NTESMO

Attachment 7.1

Transitional Tools Compliance Summary

Endorsement

Name	Job Title/Role	Signature	Date
Simon Middleton (Endorsement)	Senior Manager-Electricity and Market Reform (Core Operations)		24/12/24
Michael Besselink (Approver)	Executive General Manager (Core Operations)		20/12/24

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1 Executive summary

Operation of the Darwin-Katherine Power System (DKPS) has become more complex as large amounts of renewable generation displace traditional gas fired generation and the inherent essential system services (ESS) that they provide.

New renewable and supporting technologies, such as battery energy storage systems (BESS) and synchronous condensers, are being introduced to replace the forgone ESS. This requires new ways to determine the overall system need and the balance of energy and ESS.

System controllers are increasingly being required to review, analyse, schedule and dispatch the various energy and ESS components needed to safely, securely, reliably and economically operate the system in real time. This is no longer possible with the existing manual process and set of tools.

Power and Water's approach has been to research, develop and implement a series of transitional tools to better support more complex scheduling and dispatch a growing array of electricity resources until a more permanent, robust solution is delivered. Whilst these transitional tools assist in the short to medium-term, they do not provide a sufficiently robust, integrated solution to manage the system beyond 2027. To date, the transitional tools have been incrementally developed in two stages, namely:

- Stage 1 (2019 – 2024): Design and implementation of essential tools required to enable forecast of operational demand, tools that enable compliance to the generator performance standard (GPS), and the forecast capacity dispatch system that enables grid-connected solar generators to connect and export energy to the regulated electricity system in a controlled manner.
- Stage 2 (2024 – 2027): Expansion and evolution into a broader set of tools that support the increasingly complex scheduling and dispatch requirements for the generator controllers. These tools include enhancement to the forecasting tools, automated proportional energy dispatch, FCAS application tool, enhancement of demand forecasting, and real-time system security monitoring tools.

NTESMO has adopted a staged approach to the development of scheduling and dispatch tools to align with the incremental development of the power system that assures regulatory compliance at significantly lower cost as well as mitigation of risk that would otherwise be incurred if there were to be a full implementation of an integrated scheduling and dispatch system as defined by the Territory Dispatch Engine (TDE). Benefits extend to maintaining requisite system security and reliability whilst enhancing scheduling and dispatch efficiency. Furthermore, implementation of these tools presents a key enabler to giving effect to anticipated Government electricity market reforms that have been under way throughout the development and implementation of these tools.

This compliance statement covers Stage 1 of the transitional tool developments that were completed and implemented by the end of the 2019 to 2024 Regulatory Period. The Stage 1 transitional tools development and implementation incurred a combined expenditure of $0.881 million, within 1% of approved budget. This compliance statement addresses the Utilities Commission's (Commission's) requirements outlined in its decision paper for the depreciated actual capital expenditure to be added to the opening RAB.

2 Project Background

2.1 Stage 1 Transitional Tools overview

The transitional tools developed by NTESMO during the 2019 to 2024 Regulatory Period for which NTESMO is seeking ex-post consideration include[1]:

- Darwin-Katherine Demand Forecast (DKDF) Stage 1.
- Forecast Compliance Tool.
- Capacity Forecast Dispatch System v1.0, v1.5 and v2.0.

The transitional tools have been developed on a least-cost incremental basis to ensure minimum viability whilst maximising efficiency. The transitional tools have been developed and implemented to ensure that NTESMO continues to meet its regulatory obligations regarding the maintenance of security and reliability of the regulated power systems. Had the investment in the transitional tools not been made over the past regulatory period, and in the face of the power system transition underway in the DKPS, NTESMO would not have been able to provide sufficient and adequate operational capability for the DKPS to function securely and efficiently within acceptable levels of risk.

Since inception of the I-NTEM, the DKPS scheduling and dispatch process has functioned on a predominantly manual basis by way of spreadsheet applications. The advent of intermittent renewable generating systems, including small-scale inverter-based technologies and large-scale generating systems, has precipitated increasing complexity for scheduling and dispatch such that the manual tools and processes no longer sufficient to maintain requisite levels of capacity to meet increasingly volatile demand and standby reserves for essential system services (ESS).

