Court questions on Pondage

Dr Cameron Miles

Indus Waters Treaty (Pakistan v India), PCA Case No 2023-01

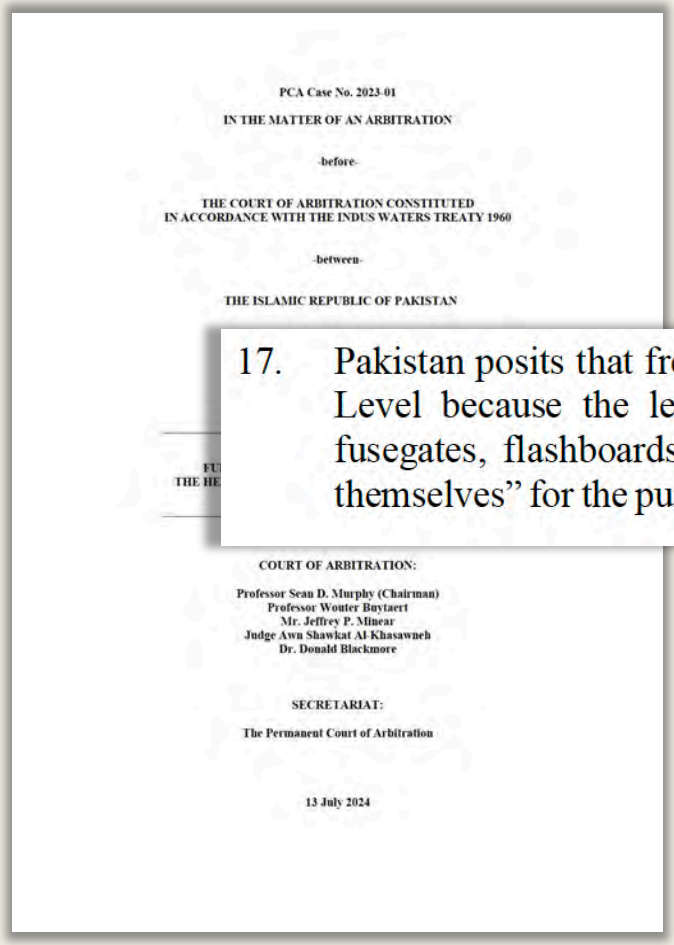
Hearing for the First Phase on the Merits

16 July 2024

Outline of submissions

- **Question 17:** Freeboard
- **Questions 28 and 29:** Paras 2(c) and 15, Ann D
- **Question 19:** Sufficiency criteria
- **Question 18:** Evolution of Parties' positions
- **Questions 29 and 24:** Kiru HEP and Firm Power
- **Question 30:** Alternative approaches

Question 17



PCA Case No. 2023-01

IN THE MATTER OF AN ARBITRATION

-before-

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

-between-

THE ISLAMIC REPUBLIC OF PAKISTAN

COURT OF ARBITRATION:

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

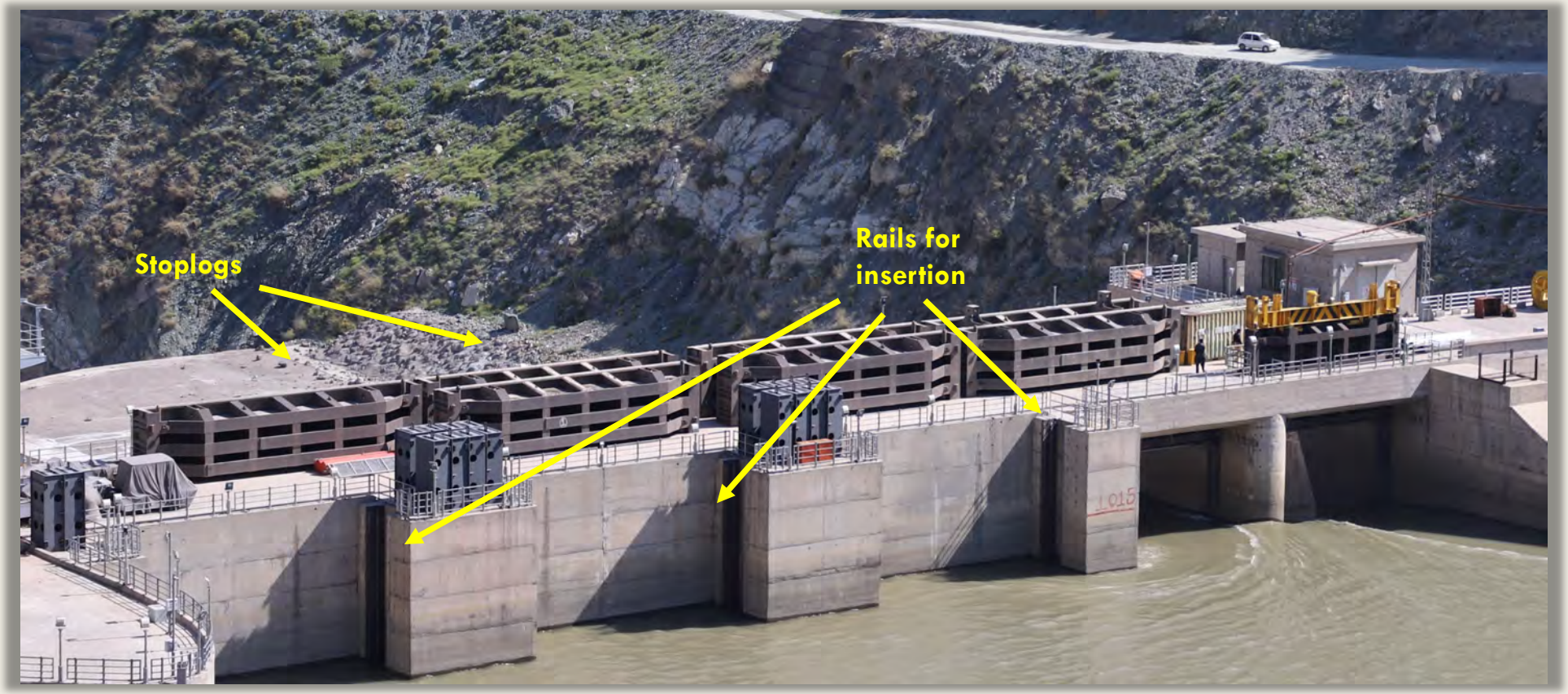
SECRETARIAT:

