

System operator capital plan

Information paper to support the 2013/14
appropriations consultation

9 October 2012



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Executive summary

The Electricity Authority (Authority) is currently consulting on its proposed appropriations for the 2013/14 financial year. \$48.421 million of the proposed \$68.646 million of the appropriations for electricity industry governance and market operations is intended to fund the activities of the various service providers the Authority contracts to operate the electricity market. The largest of these service provider roles is that of the system operator, who is responsible for the real-time co-ordination of the electricity system (i.e. ensuring electricity supply and demand remain balanced in a secure manner). The Electricity Industry Act 2010 designated Transpower as the monopoly provider of the system operator function.

Costs for the system operator service provider are forecast to increase by approximately \$2.863 million in the 2013/14 year to a total of \$38.137 million. The majority of this increase relates to the approximately \$25 million of capital expenditure the system operator expects to undertake over the 2011/12 to 2013/14 financial years.

This paper provides information on the contractual arrangements and three-year capital expenditure planning process that set the fees paid to the system operator, describes the types of capital projects being undertaken and discusses some improvements the Authority and system operator would like to make to the capital expenditure arrangements. A full list and short description of all of the projects in the capital plan are also provided.

The Authority is looking carefully at both the magnitude of the system operator's costs, including the costs arising from capital expenditure and the limits to the Authority's ability to influence these costs under the current statutory and contractual arrangements. In principle, the Authority considers capital investment that increases costs to levy-payers should either result in an increase in service quality or an increase in the scope of services provided.

While no specific consultation is being undertaken on the contents of this information paper, comments can be provided through submissions on the Authority's consultation paper '2013/14 Appropriations and Work Priorities, and EECA Work programme'.

1 System operator costs are increasing

- 1.1 The Electricity Authority (Authority) is currently consulting on its proposed appropriations for the 2013/14 financial year.¹ The main appropriation is for electricity industry governance and market operations.² This appropriation encompasses the Authority's oversight of the operation and governance of New Zealand's electricity market under the Electricity Industry Act 2010 (Act), the Electricity Industry Participation Code 2010 (Code) and regulations, including the operations of the following market operations service providers:
- (a) system operator
 - (b) pricing manager
 - (c) clearing manager
 - (d) reconciliation manager
 - (e) FTR manager
 - (f) the registry, and
 - (g) the wholesale information and trading system provider.
- 1.2 System operator fees (encompassing both operating and capital-related expenses) represent a significant proportion of the electricity industry governance and market operations appropriation. Transpower is designated as the monopoly provider of the system operator function under the Act. The terms under which Transpower provides the system operator function to the Authority are specified in the system operator service provider agreement (SOSPA).
- 1.3 The Authority is seeking to increase the electricity industry governance and market operations appropriation by \$4.740 million for 2013/14 (an increase of approximately 7.4%). This proposed increase includes approximately \$2.863 million of system operator costs, which comprises an additional \$2.315 million to fund capital-related system operator costs and an additional \$0.548 million for the consumer price index (CPI) adjustment that is provided for in the SOSPA.

Table 1: Electricity industry governance and market operations appropriation: cost breakdown

All figures in \$million	Actual	Budget	Forecast
	2011/12	2012/13	2013/14
System operator—operating expenses	23.189	23.541	24.089
System operator—capital-related expenses	9.121	11.733	14.048
Sub total—System operator	32.310	35.274	38.137
Sub total—Other service providers	8.023	8.407	10.284
Sub total—Authority operations	19.450	20.225	20.225
Total—Electricity industry governance and market operations appropriation	59.783	63.906	68.646

- 1.4 The Authority considers it is important that there is greater disclosure of information to levy payers of the reasons for this cost increase. This information paper provides background on the capital arrangements within the SOSPA and a description of the system operator capital projects being funded by the appropriation.

¹ <http://www.ea.govt.nz/our-work/consultations/corporate/appropriations-2013-14/>

² There are separate appropriations for security management, promoting and facilitating customer switching and an electricity litigation fund. The consultation paper also includes discussion on appropriations for those activities of Consumer Affairs and the Energy Efficiency and Conservation Authority that are funded by the levy on industry participants.