NTESMO conducted a research and prototype development project2 that culminated in determining priority developments required to maintain power system security as well as meet regulatory obligations. This led to the establishment of a staged approach for essential scheduling and dispatch capability requirements that serve to maintain power system security whilst enabling newly licensed generator participants to access the regulated power system in an equitable manner as follows:

- Accurately forecast impending demand volatility associated with fluctuation of aggregated that directly affects frequency regulation and contingency reserves.
- Deliver real-time generator capacity forecast compliance to meet the newly established generator performance standard obligations as prescribed in the Network Technical Code (NTC) that are a pre-requisite for licensed generators accessing the power system.
- Provide a robust real-time dispatch functionality to centrally dispatch grid-connected solar generators below their variable capacity forecast and taking into account system constraints.

During the research and prototyping undertaken, NTESMO established that scheduling and dispatch tools bespoke to the unique nature and scale of a power system such as the DKPS had never been developed before elsewhere in other jurisdictions. The impact of intermittent renewable generating systems in such an isolated power system presented significant challenges and had never been contemplated before. The

[1] Note the FCAS application tool development commenced in the 2019-24 Regulatory Period and will be implemented as part of the second stage of transitional tools during the 2024-27 Regulatory Period.
[2] Prototype Market Systems Project – reference CMD90008

staged development of the transitional tools has followed an iterative development from early prototyping through to development and implementation of operational tools. The iterative approach has presented important findings that has averted substantial expenditure on more comprehensive systems until the application of each of the tools has yielded the desired outcomes. The evolution of the tools on a staged basis has given effect to the scheduling and dispatch system roadmap that culminates in the development and implementation of the TDE.

2.2 Alignment of Transitional Tools with the Scheduling and Dispatch Systems Roadmap

The Stage 1 Transitional Tools align directly with the Scheduling and Dispatch Systems Roadmap and Regulatory Business Case for the Stage 2 Transitional Tools and Stage 1 TDE. The transitional tools when considered as a set of discrete projects represent a short to medium-term series of no regrets investments that are required to meet NTESMO's legal responsibilities under the Electricity Reform Act 2000 (ER Act), the System Control Technical Code (SCTC) and the NTC.

The transitional tools provide NTESMO with the ability to manage the entry of new generation market participants in an orderly manner. These transitional tools have been refined over time as part of the evolution of regulated electricity market in the DKPS. These tools represent a dynamic response to a changing wholesale market.

The capability inherent in Stage 1 transitional tools allows NTESMO to acquit its market operation and system control role in the DKPS given the physical wholesale electricity market assets currently operating in this system. This includes mainly gas and intermittent renewable generating systems, plus a recently operational large-scale battery and a small number of household/commercial batteries. Future investment in synchronous condensers is also foreshadowed.

However, NTESMO's transitional scheduling and dispatch tools, which continue to entail highly manual processes, will not have the capability to deliver system operator functions under the expected market design features of the prospective (post-reform) NTEM. This includes not being able to co-optimise the supply of energy and Essential System Services to meet demand in accordance with the future NTEM design.

While the suite of transitional tools may not provide the full functionality envisioned by NTEM reform as it is currently understood, which will require investment in a security constrained economic dispatch engine capable of real-time market evaluation of offers to produce a least-cost dispatch of online resources, they will comprise the foundations for a large number of functions and data processing and parameter estimation requirements that will underpin the development of the TDE. Most of these transitional tools will continue to provide vital inputs to the TDE.

3 Identified need

This section provides a brief outline of the identified need that each of the transitional tools addresses.

3.1 Prototype market systems (CMD90008)

The Prototype market systems project was undertaken to investigate and create prototypes of feasible technology solutions under the I-NTEM market rules and procedures to assure NTESMO's continued operation of the regulated power systems until a Territory Dispatch Engine (TDE) could be developed and delivered. While the Prototype Market Systems project has been critical in informing the development of the scheduling and dispatch systems roadmap, the initial regulatory proposal did not seek to recover this initial expenditure, nor does this revised regulatory proposal.