The Permanent Court of Arbitration

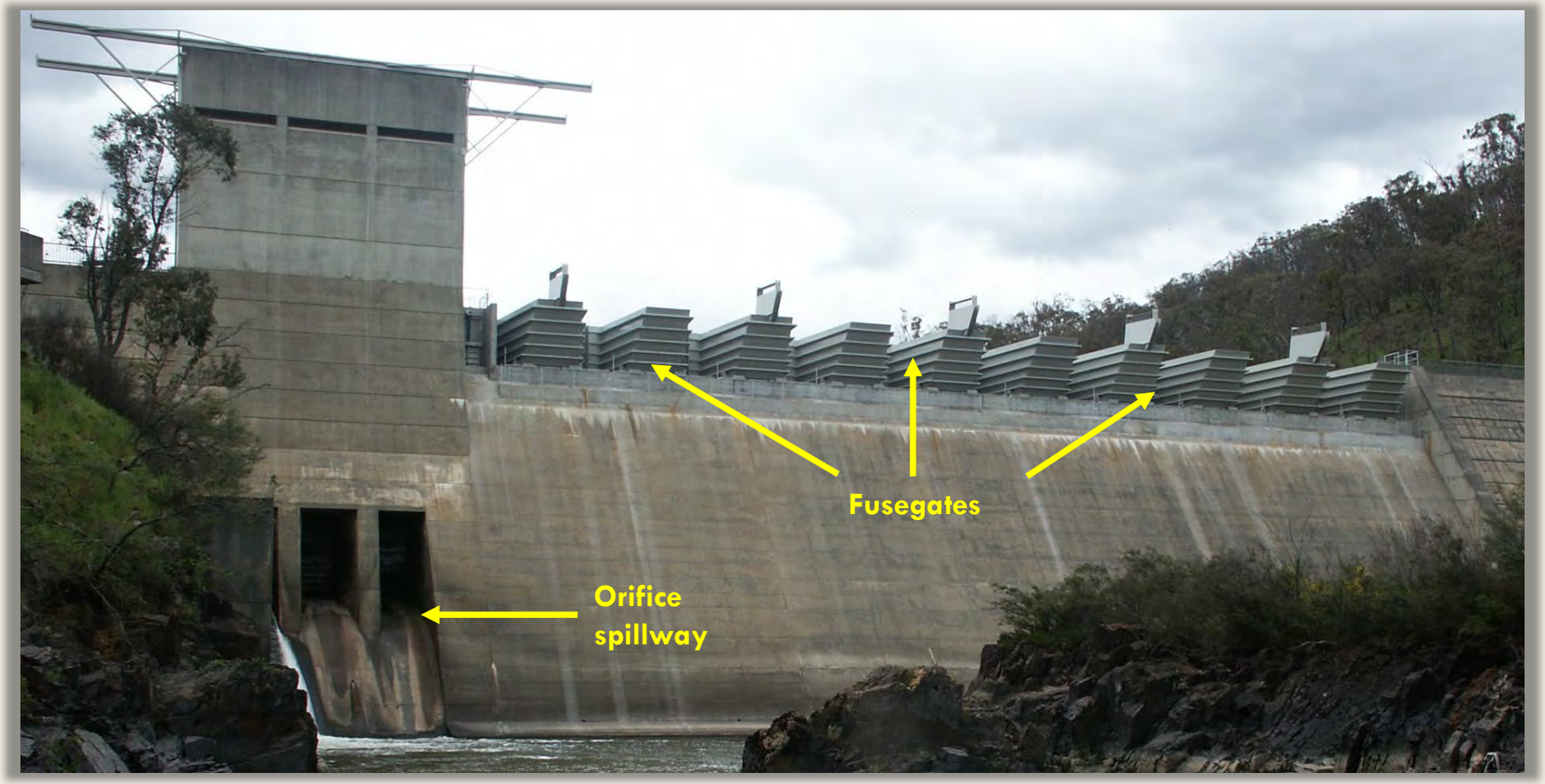
13 July 2024

17. Pakistan posits that freeboard must be restricted even with an ungated spillway at Full Pondage Level because the level of controllable storage could nevertheless be later increased with fusegates, flashboards, or stoplogs. Would such instruments constitute part of "[t]he works themselves" for the purposes of Paragraph 8(a) if they were not an integral part of the HEP design?

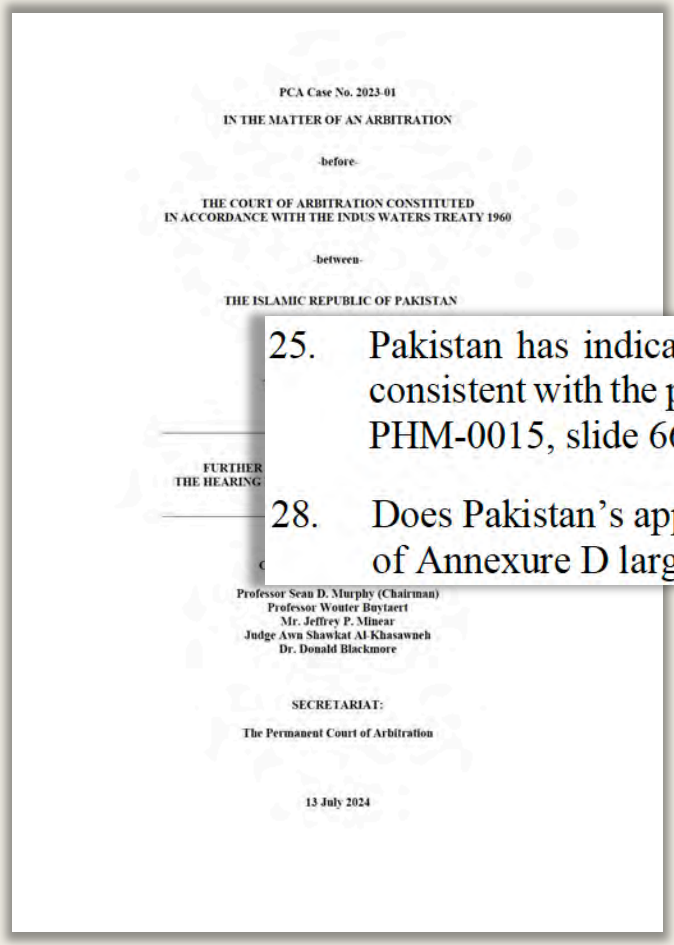
Stoplogs



Fusegates and flashboards



Questions 25 and 28



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25. Pakistan has indicated that Paragraph 2(c) of Annexure D has a peripheral role. How is this consistent with the principle of effectiveness under the law of treaties? (see Memorial, para. 11.42; PHM-0015, slide 66)?

28. Does Pakistan's approach to the calculation of MMD and maximum Pondage make Paragraph 15 of Annexure D largely irrelevant in practice?

Annexure D, Paragraphs 2(c) & 2(i)

No. 6032

INDIA, PAKISTAN and INTERNATIONAL BANK FOR RECONSTRU

The Indus Waters Tr
Karachi, on 19 Sep

Protocol to the above-
vember, 2 and 23 I

Official text: English.

Registered by India on 16 January 1962.

(c) "Pondage" means Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant.

(i) "Firm Power" means the hydro-electric power corresponding to the minimum mean discharge at the site of a plant, the minimum mean discharge being calculated as follows :

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.

Annexure D, Paragraph 15

No. 6032

INDIA, PAKISTAN and INTERNATIONA
RECONSTRUCTION AND DEVEL

The Indus Waters Treaty 1960 (with annex
Karachi, on 19 September 1960

Protocol to the above-mentioned Treaty.
vember, 2 and 23 December 1960

Official text: English.

Registered by India on 16 January 1962.

