

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

-and-

THE REPUBLIC OF INDIA

SECOND PHASE ON THE MERITS

MEMORIAL

VOLUME I

19 JANUARY 2026

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CHAPTER 1: INTRODUCTION

1.1. This Memorial is submitted pursuant to ¶ 2.2 of Procedural Order No. 17 (“**PO17**”) which directed, in ¶ 1.2 thereof, that the Court would conduct a Second Phase on the Merits (“**Second Phase**”):

“specific to ‘resolving the basis on which India must determine the installed capacity and anticipated load of a proposed Annexure D, Part 3 HEP, and, once determined, how these elements are to be taken into account for purposes of the calculation of maximum Pondage’.”

1.2. The focus of the Memorial, and this Second Phase, is accordingly narrow, defined by the terms of PO17, pursuant to which the Court requested Pakistan to address a number of specific issues, as well as the expressly stated lacuna in the Court’s Award on Issues of General Interpretation of the Indus Waters Treaty (“**General Issues Award**”) on “whether and how the Treaty regulates the basis upon which India may determine [the] installed capacity and anticipated load” of an Annexure D, Part 3 HEP (“**AnnD.3 HEP**”).¹ In so saying, the Court stated that an AnnD.3 HEP’s “installed capacity and anticipated load must correspond to how the plant will actually be operated; it cannot be hypothesised in a manner that serves to inflate the amount of maximum Pondage.”²

1.3. Following the handing down of the General Issues Award, Pakistan submitted a Request for Clarification from the Court (“**Clarification Request**”) requesting, *inter alia*, that the Court clarifies its reasoning on how the installed capacity and anticipated load of an AnnD.3 HEP “are to be taken into account for purposes of the calculation of maximum Pondage and the basis and operation of the implied Treaty constraints on India’s determination of the installed capacity and anticipated load” of such a Plant.³

1.4. In its Decision on Pakistan’s Request for Clarification of the Award on Issues of General Interpretation of 8 November 2025 (“**Clarification Decision**”), the Court declined to address the determination of the installed capacity and anticipated load of an AnnD.3 HEP, stating that it was “open to conducting a further phase of these proceedings on this issue. Such

¹ Award on Issues of General Interpretation of the Indus Waters Treaty, 8 August 2025 (“**General Issues Award**”), ¶ 743.

² *Id.*

³ Decision on Pakistan’s Request for Clarification of the Award on Issues of General Interpretation, 8 November 2025 (“**Clarification Decision**”), ¶ 32.

a phase would provide an opportunity for written submissions from both Parties on this issue that, *inter alia*, identify the relevant Treaty provisions, the relevant documents in the record, and the Parties' current and past positions and practice, including in the *Baglihar* Neutral Expert Proceedings.”⁴

1.5. While the Court declined to address the principal issue regarding installed capacity and anticipated load in the context of a clarification procedure, it did clarify other elements of the reasoning and conclusions in its General Issues Award relevant to such issues, notably that:

“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.”⁵

1.6. While gaps remain in the Court's analysis in respect of the determination of the anticipated load and installed capacity of an AnnD.3 HEP, it is clear from the General Issues Award and the Clarification Decision that the Treaty imposes material limits on India's margin of appreciation in determining such elements, including:

- (a) India must undertake a “realistic, well-founded, and defensible projection” of a proposed HEP's installed capacity and anticipated load.⁶
- (b) That projection must reflect the fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the proposed HEP.⁷
- (c) India's realistic, well-founded, and defensible projection of installed capacity and anticipated load must be based on the information relevant to the calculation of maximum Pondage that India is required to communicate to Pakistan in writing pursuant to Paragraph 9 and Appendix II of Annexure D “in advance of the beginning of construction or river works connected with the Plant”,⁸ i.e., at the design-stage of an AnnD.3 HEP.⁹

⁴ *Id.*, ¶ 86.

⁵ *Id.*, ¶ 88(H).

⁶ General Issues Award, ¶ 747(b); Clarification Decision, ¶ 88(H).

⁷ *Id.*

⁸ Indus Waters Treaty 1960 (“Treaty”), PLA-0001, Annexure D, Paragraph 9.

⁹ General Issues Award, ¶ 811(P)(1).

- (d) India's projection of installed capacity and anticipated load must correspond to how the proposed HEP will actually be operated and cannot be hypothesised in a manner that serves to inflate the amount of maximum Pondage.¹⁰

1.7. Beyond these elements, Pakistan contends that the Treaty imposes other material constraints on India's margin of appreciation in determining the installed capacity and anticipated load of an AnnD.3 HEP. An elaboration of these constraints is the focus of this Memorial.

1.8. In ¶ 2.3 of PO17, the Court requested Pakistan to address the following issues in the light of the General Issues Award:

“2.3.1 The meaning of the terms ‘capacity’ and ‘load’ as used in the Treaty, including in Annexure D, Part 3;

2.3.2 The meaning of any engineering concepts and terminology (including ‘installed capacity’, ‘load curve’, and ‘anticipated load’) that are relevant to run-of-river hydro-electric plants, especially with respect to the calculation of pondage;

2.3.3 In relation to the written record of the present proceedings:

- (a) the data India has shared with Pakistan in respect of the capacity and load of Annexure D, Part 3 HEPs, as well as India's calculations for the maximum Pondage for such HEPs; and
- (b) discussions of the capacity and load of proposed Annexure D, Part 3 HEPs, as well as calculations of the maximum Pondage for such HEPs found in: (i) all correspondence between the Parties' respective Commissioners for Indus Waters, (ii) all correspondence between other officials, and (iii) records of the Permanent Indus Commission;

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).

¹⁰ *Id.*, ¶ 743.

- 2.3.5 Pakistan's current position as to the basis upon which India must determine the installed capacity and anticipated load of a proposed Annexure D, Part 3 HEP, including what limits, if any, the Treaty places on India's discretion in this respect;
- 2.3.6 Pakistan's current position as to how those elements (once determined), along with others, are to be taken into account for purposes of the calculation of maximum Pondage under Paragraph 8(c) of Annexure D to the Treaty; and
- 2.3.7 Any other issues Pakistan considers relevant to a decision on the questions at issue for the Second Phase on the Merits."

1.9. In addition to the Court's enquiries in PO17, the Court, by its letter dated 9 December 2025, transmitted to the Parties an Excel table developed by the Court ("**COA Excel Table**") "reproducing the format of the operating pool calculations table set out in Appendix VII of [Pakistan's] Exhibit P-0546, and incorporating constraints as set out in the Treaty".¹¹ Noting that a "further constraint [on the Operating Pool] is the installed capacity and anticipated load of the HEP", the Court invited the Parties, in their written and/or oral submissions, "to address the following propositions and questions relating to the table":

- "1. The table appears to show that it is possible to adjust the different variables to produce a required Pondage that ranges from near-zero (running the HEP as a pure run-of-river HEP) to a highest possible volume, but that the highest possible volume is effectively capped due to the Treaty constraints (a) and (b) noted above. Thus, for any given HEP, there appears to be a limited range of potential required Pondage, regardless of the choices made for installed capacity and anticipated load.
- 2. The volume of required Pondage appears to be influenced primarily by adjusting the anticipated load of the HEP (i.e., the distribution over the week of the flow of the water through the turbines so as to generate electrical power). Adjusting the installed capacity appears to have some, but much more limited, effect on the volume of required Pondage.
- 3. Within the range of possibilities for required Pondage indicated by the table:
 - a. Do any provisions of the Treaty require that the HEP's installed capacity be of a certain magnitude or that the anticipated load be distributed in a certain way?

¹¹ Letter from the PCA to the Parties, 9 December 2025, pp. 1-2.

- b. Are there any assumptions as to the operation of run-of-river HEPs generally that should be applied in this regard? (noting in this regard the analysis of the *Baglihar* Neutral Expert, who adjusted downward the maximum Pondage at the Baglihar HEP)?
- c. Are there any factors extrinsic to the physical and hydrological conditions at the particular HEP site, such as the power demand of the local, regional, or national grids, or the economics of plant operation, that should be applied in this regard?”¹²

1.10. This Memorial responds to these enquiries by the Court and sets out Pakistan’s position more generally on the issue of whether and how the Treaty regulates the basis upon which India may determine the installed capacity and anticipated load of an AnnD.3 HEP.

1.11. Following this introductory **Chapter 1**, the issues are addressed in four further Chapters (together, **Volume I**) and five appendices, **Appendices A to D** being bound together in **Volume II** of this Memorial and **Appendix E**, an Excel table developed by Pakistan (“**PK Excel Table**”), which is submitted separately in its native Excel format.

1.12. In **Chapter 2**, Pakistan addresses the Court’s enquiries in ¶¶ 2.3.3 and 2.3.4 of PO17. The chapter is supplemented by **Appendices A and B**. **Appendix A** details the data provided to Pakistan by India with respect to “capacity”, “load”, as well as India’s “calculations for the maximum Pondage for such HEPs”. **Appendix B** provides a detailed description of all relevant communications between the Parties concerning Pondage for India’s AnnD.3 HEPs, with specific exchanges excerpted concerning “load”, “capacity”, and “calculations for the maximum Pondage for such HEPs”. **Section 2A** provides a brief narrative summary of these appendices. **Section 2B** provides a more detailed analysis of the evolution of India’s approach to the determination of “anticipated load” and “installed capacity”, and their role in “calculations for the maximum Pondage” and Pakistan’s sustained objections to India’s approach, particularly in respect of the determination of the anticipated load for AnnD.3 HEPs.

1.13. In **Chapter 3**, Pakistan sets out its interpretation of the Court’s consideration of Pondage in the General Issues Award. **Section 3A** addresses the Court’s enquiries in ¶¶ 2.3.1 and 2.3.2 of PO17 with respect to the meaning of the terms “capacity” and “load”, as well as other engineering concepts and terminology relevant to the calculation of Pondage. **Section**

¹² *Id.*, pp. 2-3.

3B recalls key aspects of the General Issues Award relevant to the present pleading. **Section 3C**, drawing in part on the analysis in **Chapter 2**, addresses the Court’s enquiry at ¶ 2.3.5 of PO17, identifying key factors that India must take into account in determining the anticipated load and installed capacity of its AnnD.3 HEPs. **Section 3D** addresses the Court’s enquiry at ¶ 2.3.6 of PO17 with respect to how the elements of anticipated load and installed capacity are to be factored into the calculations for maximum Pondage. **Section 3E** comments both on the role of Paragraph 15 of Annexure D and on India’s customary international law obligation, identified by the *Kishenganga* Court, to prevent significant harm to the environment by allowing for “environmental flow” in the calculation of Pondage required for Firm Power, this discussion being responsive to the Court’s invitation at ¶ 2.3.7 of PO17 to address “any other issues” relevant to this Second Phase on the Merits. The chapter concludes with **Section 3F**, which is a case study of the Kiru HEP, in which Pakistan demonstrates how the principles outlined in the chapter, with respect to anticipated load and installed capacity, would operate in practice and impact the calculation for maximum Pondage for AnnD.3 HEPs.

1.14. **Chapter 3** is supplemented by **Appendices C, D and E**. **Appendix C** addresses the *travaux préparatoires* and circumstances of the conclusion of the Treaty relevant to this Second Phase, and specifically the meaning of the terms “load” and “capacity”. **Appendix D** provides a detailed engineering analysis for the determination of anticipated load, installed capacity, and maximum Pondage in the light of the General Issues Award. **Appendix E**, the PK Excel Table developed by Pakistan, which follows that developed by the Court, sets out five alternative scenarios for the calculation of maximum Pondage for the Kiru HEP by employing the key principles identified by Pakistan in **Chapter 3**. The **Appendix E** scenarios are addressed in paragraphs 390 to 391 below and paragraph 96 of **Appendix D**.

1.15. **Chapter 4** addresses the COA Excel Table and the questions addressed to the Parties by reference thereto in the Court’s 9 December 2025 letter.

1.16. Finally, in **Chapter 5**, Pakistan makes some brief concluding remarks and sets out its Final Submissions for this Second Phase.

1.17. Before turning to the substance of Pakistan’s submissions, three further brief observations are warranted: the first to frame the submissions that follow from Pakistan; the second to address the question of certainty in the interpretation and application of the issues at

the heart of this phase of the proceedings; and the third to address information in Pakistan's possession derived from the parallel Neutral Expert proceedings ("**NE proceedings**") that has, or may have, a bearing on the Court's present enquiry.

1.18. On the issue of framing Pakistan's submissions to follow, as Pakistan expressly acknowledged in its Clarification Request,¹³ the Court, in its General Issues Award, did not accept Pakistan's submissions on the methodology relevant to the calculation of maximum Pondage, including on the relevance to this calculation of the installed capacity and projected anticipated load of a proposed HEP. This said, Pakistan also expressly affirmed in its Clarification Request that it "fully and unreservedly accepts the Award in all of its aspects",¹⁴ including "the Court's determination that the installed capacity and anticipated load of a proposed HEP are relevant to the calculation of maximum Pondage."¹⁵ For the avoidance of doubt, Pakistan reiterates this position. Nothing in the analysis that follows should be read as endeavouring to reopen issues decided in the General Issues Award or the Clarification Decision.

1.19. Without detracting from this, for purposes of properly framing the submissions that follow, Pakistan recalls that its position, expressed in its written and oral submissions in the course of the First Phase of the Merits ("**First Phase**"), was that the installed capacity and anticipated load of a proposed HEP (a) were matters solely within India's unilateral appreciation, (b) were variable and unconnected to the hydrology of the river, and (c) that they were accordingly open to abuse. This appreciation perhaps informed the Court's findings in its General Issues Award and Clarification Decision recalled in paragraph 1.6 above.

1.20. Pakistan's First Phase submissions on the calculation of Maximum Pondage were rooted in an appreciation of the interpretation Paragraph 8 of Annexure D and of the proper interaction between Paragraphs 8(c), 2(c) and 15 of Annexure D. As was addressed in its First Phase submissions, the interpretation advanced by Pakistan in that Phase revisited and revised Pakistan's previously elaborated understanding of the interpretation and application of the Paragraph 8(c) design criterion in the light of Pakistan's evolving understanding of the Treaty, including following the *Baglihar* and *Kishenganga* proceedings and wider exchanges between

¹³ Pakistan's Request for Clarification, 8 August 2025 ("**Clarification Request**"), ¶ 32.

¹⁴ *Id.*, ¶ 1.

¹⁵ *Id.*, ¶ 32.

the Parties in the Permanent Indus Commission (“**Commission**” or “**PIC**”). This evolving understanding was addressed in Pakistan’s First Phase Memorial and oral submissions as well as in its Post-Hearing Submission of 1 November 2024 (“**PHS**”)¹⁶, its Preliminary Comments on Particular Matters Addressed in Procedural Order No. 14 (respectively, “**PO14**” and “**PO14 Preliminary Comments**”), and its Final Comments on Particular Matters Addressed in PO14 (“**PO14 Final Comments**”) that followed the First Phase Hearing.

1.21. Pakistan recalls these issues to contextualise the observation that, while it unreservedly accepts, following the General Issues Award, that the installed capacity and anticipated load of a proposed AnnD.3 HEP are relevant to the calculation of maximum Pondage, it continues to struggle to arrive at—for itself—a reliable appreciation of a methodology underpinning this conclusion by the Court. While the safeguards of principle expressed by the Court (*inter alia*, as noted in paragraph 1.6 above) go some way towards addressing the risk that Pakistan perceives of variables that are subject to unilateral appreciation by India, those risks remain, and are potentially exacerbated by the uncertainty that these elements introduce into the calculation of maximum Pondage at the design stage of a HEP. They also raise issues of the incompleteness, whether wilfully or for *bona fide* reasons, of the information that India is obliged to communicate to Pakistan under Paragraph 9 and Appendix II of Annexure D and Article VII(2) of the Treaty, obligations the importance of which the Court affirmed and underscored in the General Issues Award.

1.22. Having regard to the General Issues Award and the Court’s PO17 enquiries, the submissions that follow endeavour to provide the Court with the most complete information available, in an organised and accessible format, to enable the Court to complete its analysis of the issues that remain unaddressed from the First Phase concerning the calculation of maximum Pondage. As will be apparent from what follows, there is no new PIC, Pakistani or Indian documentation, beyond that already submitted into the record of the proceedings, that has a material bearing on the issues to be addressed, and no new insights of any significance to be gleaned from the *travaux préparatoires* of the Treaty. While the Memorial sets out an affirmative statement of position by Pakistan, and concludes with a dispositive request for

¹⁶ Pakistan’s Post-Hearing Submission, 1 November 2024, Section II.

relief, this is a good faith endeavour on Pakistan's part to facilitate the Court's elaboration of an interpretative methodology about which Pakistan is still analytically unclear.

1.23. The second point warranting comment flows from the first and concerns the question of certainty in the interpretation and application of the issues at the heart of the present phase of the proceedings.

1.24. In the course of its General Issues Award analysis on Pondage, the Court addressed the uncertainty that the use of a proposed HEP's installed capacity and anticipated load introduces into the calculation of maximum Pondage, noting that "Pakistan's methodology has the merit of providing a unique formula for calculating 'maximum Pondage', which would eliminate any possibility of 'manipulation' by India when it identifies the proposed HEP's installed capacity and anticipated load." The Court continued as follows:

"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."¹⁷

1.25. Pakistan understands this analysis at an abstract level. As the current impasse between the Parties' attests, however, both at the level of the issues of which the Court and the Neutral Expert in the parallel proceedings are seised and with regard to the serious political impasse that currently afflicts the Parties in connection with India's policy of "abeyance", it is abundantly clear that good faith engagement under the Treaty by India is an entirely abstract matter. Moreover, this is not a recent development, as documents on the record of these proceedings attest. Sadly, uncertainty in the interpretation and application of the Treaty, and in particular of its Annexure D design and operation provisions, does not provide space for good faith engagement between the Parties. Rather, it is simply a recipe for further dispute.

¹⁷ General Issues Award, ¶ 705.

1.26. The Court has concluded that India’s determination of the installed capacity and projected anticipated load of an AnnD.3 HEP must be realistic, well-founded and defensible under the Treaty. It has also identified further principles relevant to this exercise. The task of this Second Phase is now to give specific content to elements that the Court has itself acknowledged result in “greater uncertainty in the calculation”. Insofar as it is possible to do so within the framework of the analysis that the Court adopted in its General Issues Award, Pakistan urges the Court to minimise the uncertainty that will follow from its award to come on the Second Phase issues.

1.27. Lastly, an observation is warranted on the relevance of information in Pakistan’s possession through the NE proceedings that has, or may have, a bearing on the Court’s present enquiry.

1.28. Pakistan wrote to the Court on this issue on 9 January 2026, *inter alia*, in the following terms:

“In the context of the NE proceedings, Pakistan undertook a detailed analysis of India’s actual utilisation of the Operating Pools of both the KHEP and the Baglihar HEP on the basis of logbook data disclosed by India in the course of those proceedings. The conclusions of this analysis are directly relevant and material to the issues engaged by the Court’s enquiry in its Second Phase on the Merits.”¹⁸

1.29. Addressing the legal and procedural framework applicable to the disclosure of information derived from the NE proceedings into the Court proceedings, Pakistan requested urgent directions from the Court on a number of issues.

1.30. The Court wrote to India on the same date inviting comments on Pakistan’s application by 16 January 2026.

1.31. By correspondence dated 17 January 2026, the Court noted that, while it was open to addressing this matter, the request had been framed at a high level of generality, and accordingly invited Pakistan to provide, on or before Friday, 23 January 2026, a “request to introduce specific information arising in the Neutral Expert proceedings” “in as much detail as possible, subject to any duty of confidentiality”. Having regard to its duty of confidentiality in

¹⁸ Letter from Pakistan to the PCA, 9 January 2026, ¶ 16.

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the NE proceedings, Pakistan will reflect further on what information it is able to provide to make its application more specific and will revert to the Court by the stipulated deadline.

* * *

CHAPTER 2: THE HISTORICAL CONTEXT REGARDING INDIA’S CALCULATION OF MAXIMUM PONDAGE

2.1. This Chapter 2 addresses the Court’s questions with regard to the written record of the present proceedings (**Section A**) and all AnnD.3 HEPs previously notified by India to Pakistan under the Treaty up to and including the Baglihar HEP (**Section B**). Issues of wider interpretation of relevant terms—notably “capacity” and “load”—are addressed in **Chapter 3** below.