2 The system operator's fees are set by contract

- 2.1 The principal role of the system operator is to ensure the real-time co-ordination of the electricity system. The functions of the system operator, and how those functions are to be carried out, are specified in the Code. Part 7 of the Code describes the system operator's performance obligations in relation to the real-time delivery of common quality and dispatch and its functions in relation to security of supply and supply emergencies. The system operator has specific functions and obligations set out in other parts of the Code and is responsible for the development of several documents that are incorporated into the Code by reference.
- 2.2 The SOSPA was originally established between Transpower and the Electricity Commission (Commission) under the framework of the Electricity Governance Regulations 2003 and the Electricity Governance Rules. Those Regulations provided for the Commission to appoint parties to the various service provider roles, including that of system operator. The current agreement commenced on 1 July 2009 and replaced a previous agreement between the two parties dating from 2003.
- 2.3 Transpower was designated as the system operator under the Act in 2010³ (i.e. there is no longer any discretion for the role to be filled by appointment) and the Authority replaced the Commission as the counter-party to the SOSPA. The Act also transferred responsibility for security of supply to the system operator, with a corresponding variation made to the SOSPA. The SOSPA and its various amendments⁴ are available at <http://www.ea.govt.nz/industry/mo-service-providers/system-operator-market-operation-service-provider/>.
- 2.4 The fees for the system operator's services are set out in Schedule 1 of the SOSPA. The main component of the fees is the base fee, which covers operating costs, IT operations, market systems support contract cost and capital related costs (depreciation, tax, post tax WACC).⁵ The operating costs of this base fee are subject to annual indexation against the CPI (all groups). The fees are paid monthly.
- 2.5 The capital related costs (of the base fee) are based on the system operator's intended capital expenditure as set out in its capex plan. The system operator is required to prepare the capex plan as part of the capital arrangements set out in Schedule 4 of the SOSPA.
- 2.6 In addition to the SOSPA there is also a separate technical advisory service contract for the procurement of technical advice and related activities from the system operator where the Authority requires this advice to support its work programme.

The SOSPA capital related costs are calculated on a three-year cycle

- 2.7 The SOSPA requires the system operator to provide the Authority with a rolling three-year capex plan, up-dated annually and commencing from 1 July of the year of the update. The system operator is required to consult with the Authority each year on the content of the draft capex plan, but is only required to take into account the Authority's comments before the plan is finalised and updated (i.e. the Authority cannot dictate the contents of the capex plan and has no formal approval or veto rights). Only those projects that are considered to be "reasonably necessary" for the system operator to meet its Code obligations are allowed to be included, and expenditure that

³ Section 8 of the Act, available at <http://www.legislation.govt.nz/act/public/2010/0116/latest/DLM2634233.html>.

⁴ In addition to the amendment to accommodate the transfer of the security of supply function there have been a number of minor amendments that reflect changes to the schedules of the SOSPA that describe the functions of the system operator's software tools (e.g. the scheduling, pricing and dispatch (SPD) tool and the reserve management tool (RMT)).

⁵ Other fees payable in the SOSPA include the recovery of identification costs (as necessary), audit fees, and any agreed development fees. \$250,000 (indexed) of the base fee is 'at risk' and is subject to the system operator achieving specified performance criteria.

- relates to the role of Transpower as both the system operator and grid owner are allocated to each role on the basis of the approved Avoidable Cost Allocation Methodology (ACAM).⁶
- 2.8 The capex plan sets out forecast expenditure during each of the three years covered by the plan, and is required to include a reasonably detailed description of the nature of each project on the plan, why each project is necessary, the cost of each project and any implications for the other SOSPA fees.
- 2.9 The capital-related expenses are set on a three-yearly basis. These were last set on 1 July 2011 (i.e. encompassing the 2011/12 to 2013/14 financial years, inclusive) and reflect the existing capital base and the planned capital expenditure in the capex plan that was valid at that time. The annual updates of the capex plan in 2012 and 2013 will not affect the capital related expenses. Any variation to the capex plan, and the differences between forecast and actual expenditure, are captured in a reconciliation or 'wash-up' process at the end of the three-year period. Under the current arrangements, the capital related expenses will next be re-set from 1 July 2014 (for the three years through to 30 June 2017).
- 2.10 The total budget for each project in the capex plan is generally a high-level estimate. As the projects proceed through the planning and design process the costs are refined through a sequence of business cases. The final costs can be quite different to those established in the capex plan. Approval of the actual investments is generally completed through Transpower's internal processes. The SOSPA capital arrangements include a process for circumstances where capital expenditure is expected to exceed the amount established in the capex plan, or where a new project needs to be added to the plan. The Authority has a limited discretion in the approval of any capital expenditure by the system operator in excess of the budgeted amount.
- 2.11 The increase in capital-related expenses from \$9.121 million for 2011/12 to the forecast \$14.048 million for 2013/14 as shown in Table 1 reflects the extent of the capital investment the system operator expects to complete over the three years for which these expenses have been established. The capex plan for the capital related expenses in 2011 is attached as Appendix A. The latest update to the capex plan is included as Appendix B to provide an indication of how the plan has changed in the interim and how much of the forecast investment has been spent.
- 2.12 The annual capital investment presented in the capex plan does not directly correspond to the capital-related expenses paid to the system operator, and recovered through appropriations, for the same year. The capital-related expenses reflect depreciation,⁷ cost of capital and tax timing differences. Capital assets are depreciated over a number of years, with a portion of the total cost charged as depreciation in each year of the asset's useful life. The depreciation charge in any one year will therefore include depreciation on assets commissioned in prior years, as well as depreciation on the new additions. Therefore in any one year, capital-related expenses recovered through appropriations may be greater than or less than the investment presented in the three-year capital plan for that year, depending on the balance of new assets versus assets ending their depreciation lives. A similar situation exists in relation to the cost of capital and tax timing differences.