INDE, PAKISTAN et BANQUE INTERNAT
LA RECONSTRUCTION ET LE DÉVEL

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

Protocole relatif au Traité susmentionné
novembre, 2 et 23 décembre 1960

Texte officiel: anglais.

Enregistrés par l'Inde le 16 janvier 1962.

15. Subject to the provisions of Paragraph 17, the works connected with a Plant shall be so operated that (*a*) the volume of water received in the river upstream of the Plant, during any period of seven consecutive days, shall be delivered into the river below the Plant during the same seven-day period, and (*b*) in any one period of 24 hours within that seven-day period, the volume delivered into the river below the Plant shall be not less than 30%, and not more than 130%, of the volume received in the river above the Plant during the same 24-hour period : Provided however that :

(i) where a Plant is located at a site on the Chenab Main below Ramban, the volume of water received in the river upstream of the Plant in any one period of 24 hours shall be delivered into the river below the Plant within the same period of 24 hours ;

(ii) where a Plant is located at a site on the Chenab Main above Ramban, the volume of water delivered into the river below the Plant in any one period of 24 hours shall not be less than 50% and not more than 130%, of the volume received above the Plant during the same 24-hour period ; and

iii) where a Plant is located on a Tributary of The Jhelum on which Pakistan has any Agricultural use or hydro-electric use, the water released below the Plant may be delivered, if necessary, into another Tributary but only to the extent that the then existing Agricultural Use or hydro-electric use by Pakistan on the former Tributary would not be adversely affected.

Kiru HEP

MMD	65.3m^3/sec (flow rate)	5.64Mm^3 (daily volume)
Location	Chenab above Ramban	Para 15(ii), Ann D applies
Pondage	10.5Mm^3 (India)	2.82Mm^3 (Pakistan)

P-0546
(resubmitted)