2A THE WRITTEN RECORD OF THE COA PROCEEDINGS

2.2. In ¶ 2.3.3 of PO17, the Court requested that Pakistan address, in relation to the written record of the present proceedings:

- (a) the data India has shared with Pakistan in respect of the capacity and load of AnnD.3 HEPs, as well as India’s calculations for the maximum Pondage for such HEPs; and
- (b) discussions of the capacity and load of proposed AnnD.3 HEPs, as well as calculations of the maximum Pondage for such HEPs found in: (i) all correspondence between the Parties’ respective Commissioners for Indus Waters, (ii) all correspondence between other officials, and (iii) records of the Permanent Indus Commission.¹⁹

2.3. Pakistan addresses each of these matters, respectively, in **Section 2A.1** and **Section 2A.2** below.

2A.1 The data India has shared with Pakistan in respect of the capacity and load of AnnD.3 HEPs, and India’s calculation of maximum Pondage

2.4. The data that India is required to provide to Pakistan with respect to each proposed AnnD.3 HEP under Paragraph 9 of Annexure D is set out in Appendix II of Annexure D.²⁰ Paragraph 9 imposes on India an obligation to communicate to Pakistan in writing certain prescribed information at least six months “in advance of the beginning of construction of river

¹⁹ Procedural Order No. 17 (Second Phase on the Merits), 21 November 2025 (“**PO17**”), ¶ 2.3.3.

²⁰ Treaty, **PLA-0001**, Annexure D, Paragraph 9.

works connected with the Plant”, to enable Pakistan to satisfy itself that the design of the proposed Plant “conforms to the criteria mentioned in Paragraph 8.”²¹

2.5. With respect to the “capacity” and “load” of an AnnD.3 HEP, and “India’s calculations for the maximum Pondage for such HEPS”, as framed by the Court’s question, the relevant provisions in Appendix II of Annexure D are as follows:

- (a) “Capacity” is addressed in paragraph 4(i) of Appendix II and requires India to provide the “[m]aximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power”.²²
- (b) “Load” is addressed in paragraph 4(h) of Appendix II and requires India to provide the “[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.”²³
- (c) “India’s calculations for the maximum Pondage” are addressed by paragraph 3(b) of Appendix II which requires India to provide the HEP’s “Full Pondage Level, Dead Storage Level and Operating Pool together with the calculations for the Operating Pool.”²⁴

2.6. As the Court found in its General Issues Award, read together, these provisions of Appendix II are:

“[F]ully 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.”²⁵

²¹ Treaty, **PLA-0001**, Annexure D, Paragraph 9.

²² *Id.*, Annexure D, Appendix II, ¶ 4(i). The term “capacity” is used elsewhere in Appendix II with reference to non-power-related elements of a HEP, such as “Dead Storage capacity” or the “maximum designed capacity” of intakes. Pakistan addresses the interpretation of this and other relevant provisions in **Chapter 3** of this Memorial.

²³ Treaty, **PLA-0001**, Annexure D, Appendix II, ¶ 4(h).

²⁴ *Id.*, Appendix II, ¶ 3(b).

²⁵ General Issues Award, ¶ 659.

2.7. With respect to each new Small Plant, Paragraph 19 of Annexure D requires India to provide to Pakistan the data prescribed by Appendix III to Annexure D.²⁶

2.8. Relevant to the Court’s question, Appendix III contains virtually identical notification requirements to Appendix II, save that it does not require India to produce any information with respect to “load”. Specifically:

- (a) “Capacity” is addressed in paragraph 4(g) of Appendix III, which likewise requires India to provide the “[m]aximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power”.²⁷
- (b) “India’s calculations for the maximum Pondage” are addressed by paragraph 3(b) of Appendix III which also requires India to provide the “Full Pondage Level, Dead Storage Level and Operating Pool together with the calculations for the Operating Pool”.²⁸

2.9. Subject to certain omissions addressed in further detail below, India has provided the information prescribed by Appendices II and III to Pakistan by way of a letter formally notifying Pakistan of each new proposed AnnD.3 HEP. **Appendix A** to this Memorial details the data provided by India with respect to “capacity”, “load”, and its “calculations for the maximum Pondage” for each AnnD.3 HEP since entry into force of the Treaty. Below, Pakistan provides a brief narrative summary of that Appendix.

(a) *Capacity*

2.10. India has historically provided a proposed installed generating capacity for each HEP as a figure expressed in MW. With the exception of several small HEPs notified shortly after entry into force of the Treaty,²⁹ this figure is generally provided in the aggregate, without distinguishing between Firm Power and Secondary Power. In addition, India typically provides

²⁶ Treaty, **PLA-0001**, Annexure D, Paragraph 19.

²⁷ *Id.*, Annexure D, Appendix III, ¶ 4(g).

²⁸ *Id.*, Annexure D, Appendix III, ¶ 3(b).

²⁹ See **Appendix A**, rows 1 to 6, and 26 (Billing, Shansha, Sissu, Khardung, Dras, Stakna, and Bhadarwah).

a breakdown of each HEP's installed capacity by reference to the individual generating capacity of each of the HEP's turbines.³⁰

(b) Load

2.11. The anticipated load for each HEP is expressed by India in cumecs (m³/sec). The anticipated load variations for each HEP are included in India's calculations for the maximum Pondage, by way of a simplified load curve in table form. This table is generally provided by way of an annex to each notification letter—though India has failed to include its calculations for the Operating Pool on many occasions.³¹ While the table's format has matured over time, it generally lists the hours that the HEP's turbines are expected to be idle or in operation, as well as the changes in inflow, releases, and accumulated storage over either a daily or weekly period.

2.12. There are, however, a number of larger HEPs (i.e., HEPs that are not Small Plants) for which no Pondage is proposed, notwithstanding their larger size. In these cases, India generally indicates that it does not anticipate any variations in load because the HEP will operate at a constant power output with no storage or release of water that changes the natural river flow, i.e., as a pure Run-of-River Plant.³²

2.13. For HEPs that include Pondage, India's practice immediately after entry into force of the Treaty was to calculate the Operating Pool on the basis of daily load variations.³³ That practice continued until India's notification of the Dul Hasti HEP on 3 July 1978, in which India proposed an 8 Mm³ Operating Pool on the basis of a weekly load variation calculation.³⁴ Thereafter, India briefly reverted to using daily load calculations in its notifications for the Upper Sind-II (1984), Kargil (1986), and Parnai (1990) HEPs.³⁵ India's notification of the Baglihar HEP in 1992 marked the return of weekly load variation calculations, and that practice

³⁰ See, e.g., **Appendix A**, row 48 (Lower Kalnai with an installed capacity of 48 MW comprised of 2 units of 24 MW each).

³¹ See, e.g., **Appendix A**, rows 6 (Stakna), 7 (Sumbal), 17 (Thirot), 26 (Badarwah), and 79 (Kargil Hunderman).

³² See, **Appendix A**, row 8 (Salal-I&II: no variation given "the Plant would operate at base load"); row 13 (Uri-I: no variation "as the Plant would operate at base load without interfering with the river regime"), row 24 (Pahalgam: no variation as the "Plant is designed purely as a Run of River plant utilising the river flows as available"), row 34 (Uri-II: "no variations in the discharge expected due to load fluctuations, being a run off river scheme with no storage").

³³ See, e.g., **Appendix A**, rows 6 to 7, and 9 (Stakna, Sumbal, and Lower Jhelum).

³⁴ **Appendix A**, row 11 (Dul Hasti).

³⁵ See **Appendix A**, rows 12, 14, and 27 (Upper Sind-II, Kargil, and Parnai).

generally continued for all larger HEPs.³⁶ For certain smaller HEPs, India has failed to specify whether daily or weekly load variations were used to calculate its Operating Pool.³⁷

(c) Calculation of maximum Pondage

2.14. India’s calculation of maximum permissible Pondage is included in the Operating Pool calculations referred to above, which are typically annexed to a HEP’s notification letter. In many instances, however, while India provides the volume of its actual proposed Operating Pool (i.e., a HEP’s proposed actual Pondage), it fails to provide detailed calculations for its claimed Pondage entitlement—that is, the maximum permissible Operating Pool India claims it would be permitted to construct within the limits imposed by the Treaty.³⁸ In some cases, India ultimately provided detailed calculations following repeated requests from Pakistan for the same.³⁹ In others, it did not.⁴⁰

2.15. India typically has not included detailed calculations for the Operating Pool of smaller HEPs where proposed Pondage is either negligible,⁴¹ or minor and intended solely to stabilize hydraulic transients (sudden changes in water flow due, for example, to turbine trips or valve closures).⁴²

2A.2 Historical discussions of the capacity and load of proposed Annexure D, Part 3 HEPs and calculations of maximum Pondage

2.16. Pakistan turns next to addressing the Parties’ historical discussions of these concepts.

2.17. In **Appendix B** to this Memorial, Pakistan provides a detailed description of all relevant communications between the Parties concerning Pondage, with specific exchanges concerning “load”, “capacity”, and “calculations of the maximum Pondage” excerpted. Given the Court’s request,⁴³ the Appendix includes “correspondence between the Parties’ respective Commissioners for Indus Waters” and “records of the Permanent Indus Commission”. It does

³⁶ See, e.g., **Appendix A**, rows 35 (Nimo Bazgo), 47 (Miyar), 48 (Lower Kalnai), 49 (Ratle), 56 (New Ganderbal), 78 (Kiru), and 86 (Kwar).

³⁷ See, e.g., **Appendix A**, rows 76 to 77, 79, 81 to 85.

³⁸ See, e.g., **Appendix A**, rows 6 (Stakna), 7 (Sumbal), 17 (Thirot), 26 (Bhadarwah), and 79 (Kargil Hunderman).

³⁹ See, e.g., **Appendix B**, pp. 3-4 (Stakna).

⁴⁰ See, e.g., **Appendix B**, pp. 4-8 (Sumbal).

⁴¹ See, e.g., **Appendix A**, rows 15 (Killar), 29 (Bazgo), 30 (Sumoor Nobra), and 31 (Hunder Nobra).

⁴² See, e.g., **Appendix A**, rows 43 to 46, 51 to 54, and 57 to 71.

⁴³ PO17, ¶ 2.3.3(b).

not, however, include the third category identified by the Court—namely “correspondence between other officials”—as, historically, such correspondence bore no relevance to the question of Pondage.⁴⁴

2.18. Below, Pakistan provides a concise narrative summary of these discussions, with reference to **Appendix B** and the underlying communications as relevant. In **Section 2B**, Pakistan provides a more detailed analysis of these discussions, but with respect to AnnD.3 HEPs, up to and including the Baglihar HEP. For ease of reference, Pakistan groups this summary thematically between “capacity”, “load”, and “calculations of maximum Pondage”.

(a) Capacity

2.19. The first HEP for which India proposed to include Pondage was the Stakna HEP, notified to Pakistan on 9 September 1968.⁴⁵ In that notification, India proposed a small installed capacity of 6 units of 540 kW each, with 4 to 5 units reserved for Firm Power and 1 to 2 units reserved for Secondary Power. In response, the PCIW requested details of the “exact value of Firm Power”.⁴⁶ The ICIW took the view that “concrete figures for Firm and Secondary Power are not required to be supplied under [the Treaty]” but nevertheless indicated in subsequent correspondence that 2,450 kW of the HEPs capacity would be reserved for Firm Power, while 790 kW would be reserved for Secondary Power.⁴⁷

2.20. As noted above, India continued its practice of providing installed capacity in the aggregate (i.e., without distinguishing between Firm Power and Secondary Power) for most subsequent HEPs.⁴⁸ While it appears that Pakistan gradually ceased protesting this practice over time,⁴⁹ the PCIW explained, in the context of the Thiroth HEP in 1993, why understanding

⁴⁴ It also includes one entry for Secretary-level discussions on the Baglihar HEP, *see* **Appendix B**, pp. 32-34; Minutes of Secretary Level Meeting on Baglihar Hydroelectric Project held in New Delhi, 3-6 January 2005 dated 7 January 2005, **Exhibit P-0650.1**.

⁴⁵ **Appendix B**, p. 3; Letter No. F.4(1)/66-IC from the ICIW to the PCIW dated 9 September 1968 (Stakna), **Exhibit P-0649.1730**.

⁴⁶ **Appendix B**, p. 3; Letter No. WT(16)/(2201-A)/PCIW from the PCIW to the ICIW dated 5 November 1968 (Stakna), **Exhibit P-0649.0137**.

⁴⁷ **Appendix B**, pp. 3-4; Letter No. F.4(1)/66-IC from the ICIW to the PCIW dated 24 December 1969 (Stakna), **Exhibit P-0649.0163**.

⁴⁸ *See, e.g.*, **Appendix B**, p. 4; Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 11 September 1968 (Sumbal), **Exhibit P-0649.1731**; Letter No. WT(16)/(2202-A)/PCIW from the PCIW to the ICIW dated 5 November 1968 (Sumbal), **Exhibit P-0649.0136**.

⁴⁹ *See, e.g.*, Letter No. WT(16)/(4618-A)/PCIW from the PCIW to the ICIW dated 18 August 1984 (Upper Sind-II), **Exhibit P-0649.0503**, p. 17.

the breakdown in capacity between Firm Power and Secondary Power was important in assessing whether India's claimed Pondage entitlement was compliant with the Treaty:

“In [India's] statement of calculations for Operating Pool [...], 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 scheme of things incorporated in the Treaty.”⁵⁰

(b) Load

2.21. As the Court has acknowledged in the General Issues Award, a central theme in the Parties' discussions concerning load was India's reliance on a hypothetical load curve to map anticipated load fluctuations, whereas Pakistan maintained that an actual load curve should be used.⁵¹ For example, on 9 May 1969, Pakistan objected to India's calculation of the Operating Pool of the Sumbal HEP, insisting on use of an “actual load curve”:

“The Live Storage needed for meeting the water requirements of a Plant during the period of 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.”⁵²

⁵⁰ Letter No. WT(125)/(5350-A)/PCIW from the PCIW to the ICIW dated 24 May 1993 (Thirot), **Exhibit P-0649.0787**, p. 5 (emphasis added). In that letter, the PCIW elaborated that because of the requirements of the Treaty, “design of the Plants on the Western Rivers has to be different from those located on rivers other than Western Rivers” and requested a revised calculation for Pondage required for Firm Power. *Id.*

⁵¹ See, e.g., **Appendix B**, pp. 6, 10-13, 23, 25-28; Letter No. WT(16)/(2295-A)/PCIW from the PCIW to the ICIW dated 9 May 1969 (Sumbal), **Exhibit P-0649.0143**; Letter No. WT(85)/(3487-A)/PCIW from the PCIW to the ICIW dated 28 January 1976 (lower Jhelum), **Exhibit P-0649.0342**, pp. 5-6, ¶ 3(c)(iii); Letter No. WT(127)/(5293-A)/PCIW from the PCIW to the ICIW dated 12 August 1992 (Baglihar), **Exhibit P-0649.2047**, p. 2, ¶ 5; Letter No. WT(14)/(4023-A)/PCIW from the PCIW to the ICIW dated 4 August 1979 (Chinani-I), **Exhibit P-0649.0425**, p. 1; Letter No. WT(104)/(4565-A)/PCIW from the PCIW to the ICIW dated 11 February 1984 (Dul Hasti), **Exhibit P-0649.0493**, p. 4; Letter No. WT(15)/(5021-A)/PCIW from the PCIW to the ICIW dated 5 December 1988 (Asthan Nallah), **Exhibit P-0649.0637**, p. 3; Letter No. WT(16)/(5138-A)/PCIW from the PCIW to the ICIW dated 14 April 1990 (Parnai), **Exhibit P-0649.0703**, p. 10; Letter No. WT(15)/(5183-A)/PCIW from the PCIW to the ICIW dated 29 October 1990 (Rajouri), **Exhibit P-0649.0722**, p. 5; Letter No. WT(15)/(5240-A)/PCIW from the PCIW to the ICIW dated 31 August 1991 (Sumoor Nobra), **Exhibit P-0649.0755**, p. 2.

⁵² Letter No. WT(16)/(2295-A)/PCIW from the PCIW to the ICIW dated 9 May 1969 (Sumbal), **Exhibit P-0649.0143**, p. 3 (emphases added).

2.22. As the Court is aware, observations of a similar nature were made by Pakistan with respect to, for example, the Sumbal HEP in 1969,⁵³ the Lower Jhelum HEP in 1976,⁵⁴ the Chinani-I HEP in 1979,⁵⁵ the Dul Hasti HEP in 1984,⁵⁶ the Asthan Nallah HEP in 1988,⁵⁷ the Parnai HEP in 1990,⁵⁸ the Rajouri HEP in 1990,⁵⁹ the Sumoor Nobra HEP in 1990,⁶⁰ the Baglihar HEP in 1992,⁶¹ and the Ratle HEP in 2012.⁶²

2.23. India refuted Pakistan's characterisation of its load curves as "hypothetical", claiming instead that they were necessary to accommodate peaking. For example, in the ICIW's letter of 26 December 1984 with respect to the Dul Hasti HEP, India stated that:

"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."⁶³

2.24. In response, the PCIW noted with respect to the Dul Hasti HEP that:

"[T]he 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."⁶⁴

⁵³ **Appendix B**, p. 6; Letter No. WT(16)/(2295-A)/PCIW from the PCIW to the ICIW dated 9 May 1969 (Sumbal), **Exhibit P-0649.0143**.

⁵⁴ **Appendix B**, p. 10; Letter No. WT(85)/(3487-A)/PCIW from the PCIW to the ICIW dated 28 January 1976 (Lower Jhelum), **Exhibit P-0649.0342**, pp. 5-6, ¶ 3(c)(iii).

⁵⁵ **Appendix B**, pp. 11-12; Letter No. WT(14)/(4023-A)/PCIW from the PCIW to the ICIW dated 4 August 1979 (Chinani-I), **Exhibit P-0649.0425**, p. 1.

⁵⁶ **Appendix B**, p. 13; Letter No. WT(104)/(4565-A)/PCIW from the PCIW to the ICIW dated 11 February 1984 (Dul Hasti), **Exhibit P-0649.0493**, p. 4.

⁵⁷ **Appendix B**, p. 23; Letter No. WT(15)/(5021-A)/PCIW from the PCIW to the ICIW dated 5 December 1988 (Asthan Nallah), **Exhibit P-0649.0637**, p. 3.

⁵⁸ **Appendix B**, p. 25; Letter No. WT(16)/(5138-A)/PCIW from the PCIW to the ICIW dated 14 April 1990 (Parnai), **Exhibit P-0649.0703**, p. 10.

⁵⁹ **Appendix B**, p. 26; Letter No. WT(15)/(5183-A)/PCIW from the PCIW to the ICIW dated 29 October 1990 (Rajouri), **Exhibit P-0649.0722**, p. 5.

⁶⁰ **Appendix B**, p. 27; Letter No. WT(15)/(5240-A)/PCIW from the PCIW to the ICIW dated 31 August 1991 (Sumoor Nobra), **Exhibit P-0649.0755**, p. 2.

⁶¹ **Appendix B**, p. 28; Letter No. WT(127)/(5293-A)/PCIW from the PCIW to the ICIW dated 12 August 1992 (Baglihar), **Exhibit P-0649.2047**, p. 2, ¶ 5.

⁶² **Appendix B**, p. 58; Letter No. WT(150)/(7314-A)/PCIW from the PCIW to the ICIW dated 26 November 2012, **Exhibit P-0078**, p. 1.

⁶³ Letter No. 16(4)62-I.T/179 from the ICIW to the PCIW dated 26 December 1984 (Dul Hasti), **Exhibit P-0649.0513**, pp. 5-6 (emphasis added).

⁶⁴ Letter No. WT(104)/(5511-A)/PCIW from the PCIW to the ICIW dated 8 October 1995 (Dul Hasti), **Exhibit P-0649.0833**, p. 4 (emphasis added).

2.25. A similar justification for the use of hypothetical load curves was made by India with respect to the Baglihar HEP in 1994, when the ICIW noted that in a large integrated “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”.⁶⁵ In response to this letter, the PCIW reiterated Pakistan’s view that India’s methodology of “running the plant at the installed capacity for [a] certain period of time and keeping it closed for some time is not understandable” and has been “drawn only to achieve the maximum pondage”.⁶⁶

2.26. In 2006, in relation to the Kishanganga HEP, the PCIW likewise expressed Pakistan’s view that India appeared to compute Pondage “with reference to an arbitrarily determined set of peaking requirements” that did not include any peaking during the weekends.⁶⁷ India’s answer was that such peaking requirements were “[d]ue to the relatively lower demand on Saturday [and] Sunday”, and that carrying forward such weekend storage to the working days of the week was “permissible in view of the very definition of ‘Pondage’ in Paragraph 2(c)” as well as the daily inflow and outflow requirements of Paragraph 15.⁶⁸ The PCIW maintained the objection to the “arbitrary peaking schedule” adopted by India on the basis that it bore “no resemblance to the peak load which would actually be expected on a reasonable or objective basis”.⁶⁹

2.27. In 2013, in the context of the Ratle HEP, India elaborated on why, in its view, its peaking schedules were justified by the operation of Paragraph 15 of Annexure D:

“[T]he operation rules in Paragraph 15 allow India to hold or release water [at the RHEP site] within a band of 50% to 130% within a period of seven days. Therefore, there can

⁶⁵ Letter No. 3(1)/84-I.T./690 from the ICIW to the PCIW dated 11 March 1994 (Baglihar), **Exhibit P-0649.0814**, p. 2 (disagreeing with Pakistan’s view that calculations for Pondage were based on a “very hypothetical load curve”, stating that “[i]n 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”).