⁶ ACAM is the international accounting standard agreed by the Authority and Commerce Commission for the sharing of costs between Transpower's system operator and grid owner functions. The use of ACAM reflects that the system operator utilises some of Transpower's assets and would face a cost for the use of these (or equivalent) assets if it was to operate totally independently.

⁷ Not all of the investment is depreciated at the same rate, which is dictated by tax and accounting requirements. For the purposes of the SOSPA fee calculations, the depreciation commences from the commissioning date.

3 System operator capital projects fall into five categories

- 3.1 Each of the projects in the system operator's capex plan is allocated into one of five categories that reflect the different types of investment required.

Lifecycle and efficiency

- 3.2 The system operator operates extensive IT infrastructure that incorporates both software and hardware elements, including proprietary software specifically developed for undertaking the system operator function. The systems must be able to respond to unforeseen events on the power system and unplanned outages of the main market system, and have built-in back-up systems and processes to ensure that real-time market operations is maintained 24 hours a day, 7 days a week, 365 days a year.
- 3.3 Lifecycle and efficiency projects are those the system operator believes to be mandatory to maintain the market system. The projects generally relate to infrastructure, architecture, and software. Projects can be lifecycle maintenance projects or upgrades required to enable additional functionality being implemented during the capex planning period (i.e. to enable market projects), or both.
- 3.4 Significant projects in the current three-year capex plan include the replacement of the enterprise service bus (ESB) that supports the market system, control centre desktop screen updates, improvements to the pre-production (testing) environment and various server upgrades.
- 3.5 The system operator determines the investments required in this lifecycle and efficiency category, and the actual investments follow Transpower's internal approvals process.

Transpower projects

- 3.6 These projects are corporate-led initiatives considered necessary for Transpower to maintain its business operations. The system operator pays a share of the costs to enhance or upgrade this infrastructure under the ACAM methodology (as explained in paragraph 2.7). These projects are approved through Transpower's internal processes.
- 3.7 Transpower projects make up a small component of the capital expenditure costs met by the Authority under the SOSPA. The most significant Transpower project in the capex plan is a data storage upgrade.

Reasonable and prudent operator (RPO)

- 3.8 These are projects the system operator considers are necessary in order for it to meet the principle performance obligations specified in the Code (that require it to act as a reasonable and prudent system operator).⁸ These projects are generally security- or dispatch-related, but can also include initiatives that are intended to improve the efficiency of general operations (such as the processing of data requests).
- 3.9 Significant projects in the current capex plan include load forecasting, a suite of market systems enhancements and the implementation of a new situational awareness tool for the system operator's control rooms.
- 3.10 Reasonable and prudent operator projects are identified by the system operator and approved through Transpower's internal processes.

⁸ The definition of a reasonable and prudent system operator is included in the Code, and reflects that the system operator will be expected to be appropriately skilled and experienced and follow good international practice. The principle performance obligations are described in clause 7.2 of the Code.

Market

- 3.11 'Market' projects are those projects requested of the system operator by the Authority in order to deliver new market and Code initiatives. Projects in this category generally involve some level of change to the system operator's market systems. A recently completed example is the demand-side bidding and forecasting project, and projects that are underway include the implementation of the dispatchable demand and scarcity pricing Code amendments, and the multiple frequency keepers project.
- 3.12 The need for market project investments is established through the cost-benefit analysis that is completed as a required part of the Code amendment process.
- 3.13 The Authority approves the business case (and also the final budget) for market projects, and there is also an internal process within Transpower for the approval of the project and the drawing down of the necessary funds.