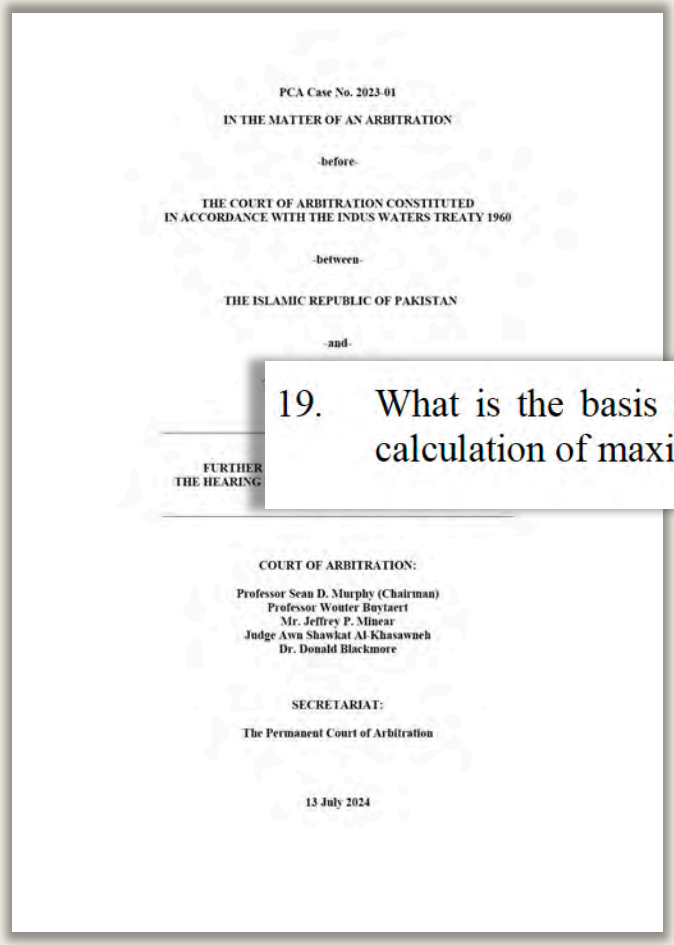
Appendix E1

PAKISTAN'S CALCULATIONS OF MINIMUM MEAN DISCHARGE[1] AT INDIA'S 624MW KIRU HEP ON CHENAB RIVER

Year	Jan			Feb			Mar			Apr			May			Jun		
	1st to 10th	11th to 20th	21st to end	1st to 10th	11th to 20th	21st to end	1st to 10th	11th to 20th	21st to end	1st to 10th	11th to 20th	21st to end	1st to 10th	11th to 20th	21st to end	1st to 10th	11th to 20th	21st to end
1975	62.2	60.7	47.9	51.2	42.2	55.3	55.3	61.1	78.3	104.1	119.2	173.4	236.2	457.8	553.4	653.9	980.6	1096.3
1976	57.7	53.9	56.2	49.2	61.7	60.1	68.9	58.7	71.5	90.2	114.0	226.2	249.1	394.2	557.5	967.5	685.9	600.9
1977	68.3	60.0	61.7	62.9	67.9	60.5	60.9	71.0	85.2	100.3	95.6	116.1	131.1	156.6	345.9	531.5	352.8	1472.5
1978	61.0	56.8	53.3	53.5	57.6	55.2	63.7	64.9	88.0	78.9	174.9	179.0	395.9	659.1	817.6	1097.7	965.8	1836.9
1979	65.8	63.0	64.1	60.6	60.3	59.8	37.9	55.4	135.8	147.3	193.0	278.7	308.5	294.5	278.9	401.7	847.2	1544.2
1980	61.4	62.0	53.6	56.3	55.0	59.6	59.1	60.8	73.8	83.3	114.5	164.8	276.9	294.9	396.1	725.5	905.5	1260.8
1981	65.0	59.0	57.1	62.3	60.5	63.9	64.6	63.8	81.7	101.0	174.8	265.7	505.7	530.8	722.2	482.8	530.8	1388.3
1982	63.4	61.6	65.1	64.5	60.2	61.6	68.0	66.0	79.4	93.9	130.8	163.8	275.6	216.3	346.7	567.3	942.1	785.9
1983	69.5	67.4	62.1	66.6	65.6	60.0	62.9	69.5	81.9	125.2	125.1	157.3	250.8	387.0	428.3	571.1	596.0	1181.3
1984	62.2	65.1	62.1	60.5	53.8	107.1	67.1	71.8	87.5	112.7	113.8	159.7	252.7	308.6	621.6	1201.5	1099.5	1174.0
1985	61.3	65.7	63.7	63.6	62.6	64.1	67.4	67.2	77.0	77.6	96.9	129.9	186.5	237.8	566.7	747.6	875.2	980.8
1986	68.7	64.7	61.9	61.5	59.7	60.3	69.6	73.5	93.0	96.0	155.1	211.9	254.0	450.0	287.7	391.6	968.0	1609.4
1987	77.8	74.9	76.8	71.8	71.5	74.1	88.9	89.8	99.1	119.8	119.8	205.8	203.4	212.2	398.1	762.5	678.5	970.1
1988	79.4	72.3	69.1	68.7	68.0	63.5	123.1	82.6	119.6	141.0	327.4	380.4	401.7	574.5	620.9	672.3	933.1	1726.8
1989	110.0	101.8	100.1	93.7	93.9	90.2	93.8	96.2	116.9	128.8	155.2	180.8	267.3	426.4	721.2	1215.9	861.0	1029.6
1990	80.9	80.3	79.7	76.6	82.9	81.7	75.4	88.8	102.6	117.7	164.4	221.5	399.4	919.4	845.2	764.0	749.4	1828.6
1991	71.5	68.6	66.7	65.5	63.9	68.5	85.2	96.6	124.2	169.8	143.4	201.1	284.2	440.7	409.0	937.5	1102.3	1049.0
1992	68.6	68.0	65.6	65.7	68.5	67.6	67.8	73.3	98.8	120.9	157.3	236.9	252.0	378.4	476.4	575.4	827.0	996.6
1993	83.4	77.5	71.8	71.3	73.9	65.5	69.3	82.6	89.4	106.6	141.5	233.1	409.9	N/A	N/A	N/A	822.4	932.5
1994	71.0	59.5	61.9	50.4	47.6	53.1	59.4	86.4	100.7	169.7	139.7	167.0	313.6	322.9	535.2	691.4	742.7	1091.9
1995	49.3	47.2	47.4	46.8	45.9	45.1	48.8	56.8	60.8	74.6	74.2	111.9	234.6	475.3	313.8	645.8	1016.8	702.1
1996	95.9	89.4	80.5	74.3	74.3	75.1	82.3	68.6	123.2	124.0	139.3	282.3	225.2	274.9	402.2	741.2	984.3	979.1
1997	86.1	83.8	82.1	80.7	76.2	72.4	74.0	77.9	80.6	84.9	98.5	146.4	181.4	204.7	261.3	304.0	361.1	474.4
1998	89.9	84.6	79.0	67.7	66.7	71.3	95.1	91.2	143.7	194.2	235.4	295.4	400.1	544.6	703.3	669.7	675.2	935.1
1999	106.0	98.1	92.3	80.9	75.6	74.9	79.6	85.7	108.2	164.0	184.1	250.5	219.9	275.1	383.5	359.6	472.5	592.1
2000	82.1	72.8	70.7	68.9	69.0	70.0	72.5	77.9	86.4	93.9	103.7	121.7	253.0	854.5	1270.6	653.0	627.4	732.1
2001	74.9	72.4	70.4	70.4	70.6	67.5	68.0	68.1	78.6	94.9	111.8	131.5	175.3	296.6	432.1	514.9	850.7	663.9
2002	115.1	114.3	74.0	60.7	61.2	67.7	74.8	99.2	141.7	158.0	201.3	229.1	288.6	649.5	676.5	835.5	970.5	1105.0
2003	77.0	76.0	71.0	68.3	65.5	64.1	70.4	67.7	94.1	166.5	191.5	300.1	492.5	729.4	829.9	1227.0	1122.8	1124.6
2004	99.0	98.2	97.4	100.6	110.7	78.5	76.7	84.2	97.7	140.1	144.8	173.0	172.1	293.8	394.6	393.4	842.4	660.2
2005	74.1	71.4	69.1	80.7	85.1	80.1	84.1	86.9	102.2	98.7	120.1	182.3	203.7	195.4	193.5	264.9	424.9	1529.9
2006	84.7	101.4	85.8	93.7	91.0	90.0	86.2	86.5	97.8	108.9	106.5	137.1	318.5	639.6	925.5	650.8	342.2	717.7
2007	71.2	66.7	64.4	49.0	45.7	43.1	74.9	76.3	N/A	160.9	248.8	332.6	493.6	607.4	392.0	498.6	936.8	1265.8
2008	57.8	58.2	58.7	53.5	52.3	59.2	70.4	75.3	72.9	78.6	107.0	138.4	208.5	410.2	493.2	723.4	1400.4	1127.5
2009	63.6	58.8	62.8	59.2	58.2	61.6	59.6	68.0	70.9	86.4	106.7	148.9	185.1	258.0	530.8	696.3	497.8	971.8
2010	67.1	60.2	56.2	47.9	63.6	69.7	69.5	79.3	112.9	113.7	173.5	192.9	421.7	360.4	583.3	681.6	575.5	1155.9
2011	62.3	58.0	59.9	50.6	36.6	51.5	61.1	73.4	101.0	95.2	151.9	272.6	511.2	711.8	852.1	794.5	1197.1	1548.0
2012	64.0	56.3	52.0	55.4	54.7	70.0	63.2	59.5	82.4	136.1	123.4	155.6	189.6	279.9	446.1	634.4	671.1	1134.4
Mean	**74.4**	**71.3**	**67.7**	**65.4**	**65.3**	**66.9**	**71.6**	**75.3**	**95.7**	**117.3**	**146.8**	**201.5**	**290.2**	**425.0**	**540.9**	**682.4**	**800.9**	**1104.6**

MMD = 65.3 m^3/s (reflecting second period in Feb)

Question 19



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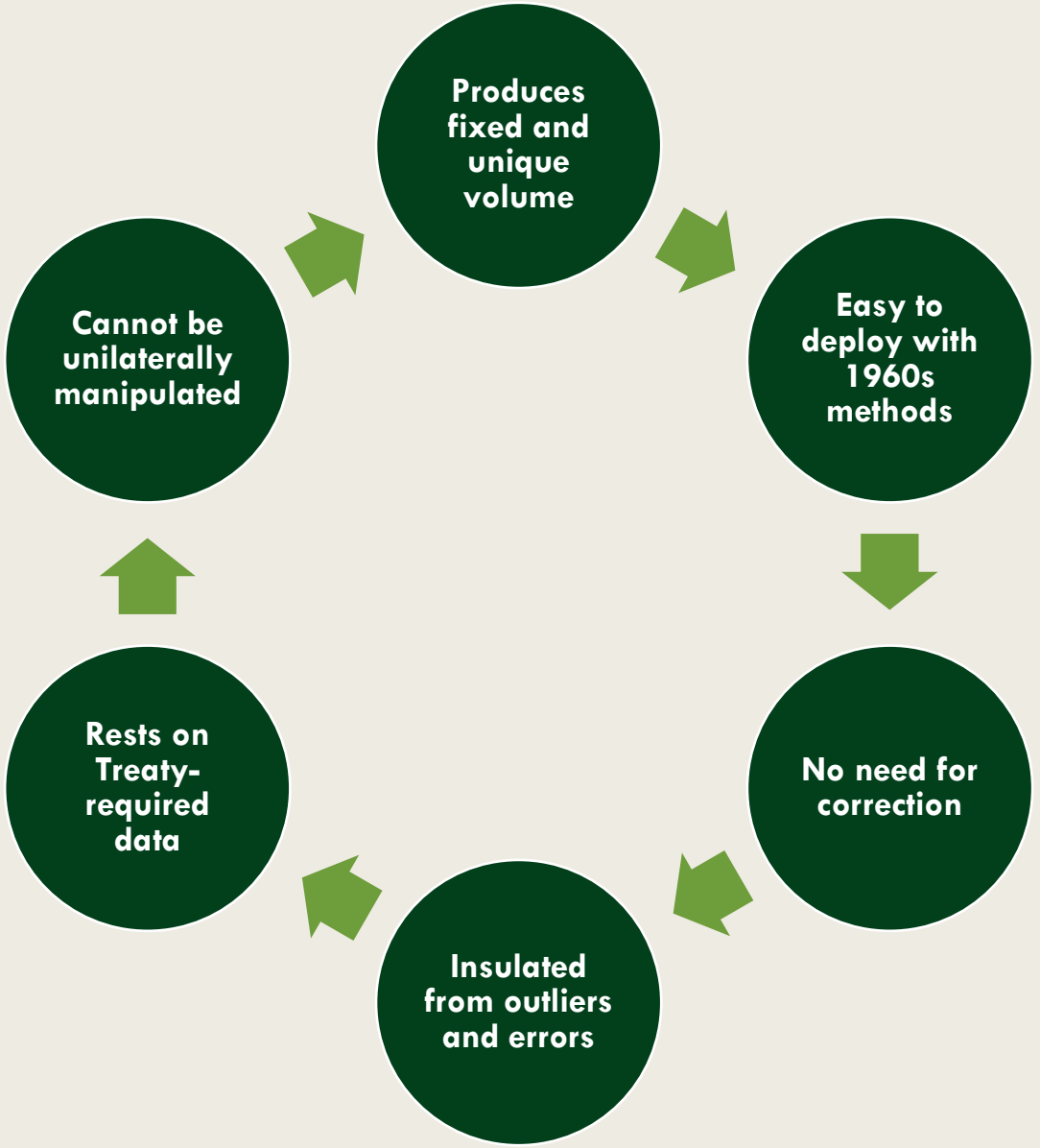
SECRETARIAT:

The Permanent Court of Arbitration

13 July 2024

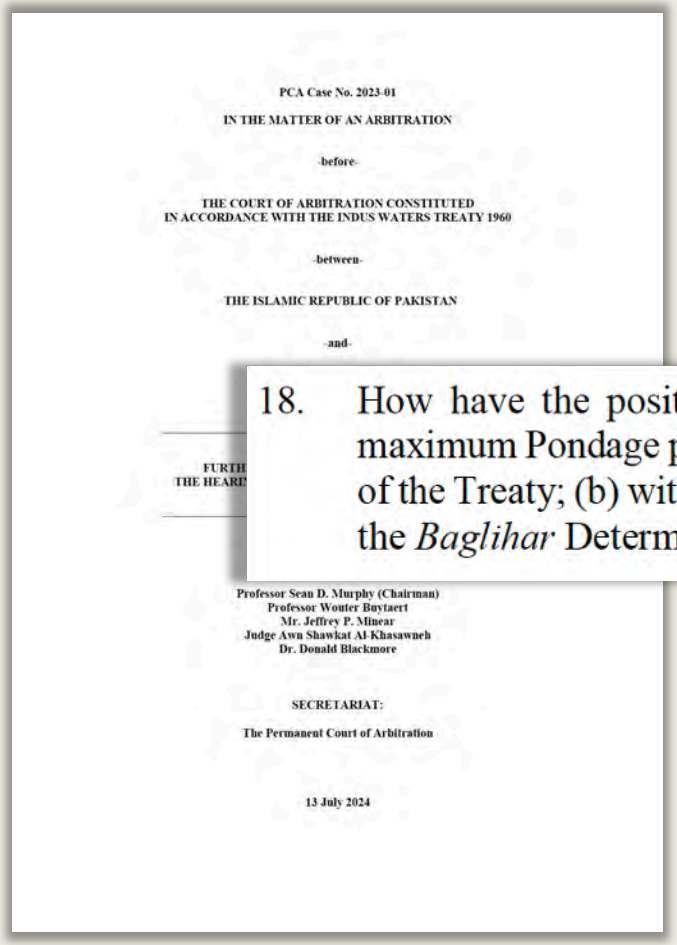
19. What is the basis *in the Treaty* of each of Pakistan's sufficiency criteria with respect to the calculation of maximum Pondage? (Memorial, para. 11.43; PHM-0015, slide 32).



Sufficiency criteria for calculation of maximum Pondage

Memorial, ¶ 11.43

Question 18



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13 July 2024

18. How have the positions of the Parties changed over time with respect to the calculation of maximum Pondage pursuant to Annexure D, paragraph 8(c), including: (a) during the negotiation of the Treaty; (b) with respect to the HEPs notified prior to the Baglihar proceedings; (c) following the *Baglihar* Determination; and (d) following the *Kishenganga* proceedings?

Discussion of changing positions

- **Negotiating the Treaty:** T2/57/20–61/12 (Ms Rees-Evans)
- ***Baglihar* proceedings:** T2/103/17 – 104/6 (Prof Webb)
- **Pakistan's evolved case:** T4/238/17–241/20 (Sir Daniel Bethlehem KC).
- **India's current case:** T5/116/18–135/13 (Dr Miles)

Pakistan's case in *Baglihar* (I)

- Premised on Paras 8(c) & 2(i), Ann D; no use of Para 2(c) & 15, Ann D.
- Function of Pondage is to turn variable inflow into constant outflow.
- Pondage must be sized according to minimum storage to allow continuous production of Firm Power.
- Pondage so obtained is doubled.

Baglihar Memorial, §§H.1–H.7

Pakistan's case in *Baglihar* (II)