⁶⁶ Letter No. WT(127)/5452-A/PCIW from the PCIW to the ICIW dated 13 October 1994 (Baglihar), **Exhibit P-0649.0822**, pp. 1-2. *See also* Record of the 84th Meeting of the Permanent Indus Commission, 29-30 March 2000 dated 30 March 2000, **Exhibit P-0647.82**, requests 15-19 (wherein Pakistan relevantly requested that India furnish data regarding the “magnitude of existing load and its load factor”, “size and shape of load duration curve over previous years”, “extent of unconnected load”, “probable growth of load over next few years”, and “present power supply system, location, size of interconnection and characteristics of existing power plants”).

⁶⁷ Letter No. WT(132)/(6713-A)/PCIW from the PCIW to the ICIW dated 24 August 2006 (Kishenganga), **Exhibit P-0056**, p. 5.

⁶⁸ Letter No. 3/7/82-IT/1369 from the ICIW to the PCIW dated 25 May 2007 (Kishenganga), **Exhibit P-0057**, p. 6, ¶ 4(b).

⁶⁹ Letter No. WT(132)/(6839-A)/PCIW from the ICIW to the PCIW dated 4 February 2008 (Kishenganga), **Exhibit P-0059**, pp. 11-12.

be no objection to the Plant generating power in any pattern, including peaking, so long as it releases water in accordance with Paragraph 15.”⁷⁰

2.28. Pakistan continued to reiterate its position that India was manipulating load variations in a hypothetical manner to maximise Pondage with respect to subsequent HEPs notified thereafter, including by pointing out that Paragraph 15 is an operational criterion that should not be used to determine a Plant’s design.⁷¹

(c) Calculation of maximum Pondage

2.29. As noted above, while India initially took the view that the Treaty did not require it to provide detailed calculations for a proposed HEP’s Operating Pool, the ICIW furnished these calculations for early HEPs⁷² after being requested to do so by the PCIW.⁷³

2.30. Likewise, there are multiple instances where Pakistan requested information regarding the MMD calculations relied on by India,⁷⁴ or otherwise disputed the MMD figures used by India.⁷⁵ Oftentimes, the ICIW responded representing India’s view that the Treaty does not require the sharing of MMD calculations.⁷⁶

2.31. As the Court is aware, a recurring protest by Pakistan throughout the course of the Parties’ correspondence on Pondage related to India’s use of Plant loading and installed capacity as the basis of its Pondage calculation, rather than Firm Power, to begin with. Pakistan

⁷⁰ Letter No. 3/5/1007-IT/2043 (with enclosures) from the ICIW to the PCIW dated 11 September 2013, **Exhibit P-0082**, ¶ 9 (emphasis added).

⁷¹ See, e.g., **Appendix B**, pp. 47-50, 68-69; Letter No. WT(159)/(6767-A)/PCIW from the PCIW to the ICIW dated 30 March 2007 (Nimo Bazgo), **Exhibit P-0649.1072**; Record of the 104th Meeting of the Permanent Indus Commission, 27-31 March 2010 dated 31 May 2010, **Exhibit P-0330**, p. 5; Record of the 117th Meeting of the Permanent Indus Commission, 1-3 March 2022 dated 3 March 2022 (Kiru), **Exhibit P-0216**, p. 10.

⁷² See, e.g., **Appendix B**, pp. 3-5; Letter No. F.4(1)/66-IC dated 24 December 1969 (Stakna), **Exhibit P-0649.0163**, p. 19 (Enclosure IX); Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 10 February 1969 (Sumbal), **Exhibit P-0649.0140 (resubmitted)**.

⁷³ See, e.g., **Appendix B**, pp. 3-4; Letter No. WT(16)/(2201-A)/PCIW from the PCIW to the ICIW dated 5 November 1968 (Stakna), **Exhibit P-0649.0137**; Letter No. WT(16)/(2202-A)/PCIW from the PCIW to the ICIW dated 5 November 1968 (Sumbal), **Exhibit P-0649.0136**.

⁷⁴ See, e.g., **Appendix B**, pp. 18, 26-28; Letter No. WT(124)/(4774-A)/PCIW from the PCIW to the ICIW dated 20 April 1986 (Kargil), **Exhibit P-0649.0543**, p. 5; Letter No. WT(15)/(5183-A)/PCIW from the PCIW to the ICIW dated 29 October 1990 (Rajouri), **Exhibit P-0649.0722**, p. 5; Letter No. WT(15)/(5239-A)/PCIW from the PCIW to the ICIW dated 31 August 1991 (Bazgo), **Exhibit P-0649.0756**, p. 4; Letter No. WT(127)/(5293-A)/PCIW from the PCIW to the ICIW dated 12 August 1992 (Baglihar), **Exhibit P-0649.2047**, p. 2.

⁷⁵ See, e.g., **Appendix B**, p. 14; Letter No. WT(104)/(5304-A)/PCIW from the PCIW to the ICIW dated 14 September 1992 (Dul Hasti), **Exhibit P-0649.0773**, p. 4.

⁷⁶ See, e.g., **Appendix B**, p. 28; Letter No. 3(1)/84-I.T./646 from the ICIW to the PCIW dated 7 May 1993 (Baglihar), **Exhibit P-0649.0786**, pp. 1, 5.

first protested this point in relation to the Lower Jhelum HEP,⁷⁷ notified by India on 21 November 1974.⁷⁸ In its letter of 28 January 1976, the PCIW represented Pakistan’s position as follows:

“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 [MMD].”⁷⁹

2.32. The same issue was raised by the PCIW with respect to the Baglihar HEP in 1992,⁸⁰ and generally for each AnnD.3 HEP with Pondage thereafter, including, for example, the Dul Hasti HEP in 1992,⁸¹ the Kishenganga HEP in 2006,⁸² and the Lower Kalnai HEP in 2012.⁸³ India’s repeated justification for considering load in its calculation of maximum Pondage was again grounded in Paragraph 2(c) and what it characterised as the “purpose” of Pondage—that is, to meet fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the Plant.⁸⁴

⁷⁷ **Appendix B**, p. 10; Letter No. WT(85)/(3487-A)/PCIW from the PCIW to the ICIW dated 28 January 1976 (Lower Jhelum), **Exhibit P-0649.0342**.

⁷⁸ **Appendix B**, p. 9; Letter No. F.4(1)/62-IC(IT) from the ICIW to the PCIW dated 21 November 1974 (Lower Jhelum), **Exhibit P-0649.0268**.

⁷⁹ Letter No. WT(85)/(3487-A)/PCIW from the PCIW to the ICIW dated 28 January 1976 (Lower Jhelum), **Exhibit P-0649.0342**, pp. 5-6, ¶ 3(c)(iii) (emphasis added). *See also* Letter No. WT(85)/(3567-A)/PCIW from the PCIW to the ICIW dated 26 July 1976 (Lower Jhelum), **Exhibit P-0649.0361**, p. 3, ¶ 3(c)(iii).

⁸⁰ **Appendix B**, p. 28; Letter No. WT(127)/(5293-A)/PCIW from the PCIW to the ICIW dated 12 August 1992 (Baglihar), **Exhibit P-0649.2047**, ¶ 5.

⁸¹ **Appendix B**, p. 14; Letter No. WT(104)/(5304-A)/PCIW from the PCIW to the ICIW dated 14 September 1992 (Dul Hasti), **Exhibit P-0649.0773**, p. 4.

⁸² **Appendix B**, pp. 34-35; Letter No. WT(132)/(6713-A)/PCIW from the PCIW to the ICIW dated 24 August 2006 (Kishenganga), **Exhibit P-0056**.

⁸³ **Appendix B**, p. 56; Letter No. WT(211)/(7302-A)/PCIW from the PCIW to the ICIW dated 8 October 2012 (Lower Kalnai), **Exhibit P-0649.1350**, p. 2.

⁸⁴ *See, e.g., Appendix B*, pp. 56-57; Letter No. 3/4/2009-IT/1971 from the ICIW to the PCIW dated 8 January 2013 (Lower Kalnai), **Exhibit P-0649.1364**, p. 2.

2B PAKISTAN’S OBSERVATIONS ON INDIA’S APPROACH TO THE CALCULATION OF MAXIMUM PONDAGE FOR ANN D.3 HEPs UP TO AND INCLUDING THE BAGLIHAR HEP

2.33. In this section, Pakistan addresses the Court’s request in ¶ 2.3.4 of PO17 that Pakistan address, “[i]n 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” for its HEPs, “as well as how those elements were taken into account in [India’s] calculation of maximum Pondage”; and
- (b) “any concerns expressed by Pakistan to India with respect to (a)”.

2.34. This section will address both elements of the Court’s inquiry in tandem (India’s approach and Pakistan’s concerns), discussing first “installed capacity”, followed by “anticipated load”. The analysis in this section is based on a review of the correspondence between the Commissioners and the minutes of the meetings of the PIC that are on the record of these proceedings, as set out in **Appendix B**.⁸⁵ The analysis builds on the summary of the discussions between the Parties on the subjects of “load”, “capacity” and “calculations for maximum Pondage” provided in **Section 2A.2** above but is limited to the time period identified in ¶ 2.3.4 of PO17.

2.35. In the period identified by the Court—i.e., “up to and including the Baglihar HEP” (1968-1992)—India notified Pakistan of 32 AnnD.3 HEPs.⁸⁶ For 19 of those projects, their design did not incorporate Pondage or had only negligible Pondage.⁸⁷ This section accordingly addresses only 13 projects, these being the Stakna, Sumbal, Lower Jhelum, Chinani-I, Dul Hasti, Upper Sind-II, Kargil, Thiroit, Asthan Nallah, Bhadarwah, Parnai, Rajouri, and Baglihar HEPs. However, given that India’s approach to determining anticipated load, and how that is taken into account in its calculation of maximum Pondage, generally remained consistent after

⁸⁵ No discussions relevant to the issues identified by the Court were found in inter-governmental correspondence; there were discussions relevant to Pondage at Secretary-level meetings on the Baglihar HEP, *see* **Appendix B**, pp. 32-34; Minutes of Secretary Level Meeting on Baglihar Hydroelectric Project held in New Delhi, 3-6 January 2005 dated 7 January 2005, **Exhibit P-0650.1**.

⁸⁶ *See* **Appendix A**, rows 1-32.

⁸⁷ These include the Billing, Shansha, Sissu, Khardung, Dras, Salal, Uri-I, Killar, Karnah, Haftal, Shaker Chicktan (Sanjak), Matayin, Matchil, Keran, Pahalgam, Chinani-II, Bazgo, Sumoor Nobra and Hunder Nobra HEPs.

the Baglihar HEP, Pakistan also refers to correspondence and PIC meeting minutes relating to post-Baglihar HEPs to buttress its stated understanding of India's approach to the element of anticipated load.

2.36. As noted in **Chapter 1** above, Pakistan's PHS and PO14 Final Comments provided a considered account of the "evolution of Pakistan's approach to the calculation of maximum Pondage under the Treaty" for all AnnD.3 HEPs up to and including the Baglihar HEP. While those submissions were made in the context of Pakistan's pre-General Issues Award approach to the calculation of maximum Pondage, they include important details regarding the Parties' discussions on Pondage, including the basis upon which India determined the "anticipated load" for its HEPs and how anticipated load was taken into account in India's calculation of maximum Pondage. While those details are also covered in the following paragraphs, Pakistan invites the Court to review its PHS and PO14 Final Comments alongside the present Memorial.

2B.1 Installed capacity

2.37. The term "installed capacity" does not appear in the Treaty but is used by the Commissioners in their correspondence. In Pakistan's appreciation, this is effectively the total capacity of the generating units housed in the Plant.⁸⁸

(a) Pakistan's understanding of the basis upon which India determines the installed capacity for its HEPs and concerns raised by Pakistan

2.38. The basis upon which India determines the installed capacity of a given proposed HEP has not been the subject of significant disagreement between the Parties in the relevant period (up to and including the Baglihar HEP). India did, however, provide a brief explanation of its basis for determining the installed capacity of a Plant in the context of the Miyar HEP at the 109th meeting of the PIC in 2013. The ICIW there observed that:

"[H]ydro 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."⁸⁹

⁸⁸ See *infra*, **Section 3A.2**.

⁸⁹ Record of the 109th Meeting of the Permanent Indus Commission, 22-25 September 2013, 14 July 2014, **Exhibit P-0083**, p. 16.

2.39. In **Section 3C.2** below, Pakistan sets out its understanding, based on the Treaty and hydroengineering practice, of the reasonable basis on which India must determine the installed capacity for its Western River HEPs.

2.40. The only other point of discussion between the Parties relating to the determination of installed capacity of a given HEP was regarding which portion of the “maximum aggregate capacity” of the power units installed in each Plant was allocated for Firm Power and which portion was allocated for Secondary Power, as discussed in **Section 2A.2** above. In its earliest HEP designs, such as the Stakna HEP, India made such an allocation of its installed capacity between Firm Power and Secondary Power.⁹⁰ However, starting with the Sumbal HEP, and for almost all HEPs notified thereafter,⁹¹ India’s designs did not make this distinction.⁹²

2.41. For example, in the case of the Sumbal HEP, the Pakistani Commissioner requested a clarification from his counterpart about whether the “maximum aggregate capacity” provided by India, in its Paragraph 9, Appendix II notification for that HEP, was intended for “Firm Power” or “Secondary Power”.⁹³ The Indian Commissioner responded that the design made no distinction between the two forms of power, and, in the case of the Sumbal HEP, the “maximum installed capacity of the power units is 22,000 KW, which can be used both for Firm as well as Secondary Power generation depending upon the river flows available”.⁹⁴

⁹⁰ Letter No. F.4(1)/66-IC from the ICIW to the PCIW dated 9 September 1968, **Exhibit P-0649.1730**, p. 5. In response to the Appendix II, paragraph 4(i) requirement to provide information on the “maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power”, the design notification provided: “Installed capacity = 6 units of 540 KW each. [F]or firm power 4 to 5 units, for secondary power 1 to 2 units”.

⁹¹ The only exception being the Bhadarwah HEP, *see* Letter No. F.3(8)/88-I.T./447 from the ICIW to the PCIW dated 29 July 1989, **Exhibit P-0649.1737 (resubmitted)**, p. 2 (“Maximum aggregate capacity of power units (exclusive of stand by units) for Firm Power and Secondary Power [...] Firm 1 MW Secondary-500 KW”).

⁹² *See, e.g.*, **Appendix B**, p. 4; Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 11 September 1968 (Sumbal), **Exhibit P-0649.1731**; Letter No. WT(16)/(2202-A)/PCIW from the PCIW to the ICIW dated 5 November 1968 (Sumbal), **Exhibit P-0649.0136**. *See also* **Appendix A**, rows 1 to 32.

⁹³ Letter No. WT(16)/(2202-A)/PCIW from the PCIW to the ICIW dated 5 November 1968, **Exhibit P-0649.0136**, p. 4 (The PCIW noted that the “total capacity of power units to be installed [in the Sumbal HEP] is 22,000 KW and that the capacity for Firm Power is also 22,000 KW. This means that there will be no power unit installed for Secondary Power”).

⁹⁴ Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 10 February 1969, **Exhibit P-0649.0140 (resubmitted)**, p. 8.

(b) Pakistan's understanding of how installed capacity is taken into account in India's calculation of maximum Pondage and concerns raised by Pakistan

2.42. In its earliest HEP designs, such as for the Stakna and Sumbal projects, India included a “load factor” as part of the information on the “maximum aggregate capacity” of the HEP’s power units, i.e., its installed capacity.⁹⁵ As explained by the Court in its General Issues Award, a load factor is “the projected average plant load divided by the peak load over a given time period”.⁹⁶

2.43. In its calculations for maximum Pondage at the Sumbal HEP, India relied on this load factor to calculate the “Firm Power” for the HEP, and it then relied on that Firm Power to calculate the maximum Pondage permissible:

“From the generating capacity [i.e., installed capacity] of 22,000 KW and load factor of 30% [...] the Firm Power works out to $22,000 \times 0.3 = 6600$ KW (continuous). The corresponding discharge against an average head of 503 ft. (from the designated range of operation given under item 3(f) of Appendix II as 499 ft. to 507 ft.) works out to $15 \times 6600 / 503 = 196$, say 200 cusecs. According to standard norms for a load factor of 30% about $\pm 33\%$ of daily requirements are necessary as pondage for Firm Power which works out to $1/3 \times 2 \times 200 = 133$ Ac. ft. We are entitled, under Para 8(c) of Annexure ‘D’ to the Indus Waters Treaty, to twice the pondage required for Firm Power i.e. 266 Acre ft. against which the total Pondage provided in both the Balancing Reservoirs is about 162 acre. ft. only.”⁹⁷

2.44. The use of a load factor for these early HEPs meant that for the hours that the Plant was producing power, its turbines were running at less than their full installed capacity. As Pakistan explains in **Chapter 3** below, this is the reasonable and expected approach to dry season turbine operation in a hydroengineering context. However, India changed this approach for later HEPs, including the Baglihar HEP, with its massive Operating Pool, which elicited a response from Pakistan. In a letter reiterating Pakistan’s objections to the use of a “hypothetical” load curve for the Baglihar HEP, the Pakistani Commissioner also noted that “[t]he method to work out the pondage while running the plant at the installed capacity for [a] certain period of time and

⁹⁵ See, e.g., **Appendix B**, pp. 3-4; Letter No. F.4(1)/66-IC from the ICIW to the PCIW dated 24 December 1969 (Stakna), **Exhibit P-0649.0163**, p. 9 (“Firm Power 2450 KW (4 to 5 units) at 60% Load Factor”); Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 9 September 1968 (Sumbal), **Exhibit P-0649.1731**, p. 7 (“For Firm Power 22000 KW at about 30% load factor”).

⁹⁶ General Issues Award, ¶ 714.

⁹⁷ Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 10 February 1969, **Exhibit P-0649.0410 (resubmitted)**, pp. 4-5 (emphases added).

keeping it closed for some time is not understandable”.⁹⁸ India adopted this as its standard approach for all post-Baglihar HEPs, whereby its Pondage calculations had periods where the Plant was operating at full installed capacity, and other periods where the Plant was zero loaded.⁹⁹

2.45. This point was also the subject of extensive discussions during Secretary-level meetings between the Parties on the Baglihar HEP. The Indian delegation explained that the Firm Power for the calculation of maximum Pondage was determined as being 130 MW for the Baglihar HEP (with an installed capacity of 450 MW),¹⁰⁰ and noted the “distinction between the [Firm] [P]ower and the generating [installed] capacity of the plant”.¹⁰¹

2.46. In response, Pakistan’s delegation drew attention to the fact that India’s calculations for maximum Pondage were not actually based on Firm Power, but rather for the full installed capacity of 450 MW “to meet the peaking requirement”:

“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.”¹⁰²

2B.2 Anticipated load

2.47. A significant feature of the Parties’ historic disagreement over India’s chosen methodology to calculate maximum Pondage concerned the basis upon which India determines the anticipated load for its AnnD.3 HEPs, and how that anticipated load is accounted for in its calculation of maximum Pondage.

⁹⁸ Letter No. WT(127)/(5452-A)/PCIW from the PCIW to the ICIW dated 13 October 1994, **Exhibit P-0649.0822**, pp. 1-2.

⁹⁹ See, e.g., **Appendix B**, p. 68; Letter No. 3/6/2007-IT/2371 from the ICIW to the PCIW dated 1 June 2021, **Exhibit P-0546 (resubmitted)**, p. 51.

¹⁰⁰ Minutes of Secretary Level Meeting on Baglihar Hydroelectric Project held in New Delhi, 3-6 January 2005 dated 7 January 2005, **Exhibit P-0650.1**, p. 11.

¹⁰¹ *Id.*, p. 21.

¹⁰² *Id.*, p. 27 (emphases added).

2.48. The term “anticipated load” does not appear in the Treaty, the Commissioners’ correspondence, or in the PIC meeting minutes. Pakistan understands “anticipated load” to be the amount of load that can be expected to be placed on a given HEP by the power system over daily and weekly time periods.¹⁰³

(a) Pakistan’s understanding of the basis upon which India determines the anticipated load for its HEPs and concerns raised by Pakistan

2.49. Pakistan’s earliest, and most sustained objection to India’s approach to the calculation of maximum Pondage, was with regard to the “anticipated load” or “load curve” determined by India for a given HEP. Starting with its objections to the Sumbal HEP and continuing until the Baglihar HEP (and indeed thereafter) Pakistan has consistently maintained that India has presented a “hypothetical load curve”¹⁰⁴ that is not “realistic” and is not “based on the actual operation of the Plant”¹⁰⁵.

