any pattern which cannot be predicted […] [and that] it may also be seen from the pondage calculation that the provision, of 'firm power' has been based on Minimum Mean Discharge only" (p. 2).

P-0649.0850 [A3.38]

"ICIW reiterated that the provision of 9.72 MCM by India [complies with] the Treaty and any reduction … is not warranted. He further stated that in future, Ladakh region would be inter-connected to the Northern Regional Grid of India. Ladakh region has acute shortage of power and alternative power sources are also very limited. With winter temperatures reaching as low as -35 C, there is an immense necessity of power for the region." (p. 6).

P-0330 [A2.13]

ICIW responds to Pakistan's objection by stating: "your contention 'the calculations for the Pondage supplied previously was based on a very hypothetical load curve' is not clear. However, it may be mentioned that the power station has to operate in the grid and provide necessary peaking capacity under varying conditions of hydrothermal mix and system operating conditions at different points of time" (p. 2).

P-0649.0795 [A3.34]

ICIW disagrees with Pakistan's view that calculations for Pondage were based on a "very hypothetical load curve", stating that "in a grid of hydro-thermal mix, the load demand curve may assume any pattern which cannot be predicted unlike in case of an isolated distribution system" and that in the pondage calculation, the provision of 'firm power' "has been based on Minimum Mean Discharge only" (p. 2).

P-0649.0814 [A3.35]

ICIW notes that "[f]or the designed operation/role of the station in the grid, the Pondage has been worked out and supplied" (p. 20).

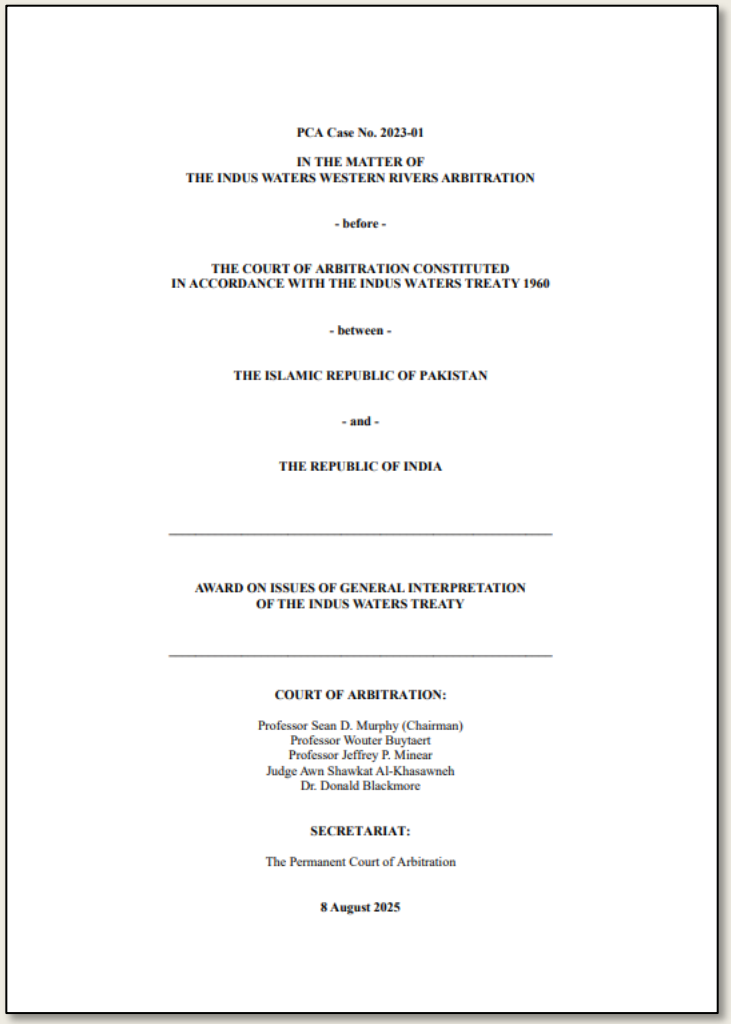
P-0650.1 [A3.44]

PCIW noted that "it was observed in India's Pondage computation that it was so much oriented towards maximizing pondage that even the load curve was not followed in true sense. No hydropower was generated for hours to maximize the difference between cumulative inflow and outflow then plant was operated at peak capacity for many hours to fulfill the criteria of Paragraph 15, and the real load curve of the area i.e. Northern Grid, was compromised. PCIW emphasized that this approach was not consistent with the provisions of the Treaty." (p. 10).

ICIW responded that "the consumption of energy by industrial or domestic consumers in an interconnected grid can vary could vary from day to day, season to season and from time to time throughout the life of the plant and with the development can assume different pattern in the time to come. With more and more capacity additions envisaged from renewable energy sources which supply variable and intermittent power, the need for balancing power for stabilizing the grid and for successful integration of the renewables, the role of hydro power is increasingly becoming important. As such, operation of hydro projects need more flexibility in operation in order to cater to the varying load demands." (p. 10).