Methodology

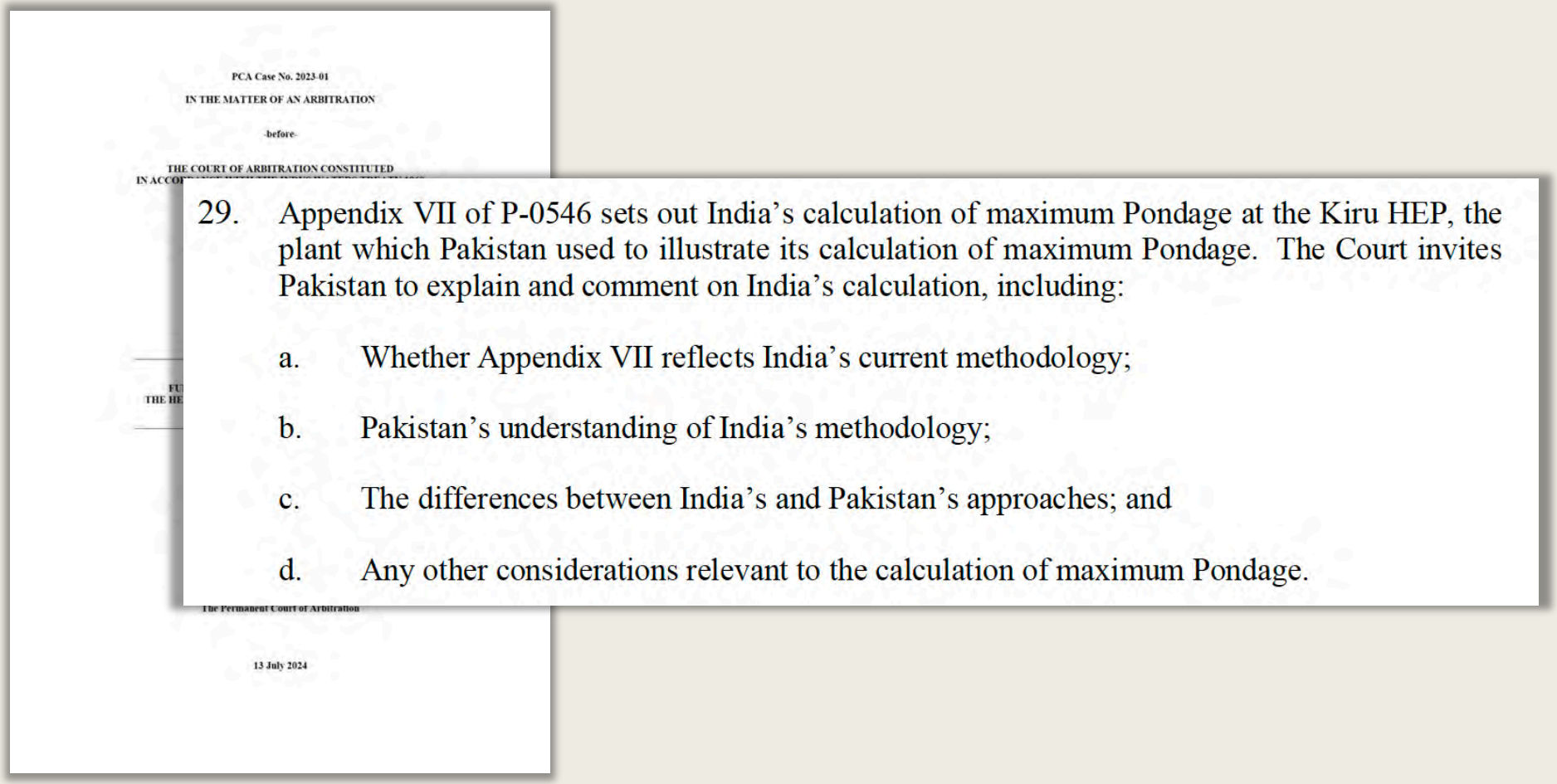
- Sift daily data to identify period with average inflow closest to MMD.
- Upscale inflows of sample week to make average equal to MMD.
- Pondage "*required for Firm Power*" is storage necessary to allow for production of constant Firm Power throughout the week, given inflows.
- Storage obtained then doubled to fix Operating Pool.

Flaws

- Does not come up with a fixed and unique value of Pondage.
- Produces a range of value from which the 'correct' value must be selected.
- Relies on data manipulation to work.
- Computationally dense.

***Baglihar* Memorial, §§H.1–H.7**

Question 29



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29. Appendix VII of P-0546 sets out India's calculation of maximum Pondage at the Kiru HEP, the plant which Pakistan used to illustrate its calculation of maximum Pondage. The Court invites Pakistan to explain and comment on India's calculation, including:

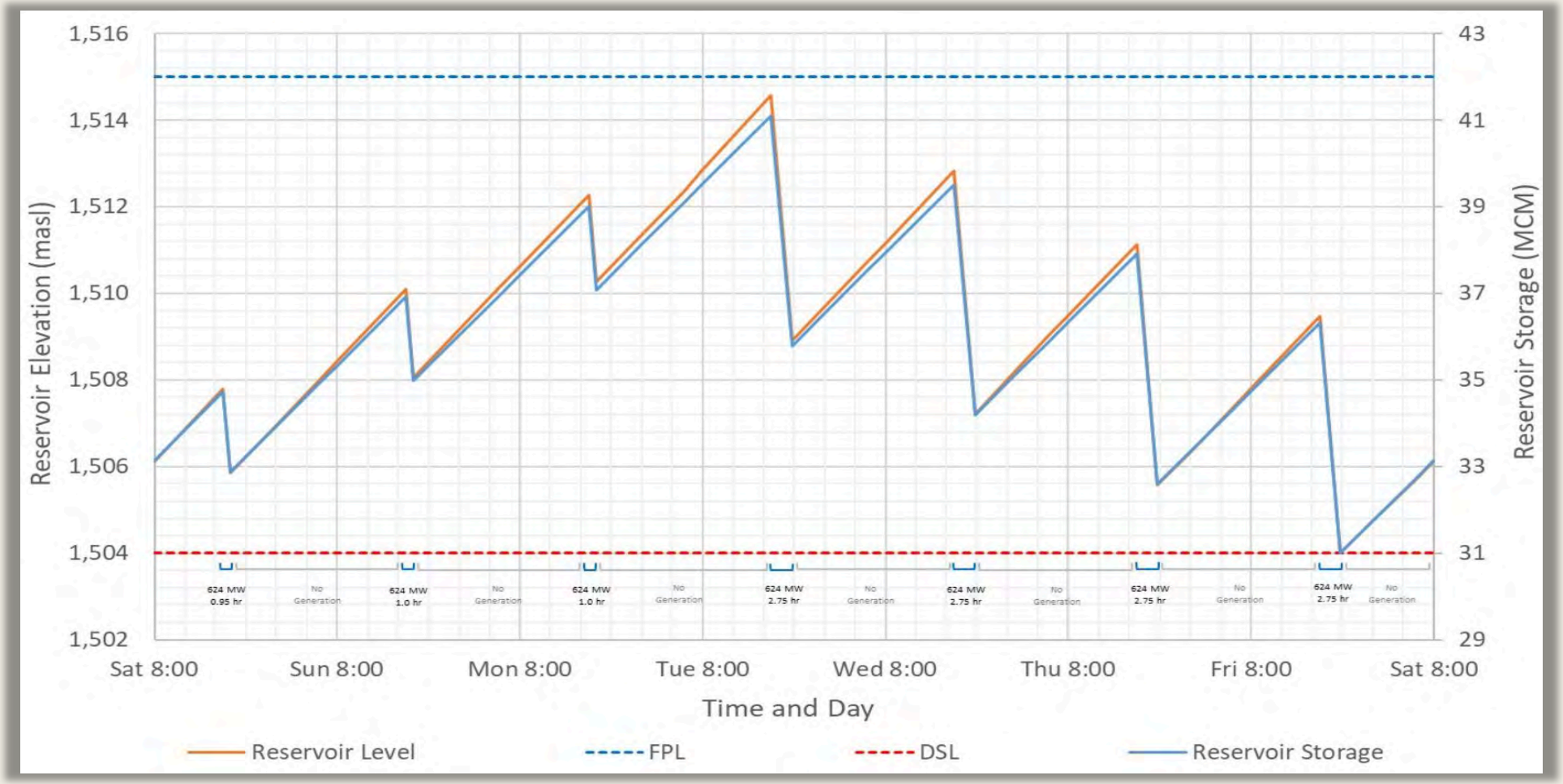
a. Whether Appendix VII reflects India's current methodology;

b. Pakistan's understanding of India's methodology;

c. The differences between India's and Pakistan's approaches; and

d. Any other considerations relevant to the calculation of maximum Pondage.