2.50. In its design notification for the Sumbal HEP, India did not include details of the calculations for the maximum Pondage for the Plant.¹⁰⁶ In response, the Pakistani Commissioner requested the “calculations for the Operating Pool allowed under the Treaty”, without which Pakistan would be “unable to satisfy itself that the design of the Plant conforms to the criteria laid down in the Treaty”.¹⁰⁷ The Indian Commissioner provided this detailed calculation (albeit under protest), in the form of a table that showed the ponding schedule proposed for the HEP, based on a daily load.¹⁰⁸

2.51. Upon reviewing these calculations, the Pakistani Commissioner made clear his objection to the load schedule (or load curve) provided by India, and insisted that the maximum

¹⁰³ See *infra*, Section 3A.2.

¹⁰⁴ See, e.g., **Appendix B**, p. 6; Letter No. WT(16)/(2295-A)/PCIW from the PCIW to the ICIW dated 9 May 1969 (Sumbal), **Exhibit P-0649.0114**, p. 5 (“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.”) (emphasis added).

¹⁰⁵ **Appendix B**, p. 15; Letter No. WT(104)/(5511-A)/PCIW from the PCIW to the ICIW dated 8 October 1995 (Dul Hasti), **Exhibit P-0649.0833**, p. 4 (“[T]he 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.”) (emphasis added).

¹⁰⁶ **Appendix B**, p. 4; Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 11 September 1968, **Exhibit P-0649.1731**, pp. 21-22.

¹⁰⁷ Letter No. WT(16)/(2202-A)/PCIW from the PCIW to the ICIW dated 5 November 1968, **Exhibit P-0649.0136**, p. 1.

¹⁰⁸ Letter No. 4(13)/65-IC from the ICIW to the PCIW dated 10 February 1969, **Exhibit P-0649.0140 (resubmitted)**, p. 23 (Enclosure-XIII).

permissible Pondage for a Treaty-compliant HEP must be determined based on “the actual load curve worked out for the proposed Plant”:

“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.”¹⁰⁹

2.52. From the available record, it does not appear that the Indian Commissioner responded to this specific criticism of India’s approach for the Sumbal HEP. The Commissioners continued to correspond about the Pondage calculation, but with respect to the calculation of the MMD for the Sumbal HEP site.¹¹⁰

2.53. Pakistan renewed its objection at the next time of asking, with respect to the Lower Jhelum HEP. Pakistan’s Commissioner took issue with India’s calculations for the maximum Pondage on the basis that the calculations “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”.¹¹¹ The Indian Commissioner responded with the vague explanation that “[t]o the extent that the pondage that could be provided at site falls short of requirement of the load curve, there will no doubt be a constraint on the peaking capability of the Plant”.¹¹²

2.54. Pakistan objected in similar terms to India’s calculation of maximum Pondage for the Chinani-I HEP. The Pakistani Commissioner observed that the:

“[G]eneration pattern has to be related to the Operating Pool provided at the site of the Plant. But in case of the Plant under reference calculations for the Operating Pool do

¹⁰⁹ Letter No. WT(16)/(2295-A)/PCIW from the PCIW to the ICIW dated 9 May 1969, **Exhibit P-0649.0114**, p. 5.

¹¹⁰ See, e.g., **Appendix B**, p. 8; Letter No. WT(16)/(2726-A)/PCIW from the PCIW to the ICIW dated 20 August 1971, **Exhibit P-0649.0215**, p. 1 (“[T]he Treaty does not allow the adoption of any assumed figure for the ‘minimum mean discharge’ and it has to be worked out in accordance with the provisions of Paragraph 2(i) of Annexure D to the Treaty” and “[y]our predecessor has agreed to rework out the figure of the ‘minimum mean discharge’ after a detailed discussion of the provisions of the Treaty and fully appreciating the Pakistan Commissioner’s views on the subject. I request you to kindly review the matter and in case you still feel that the design of the plant is to be based on the assumed minimum mean discharge of 200 cusecs then the matter shall have to be resolved under the provisions of Article IX of the Treaty”). The Indian Commissioner did not respond to this letter, despite the Pakistani Commissioner sending multiple reminder letters, the last of which was sent on 30 April 1997 (**Exhibit P-0649.0862**).

¹¹¹ Letter No. WT(85)/(3487-A)/PCIW from the PCIW to the ICIW dated 28 January 1976, **Exhibit P-0649.0342**, pp. 5-6, ¶ 3(c)(iii) (emphasis added).

¹¹² Letter No. F.4/1/62-IC(IT) from the ICIW to the PCIW dated 12 May 1976, **Exhibit P-0649.0356 (resubmitted)**, p. 3, ¶ 3(c)(iii).

not depict the actual variations through the turbines, which are proposed to be met with the pondage provided and, therefore, appear to be hypothetical.”¹¹³

2.55. With the notification of the Dul Hasti HEP, which included the largest volume of Pondage in India’s designs to date, Pakistan’s objections escalated. Pakistan’s Commissioner objected to India’s calculations for the maximum Pondage in clear terms:

“[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.”¹¹⁴

2.56. In response, and for the first time, the Indian Commissioner shed some light on the basis on which India determined the load curve (or anticipated load) it relied on for its calculation of maximum Pondage. The Indian Commissioner denied that the calculations provided were “hypothetical” and asserted that “[t]his 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”.¹¹⁵ Despite the Indian Commissioner’s protest, his explanation makes clear that India was indeed relying on a “hypothetical” load curve, as he considered that the Dul Hasti HEP would be providing power under “varying [...] system operating conditions at different points of time”—in other words, India was designing its HEPs to account for any future eventuality, no matter how unlikely, that could arise in the power system, rather than the situation as it actually existed, or was projected to exist, at the time of the HEP’s design.

2.57. India’s approach became clearer in subsequent exchanges on the Dul Hasti HEP. Pakistan’s Commissioner noted that “[i]n view of what has been stated by [the Indian Commissioner] more details are required to see that the load curve is realistic and not hypothetical”.¹¹⁶ The disagreement over the load curve for the Dul Hasti HEP was renewed after India notified Pakistan of changes in design particulars of the HEP.¹¹⁷ In response to that

¹¹³ **Appendix B**, pp. 11-12; Letter No. WT(14)/(4023-A)/PCIW from the PCIW to the ICIW dated 4 August 1979, **Exhibit P-0649.0425**, p. 1 (emphases added).

¹¹⁴ **Appendix B**, p. 13; Letter No. WT(104)/(4565-A)/PCIW from the PCIW to the ICIW dated 11 February 1984, **Exhibit P-0649.0493**, p. 4 (emphases added).

¹¹⁵ **Appendix B**, p. 13; Letter No. 16(4)/62-I.T/179 from the ICIW to the PCIW dated 26 December 1984, **Exhibit P-0649.0513**, pp. 5-6.

¹¹⁶ **Appendix B**, p. 13; Letter No. WT(104)/(4661-A)/PCIW from the PCIW to the ICIW dated 3 March 1985, **Exhibit P-0649.0514**, p. 4.

¹¹⁷ Letter No. 16(4)/62-IT/604 from the ICIW to the PCIW dated 16 July 1992, **Exhibit P-0649.0768**.

notification, the Pakistani Commissioner reiterated his objection and requested a “realistic load curve” to support India’s maximum Pondage calculation:

“[T]he calculations for the ‘Pondage’ supplied previously was based on a very hypothetical load curve, which provided for a ‘Firm Power’, which did not correspond to the Minimum Mean Discharge intimated by India.

[...]

[T]he revised Full 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 along with 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.”¹¹⁸

2.58. The Indian Commissioner repeated his earlier contention that the HEP had to provide “necessary peaking capacity” under varying “system operating conditions at different points in time”.¹¹⁹ Pakistan’s Commissioner pointed out, once again, that the “load curve supplied for the calculation of pondage was a hypothetical one” and crucially that the load curve “has not been based on the actual operation of the Plant which would be grided nation wide”.¹²⁰

2.59. In parallel to these exchanges on the Dul Hasti HEP, the Commissioners were also corresponding regarding India’s Pondage calculation at the Baglihar HEP, which with a proposed Operating Pool of 37.5 Mm³ was the largest volume of Pondage claimed by India thus far by some margin.¹²¹ Pakistan’s Commissioner immediately objected to the Pondage calculation on the ground that it was (again) based on a “very hypothetical load curve”.¹²²

2.60. In subsequent exchanges, the Indian Commissioner made clear that India was not in fact relying on an actual projection of the anticipated load in its calculations for maximum Pondage for Ann.D3 HEPs, because, according to the Indian Commissioner, in a grid with a “hydro-thermal mix”, the “load demand curve [...] can not be predicted”:

¹¹⁸ **Appendix B**, p. 14; Letter No. WT(104)/(5304-A)/PCIW from the PCIW to the ICIW dated 14 September 1992, **Exhibit P-0649.0773**, pp. 3, 7 (emphasis added).

¹¹⁹ **Appendix B**, p. 14; Letter No. 16(4)/62-I.T./660 from the ICIW to the PCIW dated 26 August 1993, **Exhibit P-0649.0795**, p. 2.

¹²⁰ **Appendix B**, p. 15; Letter No. WT(104)/(5511-A)/PCIW from the PCIW to the ICIW dated 8 October 1995, **Exhibit P-0649.0833**, p. 4 (emphasis added).

¹²¹ **Appendix B**, pp. 27-28; Letter No. 3/1/84-I.T./597 from the ICIW to the PCIW dated 20 May 1992, **Exhibit P-0585**, p. 41 (Annex III).

¹²² **Appendix B**, p. 28; Letter No. WT(127)/(5293-A)/PCIW from the PCIW to the ICIW dated 12 August 1992, **Exhibit P-0649.2047**, p. 2.

“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.”¹²³

2.61. By this point, it was clear to Pakistan what India was doing—seeking to apply the design criteria of Paragraph 8 of Annexure D to hypothesise an inflated amount of maximum Pondage by refusing to determine the actual anticipated load expected for its AnnD.3 HEPs. In his response to the Indian Commissioner’s explanation, Pakistan’s Commissioner wrote in strident terms, noting that India’s approach was designed to “achieve maximum pondage” and flatly rejected the Indian explanation that the load curve “cannot be predicted” as being irrelevant to the design criteria of Paragraph 8:

“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.”¹²⁴

2.62. In further exchanges on the Pondage calculation for Baglihar, the two Commissioners continued to reiterate their respective positions,¹²⁵ and the issue was then taken up in Secretary-level talks on the Baglihar HEP.¹²⁶ The talks were comprehensive in scope, and the minutes of the talks are a snapshot of the cat-and-mouse game being played over “load curves”, with India insisting on a hypothetical load curve and Pakistan repeatedly requesting that an actual load curve be relied on for the calculation of Pondage. At the outset of the discussions, a member of the Indian Central Water Commission (“CWC”) addressed the “[b]asis of the load curve adopted for the Plant”:

¹²³ **Appendix B**, p. 29; Letter No. 3(1)/84-I.T./690 from the ICIW to the PCIW dated 11 March 1994, **Exhibit P-0649.0814**, p. 2 (emphasis added).

¹²⁴ **Appendix B**, p. 29; Letter No. WT(127)/(5452-A)/PCIW from the PCIW to the ICIW dated 13 October 1994, **Exhibit P-0649.0822**, p. 2 (emphases added).

¹²⁵ **Appendix B**, pp. 29-30, 32; Letter No. 3(1)/84-IT/784 from the ICIW to the PCIW dated 2 May 1996, **Exhibit P-0649.0850**, p. 2; Letter No. WT (127)/(6014-A)/PCIW from the PCIW to the ICIW dated 13 August 1997, **Exhibit P-0649.0866** p. 2; Record of the 84th Meeting of the Permanent Indus Commission, 29-30 March 2000 dated 30 March 2000, **Exhibit P-0647.82**, p. 3, List of Additional Data of Baglihar Hydro-Electric Plant Required by Pakistan (“15. Magnitude of existing load and its load factor, 16. Size and shape of load duration curve over previous years, 17. Extent of unconnected load, 18. Probable growth of load over next few years”).

¹²⁶ Minutes of Secretary Level Meeting on Baglihar Hydroelectric Project held in New Delhi, 3-6 January 2005 dated 7 January 2005, **Exhibit P-0650.1**.

“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.”¹²⁷

2.63. The CWC official’s statement at least acknowledged that the anticipated load of the HEP must be “consistent with system needs” but then added the qualifier that it must also correspond to the “generation potential at the plant”. The official insists that the generation schedule for the Baglihar HEP “has been designed to cater to the peaking requirements of the power system”—however, neither in those talks, or otherwise, has India provided evidence of the actual load demands of the relevant power system.

2.64. In the course of the discussions, the Indian delegation further justified its chosen generation schedule for Baglihar by suggesting that “hydroelectric stations are amenable to quick start and stop and respond almost instantaneously to load variations which make them most suitable to cater to least variations and provide peaking power”.¹²⁸ Pakistan’s delegation drew attention to the unusual loading pattern in India’s calculations for Baglihar, noting that the “load curve provided by India provides 450 MW generation of electricity for a few hours in a day and provides periods of zero generation in the remaining part of the day” and noted that this schedule did not “correspond to the concept of Firm Power and fluctuations in continuous flow of [p]ower over it”.¹²⁹ Pakistan repeated its request that India provided a “realistic load curve corresponding to the requirement of the Treaty showing Firm Power and fluctuation” to enable calculation of the maximum Pondage.¹³⁰

2.65. Pakistan also emphasised that it was not objecting to the “[p]ower [g]eneration capacity” of the Baglihar HEP, but rather the way “Pondage has been computed”, given that

¹²⁷ *Id.*, p. 9 (emphases added). At another point in the discussions, Indian representatives reiterated that the Baglihar “project is designed to (i) optimally harness the hydroelectric power potential at the site and at the same time to (ii) cater to the power system requirements based on the assured energy available from the station”. *Id.*, p. 20.

¹²⁸ *Id.*, p. 20.

¹²⁹ *Id.*, p. 41 (emphasis added).

¹³⁰ *Id.*.

the “load curve provided by India has abrupt variations in power generating capacity and not fluctuations in Firm Power”.¹³¹

2.66. The dispute about Pondage, amongst other issues, at the Baglihar HEP was eventually brought to a Neutral Expert for determination.

2.67. Between Dul Hasti and Baglihar, India notified Pakistan of its designs for several other HEPs with significantly smaller Operating Pools. While the Parties were primarily engaged in other, equally fundamental, disagreements regarding Pondage (i.e., not regarding anticipated load) for these projects, Pakistan still raised its concerns regarding India’s reliance on “hypothetical” load curves. For example, for the Asthan Nallah¹³² and Parnai HEPs, the Pakistani Commissioner noted that the Pondage calculations were based on a “hypothetical” load curve and requested the calculations be based on the “actual” load curve.¹³³

2.68. More notably, for the Rajouri HEP (another Small Plant like the Asthan Nallah HEP), the Pakistani Commissioner noted the discrepancy between the hypothetical load curves supplied for previous HEPs and the actual manner in which those HEPs were operated, and requested the “load curve to be actually followed” for the Rajouri HEP:

“It may also be indicated whether the operation of the Plant as proposed in Annexure V [Calculations for Operating Pool] to your letter is a hypothetical one or it will be followed as proposed. In the past you have termed such operation (load curve) as hypothetical when those plants like LJHP came into operation. In case it is a hypothetical one, a load curve to be actually followed may be given.”¹³⁴

2.69. It is clear now that India does not determine the actual anticipated load for its AnnD.3 HEPs, i.e., the anticipated load that corresponds to the actual load demands of the relevant power system and reflects how the HEP will actually be operated. Rather, India relies on a hypothetical anticipated load, that is designed to achieve a maximal volume of permissible Pondage to allow for operational flexibility to deal with any unanticipated eventualities.

¹³¹ *Id.*, p. 42 (emphasis added).

¹³² This was a Small Plant subject to the design criteria in Paragraph 18 of Annexure D and not Paragraph 8.

¹³³ **Appendix B**, pp. 23, 25; Letter No. WT(15)/(5021-A)/PCIW from the PCIW to the ICIW dated 5 December 1988 (Asthan Nallah), **Exhibit P-0649.0637**, p. 3; Letter No. WT(16)/(5138-A)/PCIW from the PCIW to the ICIW dated 14 April 1990 (Parnai), **Exhibit P-0649.0703**, p. 10.

¹³⁴ **Appendix B**, p. 26; Letter No. WT(15)/(5183-A)/PCIW from the PCIW to the ICIW dated 31 August 1990, **Exhibit P-0649.0722**, p. 5 (emphases added). From the available record, it appears that the Indian Commissioner did not respond to this letter, despite reminder letters, the last of which was sent on 31 July 1997 (**Exhibit P-0649.0863**).

Pakistan raised these concerns with India at the 113th PIC Meeting in the context of post-Baglihar HEPs that relied on the same approach:

“[I]t 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 fulfil the criteria of Paragraph 15, and the real load curve of the area i.e. Northern Grid, was compromised.”¹³⁵

2.70. The Indian Commissioner’s response only confirms Pakistan’s understanding:

“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.

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.”¹³⁶

(b) *Pakistan’s understanding of how anticipated load is taken into account in India’s calculation of maximum Pondage and concerns raised by Pakistan*

2.71. For the relevant HEPs under discussion in this section, India switched between the use of a daily load and a weekly load in its calculations for maximum Pondage. For the earlier HEPs with smaller volumes of Pondage, including the Stakna, Sumbal, Lower Jhelum, Upper Sind-II, Kargil and Parnai HEPs, India relied on a daily load in its calculations.¹³⁷ For later HEPs, including the ones with the two largest volumes of Pondage, i.e., Dul Hasti and Baglihar,

¹³⁵ **Appendix B**, p. 57; Record of the 113th Meeting of the Permanent Indus Commission, 20-21 March 2017 dated 29 March 2018, **Exhibit P-0103**, p. 10, ¶ 31 (emphases added).

¹³⁶ *Id.*, p. 10, ¶¶ 33-34 (emphases added).

¹³⁷ General Issues Award, ¶ 710.

India switched to relying on a weekly load in its calculation of maximum Pondage.¹³⁸ India continued this practice of relying on a weekly load in its calculations for most HEPs thereafter.

2.72. As Pakistan explained in its PO14 Final Comments, “[t]he choice of using either ‘daily’ or ‘weekly’ load variations is critical to the ultimate value for the claimed Pondage entitlement of a HEP [...] it is not a coincidence that for the two Plants with the largest claimed Pondage entitlement (and therefore eliciting the strongest objections from Pakistan) India based its calculation on ‘weekly’ load variations”.¹³⁹

2.73. To conclude, the historical record between the Parties on the subjects “capacity”, “load” and “calculations for the maximum Pondage” reveals the following key trends:

- (a) In providing details of the “installed capacity” of an AnnD.3 HEP, India initially allocated a portion of the capacity for Firm Power, and the remainder for Secondary Power. For later projects, starting with the Sumbal HEP, with a few exceptions, India provided the installed capacity in the aggregate i.e., without an allocation of power units between Firm Power and Secondary Power.
- (b) India did not determine the actual “anticipated load” for its AnnD.3 HEPs and instead relied on what Pakistan termed a “hypothetical” load curve in its calculations for maximum Pondage. India attempted to justify its chosen approach by reference to the “hydro-thermal mix” in its power system, and the need for “more flexibility in operation in order to cater to the varying load demands”.
- (c) India’s calculations for maximum permissible Pondage for its earliest HEPs, such as the Stakna and Sumbal projects, incorporated the use of a “load factor”, with the effect that the HEP was producing power at less than its full installed capacity, in keeping with conventional hydroengineering practice. For later projects, India’s calculations assumed that the HEP would produce at its full installed capacity.
- (d) In its earlier projects, again such as the Stakna and Sumbal HEPs, India relied

¹³⁸ *Id.*

¹³⁹ Final Comments of Pakistan on Particular Matters Addressed in Procedural Order No. 14, 25 February 2025, ¶ 2.66.

on a “daily” loading schedule. With the Dul Hasti and Baglihar HEPs, India resorted to using a “weekly” loading schedule, which resulted in much larger volumes of Pondage in the HEP design.

- (e) India’s initial position was that the Treaty did not require it to furnish details of its calculations for the maximum permissible Pondage for its AnnD.3 HEPs (which also included important information on the “anticipated load”); it only did so for earlier projects after repeated requests by Pakistan. India later furnished these calculations as standard practice, albeit with a few exceptions where it determined that the Pondage provided in a HEP design was “negligible”.

* * *

CHAPTER 3: PAKISTAN'S INTERPRETATION OF THE COURT'S CONSIDERATION OF PONDAGE IN THE GENERAL ISSUES AWARD

3A KEY TERMINOLOGY RELEVANT TO PONDAGE

3.1. In its PO17, the Court requested that Pakistan address “[t]he meaning of the terms ‘capacity’ and ‘load’ as used in the Treaty, including in Annexure D, Part 3.” As the Court has acknowledged, these terms are not defined in the Treaty.