3.2 Darwin-Katherine Demand Forecast Stage 1(CMD90020)

As a direct result of the increasing uptake of small-scale intermittent renewable generating systems, power system demand profile has become more volatile due to rapidly changing local weather conditions. At the same time, the connection of intermittent grid connected renewable generation also adversely impacts the generation capacity profile certainty. The intensifying impact of weather patterns on power system security in conjunction with the change in the behind the meter penetration of solar PV necessitates NTESMO's need to increase its capability to accurately forecast power system demand utilising a combination of accurate weather and forecast capacity inputs.

Traditionally System Control managed the Darwin-Katherine Power System (DKPS) by using generic weather forecasts provided by Solcast as their reference point, supported by the generator controller's expertise and power system risk notices for holding required quantities of spinning reserve to maintain system security. These systems and processes did not provide System Control sufficient confidence to further optimise spinning reserve below planned levels, which were deemed to be conservative. There was a growing risk that during certain times, spinning reserve levels may be insufficient to meet likely volatility in demand due to rapidly changing localised weather conditions. Similarly, there are other instances whereby spinning reserve levels are greater than that required to adequately ensure system security and reliability.

A Darwin-Katherine demand forecast tool (DKDF) developed with a high level of accuracy and in which System Control has sufficient confidence, is now used to inform System Control of more accurate forecast demand to preserve system security through centrally scheduling and dispatching grid connected generators. The forecast provides improved visibility and vital decision support, to accurately project the aggregated effect of the small-scale intermittent renewable generating systems on the system.

For the reasons noted above, the development and implementation of the DKDF tool was required as soon as possible. The DKDF project was planned to be a staged implementation. DKDF Stage 1 delivered the development of the DKDF tool on an external web-based platform. The DKDF provides the System Controller with improved visibility and vital decision support to accurately project the aggregate effect of the BTM solar on the power system. This in turn provides a more accurate demand forecast which enables improved central scheduling of generator capacity to maintain requisite standby reserves.

The forecasting services, data integration and display format of the DKDF tool is a transitional solution that is subject to further enhancement as part of the 2024/27 DKDF Stage 2 project, and its evolution toward full forecasting and regulation reserve capabilities and as part of the TDE.

3.3 Forecast Compliance Tool (CMD20021)

The Forecast Compliance Tool (FCT) computes the compliance requirements set out in the Generator Forecasting Compliance Procedure3 that gives effect to the Generator Performance Standard (GPS)

[3] Forecasting Compliance Procedure - Final Procedure following consultation (ntesmo.com.au)

prescribed in clause 3.3.5.17 of the NTC. The FCT determines real-time generator forecast compliance and provides the generator controller with the necessary visibility and decision support to make real-time determinations regarding dispatchable capacity.

The NTC obliges generator participants to provide accurate capacity forecasts to System Control that enables scheduling of sufficient residual capacity in a timely manner to meet forecast operational demand on an interval basis. This obligation represents a fundamental element of the generator performance standards that directly impacts power system security taking account of often intermittent nature of VRE that is subject to localised weather conditions.

The FCT requires inputs from the real-time energy management system (EMS) which includes the generator participant forecasts so that the output can be computed. The FCT detects forecasting non- compliance and calculates a percentage generator de-rating that can be applied by the System Controllers within the EMS to constrain a generator's output.

In the absence of the FCT, system control operators would have no real time decision support to validate the application of real-time generator constraints due to a forecast non-compliance. Application of the FCT has direct commercial consequences for licensed generator participants; therefore, the constraint should be calculated through an auditable systematic and procedural approach. Had the FCT not been developed, the System Controller would not have been compliant with its regulatory obligation to monitor and manage forecast compliance.

3.4 Capacity Forecast Dispatch System (CMD90022)

The Capacity Forecast Dispatch System (CFDS) was developed as an automated application that dispatches committed variable capacity generators, by way of an accurate capacity forecast as per the GPS prescriptions. The development of the CFDS has been undertaken iteratively, from initial prototype development, to progressively increase its functional capability. The initial prototype of the CFDS was developed to provide the required functionality to the first connection solar generator, Katherine Power Station, ahead of the substantial development of the enduring tool to manage multiple simultaneous forecast-derived centralised dispatch instructions in an automated manner.