P-0103 [A1.9]

The Court's General Issues Award, ¶¶ 745-8



PCA Case No. 2023-01

IN THE MATTER OF
THE INDUS WATERS WESTERN RIVERS ARBITRATION

- before -

THE COURT OF ARBITRATION CONSTITUTED
IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

- between -

THE ISLAMIC REPUBLIC OF PAKISTAN

- and -

THE REPUBLIC OF INDIA

AWARD ON ISSUES OF GENERAL INTERPRETATION
OF THE INDUS WATERS TREATY

COURT OF ARBITRATION:

Professor Sean D. Murphy (Chairman)
Professor Wouter Buytaert
Professor Jeffrey P. Minear
Judge Awn Shawkat Al-Khasawneh
Dr. Donald Blackmore

SECRETARIAT:

The Permanent Court of Arbitration

8 August 2025

745. The Court concludes that Paragraph 8(c) requires that, when designing an Annexure D, Part 3 HEP, India shall calculate the maximum Pondage pursuant to Paragraph 8(c) by taking into account the following restrictions.

746. *First*, "Firm Power", shall be calculated as the hydro-electric power corresponding to the MMD at the site of the plant, calculated in accordance with Paragraph 2(i) of Annexure D.

747. *Second*, "Pondage required for Firm Power" shall be calculated based on the water that can be accumulated and released at the site of the plant during the course of no more than a seven-day period, within the following constraints:

(a) Pondage required for Firm Power shall be calculated based on what can be accumulated during that period when the stream flow of the river is at the MMD, as set forth in Paragraph 2(i) of Annexure D.

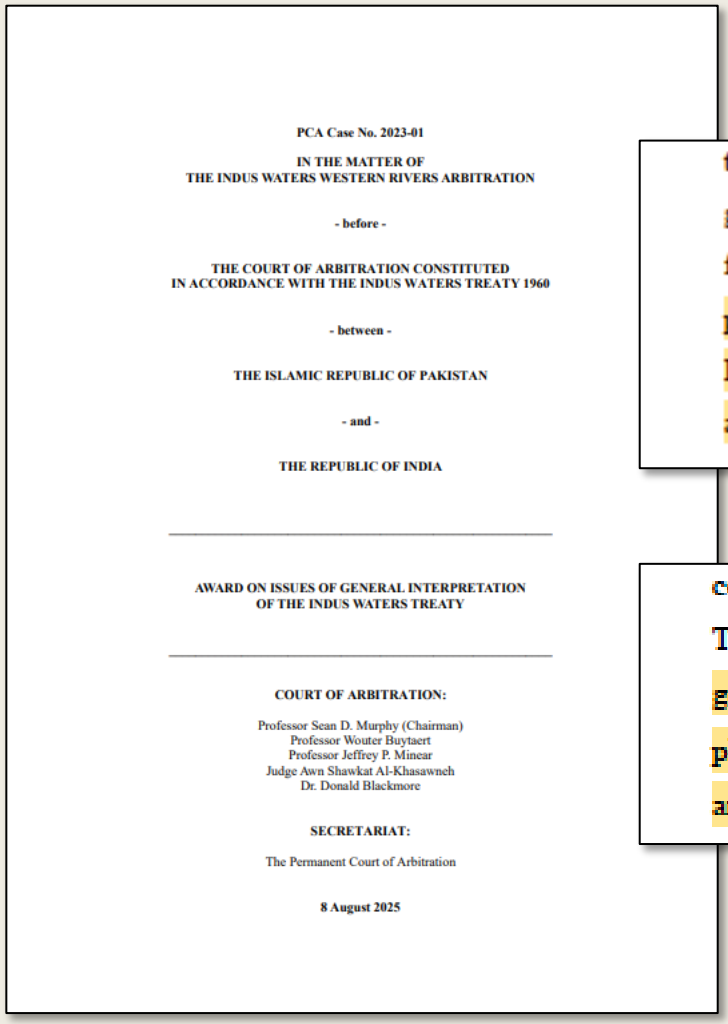
(b) Pondage required for Firm Power shall be calculated based on a realistic, well-founded, and defensible projection of the proposed Annexure D, Part 3 HEP's installed capacity and anticipated load, reflecting the fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the plant, as set forth in Paragraph 2(c) of Annexure D.

(c) Pondage required for Firm Power shall be calculated in a manner that abides by the daily and weekly release requirements set forth in Paragraph 15 of Annexure D.

748. *Third*, the maximum Pondage shall be no more than twice the Pondage calculated in accordance with the above requirements.