3.2. To assist the Court in its task, Pakistan has again consulted the preparatory work of the Treaty to identify anything that may be gleaned from it relevant to the meaning of these terms. In doing so, Pakistan has paid particular regard not only to the use of the terms “capacity” and “load” in draft versions of the Treaty, but also to the evolution in draft versions of the Treaty of the provisions that the Court identified in its General Issues Award as “relevant context” for the interpretation of Annexure D, Paragraph 8(c).¹⁴⁰ The preparatory work of the Treaty, however, provides only limited guidance on the meaning of the terms “capacity” and “load” as used in the Treaty. What limited guidance it does provide, however, lends support to the General Issues Award finding that the projection of an AnnD.3 HEP’s installed capacity and anticipated load must be “realistic, well-founded, and defensible”, as opposed to hypothetical. Beyond this, however, the preparatory works provide no further guidance on how “realistic, well-founded, and defensible” projections should be calculated. Pakistan’s review of the *travaux préparatoires* is set out in detail in **Appendix C** to this Memorial.

3.3. Pakistan begins its analysis by reference to two categories of defined terms. The first are the terms of the Treaty themselves—which remain controlling of the process by which maximum Pondage is to be calculated for an Indian HEP on the Western Rivers. The second are terms of art within the realm of hydropower—which despite not being included (or if included, not defined) within the Treaty, are nevertheless key to understanding how Pondage and its calculation are conceived of as a matter of engineering.

¹⁴⁰ Namely, Annexure D, Paragraph 15 (water delivery requirements); Paragraph 9 and Appendix II of Annexure D (notification requirements); and Annexure E (storage of waters).

3A.1 The Treaty terms

3.4. The Court is already familiar with the Treaty terms material to Pondage. Nevertheless, for ease of reference, Pakistan recalls the key terms below.

3.5. The Annexure D design criterion for the calculation of Pondage is set out in Paragraph 8(c). This provides that “[t]he maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power”.¹⁴¹ Annexure D contains several defined terms relevant to the interpretation of this criterion.

- (a) “Pondage” is defined in Paragraph 2(c) of Annexure D as “Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the plant”.¹⁴²
- (b) “Operating Pool” is defined in Paragraph 2(f) of Annexure D as “the storage capacity between Dead Storage level and the Full Pondage Level”.¹⁴³
- (c) “Firm Power” is defined in Paragraph 2(i) of Annexure D as “the hydro-electric power corresponding to the minimum mean discharge at the site of a plant”¹⁴⁴— with the minimum mean discharge (“**MMD**”) calculated in accordance with the historical averaging formula contained in the latter part of the same provision.

3.6. The Annexure D definitions contain further terms which must themselves be defined to situate the Operating Pool within the reservoir of an AnnD.3 HEP. In particular:

- (a) “Dead Storage” is defined in Paragraph 2(a) of Annexure D as “that portion of the storage which is not used for operational purposes”.¹⁴⁵
- (b) “Dead Storage level” is also defined in Paragraph 2(a) of Annexure D as the “level [in the reservoir] corresponding to Dead Storage”.¹⁴⁶

¹⁴¹ Treaty, **PLA-0001**, Annexure D, Paragraph 8(c).

¹⁴² *Id.*, Annexure D, Paragraph 2(c).

¹⁴³ *Id.*, Paragraph 2(f).

¹⁴⁴ *Id.*, Annexure D, Paragraph 2(i). Firm Power may be contrasted with “Secondary Power”, defined in Paragraph 2(j) as meaning “the power, other than Firm Power, available only during certain periods of the year”. *Id.*, Annexure D, Paragraph 2(j).

¹⁴⁵ *Id.*, Annexure D, Paragraph 2(a).

¹⁴⁶ *Id.*, Annexure D, Paragraph 2(a).

- (c) “Live Storage” is defined in Paragraph 2(b) of Annexure D as “all storage [in the reservoir] above Dead Storage”.¹⁴⁷
- (d) “Full Pondage Level” is defined in Paragraph 2(d) of Annexure D as “the level corresponding to the maximum Pondage provided in the design in accordance with Paragraph 8(c)”.

3.7. Beyond the formally defined terms set out above, Annexure D contains other engineering terms that may be relevant to the calculation of Pondage. As these lack formal definitions in the Treaty itself, they must be interpreted in accordance with the applicable rules of treaty interpretation under international law, which as the Court observed in its General Issues Award, require that the Treaty “shall be interpreted ‘in good faith’ in accordance with the ‘ordinary meaning’ to be given to the terms of the treaty in their ‘context’ and in the light of the treaty’s ‘object and purpose’”.¹⁴⁸ Pakistan begins that analysis with the ordinary meaning given to the terms of the Treaty.

3.8. A good glossary for the ordinary meaning of these engineering terms is found in Appendix S of the U.S. Army Corps of Engineers’ *Hydropower* manual,¹⁴⁹ with which the Court is already familiar. Another useful—although less authoritative—glossary is in Appendix B of J.S. Gulliver and R.E.A. Arndt’s *Hydropower Engineering Handbook*.¹⁵⁰ These contain definitions of the following terms.¹⁵¹

3.9. Paragraph 2(c) of Annexure D refers to the “daily and weekly loads of the plant”.¹⁵²

- (a) In this context, “load” may be defined as “the amount of electric power delivered at a given point”¹⁵³ by the Plant within the power system to which it

¹⁴⁷ *Id.*, Annexure D, Paragraph 2(b). In addition to Pondage, the other form of Live Storage recognised by Annexure D is “Surcharge Storage”, defined in Paragraph 2(e) as meaning “uncontrollable storage occupying space above the Full Pondage Level”. *Id.*, Annexure D, Paragraph 2(e).

¹⁴⁸ As to which, *see* General Issues Award, ¶¶ 270-272.

¹⁴⁹ United States Army Corps of Engineers, “Engineer Manual 1110-2-1701”) *Hydropower* dated 31 December 1985 (“USACE, *Hydropower*”), **Exhibit P-0302 (resubmitted)**, Appendix S.

¹⁵⁰ J.S. Gulliver & R.E.A. Arndt, *Hydropower Engineering Handbook* (McGraw Hill 1991), **Exhibit P-0477 (resubmitted)**, Appendix B.

¹⁵¹ Within this list, where both sources provide a definition of a particular term, the USACE definition is preferred.

¹⁵² Treaty, **PLA-0001**, Annexure D, Paragraph 2(c).

¹⁵³ USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-8, p. 298.

is attached—and therefore to correspond to the demand which that power system places on the Plant on either a daily or weekly basis.

- (b) The “plant” itself in this context self-evidently is a reference to a “hydroelectric plant”—being “the comprehensive term for all structures (one powerhouse and pertaining installations) necessary for utilizing a selected power site”.¹⁵⁴

3.10. Paragraph 2(i) of Annexure D makes reference to “power”, which is generally understood as “[t]he time rate of transferring energy”,¹⁵⁵ with “energy” simply meaning “[t]hat which does or is capable of doing work”.¹⁵⁶ Electricity is, self-evidently, a form of energy which can be measured in MW-hrs. Electrical power is therefore the rate at which that energy is generated and transferred to the power system, as measured in MW.

3.11. Paragraph 4(i) of Appendix II to Annexure D makes reference to the “[m]aximum aggregate capacity of power units [...] for Firm Power and Secondary Power” attached to the Plant.¹⁵⁷ “Capacity” in this context may have several meanings.

- (a) At its most generic level, it refers to “[t]he load for which a generator, turbine, transformer, transmission circuit, apparatus, station or system is rated”.¹⁵⁸
- (b) It may also mean the discharge or “hydraulic” capacity of a Plant, being “[t]he maximum flow which a hydroelectric plant can utilize for energy”.¹⁵⁹
- (c) Given the reference to “maximum aggregate capacity”, however, within the context of Paragraph 4(i), “capacity” likely refers to “installed” capacity, being “[t]he sum of capacities in a powerplant or power system, as shown by the nameplate ratings of similar kinds of apparatus, such as generating units,

¹⁵⁴ J.S. Gulliver & R.E.A. Arndt, *Hydropower Engineering Handbook* (McGraw Hill 1991), **Exhibit P-0477 (resubmitted)**, B.3, p. 93. The generic “plant” also appears in the defined term “Run-of-River Plant” in Para 2(g), meaning “a hydro-electric plant that develops power without Live Storage as an integral part of the plant, except for Pondage and Surcharge Storage”: Treaty, **PLA-0001**, Annexure D, Paragraph 2(g).

¹⁵⁵ USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-12, p. 302. Outside the particular field of hydropower, but within the electric power industry, there is a tendency to use “power” to mean “inclusively both capacity (power) and energy”. *Id.*

¹⁵⁶ *Id.*, S-5, p. 295.

¹⁵⁷ Treaty, **PLA-0001**, Annexure D, Appendix II, paragraph 4(i).

¹⁵⁸ USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-2, p. 292.

¹⁵⁹ *Id.*

turbines, or other equipment”.¹⁶⁰ Here, it is the capacity of the Plant that is relevant, not that of the power system.

3.12. Equally, within Paragraph 4(i), a “power unit” is plainly to be equated to a “generating unit”, being “[a] single power-producing unit, comprised of a turbine, generator, and related equipment”.¹⁶¹

3.13. Finally, while the term “Firm Power” has been defined in Paragraph 2(i) of Annexure D, that “definition” is in fact the Treaty’s mandated method of calculation of Firm Power. In the context of hydroengineering, the term “firm power” is understood to mean the “[p]ower intended to have assured availability to the customer” or, in this case, the power system, “to meet all or any agreed upon portion of the [load] requirements”.¹⁶² “Firm energy” is a counterpart to “firm power” and is understood to mean “[e]lectric energy which is intended to have assured availability to the customer to meet any or all agreed upon portion of his load requirements.”¹⁶³ Assured availability is usually meant to require that the firm energy and firm power are available for at least 95 to 98% of the time. Energy generated in excess of the firm energy is secondary energy.¹⁶⁴

3A.2 Engineering concepts and terminology relevant to the calculation of Pondage in Run-of-River hydroelectric Plants

3.14. Beyond the above terms, wider engineering concepts appear in Part XI of the Court’s General Issues Award that do not appear in the Treaty—but are very much relevant to the calculation of Pondage under the methodology set out therein. Three terms arising from these concepts are explained here.

3.15. The first term is “load curve”. As its name suggests, this is tied to the concept of load—and in its natural and ordinary sense means “[a] curve of demand versus time showing in chronological sequence the magnitude of the load for each unit of time of the period

¹⁶⁰ *Id.*

¹⁶¹ *Id.*, S-7, p. 297.

¹⁶² *Id.*, S-12, p. 302. Similarly, the term “Secondary Power” or “Seasonal Power” as it is referred to in the USACE manual, is understood as the “[p]ower generated or made available to customers [or the power system] only during certain seasons of the year”. *Id.*, S-13, p. 303.

¹⁶³ *Id.*, S-5, p. 295.

¹⁶⁴ Secondary energy is defined as “all hydroelectric energy other than primary energy. Secondary energy is generally marketed as non-firm energy”, USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-5, p. 295.

covered”.¹⁶⁵ While a load curve is ordinarily used to show the load on the power system, there is no reason why it cannot be adapted to show the load on a particular Plant as demanded by the power system—which is the sense in which the Court generally appears to use it.¹⁶⁶

3.16. The second term is “installed capacity”. As noted above, this is merely another term for what the Treaty refers to in Paragraph 4(i) of Appendix II to Annexure D as “maximum aggregate capacity”—effectively the total capacity of the generating units housed in the Plant.

3.17. The third term is “anticipated load”, which is a term that does not feature within normal engineering parlance,¹⁶⁷ but the Court’s meaning is clear enough when the meaning of “load” itself is considered in the context of Paragraph 2(c) and the definition of Pondage for the purposes of the Treaty. It is simply the amount of load that can be expected to be placed on the Plant by the power system over daily and weekly time periods.

3B KEY ASPECTS OF THE COURT’S GENERAL ISSUES AWARD ON THE CALCULATION OF PONDAGE

3.18. Pakistan next turns to consider the approach to the calculation of Pondage that the Court has found (in the General Issues Award) is required by Paragraph 8(c) of Annexure D.

3.19. This is set out at paragraphs 745 to 748 of the General Issues Award, as follows:

“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:

¹⁶⁵ *Id.*, S-9, p. 299.

¹⁶⁶ *See, e.g.*, General Issues Award, ¶ 725: “[i]n other words, the disagreement between the Commissioners was about how to determine the load curve, not about the use of the load curve when calculating Pondage”.

¹⁶⁷ *See, e.g.*, USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-9, p. 299, which refers not only to “load” in the generic sense, but to specific types of load—such as “base”, “intermediate”, “interruptible” and “peak” load. “Anticipated” load, however, is not listed.

- (a) Pondage required for Firm Power shall be calculated based on what can be accumulated during that period when the stream flow 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 of Paragraph 15 of Annexure D.

748. *Third*, the maximum Pondage shall not be more than twice the Pondage calculated in accordance with the above requirements.”¹⁶⁸

3.20. In addition to this, the Court included additional commentary on the calculation of Pondage elsewhere in the General Issues Award.

3.21. At paragraph 742, the Court said that:

“[I]f a difference emerges 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.”¹⁶⁹

3.22. So, for example, if Pakistan considers that a proposed Indian HEP's installed capacity and anticipated load for the purposes of Step 3 above are not “realistic, well-founded, and defensible”, then the burden is on India to prove that they meet the necessary standard.

3.23. At paragraph 743, moreover, the Court said that:

“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 hypothesised in a manner that serves to inflate the amount of maximum Pondage.”¹⁷⁰

3.24. India is accordingly precluded from inflating or exaggerating the installed capacity and anticipated load of a HEP in order to maximise the size of its Operating Pool. Put another way, India is not permitted Pondage for the sake of Pondage, or for the sake of assumed operational

¹⁶⁸ General Issues Award, ¶¶ 745-748.

¹⁶⁹ *Id.*, ¶ 742.

¹⁷⁰ *Id.*, ¶ 743.

flexibility not evident in the actual anticipated load of the Plant. Rather, both these considerations must bear a direct and corresponding relationship to the daily and weekly reality of the HEP once constructed, i.e., “how the plant will actually be operated”. Once a plausible model of daily and weekly HEP operation is established, this will allow for a “realistic, well-founded, and defensible” understanding of installed capacity and anticipated load to be developed and play a role in the methodology that the Court has set down.

3C THE BASIS UPON WHICH INDIA MUST DETERMINE THE INSTALLED CAPACITY AND ANTICIPATED LOAD OF A PROPOSED ANN D.3 HEP AND THE LIMITS IMPOSED BY THE TREATY

3.25. Pakistan turns next to address—by reference to the reasoning in the General Issues Award—how India must determine the installed capacity and anticipated load of a proposed AnnD.3 HEP. Before doing so, however, it addresses the content of the Treaty itself, and the constraints that it imposes on the determination of the installed capacity and anticipated load of a proposed AnnD.3 HEP.

3C.1 Limitations imposed by the Treaty on installed capacity and anticipated load

3.26. Neither “installed capacity” nor “anticipated load” are concepts mentioned in the Treaty—although, as shown above, closely related or functionally identical concepts like “maximum aggregate capacity” or “daily and weekly loads of the plant” do appear in the Treaty.

3.27. The Treaty does not expressly limit the installed capacity or anticipated load of an AnnD.3 HEP. Limitations on installed capacity and anticipated load necessarily follow from the Court’s wider analysis in its General Issues Award with regard to other design features of such HEPs.

3.28. The Court made this conclusion plain at paragraph 705:

“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.”¹⁷¹

¹⁷¹ *Id.*, ¶ 705 (emphasis added).

3.29. The Court went on to elaborate:

“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.”¹⁷²

3.30. In addition to Paragraph 8(c) as interpreted by the Court, other elements of the Treaty also impose implicit limits on the installed capacity and anticipated load of a proposed AnnD.3 HEP, relevant through the interpretative prisms of both “context” and “object and purpose” of the Treaty. These include the following:

- (a) Paragraph 8(a) of Annexure D, insofar as the works in question would themselves allow raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design.
- (b) Paragraph 8(b) of Annexure D, insofar as this requires the design of the works to take account of the requirements of Surcharge Storage and Secondary Power.
- (c) Paragraph 15 of Annexure D, insofar as this imposes mandatory operational constraints on the proposed HEP by reference to the actual flow of the river on any given day at the site of the Plant.
- (d) The differences in the nature of Annexure D Run-of-River and Annexure E storage works, and that the installed capacity and anticipated load of a proposed Annexure D Run-of-River HEP cannot in effect lead to a design outcome in which what is characterised as an Annexure D Run-of-River HEP is in fact closer in character to an Annexure E storage work.

3.31. Relevant both generally and to the preceding, a further limitation (or an acknowledgement that limits on installed capacity and anticipated load are appropriate under the Treaty) can also be inferred from the data that India is required to communicate to Pakistan with respect each proposed AnnD.3 HEP pursuant to Paragraph 9 and Appendix II of Annexure D, which include but are not limited to:

¹⁷² *Id.*.

- (a) Observed or estimated daily river discharge data on which the design is based.¹⁷³
- (b) Flood data, observed or estimated (with details of estimation).¹⁷⁴
- (c) Full Pondage Level, Dead Storage Level and Operating Pool together with calculations for the Operating Pool.¹⁷⁵
- (d) Estimated evaporation losses in the reservoir, Regulating Basin, headrace, forebay and tailrace.¹⁷⁶
- (e) Maximum designed flood discharge and maximum designed flood level.¹⁷⁷
- (f) Designated range of operation.¹⁷⁸
- (g) Type of dam, length and height above mean bed of the river.¹⁷⁹
- (h) Cross-section of the river at the site; mean bed level.¹⁸⁰
- (i) Head-race and tail-race: length, size, maximum designed capacity.¹⁸¹
- (j) Outlet works: function, type, size, number, maximum designed capacity and sill levels.¹⁸²
- (k) 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.¹⁸³
- (l) Maximum aggregate capacity of power units (exclusive of standby units) for Firm Power and Secondary Power.¹⁸⁴

¹⁷³ Treaty, **PLA-0001**, Annexure D, Appendix II, paragraph 2(b).

¹⁷⁴ *Id.*, Annexure D, Appendix II, paragraph 2(c).

¹⁷⁵ *Id.*, Annexure D, Appendix II, paragraph 3(b).

¹⁷⁶ *Id.*, Annexure D, Appendix II, paragraph 3(d).

¹⁷⁷ *Id.*, Annexure D, Appendix II, paragraph 3(e).

¹⁷⁸ *Id.*, Annexure D, Appendix II, paragraph 3(f).

¹⁷⁹ *Id.*, Annexure D, Appendix II, paragraph 4(b).

¹⁸⁰ *Id.*, Annexure D, Appendix II, paragraph 4(c).

¹⁸¹ *Id.*, Annexure D, Appendix II, paragraph 4(f).

¹⁸² *Id.*, Annexure D, Appendix II, paragraph 4(g).

¹⁸³ *Id.*, Annexure D, Appendix II, paragraph 4(h).

¹⁸⁴ *Id.*, Annexure D, Appendix II, paragraph 4(i).

- (m) Regulating Basin and its outlet works: type, number, size, sill levels and designed maximum discharge capacity.¹⁸⁵

3C.2 Basis for the calculation of installed capacity and anticipated load by India

3.32. Pakistan now turns to the question of how India must determine installed capacity and anticipated load for purposes of the calculation of maximum Pondage. On the basis of the analysis in **Sections 3A and 3B** above, the following general principles for the determination of installed capacity and anticipated load can be extrapolated from the Court’s reasoning in the General Issues Award:

- (a) First, installed capacity is the total power capacity of the HEP’s turbines, usually measured in MW. Anticipated load, in turn, refers to the load that can be expected to be placed on the HEP by the power system over daily and weekly time periods.
- (b) Second, installed capacity and anticipated load must be determined on the basis of a “realistic, well-founded, and defensible”¹⁸⁶ projection for each AnnD.3 HEP, in respect of which India bears the burden of proof.
- (c) Third, and relatedly, this allocation of the burden of proof implies that the projection in question must be based on, and reflected in, the information with respect to each proposed HEP that India is obliged to provide to Pakistan pursuant to Paragraph 9 and Appendix II of Annexure D.
- (d) Fourth, in determining what is “realistic, well-founded, and defensible” for a particular AnnD.3 HEP, India may not deliberately inflate the installed capacity

¹⁸⁵ *Id.*, Annexure D, Appendix II, paragraph 4(j).