CFDS v2.0 was developed and implemented to reduce the cognitive loading of the generator controller and mitigate risk of real-time capacity shortfalls as well as insufficient standby reserves to meet both regulating and contingency services. In addition, the CFDS v2.0 was developed to provide greater situational awareness including an aggregate view of solar generation with a hierarchical regional and unit views as well as more detailed information, events and alarms for generators, capacity and reserves. The CFDS v2.0 mitigates the need for generator controllers to manually determine an aggregated view of the generator capacity as it generates an integrated view across multiple solar facilities.

Whilst the CFDS v2.0 presents a significant improvement in the centralised scheduling and dispatch of generators it does not provide the requisite capability to undertake assessment for provisioning regulating and contingency frequency control capability (FCAS). This functionality is being developed as part of the FCAS tool.

4 NTESMO's regulatory compliance obligations

As the System Controller, NTESMO has obligations under the ER Act the System Control licence and the System Control and Technical Code (SCTC) to perform "the function of monitoring and controlling the operation of the power system with a view to ensuring that the system operates reliably, safely and securely":

- Section 38(1) of the ER Act states that the System Controller must do this in accordance with the SCTC.
- The System Control Licence (condition 11.1) states that the licensee must comply with all applicable laws and the provisions of the Network Access Code, the SCTC and the NTC.
- The SCTC establishes (among other things):
  - Obligations on the System Controller, Market Operator and other power system entities and market participants associated with operation of the power system and the market.
  - Performance standards of power systems in the NT
  - Power system operational requirements
  - Principles for scheduling and dispatch
  - Procedures and guidelines relating to various aspects of power system and market operations, including the Secure System Guidelines, and Dispatch and Pricing Procedures
- The NTC and Secure System Guidelines (SSG) establish performance standards and technical requirements (e.g. acceptable voltage limits and frequency ranges) that apply to the operation of the power system and to plant connected to the electricity network.

Whilst these documents do not explicitly require the System Controller or Market Operator to develop a dispatch engine or dispatch tools[4] collectively, the Codes, Standards and guidelines create a wide range of standards and technical requirements pertaining to the operation of the power system and market, many of which directly impact on the functions that must be performed by NTESMO in order to meet its legal and regulatory obligations in relation to system control and market operations. Scheduling and dispatch are one of NTESMO's key functions in this regard.

There are obligations contained, for example, in the ER Act and the SCTC that are relevant to and drive the requirement for the proposed projects to enhance NTESMO's scheduling and dispatch systems.

For example:

- Section 38 of the ER Act, and clause 1.7.4(b) of the SCTC place clear obligations on NTESMO to maintain a reliable, secure, stable and safe power system.
- SCTC 1.7.4(d) makes NTESMO responsible for establishing operational protocol(s) and arrangements for dispatch and to maintain system security, effectively making NTESMO responsible for ensuring its scheduling and dispatch systems/processes evolve to meet the challenges presented by the additional complexity and volatility of the new intermittent renewable energy sources and storage devices.
- SCTC 3.3.2 obliges NTESMO to arrange the required ancillary services (or ESS) to maintain power system security – effective management of ESS including the co-optimisation of dispatch for ESS and energy is becoming increasingly important due to the increasing volatility of supply and demand.
- Specification of System Constraints in accordance with Clause 3.9.1 and Clause 3.9.2 of the SCTC respectively.

[4] It is generally appropriate that regulatory Codes do not explicitly specify what processes or systems a system controller must use to meet their legal and regulatory obligations. This is necessary to provide the system controller with the ability and flexibility to update, enhance or otherwise choose what systems it implements to best meet its obligations without a requirement for a formal Code change. Codes may, however, on occasions require that system controllers consult or provide adequate notice of changes to its systems where such changes may have a significant impact on other system or market participants.