Pondage calculations for Kiru HEP



Approach premises

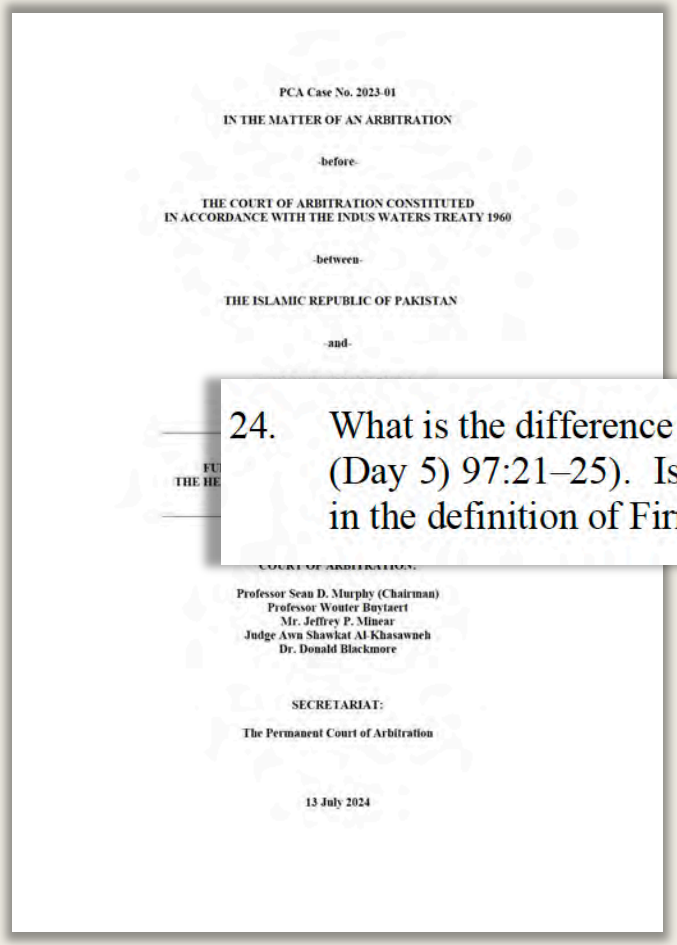
PAKISTAN

- Governed by hydrology (Paras 8(c), 2(i), Ann D)
- Results in production at Firm Power rate
- Turns variable inflow into constant outflow (MMD)

INDIA

- Governed by load (Paras 2(c), 15, Ann D)
- Results in production of Secondary Power, up to installed capacity
- Turns constant inflow (MMD) into variable outflow

Question 24



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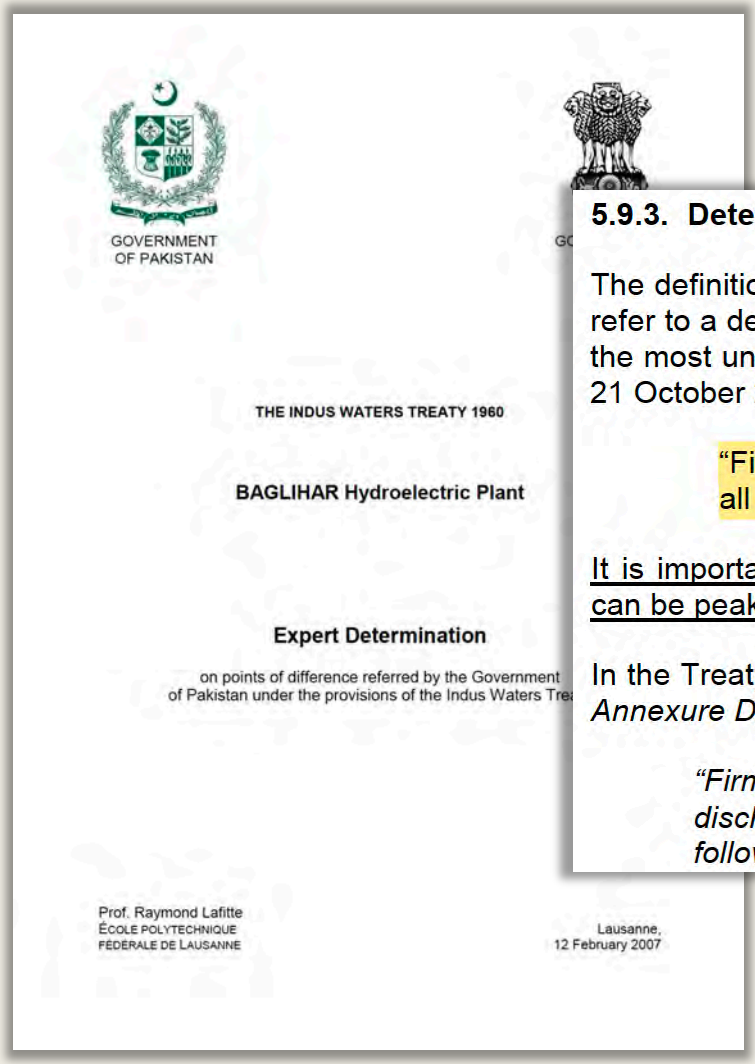
24. What is the difference between the Parties as to the language of "required for Firm Power"? (Tr., (Day 5) 97:21–25). Is there also a potential difference as to the meaning of "corresponding to" in the definition of Firm Power?

The *Baglihar* approach to Firm Power


GOVERNMENT
OF PAKISTAN

THE INDUS WATERS TREATY 1960

BAGLIHAR Hydroelectric Plant

Expert Determination

on points of difference referred by the Government
of Pakistan under the provisions of the Indus Waters Trea

Prof. Raymond Lafitte
ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Lausanne,
12 February 2007

5.9.3. Determination of firm power

The definition of firm power is given in many manuals and guidelines. The NE has chosen to refer to a definition given by American Society of Civil Engineers, which appears to him to be the most understandable and which was mentioned by the Parties during Meeting No. 2, 19-21 October 2005, in Geneva,[106] providing:

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

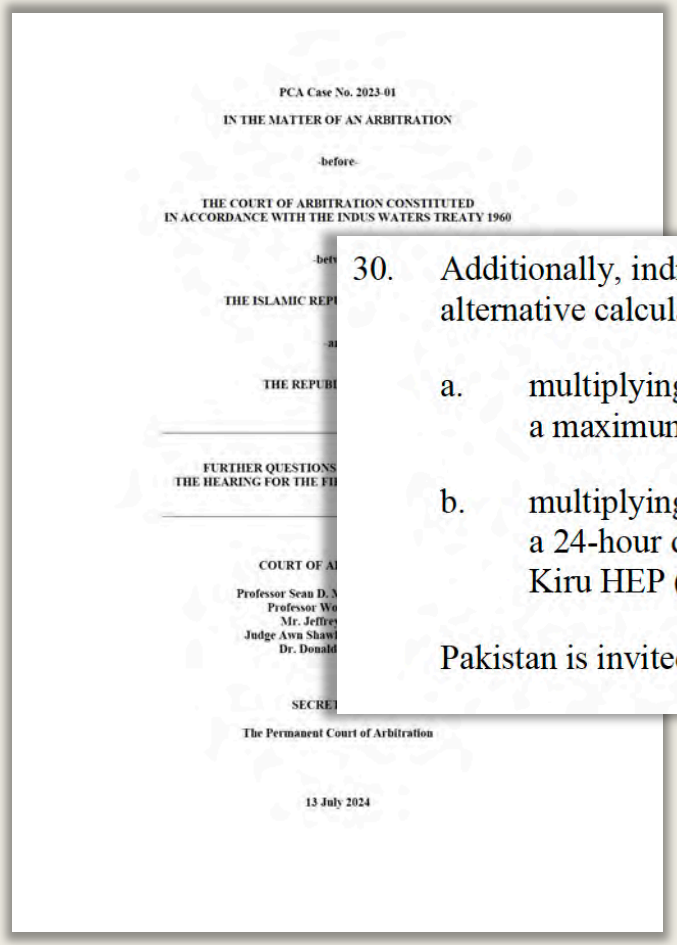
It is important to highlight[107] that firm power, according to the requirements of consumers, can be peak load or base load.