¹⁸⁶ General Issues Award, ¶ 747. Each of these terms, as defined in the *Shorter Oxford English Dictionary* (5th edn: OUP 2003) has a subtly different meaning—although it is not suggested by Pakistan that much turns on these differences. “Realistic” means “[c]haracterised by fidelity of representation; representing things as they really are”, “Realistic”, *Shorter Oxford English Dictionary* (5th edn: Oxford University Press 2003), Volume 2, **Exhibit P-0712**, p. 2480. “Well-founded” means “built on a firm or solid base”, or “having a foundation in fact or reason, based on good grounds and evidence”, “Well-founded”, *id.*, p. 624. And “defensible” means “able to be defended; easily defended; justifiable”, “Defensible”, *id.*, p. 3610. Similar definitions appear in *Websters Third New International Dictionary* (Merriam Webster 2002): “Realistic” means “facing reality squarely: not impractical or visionary”, “Realistic”, *Websters Third New International Dictionary* (Merriam Webster 2002), **Exhibit P-0713**, p. 1890. “Well-founded” means “constructed on a solid or firm foundation” or “having a firm foundation in fact: based on excellent reasoning, information, judgment or grounds”, “Well-founded”, *id.*, p. 2595. And “defensible” means “capable of being defended”, “Defensible”, *id.*, p. 591.

and anticipated load in order to obtain more Pondage. Rather, the installed capacity and anticipated load must correspond to how the HEP will “actually be operated”.¹⁸⁷

3.33. When determining how a HEP will actually be operated, there are—as a matter of engineering—two factors that must be borne in mind.

(a) *The role of HEP site hydrology*

3.34. The first is the hydrology at the AnnD.3 HEP site on one of the Western Rivers or a Tributary of the same. That hydrology is the source of fuel for the Plant, with the result that it could not be credibly contended that a “realistic, well-founded, and defensible” projection of installed capacity and anticipated load could be based on an assumed hydrological supply greater than the river at the HEP site could provide. To assume otherwise would be to construct a hypothesis that does not reflect how the Plant would or could actually be operated.

3.35. Hydrology will have the greatest impact when projecting an AnnD.3 HEP’s installed capacity because of its importance for the estimation of the overall energy yield of the HEP and its firm energy and secondary energy. For example, the Kishenganga River at the site of the KHEP has a relatively modest flow compared with other sites on the Western Rivers, with an MMD of only 18.59 m³/sec.¹⁸⁸ The maximum observed and daily river discharge,¹⁸⁹ the observed flood data,¹⁹⁰ and maximum designed flood level¹⁹¹ are likewise similarly limited. This may justify a relatively small HEP with an installed capacity of 330 MW HEP, such as the KHEP, but it could not justify constructing, in the same location, something like India’s planned 1,856 MW Swalkot HEP. A Plant of the size of Swalkot would have surplus generation power capacity that would be idle for much of the year. Such a Plant would be more

¹⁸⁷ General Issues Award, ¶ 743.

¹⁸⁸ In its original notification to Pakistan, that the KHEP was being re-designed as an AnnD.3 HEP, the MMD value for the KHEP site provided by India was 21.19 m³/sec, *see* Letter No. 3/7/82-IT/1228 (with enclosures) from the ICIW to the PCIW dated 19 June 2006, **Exhibit P-0055**, p. 6, Annexure A. In the subsequent *Kishenganga* arbitration proceedings, India provided an updated water availability series for the KHEP site to the *Kishenganga* Court; according to that updated time series, the MMD of the KHEP site (i.e., “the lowest of the mean [of the yearly values for each 10-day period]” is 18.59 m³/sec, *see* Central Water Commission (CWC), Government of India, ‘Hydrology Report’ (submitted in Volume 2 of India’s Submission on the Information Requested by Court by its Partial Award), June 2013, **Exhibit P-0548/KR-0075**, p. 75.

¹⁸⁹ Letter No. 3/7/82-IT/1228 (with enclosures) from the ICIW to the PCIW dated 19 June 2006, **Exhibit P-0055**, pp. 9-38 (Annexure III).

¹⁹⁰ *Id.*, p. 39 (Annexure IV).

¹⁹¹ *Id.*, p. 3, item 3(e).

appropriately sited on a river with more abundant hydrology, such as the Chenab Main below Ramban, which is in fact where India proposes to locate the Swalkot HEP.

3.36. With respect to anticipated load, hydrology will be relevant in determining when the AnnD.3 HEP will be expected to produce power as well as the amount of Firm Energy that can be produced at a site. Absent flood events (which are unpredictable at best, and rare in the dry season, when Pondage is ordinarily required), the hydrology of the Western Rivers on an hour-to-hour basis is relatively stable. Were India to determine the anticipated load of an AnnD.3 HEP on the basis of sudden hourly increases in the flow of the river at the HEP site, this would not form a proper basis for a “realistic, well-founded, and defensible” projection.

(b) The role of the power system to which the HEP is expected to contribute

3.37. The second relevant factor is the power system to which the HEP is to be connected, once constructed. The power system determines the demand that the HEP is expected to meet, as well as the point at which that demand arises. Once again, without demand from the power system being taken into account, it could not be credibly contended that the installed capacity and anticipated load of a Plant has been determined on the basis of a “realistic, well-founded, and defensible” projection. This much is recognised in engineering texts from the time of the Treaty’s conclusion.¹⁹²

3.38. As with hydrology, the power system may vary seasonally, with weather conditions, and the nature of the loads connected to the system. Some power systems may experience considerable hour-to-hour variations in the course of a day. This much can be seen from the sample load curve in **Figure 3.1** below.

¹⁹² See, e.g., W.P. Creager & J.D. Justin (eds.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309 (resubmitted)**, p. 162 (“[t]he advisable [installed] capacity of a hydroelectric project depends on the extent to which the installation may be utilised within the limits of the connected load curve”).

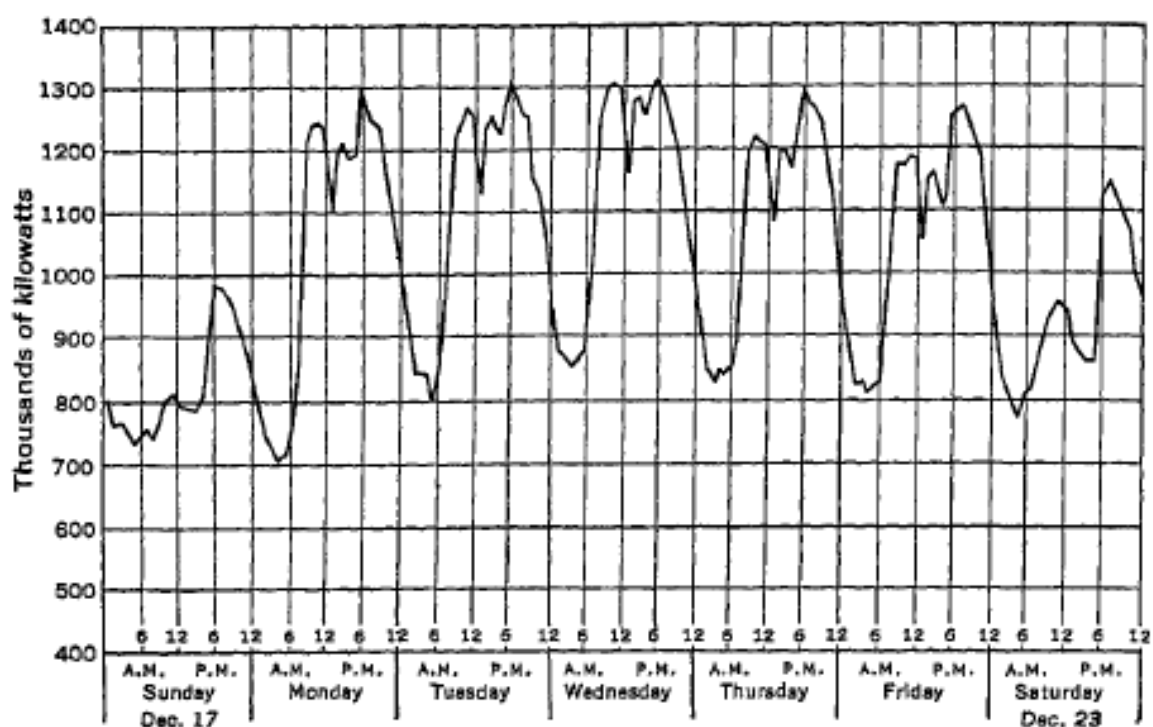


Figure 3.1 – Weekly load curve of a power system with a high base load¹⁹³

3.39. What this load curve shows is that demand in this sample power system will be lower from the period 12am (midnight) to 7am, during which many people are asleep and thus not consuming power. Equally, demand is higher from 7am to 12pm (noon), when most people are awake and businesses are operating. Within that period, two periods of peak demand are reflected—the first from roughly 8am to 12pm (noon), and the second from roughly 5pm to 10pm.

3.40. The same load curve also shows how demand may fluctuate on a day-to-day basis throughout the week, although there is a large base load (note that the load from 0 to 400 MW is not shown on the graph). Demand in this sample power system is lower over the course of the weekend (Saturday to Sunday) when businesses are closed and people are at home. It increases dramatically over the working week (Monday to Friday), when those same businesses are open and people are at work.

3.41. From the perspective of installed capacity, the relationship between the power system and the proposed HEP is relatively straightforward, in the sense that the projected installed

¹⁹³ *Id.*, p. 252.

capacity of the Plant must have a rational relationship to the power system that the Plant is intended to service. For example, if an AnnD.3 HEP is proposed to service a local power grid with a total capacity of 1,300 MW (as in the sample above), a 2,000 MW Plant would not be considered “realistic, well-founded, and defensible”, because, when operating at its design discharge, the capacity of the HEP would be over 1.5 times that of the power system, effectively overwhelming it. Instead, what would be required is a HEP with firm energy sufficient to meet the demand and a firm power sufficient to dispatch the firm energy. The installed capacity of the HEP would likely be constrained, as there would be little to no benefit gained by an arbitrary increase.

3.42. Such issues are less of a problem today than they were when the Treaty was concluded. Developments in the Indian electricity grid have largely done away with smaller local grids in preference to large regional grids of many thousands of MW.¹⁹⁴ These are combined power systems in which hydropower operates in conjunction with thermal, renewable, and other energy sources to provide a reliable mix capable of meeting base, intermediate and peak load requirements. In such circumstances, the installed capacity of a HEP is unlikely to be an issue in and of itself—as it will only ever reflect a small portion of the grid’s total capacity. It is only if the grid cannot be expanded to accommodate the Plant’s contribution that a problem would arise from the perspective of the Treaty and its need for a “realistic, well-founded, and defensible” projection of installed capacity. However, the projected operation of the HEP within the power system is still important in ensuring that the firm power and firm energy can contribute to the overall capabilities of the power system—this requires that the anticipated daily utilisation of the HEP complements other Plants in the power system in a manner that optimises the overall capital investment (as detailed further in **Appendix D** hereto).

3.43. Demand on the power system may also shape anticipated load on the basis of fluctuations in demand. When demand is high, a Run-of-River Plant should be producing to meet that demand. When it is low, the grid can do without the Plant’s contribution, allowing the Plant to store water as Pondage ahead of the next peak. With respect to the sample power system shown above, an operator can expect that the load on the Plant will be less overnight and on weekends—enabling the Plant to fill the Operating Pool at that time. But that same

¹⁹⁴ For example, the power grid for the Northern Region of India, which includes Indian-administered Kashmir, and thus all Indian HEPs constructed under the auspices of Annexures D and E, had a capacity of 137,000 MW as of 2025. *See further Appendix D.2.1.*

storage will not be justified during the day and on weekdays, where increased demand will require the Plant to be producing power so that the needs of the power system may be met. Modelling an anticipated load that reflects this pattern—i.e., how the Plant will actually be operated in the context of its connected power system—will be “realistic, well-founded, and defensible”. The same cannot be said of a Plant that does not reflect the expectations of the power system.

3.44. The demand on the power system also affects the selection of the number of generating units in a HEP and their capacity. Most hydroelectric turbines are subject to a minimum power cutoff, below which the turbine will not be operated.¹⁹⁵ In extended low flow periods, there is an adjustment made to the number of generating units in operation and the Pondage available.¹⁹⁶

3.45. In stating this, it must be recalled that every power system is different. Where the load curve for the power system changes, so too will the anticipated load on a Plant. So, for example, a power system in which there is no significant drop in demand over the weekend will not be justified in using Saturday and Sunday to store more water than on weekdays, as the inflow into the reservoir during the weekend will be required by the power system for power production. Likewise, if for whatever reason, the power system reflected only one peak period per day, as opposed to two, then this would also need to be taken into account. Put another way, the sample power system reflected in **Figure 3.1** above is generic in character. The load curves for the Indian power system, to which its AnnD.3 HEPs will be connected, may (and does) differ,¹⁹⁷ but this information will be readily available to India, as it is used for power planning and dispatch purposes.

3.46. There are multiple ways in which a projection of anticipated load can be made “realistic, well-founded, and defensible” in light of demand within the power system. One approach—common in the small, local grids which would still have existed in Kashmir at the time of the Treaty’s conclusion—is “unit loading”, in which the HEP continuously tracks the load curve of the power system minute-by-minute.¹⁹⁸ As demand in any grid is never zero, in

¹⁹⁵ **Appendix D, ¶¶ 69-70.**

¹⁹⁶ *Id.*, ¶ 72.

¹⁹⁷ *See further Appendix D.2.*

¹⁹⁸ *See J.J. Doland, Hydro Power Engineering: A Textbook for Civil Engineers* (Ronald Press 1954), **Exhibit P-0654**, p. 51.

circumstances where the HEP is the only source of power within the power system, this means that the HEP can never be shut off (or “zero loaded”) to store the entirety of the reservoir inflow as Pondage. Pondage would still be used to match the hourly power output from the Plant with the available inflow, i.e., the daily peak period can be higher than can be supplied with the natural inflow, so Pondage is used to supplement inflow for part of the day.

3.47. In larger regional power systems, however, the diversity of other power sources means that zero loading the Plant is possible, as well as power production for a relatively short portion of the day. This is referred to as “block loading”, i.e., where the Plant’s discharge “is increased or decreased in definite steps without regard to following a particular load shape”, enabling that discharge to be “maintained at a fixed level for an extended period of time”,¹⁹⁹ for example with a view to meeting the morning or the afternoon peak. At the same time, however, the daily block that the HEP is charged with meeting must be of sufficient duration to allow the Plant to be of use to the grid operator and have a meaningful role in the power system, as the limitation of generating time will require that other power stations are added to the system, incurring additional capital investments.

3.48. As they bear a rational relationship to the relevant power system, unit and block loading can both, as a matter of principle, give rise to a “realistic, well-founded, and defensible” projection of anticipated load for a particular HEP. What is clear, however, is that India is not entitled to maximise its Pondage on the basis of a professed need for “operational flexibility”, i.e., the idea that the grid may change such that one day the Plant will be subjected to an unanticipated load pattern that it must have the installed capacity to meet now. This, however, as shown above,²⁰⁰ is precisely what India purports to do on its current approach. So far as Pakistan is aware, India recognises no limitation at all on anticipated load in the Treaty—or for that matter on installed capacity. Subject to the operational limits imposed only by Paragraph 15 of Annexure D—to which Pakistan will turn to below—India’s apparent position is that it is entitled to make provision for Pondage in its HEPs to the maximum extent, without regard to what the power system is actually doing.

3.49. Whatever else that may be, it is not a “realistic, well-founded, and defensible” projection of anticipated load or installed capacity. Indeed, it is not a “projection” at all—for,

¹⁹⁹ USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, S-1, p. 291.

²⁰⁰ See *supra*, ¶ 2.69.

as a general rule, and as the drafters of the Treaty would have been aware, while the demand on the power system will change hour-to-hour, day-to-day, week-to-week, and month-to-month, it generally reflects remarkable stability year-to-year. Indeed, it is this essential predictability that enables load curves to be used as the basis of power planning²⁰¹—and, by extension, to be used as a tool for the calculation of Pondage as a matter of ordinary engineering practice. As Pakistan turns to next, the power system for the Northern Region of India is no exception in this respect.

3.50. Seasonal variation affects the role of Run-of-River power stations in the overall power system. During the wet months of the year, the hydrology may allow the Plant to operate at or close to its installed capacity, with surplus water released as spill. In this period, a Run-of-River Plant would supply base load and cannot provide any daily peaking operation. Other power stations must be available in the power system to provide peaking service during the wet season. However, these same peaking power stations are also available in the dry season, meaning that the Run-of-River Plant would necessarily not be required to provide peaking. The expectation would be that the Run-of-River Plants would provide intermediate load where daily Pondage is used to regulate the available hydrology to enable Plant dispatch to suit demands. Run-of-River Plants would not be in the base load during the dry season because of limitations on the available hydrology.

3C.3 The power system for the Northern Region of India

3.51. The above analysis has presented a generalised overview of Pakistan’s understanding of how a “realistic, well-founded, and defensible” projection of installed capacity and anticipated load may be calculated based on two key, and interrelated, factors: the hydrology of the river, and the needs of the power system.

²⁰¹ See, in this respect, W.P. Creager & J.D. Justin (eds.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309 (resubmitted)**, pp. 249-250:

“If one examines the weekly load curves for any given system for the past few years, he will be impressed by the similarity of the shape of the weekly load curve for any given period in the year. Thus, if one were to take a typical weekly load curve for October of a recent year and multiply the ordinates by the growth ratio between the two periods, he would closely approximate the actual weekly load curve for the October of the later year. The similarity in the shape of the weekly load curve for any given period of the year makes the curve particularly valuable in helping to determine how a proposed hydro plant may be fitted to the load curve.”

3.52. With that set out, Pakistan turns to apply this analysis to India’s particular requirements, as reflected in the regional power system for North India, to which India’s AnnD.3 HEPs are connected. In this, it produces a condensed version of the more detailed engineering analysis in **Appendix D** hereto.

(a) Features of the power system for the Northern Region of India

3.53. All Indian HEPs on the Western Rivers are connected to the grid for the Northern Region of India (“**NRG**”), recent load data for which is available through Grid-India.²⁰² The NRG is a large, integrated power system with an installed capacity in 2025 of approximately 137,000 MW split between thermal power (coal, oil, gas), renewables (solar, wind) and hydropower (Run-of-River and storage works).²⁰³

3.54. The NRG is centrally administered by India’s National Load Despatch Centre (“**NLDC**”), which in turn directs a Regional Load Despatch Centre (“**RLDC**”) for Northern India.²⁰⁴ The installed capacity of the NRG is then dispatched on a daily basis to meet demand within the power system.

3.55. Analysis of the Grid-India data reveals several significant features for present purposes.

(a) First, there is considerable seasonal variation in the NRG. In the wet season, demand is highest due to the need for air conditioning, but there is relatively little variability in that demand during the day.²⁰⁵ Demand is overall lower in the dry season, but the variability in daily demand is greater—which is what increases the need for Pondage in a Run-of-River HEP.²⁰⁶

(b) Second, comparison of the NRG’s hourly data during the nadir of the dry season (December to February) shows that the week-to-week demand during this

²⁰² For the purposes of this review, hourly data were obtained from the India Climate & Energy Dashboard, which provides a selection of data from Grid-India, available at: <https://iced.niti.gov.in/energy/electricity/distribution/national-level-consumption/load-curve>.

²⁰³ National Power Portal (India), “Location wise Northern Region state-wise installed capacity as on 30/11/2025”, available at: <https://npp.gov.in/public-reports/cea/monthly/installcap/2025/NOV/capacity2-Northern-2025-11.pdf>, **Exhibit P-0714**.

²⁰⁴ Ministry of Power, Government of India, “Power System Operation Corporation Limited is now Grid Controller of India Limited”, 14 November 2022, available at: <https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1875864>, **Exhibit P-0715**.

²⁰⁵ **Appendix D**, ¶ 11.

²⁰⁶ *Id.*, ¶ 11.

period is relatively consistent.²⁰⁷ This enables the generation of an average ‘typical’ load curve for this period—where Pondage is most required due not only to the low flow of the river but also increased hour-to-hour demand variation in the power system.

- (c) Third, that average ‘typical’ load curve only shows an insignificant variation in demand on the NRG during the weekday as opposed to the weekend. The load pattern for each of the seven days of the week is more or less identical,²⁰⁸ showing a consistently high baseload of approximately 35,000 MW with two daily peaks—one in the morning of approximately 65,000 MW, and another in the afternoon of 55,000 to 58,000 MW.²⁰⁹
- (d) Fourth, a load duration analysis of the NRG confirms that demand on the grid never drops below 40% of the peak of 66,400 MW (i.e., even when demand is at its lowest, the NRG will still need to meet a load of 26,560 MW) and for half of the week the grid is operating at 80% of that peak load or higher.²¹⁰ Even when hour-to-hour variability in the NRG is at its greatest (as it is in the dry season), there is a relative lack of variability within the power system. The Plants within the NRG must be able to supply a large baseload, with a relatively small part of the total energy available being used for peaking.

(b) *Impact of the Northern Region power system on HEP operations*

3.56. All of the above provides valuable information for how a new AnnD.3 HEP will be expected to function within the NRG—in other words how the Plant will “actually be operated”. As a general matter, a Run-of-River Plant with Pondage operating within the constraints of such a load could be expected to behave as follows.