- Forecasting in accordance with Clause 3.11
- SCTC 3.11.2 obligates NTESMO to produce short and medium-term demand forecasts as well as a daily load forecast.
- SCTC 6.1 requires NTESMO to undertake short-term operational planning to achieve system security and stability and to ensure the system is operating in an efficient manner.
- SCTC 3.7 requires NTESMO to (accurately) assess the overall stand-by availability in the power system and where necessary declare a lack of stand-by generation as well as take necessary measures to restore sufficient standby reserves.
- SCTC 4.3 defines the dispatch principles and criteria that need to be considered in the dispatch process, highlighting the complexities involved in forecasting, constraints, treatment of ESS in real-time, commitment and dispatch, decision making for commitment/decommitment, required pre-dispatch and real-time dispatch outputs and determination of market prices, etc. Clearly, the optimisation process is becoming more complex and increasingly difficult to manage manually in real time – driving the business need for a more automated TDE.

Given these legislative and Code obligations, ongoing investment by NTESMO in the transitional tools has been required from a compliance perspective and to ensure an ongoing stable, secure and reliable power system is maintained. Should the investment in the tools not have been made, and in the face of the transition of the DKIS toward a high volume of intermittent renewable generating systems, NTESMO could not have sufficiently ensured operational capability to maintain the regulated electricity system to remain stable, secure and reliable.

Manual processes for scheduling and dispatch of resources would no longer enable NTESMO sufficient capability to manage multiple facilities entering the market whilst making necessary changes to provisioning ancillary services to meet dynamic requirements. The implementation of the first stage of transitional tools has enabled NTESMO the ability to transition toward a more dynamic scheduling and dispatch of resources in an orderly manner and continue to meet its regulatory obligations.

5 Benefits identification

Notwithstanding meeting the NTESMO's ongoing regulatory compliance obligations as the primary driver for investing in these transitional tools, there are several additional benefits that the implementation of these tools in aggregate provide:

- Collective application of these tools serves to reduce the risk of involuntary loss of supply and at worst case, black-out of the power system. Such a loss is becoming more likely with the increasing volume of intermittent renewable energy resources being integrated with the power system. The low cost of investment is considered a prudent and efficient means to mitigate such risk.
- These tools, implemented effectively, serve to reduce the cognitive overload of generator controllers and improve their situational awareness in light of scheduling decisions remaining to be manual.
- These tools unlock insights into the evolving behaviour of the power system that are beneficial to both generator controllers as well as participants that serve to improve operations as well as explore innovative means to maintain stable system operation.
- The application of these tools affords greater integration of renewable energy sources with indirect benefits arising from improved economic efficiency through optimised dispatch efficiency. To fully leverage such benefits, however, a fully integrated scheduling and dispatch engine remains a pre-requisite due to the complexity of variables that need to be considered.

- These tools align with the intent of the NT Government reform agenda and provide a pathway for orderly transition toward electricity market reforms.

Each of the transitional tools implemented as part of Stage 1 during the 2019 to 2024 regulatory period present a range of unique benefits and these have been summarised in Table 1 below.

Table 1: Transitional Tools cost / benefits

Transitional Tool	Nominal Cost	Benefit
Darwin-Katherine Demand Forecast Stage 1	$211,750	• Reduction of the risk of provisioning insufficient reserves ahead of weather-related demand fluctuations. Enhanced grid stability and frequency control through improved situational awareness in real time for the generator controllers to schedule provision of sufficient standby reserves in a timely manner that provide for increased frequency regulation attributable to fluctuation of demand due to unforeseen weather changes. • Provides a basis for more sophisticated management of reserves to account for integration of intermittent renewable generating systems and support an orderly transition to renewable energy resources. • Providing a more sophisticated and accurate forward demand forecasting capability enables improved decision-making and reduces cognitive overload of generator controllers. This drives improved economic efficiency from better utilisation of committed generators and improvement of centralised unit commitment. • Application of a software as a service application (SaaS) that is being continually improved by an industry specialist vendor avoids significant ongoing costs associated with the development of an in-house demand forecasting system. • Application of the DKDF provides valuable improvement of the generator controller experience, thereby enhancing their capability to better manage the power system.
Forecast Compliance Tool	$297,217	• Provides a robust and easily auditable system for determining forecast compliance in near real-time to avert disputes between generator participants when forecasts are not compliant to the prescription of the GPS. • Enables greater visibility and transparency of the impact of variable capacity generator participants on the power system which provides a basis for improving individual capacity forecasting capability. Provides a means to expedite capacity forecast improvements in a timely and auditable manner.