In the Treaty, the definition of firm power, which is in fact a method of calculation, is given in *Annexure D, Part 1 – Definitions, 2(i) stating*:

> *"Firm Power" means the hydro-electric power corresponding to the minimum mean discharge at the site of a plant, the minimum mean discharge being calculated as follows:*

PLA-0002,
§ 5.9.3

Question 30



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-before-

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

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FURTHER QUESTIONS
THE HEARING FOR THE FI

COURT OF A

Professor Sean D. M
Professor Wo
Mr. Jeffrey
Judge Awn Shaw
Dr. Donald

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The Permanent Court of Arbitration

13 July 2024

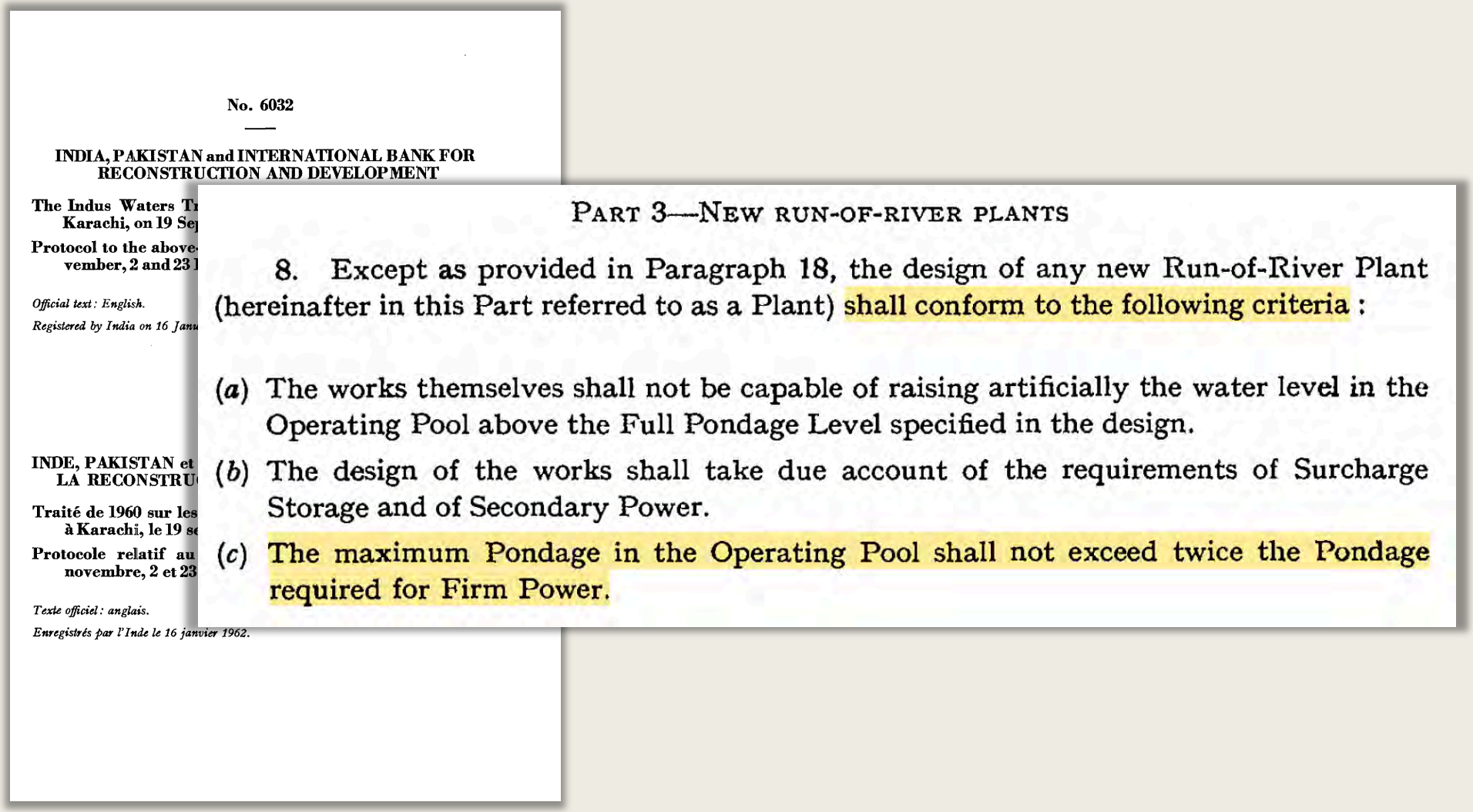
30. Additionally, individual Members asked whether the Treaty's language would support two other alternative calculation methods for determining maximum Pondage:

a. multiplying the minimum mean discharge by a 24-hour duration factor, doubled, producing a maximum Pondage of 11.284 Mm^3 for the Kiru HEP (65.3 x 3600 x 24 x 2); and

b. multiplying the minimum mean discharge, less the lowest historic minimum discharge, by a 24-hour duration period, doubled, producing a maximum Pondage of 4.959 Mm^3 for the Kiru HEP ((65.3 -36.6) x 3600 x 24 x 2).

Pakistan is invited to comment on those alternatives.

Annexure D, Paragraph 8(c)



No. 6032

INDIA, PAKISTAN and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

The Indus Waters Tr
Karachi, on 19 Sep
Protocol to the above
vember, 2 and 23 I

Official text: English.
Registered by India on 16 Janu

INDE, PAKISTAN et
LA RECONSTRU
Traité de 1960 sur les
à Karachi, le 19 se
Protocole relatif au
novembre, 2 et 23

Texte officiel: anglais.
Enregistrés par l'Inde le 16 janvier 1962.

PART 3—NEW RUN-OF-RIVER PLANTS

8. Except as provided in Paragraph 18, the design of any new Run-of-River Plant (hereinafter in this Part referred to as a Plant) shall conform to the following criteria :

(*a*) The works themselves shall not be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design.

(*b*) The design of the works shall take due account of the requirements of Surcharge Storage and of Secondary Power.

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


ایمان اتحاد نظم