3.57. First, the HEP would not adopt a reduced power production schedule over the ‘low-demand’ weekend to enable increased production during the ‘high-demand’ week, because this distinction does not exist. Rather, the Plant would have the same operating pattern for each

²⁰⁷ See **Appendix D.2.3**.

²⁰⁸ Inspection of individual weeks shows a slightly higher demand in some weeks. On the whole, weekends reflect 99% of the weekly average demand, with weekdays reflecting 101% of the weekly average demand, see **Appendix D.2.3**.

²⁰⁹ **Appendix D**, ¶ 19.

²¹⁰ *Id.*, ¶ 38.

day of the week to meet the consistent demand observed for both weekends and weekdays. A power production schedule that left weekend demand unmet would not be optimal because other generating facilities would need to take up the slack, resulting in increased costs for investment in Plant capacity (i.e., planning to use the HEP mainly on weekdays would require that the power system must construct additional power stations to supply the unmet demand on the weekends, which is clearly unsatisfactory).

3.58. Second, the HEP would be block loaded for several hours each day so that it can make a meaningful contribution to meeting that consistent daily demand. As to this:

- (a) In some circumstances, the Plant operator may task the Plant to operate for four hours from 5pm to 9pm to meet the evening peak, placing the Plant in storage mode from 9pm to 5pm the following day so that same peak may be met when it arrives.²¹¹
- (b) In other circumstances, however, it may be preferable for the Plant to be dispatched to meet intermediate as opposed to peak load,²¹² resulting in a longer period of 9 to 14 hours of power production.²¹³
- (c) Conversely, the Plant operator is unlikely to require the HEP to operate for only a single hour per day. Such an operating schedule would be of no utility at all to the system dispatcher at the NLDC or RLDC who will be required to coordinate the startup and shut down of a large number of power stations along with load variations. The use of very short daily operating periods for a given Run-of-River Plant would also affect the overall system investment by requiring that other Plants are available to meet demand in the off hours.

3.59. Third, when block loading, it is unrealistic to assume that the HEP will be operating under an ‘ON/OFF’ modality, in which the Plant is either zero loaded or producing with all turbines at its maximum installed capacity, with nothing in between. As to this:

²¹¹ Such an arrangement is common where—as in the case of the NRG—the grid includes large amounts of solar power that can be relied upon to meet the morning peak during the day, but after night falls, cannot be relied upon in the same way for the evening peak. *Id.*, ¶¶ 74-75.

²¹² The Court will recall that baseload is consistent, peak load is eight hours a day or less, and intermediate load is between 14 and eight hours a day. *See* USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, pp. 2-4.

²¹³ **Appendix D**, ¶ 51.

- (a) When generating power, the Plant operator will typically ramp up the flow rate from the minimum power when the Plant starts up to operation at the best efficiency point, which will be less than the maximum installed capacity for a typical HEP.²¹⁴
- (b) Peaking time must therefore be adjusted to account for daily ramp-up and ramp-down of the turbines, together with operation at optimum efficiency—which may be fixed, for Francis turbines (used by India at the Kiru HEP), at about 75–90% of the full turbine capacity, which will allow for an increase in generating hours with the same flow volume, thereby resulting in a net increase in the energy produced.²¹⁵
- (c) The maximum number of hours the Plant can operate in a day is limited by the minimum load capacity of a single turbine. The Francis turbines in a HEP will operate between a minimum load of about 50–60% of the capacity and their maximum capacity, with a preference for operation at the best efficiency point to maximise energy production.²¹⁶
- (d) Moreover, during the dry season (when Pondage is required), it is ordinary practice to have one unit offline for maintenance purposes.²¹⁷

3.60. These assumptions reflect relevant factors to be taken into account when developing a “realistic, well-founded, and defensible” projection of a Plant’s anticipated load and installed capacity for the calculation of Pondage, using well-established engineering tools.

²¹⁴ *Id.*, ¶ 69.

²¹⁵ *Id.*, ¶¶ 66-68.

²¹⁶ *Id.*, ¶ 69.

²¹⁷ *Id.*, ¶ 72; USACE, *Hydropower*, **Exhibit P-0302 (resubmitted)**, 2-11, p. 346; ASME, “The Guide to Hydropower Mechanical Design”, Prepared by the ASME Hydro Power Technical Committee, HCI Publications, 1996 (Extract), **Exhibit P-0716**.

3D THE BASIS UPON WHICH INSTALLED CAPACITY AND ANTICIPATED LOAD ARE TO BE TAKEN INTO ACCOUNT FOR PURPOSES OF THE CALCULATION OF MAXIMUM PONDAGE UNDER PARAGRAPH 8(C)

3.61. With the basis for the calculation of installed capacity and anticipated load set out, the next question is how they are to be taken into account in the calculation of maximum Pondage.

3.62. As set out in **Section 3B** above, the General Issues Award provides guidance on this matter in the form of the methodology set out at paragraphs 745 to 747, together with the further commentary at paragraphs 742 and 743. Taken together, this produces the following six-step methodology:

- (a) Step 1: Calculate the MMD for the site of the relevant Plant in accordance with Paragraph 2(i) of Annexure D.
- (b) Step 2: Assume that the river at the site of the Plant will be flowing consistently (i.e., minute-to-minute) at the MMD, without variation.
- (c) Step 3: Using weekly time periods stipulated by Paragraph 16 of Annexure D (i.e., in which a week commences at 8am Indian Standard Time on Saturday, and ends at 8am the following Saturday), schedule the MMD inflow for power production over the course of a model week by reference to a “realistic, well-founded, and defensible” projection of the Plant’s installed capacity and anticipated load, in accordance with Paragraph 2(c) of Annexure D. These projections must reflect how the Plant “will actually be operated” in light of the hydrology of the HEP site and the demands of the relevant power system.
- (d) Step 4: Check that the resulting schedule abides by the daily and weekly storage and discharge requirements of Paragraph 15 of Annexure D, and moderate the schedule to the extent these limits are exceeded.
- (e) Step 5: Select the largest amount of storage required over the course of the model week to meet the schedule produced, and fix the result as the “Pondage required for Firm Power”.

- (f) Step 6: Double the Pondage required for Firm Power to fix the maximum limit of the Operating Pool.

3.63. As can be appreciated by the foregoing, installed capacity and anticipated load are relevant to Step 3 of the analysis—in which the operating schedule for the Plant’s operations is set by reference to the hydrology of the HEP site and the power system to which it is attached.

3.64. Drawing together the threads of the preceding analysis, Pakistan articulates the following interpretative assumptions for the determination of installed capacity and anticipated load, and the manner in which they are to be taken into account in the calculation of maximum Pondage for an AnnD.3 HEP:

- (a) The installed capacity and anticipated load of a HEP for the purposes of calculating Pondage required for Firm Power must be determined on the basis of a realistic, well-founded and defensible projection of that installed capacity and anticipated load.
- (b) A realistic, well-founded and defensible projection of a HEP’s installed capacity and anticipated load:
 - (i) must correspond to how the HEP will actually be operated once constructed;
 - (ii) cannot be hypothesised in a manner that serves to inflate the maximum Pondage; and
 - (iii) must be established by India on the basis of the material which it is required to provide to Pakistan with respect to the HEP under Paragraph 9 and Appendix II of Annexure D.
- (c) The question of how the HEP will actually be operated must be determined by reference to the hydrology of the HEP site and the needs of the power system to which it will be expected to contribute during the dry season.
- (d) The needs of the power system will be determined by reference to a load curve representative of typical demand during the dry season.

- (e) When determining the capacity utilised and anticipated load in light of the needs of the power system during the dry season, account may be taken of, *inter alia*:
 - (i) distribution of demand as between weekends and weekdays within the power system;
 - (ii) the need for the HEP to make a meaningful contribution to the power system on a daily and weekly basis at times of peak demand, and that the daily dispatch schedule be realistic considering the operation of the HEP within the overall system; and
 - (iii) the operational requirements of the HEP's turbines, including the need for:
 - a. ramp-up and ramp-down time;
 - b. operation at the best efficiency point; and
 - c. maintenance.

3E THE ROLE OF PARAGRAPH 15 AND ENVIRONMENTAL FLOW IN THE CALCULATION OF MAXIMUM PONDAGE

3.65. A final element of Pakistan's analysis of the calculation of maximum Pondage under Annexure D to the Treaty concerns the appropriate role for the daily and weekly limits of Paragraph 15 and environmental flow, pursuant to ¶ 2.3.7 of PO17.²¹⁸ Although ancillary to the central questions of installed capacity and anticipated load in the context of the present pleading, they are nevertheless important limitations on maximum Pondage—and Pakistan takes this opportunity to outline its position on the role they play.

3E.1 Paragraph 15

3.66. As set out above in relation to Step 4, the limitations of Paragraph 15 prevent India from adopting a power production schedule for the purposes of Pondage calculation that would exceed the operational rules imposed by Annexure D. Per the Court's analysis, Paragraph 15 is, having regard to the relationship between the design criteria and operational rules in

²¹⁸ Which invited Pakistan to address "[a]ny other issues [it] considers relevant to a decision on the questions at issue for the Second Phase on the Merits".

Annexure D, “a vital element for the methodology for calculating” maximum Pondage under Paragraph 8(c).²¹⁹ As the Court further pointed out:

“Thus, although Paragraph 8(c) does not expressly refer to Paragraph 15, the latter is a vital element for the methodology for calculating ‘maximum Pondage’, for it serves as a turbine discharge constraint that must be considered in determining how to manage water storage to meet the HEP’s daily and weekly load conditions. Absent the daily and weekly water delivery requirements contained in Paragraph 15, India would have much greater latitude to accumulate storage to meet peak load demands, contrary to the object and purpose of the Treaty.”²²⁰

3.67. This passage, together with the approach indicated in Paragraph 811(O) of its General Issues Award, indicates that Paragraph 15 operates as a constraint on the Pondage required for Firm Power rather than as a yardstick in the calculation of a HEP’s installed capacity and anticipated load that exists independently of the requirements of the power system.

3.68. To take a simple example. With respect to an AnnD.3 HEP on the Chenab River above Ramban, India is entitled to operate a constructed HEP in a manner that it stores 50% of actual daily inflow for the first three days of the week, before discharging 130% of the actual daily inflow for the remaining four days, such that the applicable weekly limit is met. For the design purpose of calculating Pondage, however, India is only entitled to adopt such a schedule if it is justified by a “realistic, well-founded, and defensible” projection of anticipated load and installed capacity. It is not allowed to do so merely because it is a method of operation available to it under Paragraph 15.

3.69. Thus, where—as with the NRG—the power system requires that the HEP is operated in such a way as to meet a specific block load every day, India will be precluded from adopting an operating schedule that tests (without exceeding) the boundaries of Paragraph 15 in the manner above described. To do so would be to abandon any pretence of calculating anticipated load by reference to how the Plant will “actually be operated” and use Paragraph 15 as a means to increase Pondage. Put another way, it would impermissibly use Paragraph 15 to hypothesise anticipated load “in a manner that serves to inflate the amount of maximum pondage”.²²¹

²¹⁹ General Issues Award, ¶ 681.

²²⁰ *Id.* (emphasis added).

²²¹ *Id.*, ¶ 743.

3.70. Pakistan mentions this because—as also described above²²²—this appears to be how India has conceived the role of Paragraph 15 in the context of Paragraph 8(c), starting with the Dul Hasti and Baglihar HEPs. As analysis of the General Issues Award shows, however, that India is not permitted to generate power in any pattern for the purposes of calculating Pondage. Rather, it can only generate power by reference to a justifiable conception, backed by evidence, of installed capacity and anticipated load, which reflects how the Plant will operate in the real world. The role played by Paragraph 15 in the analysis is to restrain that conception where the applicable daily and weekly limits are exceeded.

3E.2 Environmental flow

3.71. The same logic, moreover, applies to the requirement to maintain an environmental flow.

3.72. As the Court is aware, India makes provision for “minimum environmental flow” in the calculation of maximum Pondage. For example, and as the Court noted, in its Pondage calculation for the Kiru HEP, India makes provision for an environmental flow of 16.33 m³/sec.²²³

3.73. The reason why India does this is because of the general obligation on it in the context of the Treaty to make provision for environmental flow for the purposes of avoiding significant harm—not just to Pakistan, but more generally to the environment downstream of a given HEP. The obligation to proceed in this manner is not expressly stated in the Treaty but was addressed by the *Kishenganga* Court in the context of setting operational rules for the KHEP on the basis that customary international law imposes upon “States [...] ‘a duty to prevent, or at least mitigate’ significant harm to the environment when pursuing large-scale construction activities”.²²⁴ In its Final Award, the *Kishenganga* Court said:

“[T]he Court has no difficulty concluding that the requirement of an environmental flow (without prejudice to the level of such flow) is necessary in the application of the Treaty. At the same time, the Court does not consider it appropriate, and certainly not

²²² See *supra*, ¶ 2.26.

²²³ General Issues Award, ¶ 643. In addition to the Kiru HEP, India has incorporated environmental flows in the Operating Pool calculations for the Kwar HEP (**Exhibit P-0649.1718**; 16.49m³/sec) and the RHEP (**Exhibit P-0077 (resubmitted)**; 33.3m³/sec). Following the *Kishenganga* Award, these three HEPs are the only new Plants in respect of which India has provided Operating Pool calculations pursuant to Paragraph 9 and Appendix II of Annexure D.

²²⁴ *Indus Waters Kishenganga (Pakistan v India)*, Partial Award (2013) XXXI RIAA 55, **PLA-0003**, ¶ 451.

‘necessary,’ for it to adopt a precautionary approach and assume the role of policymaker in determining the balance between acceptable environmental change and other priorities, or to permit environmental considerations to override the balance of other rights and obligations expressly identified in the Treaty—in particular the entitlement of India to divert the waters of a tributary of the Jhelum. The Court’s authority is more limited and extends only to mitigating significant harm. Beyond that point, prescription by the Court is not only unnecessary, it is prohibited by the Treaty. If customary international law were applied not to circumscribe, but to negate rights expressly granted in the Treaty, this would no longer be ‘interpretation or application’ of the Treaty but the substitution of customary law in place of the Treaty.”²²⁵

3.74. In view of this, the *Kishenganga* Court concluded that India was required to operate the KHEP to take account of a constant 9 m³/sec environmental flow—and, when the flow of the river dropped below this amount, release all of the flow into the Kishenganga below the KHEP dam.²²⁶ The Court adopted this figure as being “consistent with Pakistan’s analysis of environmental flows, given the need to balance power generation with environmental and other downstream uses, and, based on India’s data, would maintain the natural flow regime in the most severe winter conditions”.²²⁷

3.75. It follows that where the operation of an AnnD.3 HEP would give rise to a risk of significant environmental harm due to the interruption of downstream flows—as all HEPs invariably do, particularly in the dry season—India is obliged to incorporate an environmental flow limitation into the operational rules for the HEP alongside the requirements of Paragraph 15 of Annexure D.

3.76. Despite Paragraph 15 not being expressly referenced in Paragraph 8(c), the Court determined that Paragraph 15 is a central part of the methodology for the calculation of maximum Pondage under Paragraph 8(c), having regard to the relationship between the design criteria and operational rules in Annexure D²²⁸ The same logic—necessarily and unavoidably—must be applied to India’s obligation to allow for environmental flow, which—as the *Kishenganga* Court observed—is just as much an operational rule as Paragraph 15, albeit one that is not found in the literal text of the Treaty.

²²⁵ *Indus Waters Kishenganga (Pakistan v India)*, Final Award (2013) XXXI RIAA 209, **PLA-0004**, ¶ 112 (emphasis added).

²²⁶ *Id.*, *dispositif* A.

²²⁷ *Id.*, ¶ 115.

²²⁸ General Issues Award, ¶ 681.

3.77. Within the scheme that Pakistan has set out in **Section 3D** above, therefore, environmental flow would be included as, in effect, Step 4A—which could be expressed as:

“Check that the resulting schedule incorporates the applicable environmental flow that India is required to permit under customary international law to mitigate significant environmental harm, and moderate the schedule accordingly.”

3.78. Self-evidently, the precise environmental flow requirements will vary from Plant-to-Plant—or site-to-site. Pakistan does not ask the Court to set a methodology for the calculation of environmental flow—that will be a matter for case-by-case approach. Pakistan does, however, ask that the Court acknowledge that, in addition to the daily and weekly release requirements of Paragraph 15 of Annexure D, Pondage required for Firm Power must be calculated in a manner that abides by India’s obligation to prevent significant harm to the environment through provision of an environmental flow specific to each HEP site.

3F CASE STUDY: THE KIRU HEP

3.79. A case study of the Kiru HEP will assist to show how the above analysis would operate by reference to the above-mentioned principles.

3.80. As the Court will recall, the Kiru HEP is a 624 MW Run-of-River HEP which India is currently in the process of constructing on the Chenab River above Ramban. In the First Phase Hearing, Pakistan submitted into evidence Annexure VII of the HEP’s proposed vital statistics, as provided to Pakistan by India under Paragraph 9 and Appendix II of Annexure D.²²⁹ This was said by India to justify a maximum Pondage for the Kiru HEP of **20.22 Mm³**.

3.81. In the course of oral submissions, counsel for Pakistan criticised the approach that India had taken in this document—essentially on the basis that it did not reflect how the Plant would actually be operated.²³⁰ To put the matter in the language of the General Issues Award, Pakistan did not consider India’s approach to be “realistic, well-founded, and defensible”.

3.82. Having performed the analysis set out above, Pakistan is now in a position to furnish the Court with a range of options that are more “realistic, well-founded, and defensible” than

²²⁹ Letter No. 3/6/2007-IT/2371 from the ICIW to the PCIW dated 1 June 2021 (with enclosure), **Exhibit P-0546 (resubmitted)**, p. 51 (Annexure VII).

²³⁰ Transcript of Hearing for the First Phase on the Merits, Day 6 (15 July 2024), p. 91, line 5 – p. 99, line 16 (Dr Miles).

India's approach to the Kiru HEP in Annexure VII. It notes that it does not do so in the expectation that the Court will select one of these options as being 'correct'—the Kiru HEP not being formally before the Court. Rather, it does so only to demonstrate the types of factors that could potentially be relevant to generating a "realistic, well-founded, and defensible" projection of the HEP's operations, and modelling how those factors can impact on the calculation of maximum Pondage under Paragraph 8(c).

3.83. Precisely which factors are selected as potentially determinative, and the weight to be given to each, will be a matter either for agreement between Pakistan and India with respect to an individual AnnD.3 HEP or for determination by a Neutral Expert or Court of Arbitration, should agreement between the Parties not be forthcoming.

3.84. This analysis has been conducted in light of the discussion in **Section 3C.3** above on the particular features of the NRG—being the power system into which the Kiru HEP will in due course feed—and the load curve that Pakistan has identified from Grid-India as being reflective of the NRG's demand during the dry season. It has also been conducted in light of the hydrology at the Kiru HEP's site on the Chenab—and, in particular, that site's MMD of **65.3 m³/sec**.

3.85. Within the six-step framework set out in **Section 3D** above, the MMD provides the necessary information to complete Steps 1 and 2 and provide an assumed week of reservoir inflow for the purposes of determining the Pondage required for Firm Power. Step 3, however, gives rise to the principal point of contention—calculation of a "realistic, well-founded, and defensible" projection of the Kiru HEP's installed capacity and anticipated load that reflects how the Plant will "actually be operated".

3.86. Pakistan now turns to a discussion of India's alternative options. Examining the hydrology of the Kiru HEP site, and the requirements of the NRG, the Plant's installed capacity of 624 MW appears (at least as a matter of first impression) not to be problematic. Multiple HEPs of similar or larger capacity—Baglihar and Dul Hasti—have been built along that stretch of the Chenab without incident.

3.87. With respect to anticipated load, the **Section 3C.3** analysis of the NRG provides a list of potentially relevant elements that could be taken into account when developing a satisfactory projection of the anticipated load. These include (but may not be limited to):

- (a) The insignificant variations in demand between weekends and weekdays requires the Plant to be loaded evenly on each day throughout the week.
- (b) The need for the Plant to make a meaningful contribution to the NRG requires the loading of the Plant to be between four to eight hours of power production a day, even if this means a reduction in capacity.
- (c) The fact that, during dry season operation, it is optimal for the Plant's turbines to be operated at 85–90% of their rated capacity.
- (d) During dry season operation, it will be normal for one of the Plant's turbines to be offline for maintenance.

3.88. Each of these factors, individually or together, may have an impact on the Plant's anticipated load—and this on the calculation of maximum Pondage. To that end, Pakistan has produced a number of scenarios to test combinations of factors and the consequential impact on the Paragraph 8(c) calculation.

3.89. Each scenario also models the impact of the daily and weekly limits of Paragraph 15 and the obligation to maintain an environmental flow. As a final step, it also doubles the Pondage required for Firm Power produced, producing a maximum Pondage as required under Paragraph 8(c).