Building and fixed assets

- 3.14 Building and fixed assets projects relate to the system operator's dedicated buildings and other fixed assets (e.g. the national co-ordination centres). These projects are approved through Transpower's internal processes.

Short project descriptions are included in the capex plan

- 3.15 A short description of each project is included in the capex plan in Appendix A.

Around \$26 million of investment is anticipated over the term of the capex plan

- 3.16 The share of investment across these different categories over the current three-year determination of the capital-related expenses is set out in table 2 below.

Table 2: Capex plan allocation by project category

Category	2011/12 \$	2012/13 \$	2013/14 \$	Capex plan total \$
Lifecycle and efficiency	\$2,230,775	\$2,343,610	\$1,000,000	\$5,574,385
Transpower	\$2,029,902	\$1,635,769	\$1,579,500	\$5,245,171
Reasonable and prudent operator	\$4,287,519	\$1,750,000	\$3,500,000	\$9,537,519
Market	\$1,920,000	\$3,500,000	\$0	\$5,420,000
Building and fixed assets	\$0	\$0	\$0	\$ 0
TOTAL capex	\$10,468,196	\$9,229,379	\$6,079,500	\$25,777,075

(From the 1 July 2011 capex plan presented in Appendix A.)

- 3.17 Since the capex plan was established some projects have been added or removed, and the timing and budgets for other projects have been changed. The most recent update of the capex plan (attached as Appendix B) suggests the actual amount of capital expenditure may be less

than what was originally estimated. Total costs over the three-year term are currently estimated at about \$21.5 million (with just under \$6 million of projects expected to be un-commissioned and carried over into the next three-year term). However, as the term of the capex plan is not yet half way through there is still a possibility there will be further change and the final situation is unlikely to be clear until the term of the capital plan nears its end.

The system operator anticipates the need for significant further capex into the future

- 3.18 The latest capex plan update identifies significant potential investment in the 'lifecycle and efficiency' and 'reasonable and prudent operator' categories for the 2014/15 financial year (and further expected investments in 2015/16). Proposed projects include an upgrade of the SCADA control system, the replacement of the reserve management tool, a partial upgrade of the market system, and potentially the implementation of round power controls on the HVDC link. Indicative costs for the projects provisionally scheduled for 2014/15 and 2015/16 are in excess of \$30 million.
- 3.19 This potential investment has yet to be formally committed through the SOSPA capital arrangements, but system operator capital-related expenses would be expected to remain at a similar (or possibly higher) level to the current requirements if this potential investment proceeds.⁹

4 The capex arrangements require review

- 4.1 The current SOSPA capital expenditure arrangements create issues for both the Authority and the system operator. These include that:
- (a) variations in expenditure cannot be reconciled until the wash-up at the end of the three-year capex plan period, rather than being managed as the developments proceed, with resulting accounting challenges (especially for the Authority in respect of setting its appropriations requirements);
 - (b) actual project costs can differ significantly from those in the capital plan, especially those towards the end of the three-year term that were only able to be estimated at a high level when the plan was developed;
 - (c) Transpower might choose to undertake different corporate projects to those it expected to undertake when the capital plan was established,¹⁰ and the ACAM allocation may also change for the final projects;
 - (d) projects that are delayed or only partially completed can end up being carried over to the next three-year capex planning term,¹¹ (with resulting impacts on the Authority's appropriations process);
 - (e) the system operator's development of the detailed design, costs and timelines for the Authority's market projects is out-of-step with the development of the Code amendments (and the related cost-benefit analysis);
 - (f) the number and extent of the projects being pursued creates resource and timing challenges, and resulting issues for project prioritisation; and

⁹ Due to the complex nature of the calculations required, the unknown impact of projects post 2015/16 and the potential for projects to be carried over from the current capex plan we have not attempted to estimate the capital related expenses for the three year period commencing in 2014.

¹⁰ The Commerce Commission's regulatory framework provides Transpower with some discretion to change its capital expenditure plan for corporate projects.

¹¹ The capex plan is based around commissioning dates (i.e. when the project becomes operational) rather than cashflow.