PLA-0001 [B.49]

The Court's General Issues Award, ¶¶ 742-3



PCA Case No. 2023-01

IN THE MATTER OF
THE INDUS WATERS WESTERN RIVERS ARBITRATION

- before -

THE COURT OF ARBITRATION CONSTITUTED
IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

- between -

THE ISLAMIC REPUBLIC OF PAKISTAN

- and -

THE REPUBLIC OF INDIA

AWARD ON ISSUES OF GENERAL INTERPRETATION
OF THE INDUS WATERS TREATY

COURT OF ARBITRATION:

Professor Sean D. Murphy (Chairman)
Professor Wouter Buytaert
Professor Jeffrey P. Minear
Judge Awn Shawkat Al-Khasawneh
Dr. Donald Blackmore

SECRETARIAT:

The Permanent Court of Arbitration

8 August 2025

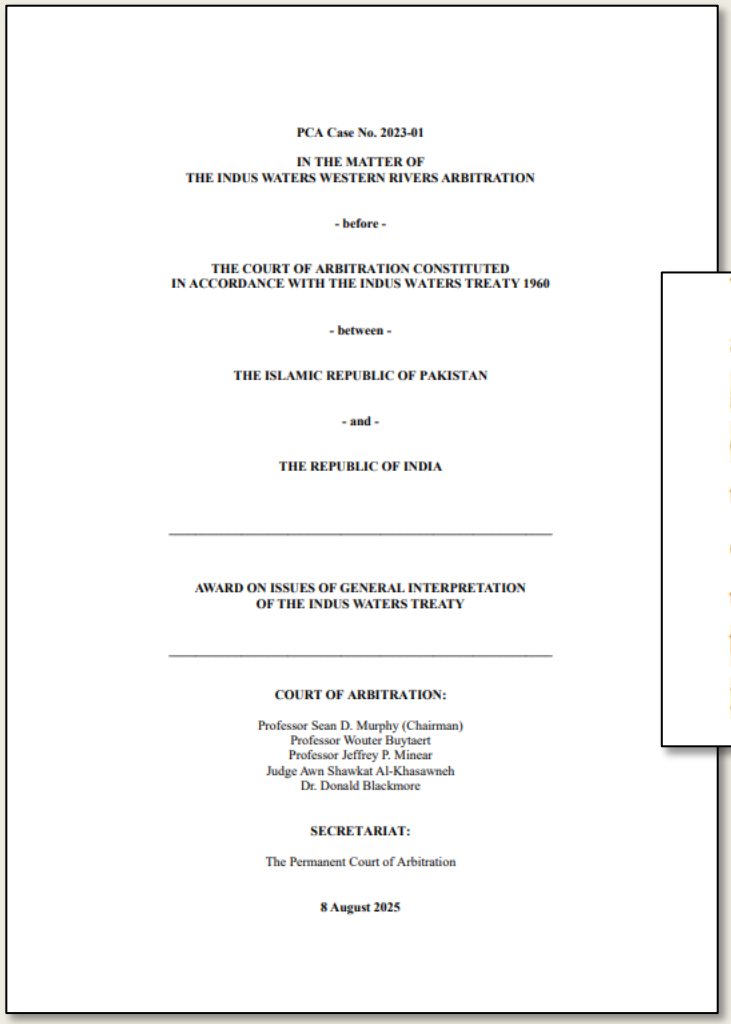
to modify its design in the face of valid concerns. If Pakistan raises timely objections, India must give them careful consideration and both Parties must proceed in a spirit of cooperation and good faith. Ultimately, if a difference emerges in this regard between the Parties, it is for India, as the proponent of the design and construction of the HEP, to establish that the proposed maximum Pondage satisfies the requirements of Paragraph 8(c), bearing in mind any Pakistani position that a more Treaty-compliant alternative exists.

context of the KHEP or RHEP, Pakistan or India may seek to pursue the matter through the Treaty's dispute resolution procedures, including a further phase of these proceedings. As a general matter, the plant's installed capacity and anticipated load must correspond to how the plant will actually be operated; it cannot be hypothesized in a manner that serves to inflate the amount of maximum Pondage.

PLA-0001 [B.49]

The Court's General Issues Award,

¶ 705



PCA Case No. 2023-01

IN THE MATTER OF
THE INDUS WATERS WESTERN RIVERS ARBITRATION

- before -

THE COURT OF ARBITRATION CONSTITUTED
IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

- between -

THE ISLAMIC REPUBLIC OF PAKISTAN

- and -

THE REPUBLIC OF INDIA

AWARD ON ISSUES OF GENERAL INTERPRETATION
OF THE INDUS WATERS TREATY

COURT OF ARBITRATION:

Professor Sean D. Murphy (Chairman)
Professor Wouter Buytaert
Professor Jeffrey P. Minear
Judge Awn Shawkat Al-Khasawneh
Dr. Donald Blackmore