3.90. The full workings for each scenario are contained in **Appendix D** and the calculations are illustrated in **Appendix E**. What follows is a summary.

- (a) In **Scenario 1**, all that Pakistan has done is take the total power production that India allowed the Kiru HEP in Annexure VII, and divided it evenly through every day of the week—i.e., 1.99 hours of production at the HEP's installed capacity per day, for a total of 13.95 hours of generation per week. This corresponds to the load curve for the NRG, which shows very little weekend to weekday variation in demand—as detailed further in **Appendix D**. This concept of anticipated load—the Pondage required for Firm Power—does not exceed the limits of Paragraph 15, and so no further modification is required. Once environmental flow is accounted for, the maximum storage required to meet the anticipated load is 3.86 Mm³. Once doubled in accordance with

Paragraph 8(c), the maximum Pondage so produced is **7.71 Mm³**. However, this generation pattern is still not practical for dispatch in a large integrated power system as (i) it is unrealistic in that a rational operator would want to operate the generating units more than the HEP; (ii) there is no provision for any of the generating units being unavailable for maintenance purposes, and (iii) the time scheduled for generation is less than the duration of the peak, meaning that the system operator must coordinate other Plants to start up and shut down.

- (b) In **Scenario 2**, Pakistan once again distributes hours of power production equally through each day of the week, with 3.21 hours of generation time per day leading to 22.49 hours of generation time per week. This generation pattern is more realistic, in that the system operator would have the HEP available for a significant period of the daily peak, although the generating time is still short relative to the duration of the peak load period. The scenario further assumes one turbine is offline for maintenance, and that the remaining three turbines are generating at their best efficiency point of 85% of their rated capacity (or maximum discharge). Again, this concept does not exceed the limits of Paragraph 15, and so no further modification is required. Once environmental flow is taken into account, the maximum storage required to meet the anticipated load is 3.64 Mm³. When doubled in accordance with Paragraph 8(c), the maximum Pondage is **7.29 Mm³**. The modest reduction in Pondage relative to **Scenario 1** illustrates the limited effect of small changes in the available installed capacity.
- (c) In **Scenario 3**, Pakistan assumes even distribution of production throughout the week, and removes a turbine from operation for maintenance—but also increases the generation time for the Plant to eight hours per day, or 56 hours per week. Given the fixed amount of water available, this means that the turbine capacity varies again—with the load being shouldered by a single turbine running at nearly 100% of the rated capacity.²³¹ This concept does not exceed Paragraph 15, and once environmental flow is accounted for, the maximum

²³¹ The same could also be accomplished, with less efficiency, by two turbines running at 50% of their rated capacity.

storage required to meet the anticipated load is 2.80 Mm³. Once doubled under Paragraph 8(c), the maximum Pondage produced is **5.61 Mm³**.

- (d) In **Scenario 4**, Pakistan makes the same assumptions as in Scenario 3, but increases production time to 12 hours a day, or 84 hours a week—converting the HEP into an intermediate Plant as opposed to a peaking Plant. This requires a single turbine operating at 66% of its rated capacity. The concept does not exceed Paragraph 15, and when environmental flow is accounted for, the result is a maximum storage requirement of 2.10 Mm³. Once doubled, the maximum Pondage is **4.20 Mm³**.
- (e) In **Scenario 5**, Pakistan has illustrated the results of the methodology for the calculation of maximum Pondage in **Appendix D.3 to D.6**, based on Pakistan's understanding of the Court's interpretation of Paragraph 8(c) in its General Issues Award. Pakistan has adjusted the relevant parameters in this scenario so that the value for maximum Pondage is similar to the value determined in paragraph 92 of **Appendix D**. Pakistan has made the following adjustments:
 - i. There is an even distribution of production throughout the week, with a daily generating time of six hours.
 - ii. Weekday energy is set to 101% of the average weekly energy, with the resulting weekend energy being 97.% of the average weekly energy, consistent with the variations seen in the average weekly load curve for the Northern Region grid determined in **Appendix D**.
 - iii. One unit is offline for maintenance, and the remaining units are running at 85% of their rated capacity, which is their best efficiency point.
 - iv. The weekday peaking flow rate is 196.6 m³/sec and the weekend peaking flow rate is 189.8 m³/sec.

The scenario does not exceed the Paragraph 15 operational constraints and, when environmental flow is accounted for, the result is Pondage of 3.36 Mm³. Once doubled, the maximum Pondage is **7.72 Mm³**.

3.91. What this shows is that, within the boundaries of Paragraph 8(c), modifications to the anticipated load in accordance with the likely operating rules of the HEP within the relevant power system can have a significant impact on maximum Pondage. And, while this is not a conclusion that Pakistan asks the Court to draw with regard to the Kiru HEP, it also shows that India's claim that it is entitled to a 20.22 Mm³ Operating Pool in the case of the Kiru HEP is wildly exaggerated.

3.92. While Pakistan does not ask the Court to reach any conclusions with regard to the Kiru HEP, it does submit that the analytical framework addressed above is appropriate to a more generic finding by the Court regarding the methodology applicable to the determination of installed capacity and anticipated load, and how, once determined, these must be taken into account for the calculation of maximum Pondage for AnnD.3 HEPs.

* * *

CHAPTER 4: THE COA EXCEL TABLE

4.1. As noted in **Chapter 1**, under cover of its letter of 9 December 2025, the Court provided to the Parties what it described as a “table in Excel, reproducing the format of the operating pool calculations table set out in Appendix VII of Exhibit P-0546, and incorporating constraints as set out in the Treaty”.²³²

4.2. In addition to the Excel Table itself, the Court invited the Parties’ submissions, in this phase of the proceedings, on several questions concerning its operation. Pakistan now turns to address those questions.

4.3. Before doing so, Pakistan recalls the preliminary observations it made to the Court in its letter of 9 January 2026,²³³ noting two apparent structural limitations in the Excel Table that constrain its utility. Noting the Court’s observations in response to Pakistan’s 9 January 2026 letter, received on 17 January 2026,²³⁴ as this Memorial was being finalised, Pakistan reserves its position on the issues raised in the correspondence to the Hearing scheduled for 2-3 February 2026.

4.4. Turning to the Court’s questions regarding the Excel Table, the Court’s **first question** is as follows:

“The table appears to show that it is possible to adjust the different variables to produce a required Pondage that ranges from near-zero (running the HEP as a pure run-of-river HEP) to a highest possible volume, but that the highest possible volume is effectively capped due to the Treaty constraints (a) and (b) noted above.”²³⁵ Thus, for any given

²³² Letter from the PCA to the Parties, 9 December 2025, pp. 1-2.

²³³ Letter from Pakistan to the PCA, 9 January 2026, ¶¶ 24-29.

²³⁴ Letter from the PCA to the Parties, 17 January 2026, pp. 2-3.

²³⁵ By “Treaty constraints (a) and (b)”, the Court means that the Pondage required for Firm Power must be (Letter from the PCA to the Parties, 9 December 2025, p. 2):

“(a) calculated based on what can be accumulated when the stream flow of the river is at the [MMD], as set forth in Paragraph 2(i) of Annexure D; and

(b) calculated in a manner that abides by the daily and weekly release requirements set forth in Paragraph 15 of Annexure D; namely:

i. the volume of water delivered into the river below the Annexure D, Part 3 HEP in any given day shall not be less than 30% (or 50% based on location) or more than 130% of the volume received above the HEP during the same 24-hour period; and

ii. the same volume of water received in the river upstream of the HEP in a week must be released back into the river below the HEP in the same week [...].”

HEP, there appears to be a limited range of potential required Pondage, regardless of the choices made for installed capacity and anticipated load.”

4.5. Pakistan agrees with this statement. Constraints (a) and (b)—respectively, the need to calculate Pondage on the basis of an assumed constant inflow at the MMD, and the constraints of Paragraph 15—provide hard limits on the maximum Pondage. The first does so by limiting (for the purposes of the Paragraph 8(c) exercise) the maximum inflow into the HEP’s reservoir in the course of the hypothetical week within which Pondage is to be calculated under the methodology set out by the Court in paragraphs 745 to 748 of the General Issues Award.²³⁶ The second does so by restricting India’s ability to schedule that inflow within the week (i.e., the daily limit) and prohibiting storage between weeks (i.e., the weekly limit).

4.6. Both constraints materially limit the possibilities available to India—the first by reference to HEP site hydrology, and the latter by reference to a daily and weekly time period. That being said, Pakistan notes that, within those limits, the “highest possible volume” of Pondage so far as Pakistan is concerned is very high indeed—particularly once the Pondage required for Firm Power is doubled as the final step of the calculation exercise, as required by Paragraph 8(c).

4.7. The Court’s **second question** is as follows:

“The volume of required Pondage appears to be influenced primarily by adjusting the anticipated load of the HEP (i.e., the distribution over the week of the flow of the water through the turbines so as to generate electrical power). Adjusting the installed capacity appears to have some, but much more limited, effect on the volume of required Pondage.”

4.8. Again, Pakistan agrees. As the analysis of **Section 3F** above shows with respect to the Kiru HEP, relatively small adjustments to the HEP’s anticipated load will have a dramatic impact on the allowable Pondage. As can be seen by **Scenario 1** in that section, a simple rescheduling of India’s projected anticipated load for the Kiru HEP to reflect the demand pattern of the NRG results in maximum Pondage falling from 20.22 Mm³ to 7.71 Mm³—a reduction of some 62%.²³⁷ While assumed MMD inflow and Paragraph 15 are the primary constraints on Pondage within the interpretation of Paragraph 8(c) furnished by the Court in the General Issues Award, within the remaining material factors, anticipated load is

²³⁶ General Issues Award, ¶¶ 745-748.

²³⁷ See *supra*, ¶ 3.91(a).

undoubtedly the most significant. Conversely, installed capacity is likely to have a much more limited impact on maximum Pondage, as illustrated in the discussion of **Scenario 2** in **Section 3F** above.²³⁸

4.9. The Court’s **third question** is as follows:

“Within the range of possibilities for required Pondage indicated by the table:

- a. Do any provisions of the Treaty require that the HEP’s installed capacity be of a certain magnitude or that the anticipated load be distributed in a certain way?
- b. Are there any assumptions as to the operation of run-of-river HEPs generally that should be applied in this regard? (noting in this regard the analysis of the *Baglihar* Neutral Expert, who adjusted downward the maximum Pondage at the Baglihar HEP)?”

4.10. Once again, Pakistan answers to both elements of the Court’s question in the affirmative.

4.11. As to **part (a)** of the question, Pakistan considers that Paragraph 8(c) of Annexure D itself may, circumstances depending, require that the installed capacity of a proposed HEP be of a certain magnitude, and/or that its anticipated load be distributed in a certain way throughout the week. This conclusion is made clear by the interpretation of the provision in the General Issues Award, in which the Court specified that the projected installed capacity and anticipated load of a proposed HEP be “realistic, well-founded, and defensible”, and reflect how the HEP will “actually be operated”.

4.12. As explained in **Section 3C.2** above, such a projection will be driven by the hydrology of the river and—more significantly—the requirements of the power system to which the HEP is expected to contribute. Where these are such that any “realistic, well-founded, and defensible” projection of anticipated load would be limited, or any similar projection of anticipated load be distributed throughout the week in a certain way, then Paragraph 8(c) itself will have the effect that part (a) of this question suggests.

4.13. Indeed, Pakistan considers that the NRG itself has precisely this character—as explained in **Section 3C.3**. The NRG shows no appreciable change in demand between

²³⁸ See *supra*, ¶ 3.91(b).

weekends and weekdays.²³⁹ Rather, the daily load curve for each of the seven days of the week is more or less identical. What this means is that a HEP that operates within this power system cannot spend the ‘low demand’ weekend storing water in anticipation of the ‘high demand’ weekdays, as this distinction does not exist in reality. Rather, it must produce the same amount of power every day of the week in order to ensure that daily demand is met. As any other schedule would not be “realistic, well-founded, and defensible”, Paragraph 8(c) requires that the anticipated load on the HEP be distributed equally throughout the hypothetical week that forms the basis of the Pondage calculation.

4.14. As to **part (b)** of the Court’s question, Pakistan considers that there are, as the question suggests, several general assumptions in the operation of Run-of-River Plants that should be applied in the calculation of Pondage—and especially with respect to questions of anticipated load. One of these was identified by the Neutral Expert in the *Baglihar* case, who noted that “the objective of pondage is to enable operation during peak load hours”, i.e., when demand on the power system is at its highest.²⁴⁰

4.15. This is nothing more or less than an articulation of a principle that Pakistan has already identified—which is that anticipated load must be driven, in part, by the needs of the relevant power system. Put another way, where the power system shows two daily peaks during the day, it does little good for the Plant to be scheduled to produce power in the middle of the night. Similarly, it might be said, where the power system reflects the same demand on the weekend and during the week, there is no basis for the weekend to be used by the HEP operator to allow for greater storage. In the event the power system has to fill a daily peak of four, eight, or 12 hours, as the case may be, then the HEP’s power production capacity must be made available to assist in servicing that peak.

4.16. Beyond the need for the anticipated load to reflect the needs of the power system, Pakistan has in **Section 3C** identified a number of other possible assumptions that may also be

²³⁹ In this, the NRG does not reflect the assumption inherent in the approach of the *Baglihar* Neutral Expert to the calculation of Pondage, namely that “water will be stored in the operating pool during the weekend, when, as is generally the case, consumption is lower than during working days”. *Baglihar Hydroelectric Plant (Pakistan v India)*, Indus Waters Treaty Annexure F, Neutral Expert Determination, 12 February 2007, **PLA-0002**, ¶ 6.5.2. With the general rule not applicable, a different approach to HEPs linked to the NRG is, in Pakistan’s submission, warranted.

²⁴⁰ *Id.*, ¶ 6.5.3.

material to producing a “realistic, well-founded, and defensible” projection of anticipated load for the purposes of Paragraph 8(c). These include, but are not limited to, the following:

- (a) The anticipated load should be scheduled such that the Plant can make a meaningful contribution to meeting demand on the power system, whether as a peaking Plant (four to eight hours of daily generation) or an intermediate Plant (eight to 12 hours of daily generation).
- (b) The anticipated load should take account of the fact that within the selected mode of generation, power production at the Plant’s full installed capacity may not be the most economically efficient way to operate the Plant, especially in the dry season when Pondage is required, and that production at a reduced capacity with higher efficiency may be optimal.
- (c) The anticipated load should take account of the fact that, in the dry season when Pondage is required, it is not uncommon to have a turbine offline for maintenance, or other turbines offline to allow for a more economically efficient mode of power production.

4.17. All of these assumptions, where appropriate, will assist in the development of a projection of anticipated load that reflects how a proposed Indian HEP will “actually be operated”—in line with the interpretation of Paragraph 8(c) developed by the Court in the General Issues Award. Ultimately, however, each Plant is unique—and assumptions that are appropriate in some cases may not be in others. However, as the Court noted in the General Issues Award, the Treaty “sets standards that must then be implemented in good faith by the Parties in the context of a specific HEP”.²⁴¹

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²⁴¹ General Issues Award, ¶ 705.

CHAPTER 5: CONCLUDING REMARKS AND FINAL SUBMISSIONS

5.1. The Indus Waters Treaty was the solution to a serious rupture in relations between the nascent Pakistan and India following partition and independence in 1947. It was the carefully brokered compact that had the purpose of dividing the waters of the Indus Basin between the two States and bringing certainty to their respective utilisation of the waters of the rivers. Regrettably, while the Treaty worked well in its early years, its application became mired in technical disputes, largely around the interpretation and application of the design criteria in Paragraph 8 of Annexure D with respect to new Run-of-River HEPs.

5.2. The present political impasse between the Parties over the application of the Treaty bears resemblance to the events of 1948, although far more serious. There is, though, no peaceful alternative to the Treaty in relations between the Parties concerning the use of the waters of the Indus Basin rivers. Pakistan's purpose in pursuing clarity and certainty regarding the interpretation and application of the Treaty through the independent, third-party adjudicatory procedure of the present Court and Neutral Expert, even as India has now set its face against both, and seeks to diminish and undermine the Treaty more generally, is driven by a belief that clarity and certainty is required with respect to existing cornerstone legal commitments that apply between the Parties before new arrangements can be spoken about. This is not tilting at windmills or scratching at sores or using adjudicatory proceedings as a cudgel to advance grievances. It is a reflection of a principle that the powerful—those who control the upstream heights of arterial waterways—cannot at will and whim trample on settled, constitution-like rights to serve political agendas. It is a statement that commitments of the kind safeguarded by the Treaty cannot be eviscerated without proper cause and process, and in breach of the law.

5.3. Pakistan hopes that the day will come when it will be possible for the Parties to sit together to address the future, and it is committed to working to this end. These proceedings before the Court are important markers on the route to such an accommodation, even if, in the moment, that does not appear to be the case.

5.4. In its General Issues Award, the Court provided a compelling analysis and reached sound conclusions—including those that rejected contentions that had been advanced by Pakistan—that provide a foundation for a return to legality in relations between the Parties over

the use of the waters of the Western Rivers. The brick missing in that wall of general interpretations concerns the issue that is now engaged by the present phase of the proceedings, namely, the basis on which India must determine the installed capacity and anticipated load of a proposed AnnD.3 HEP, and, once determined, how these elements are to be taken into account for purposes of the calculation of maximum Pondage.

5.5. As noted in opening this Memorial, Pakistan continues to struggle to arrive at a reliable appreciation of a methodology underpinning this conclusion by the Court on the calculation of maximum Pondage as regards installed capacity and anticipated load. But the Court has spoken and the interests of both Parties will now be best served by clarity and certainty from the Court on the one element that remains outstanding.

5.6. As the Court's various conclusions on the calculation of maximum Pondage are closely intertwined, and located in both the General Issues Award and the Clarification Decision, Pakistan requests the Court, in the interests of clarity and certainty, to adopt a *dispositif* in the award to come in this phase that sets out a consolidated finding on the issue of the interpretation of Paragraph 8(c) of Annexure D, and the calculation of maximum Pondage, that incorporates its prior findings on this issue. To facilitate this, Pakistan's Final Submissions below reproduce in blue text those elements of the Court's prior findings that remain untouched by the preceding analysis, leaving in black text those elements that Pakistan requests the Court to adjudge and declare anew in these proceedings.

5.7. To this end, having regard to the analysis and submissions advanced in this Memorial, Pakistan respectfully requests the Court to adjudge and declare as follows:

When designing an Annexure D, Part 3 HEP, India is limited to a maximum Pondage pursuant to Paragraph 8(c) of Annexure D of the Indus Waters Treaty taking into account the following restrictions and interpretative principles:

- (1) "Firm Power", shall be calculated as the hydro-electric power corresponding to the minimum mean discharge at the site of the Plant, calculated in accordance with Paragraph 2(i) of Annexure D;
- (2) "Pondage required for Firm Power" shall be calculated based on the water that can be accumulated and released at the site of India's proposed Annexure D,

Part 3 HEP 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 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) A “realistic, well-founded, and defensible” projection of the proposed HEP’s installed capacity and anticipated load:
 - (i) must correspond to how the HEP will actually be operated once constructed;
 - (ii) cannot be hypothesised in a manner that serves to inflate the maximum Pondage; and
 - (iii) must be established by India on the basis of the information that it is required to communicate to Pakistan with respect to the HEP pursuant to Paragraph 9 and Appendix II of Annexure D;
- (d) The question of how the HEP will actually be operated must be determined by reference to the hydrology of the HEP site and the needs of the power system to which it will be expected to contribute during the dry season;
- (e) The needs of the power system will be determined by reference to a load curve representative of typical demand during the dry season;
- (f) When determining the installed capacity and anticipated load in light of the needs of the power system during the dry season, account must be taken of, *inter alia*:

- (i) distribution of demand as between weekends and weekdays within the power system;
 - (ii) the need for the HEP to make a meaningful contribution to the power system on a daily and weekly basis at times of peak demand, and that the daily dispatch schedule be realistic considering the operation of the HEP within the overall system; and
 - (iii) the operational requirements of the HEP's turbines, including the need for:
 - α. ramp-up and ramp-down time;
 - β. operation at the best efficiency point; and
 - γ. maintenance;
- (g) “Pondage required for Firm Power” shall be calculated in a manner that abides by:
- (i) the daily and weekly release requirements set out in Paragraph 15 of Annexure D; and
 - (ii) India's obligation to prevent significant harm to the environment through provision of an environmental flow specific to each HEP site; and
- (3) “maximum Pondage” shall be no more than twice the Pondage calculated in accordance with the above requirements.

**Memorial of Pakistan on the Second Phase on the Merits
Pursuant to ¶ 2.2 of Procedural Order No. 17
19 January 2026**

Respectfully submitted,



(MANSOOR USMAN AWAN)

Attorney General for Pakistan

Agent of Pakistan