Transitional Tool	Nominal Cost	Benefit
		• Provides a basis for which generator participants could secure a more consistent revenue streams through improved forecasting of capacity. • Provides real-time visibility of capacity forecast capability for generator controllers to support decision making regarding the scheduling of residual generator capacity.
Capacity Forecast Dispatch System V2.0	$372,333	• Enables a robust and secure means for the centralised dispatch of predominantly variable capacity generators whilst preserving real time power system stability. Without such a system, it would not be possible to dispatch multiple large-scale grid-connected solar generators in a secure and reliable manner. • Regulates the ramping of variable capacity in an orderly manner to avert risk of power system disturbances and induced contingency events. • Provides essential information to inform generator controllers in making well informed decisions regarding centralised scheduling and dispatch of fast-start synchronous generator capacity. • Improves dispatch of the power system with likely economic benefits arising from better utilisation of committed generator resources.

6 Governance, delivery, and expenditure

The development of each of the projects considered in Stage 1 of the transitional tools have been subject to the stringent business case approval framework which is established through the Board approved Project Investment Delivery Management Framework (PIDF) which applied at the time[5]. The projects were all classified as Category C (< $2 million expenditure) as per the PIDF and therefore governed by a program steering committee with requisite financial delegation of authority to approve investment milestone stages. The projects were subject to governance under the joint EMS, Transitional Tools and Territory Dispatch Engine Project Steering Committee (Steering Committee) to ensure alignment with all initiatives regarding operational technology uplift, ICT support and power system management. The importance of the ongoing transitional tools project is underlined by the Steering Committee being chaired by Executive General Manager, Core Operations (EGM), with representation from senior members from across Power and Water.

The projects were subject to all gateway stages being approved by the EGM with monthly progress being reported to the Project Board. The gateway milestones for each of the projects are presented in Table 3

[5] See Chapter 2 of the revised regulatory proposal for further details of Power and Water's governance framework

below[6]. The projects were all delivered within their respective business case budget approvals as per the Project Investment Management Standard.

6.1 Project investment milestones and review

The projects were delivered to all requisite investment gateway milestones required for Category C projects, as evidenced in Table 2 below. Key observations regarding the project gateway milestones for each of the projects are summarised below.

6.1.1 DKDF Stage 1 (CMD90020):

The project investment milestones for the DKDF are presented in Figure 1 below.

Figure 1: DKDF project investment milestones

- The project is classified as a minor project and hence the final business case accounted for the entire project budget inclusive of project development costs. A project budget of $0.195 million was approved. The final project implementation incurred an expenditure of $ 0.212 million, which was within 9% of the approved budget[7].
- The final project implementation was delayed by 3 months due to necessary contractual processes and cyber security validation of the vendor at the planning stage as well as final integration of the system. This, however, did not adversely impact NTESMO nor did it affect the expenditure.
- The project was successfully implemented and represents an essential element to the scheduling and dispatch of generator participants.

6.1.2 FCT(CMD90021)

The project investment milestones for the FCT are presented in Figure 2 below.

Figure 2: FCT project investment milestones

[6] Project gateway documentation available upon request
[7] Project gateway documentation available upon request

- The project is classified as a minor project and hence the final business case accounted for the entire project budget inclusive of project development costs. A project budget of $0.3 million was approved. The final project incurred an expenditure of $ 0.297 million, which was within the approved budget.
- The final project implementation was delayed by 8 months due to significant ICT uplift required for the corporate systems required to support the application. These delays were identified and approved through project variation requests submitted to the Project Board. The delays did not adversely affect the project expenditure nor did these affect NTESMO's compliance obligations. The project was implemented in January 2023 and finalised by March 2023.