SECRETARIAT:

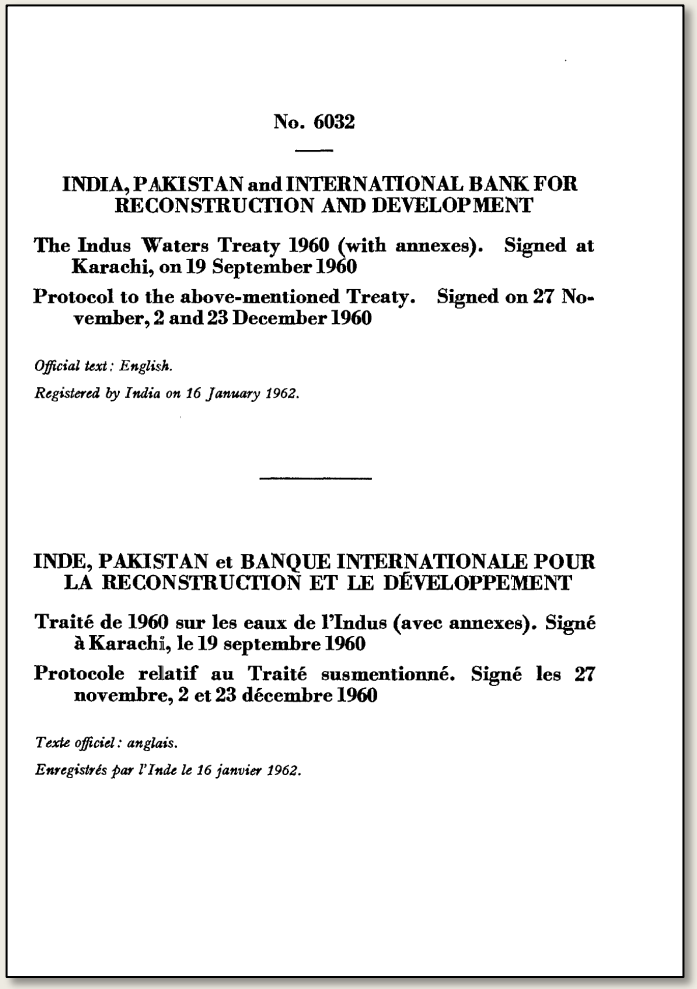
The Permanent Court of Arbitration

8 August 2025

While an interpretation that regards the proposed HEP's installed capacity and anticipated load as additional elements for calculating maximum Pondage does introduce greater discretion, the general approach in the Treaty is not to reduce the design of a Run-of-River HEP to the application of unique formulas. Rather, it often sets standards that must then be implemented in good faith by the Parties in the context of a specific HEP. Indeed, while use of the proposed HEP's installed capacity and anticipated load when calculating maximum Pondage results in some greater uncertainty in the calculation, the installed capacity and anticipated load advanced by India must be realistic and defensible under the Treaty, in the same way that the use and exact positioning of low-level outlets, crest-gated spillways, power intakes, and freeboard must be defensible.

PLA-0001 [B.49]

Cooperation on data



No. 6032

INDIA, PAKISTAN and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

The Indus Waters Treaty 1960 (with annexes). Signed at Karachi, on 19 September 1960

Protocol to the above-mentioned Treaty. Signed on 27 November, 2 and 23 December 1960

Official text: English.

Registered by India on 16 January 1962.

INDE, PAKISTAN et BANQUE INTERNATIONALE POUR LA RECONSTRUCTION ET LE DÉVELOPPEMENT

Traité de 1960 sur les eaux de l'Indus (avec annexes). Signé à Karachi, le 19 septembre 1960

Protocole relatif au Traité susmentionné. Signé les 27 novembre, 2 et 23 décembre 1960

Texte officiel: anglais.

Enregistrés par l'Inde le 16 janvier 1962.

- Observed or estimated daily river discharge data on which the design is based.
- Flood data, observed or estimated (with details of estimation).
- Full Pondage Level, Dead Storage Level and Operating Pool together with calculations for the Operating Pool.
- Estimated evaporation losses in the reservoir, Regulating Basin, headrace, forebay and tailrace.
- Maximum designed flood discharge and maximum designed flood level.
- Designated range of operation.
- Type of dam, length and height above mean bed of the river.
- Cross-section of the river at the site; mean bed level.
- Head-race and tail-race: length, size, maximum designed capacity.
- Outlet works: function, type, size, number, maximum designed capacity and sill levels.
- Discharge proposed to be passed through the Plant, initially and ultimately, and expected variations in the discharge on account of the daily and weekly load fluctuations.
- Maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power.
- Regulating Basin and its outlet works: type, number, size, sill levels and designed maximum discharge capacity.

PLA-0001 [B.49]


ایمان اتحاد نظم