6.1.3 CFDS V2.0 (CMD9022)

The project investment milestones for the CFDS V2.0 are presented in Figure 3 below.

Figure 3: CFDS V2.0 project investment milestones

- The project is classified as a minor project and hence the final business case accounted for the entire project budget inclusive of project development costs. A project budget of $0.33 million was initially approved as part of the final business case in March 2023. A project variation request of an additional $50,000 for an escalation of internal support costs was approved in April 2024 culminating in an approved budget of $0.38 million. The final project implementation incurred an expenditure of $ 0.372 million, which was within the approved budget.
- The final project implementation was justifiably delayed by 8 months. The revision of the schedule was covered within two project variation requests during implementation and the primary reason for the delay was due to a loss of core expertise both internally and externally for the planning, development and configuration of the CFDS that is embedded within the EMS. The revision of schedule resulted from the mitigation of risks associated with reconfiguring the operational EMS. The schedule variance did not adversely impact NTESMO's regulatory obligations, nor did it prevent generator participants accessing the power system.
- Whilst the project has been practically completed it remains subject to a final post implementation review, which is imminent at the writing of this compliance statement. The implementation of this project is a pre-requisite to centralised dispatch of multiple grid-connected solar farms based upon capacity forecast.

Table 2: Transitional Tool Project Investment Milestones

Project	Investment Milestone	Approval	Date	Phase Approved Value ($ millions)	Total Value Approved ($ millions)
DKDF Stage 1 (CMD90020)	Final Business Case [redacted]	Executive GM Core Operations	20/09/2022	0.195	0.195
	Post Implementation Review [redacted]		31/03/2023	0.212*	0.195
FCT (CMD90021)	Final Business Case [redacted]	Executive GM Core Operations	11/02/2022	0.300	0.300
	Project Variation 1		03/08/2022	0.300	0.300
	Project Variation 2		16/12/2022	0.300	0.300
	Post Implementation Review [redacted]		08/12/2023	0.297*	0.300
CFDS V2.0 (CMD90022)	Final Business Case [redacted]	Executive GM Core Operations	30/01/2023	0.330	0.330
	Project Variation 1		27/10/2023	0.330	0.330
	Project Variation 2 [redacted]		02/04/2024	0.380	0.380
	Post Implementation Review		TBD	0.400*	0.380

* Actual Expenditure

[redacted]

6.2 Project expenditure

The overall project expenditure is presented in Table 3 below. The initial regulatory proposal accounted for aggregate forecast project expenditure of $0.65 million for only two years of the 2019 to 2024 regulatory period, namely 2021/22 and 2022/23. Since reviewing the actual aggregate project expenditure for the entire 2019 to 2024 regulatory period, NTESMO has accounted for an expenditure of $0.909 million over three years.

6.2.1 Project implementation cost

As can be seen in Table 3, the final implementation cost of the combined projects was $0.881 million against a combined approved project budget of $0.875 million. There was a combined over expenditure of less than 1%, well within the acceptable contingency value for minor projects.

Table 3: Transitional tool expenditure included in the NTESMO Revised Regulatory Proposal

Transitional Tool Project	Project Reference	2021-22 ($ million)	2022-23 ($ million)	2023-24 ($ million)	Total ($ million)
DKDF Stage 1 (CMD90020)	CMD90020	0	0.212	0	0.212
FCT (CMD90021)	CMD90021	0.225	0.072	0	0.297
CFDS V2.0 (CMD90022)	CMD90022	0.029	0.029	0.315	0.372
Total:		0.254	0.313	0.315	0.881

6.2.2 Ongoing operational expenditure

Ongoing operational costs are not included in the expenditure claimed as per the Commission's final decision. The forecast ongoing operational expenditure for stage 1 of the Transitional Tools for the 2024 to 2027 regulatory period is accounted for in the Operational Expenditure Forecast[8].

[8] Attachment 5.2, Section 4.4.3

Power and Water Corporation

NT Electricity System and Market Operator
1800 245 092
market.operator@powerwater.com.au

ntesmo.com.au

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