- (g) it is difficult for the Authority to comment meaningfully on the projects in the plan where limited detail is available, or in areas such as lifecycle and efficiency projects where the Authority has limited ability to understand the project requirements.
- 4.2 Both the Authority and system operator recognise these short-comings and expect to continue to work together pragmatically to minimise any potentially adverse effects of these capital arrangements on their respective operations.
- 4.3 The Authority is also concerned about the impact of the significant and on-going increases in system operator costs on levy payers that are being driven by the capital expenditure programme. The Authority is looking carefully at a range of issues relating to the SOSPA, its capital arrangements and the proposed expenditure, including:
- (a) the magnitude of system operator costs, including the costs arising from capital investment and the business cases supporting this investment;
 - (b) the timing uncertainty discussed in 4.1, above;
 - (c) the transparency of system operator costs to levy payers; and
 - (d) limits to the Authority's ability to influence system operator costs under the current statutory and SOSPA arrangements.
- 4.4 Ideally, the business cases presented for capital investment projects should identify one or more of the following benefits:¹²
- (a) efficiency gains in the system operator's business;
 - (b) improvements in service quality; or
 - (c) increases in the scope of services provided.
- 4.5 Projects that deliver efficiency gains within the system operator should not be expected to result in increases in system operator fees (and to the corresponding increase in appropriations on levy payers). It should also be possible for the system operator to demonstrate that projects that provide service quality improvements or increases in scope of system operator services have the support of the industry, as they should result in efficiency or value gains for industry participants' businesses.
- 4.6 The Authority is reviewing the system operator arrangements and the SOSPA in two related projects in its 2012/13 work programme:
- (a) the system operator alignment review project (project C15 on the Authority's work programme¹³), looking at the alignment of the SOSPA with the Authority's statutory objective, the development of a suite of system operator performance measures and potential variations to the SOSPA; and
 - (b) a market performance research project looking at the efficiency of the current system operator arrangements (project D2 in the Authority's work programme).

¹² Capital expenditure for projects in the lifecycle and efficiency category may not necessarily involve enhancements to the system operator's activities. They may be more about preserving existing levels of activity and performance, which would then be reflected in the contents of the business case.

¹³ The Authority's work programme is available from <http://www.ea.govt.nz/about-us/documents-publications/work-programme/>

Appendix A **Current system operator capex plan (1 July 2011 to 30 June 2014)**

- A.1 The system operator capex plan that was current at 1 July 2011 set the base fee capital components for the three year period from 1 July 2011 to 30 June 2014. Any costs indicated beyond 30 June 2014 are indicative only.
- A.2 The table below provides a guide to interpreting the columns in the capex plan:

Table 3: Key to capex plan

Column heading	Description
Category	General class or type of project (see section 3).
Project Name	Project name or title
Estimated Total Project Budget	Estimated total cost of the project
SO%	Share of project costs allocated to the system operator (projects are shared with Transpower have costs allocated by the ACAM methodology).
SO% Budget	Estimated total cost of the project times the SO%
EA Budget Current	The costs to be recovered from the Authority via the SOSPA arrangements
SO% YTD Project Spend	Amount spent in current financial year
SO% Actual Project Spend	Total amount spent on project (across all years)
IAD Sent to EA	Date the system operator sent their completed investigation approval documents (IAD) to the Authority. ¹⁴
SO% Budget Phasing	How the 'EA Budget' is allocated over the term of the capex plan
IST INVEX Start	Start date of the project investigation by the system operator's IST group.
CAPEX Start	The expected project investment start date.
CAPEX End	The expected project commissioning date.
High Level Project Scope Description	Short project description

¹⁴ The IAD is a Transpower internal document. A copy is sent to the Authority as a record of the final project scope. The Authority does not formally approve the IAD.

Row Ref	Category	Project Name	High Level Project Scope Description
1	SO/IST Portfolio		
2	Lifecycle and Efficiency	Market Systems Server Upgrades & Testing - Capex	Upgrade the non-solver Windows servers in the Market System e.g. ESB servers, CSM and Citrix
3	Lifecycle and Efficiency	PSCADA Upgrade - CAPEX	Replace the SCADA system's historical data repository hardware to provide high availability for PI Historian for Market System
4	Lifecycle and Efficiency	SFT Codeset Integration	Integrate SFT code into SCADA/EMS system to fully align the systems and facilitate coordinated maintenance
5	Lifecycle and Efficiency	VSAT Consolidation - CAPEX	Aligning VSAT versions and technologies between Market System and SCADA, for support and to allow common inputs
6	Lifecycle and Efficiency	MDB Performance (DR 05/10/2010)	Resolve the poor performance of the database in the current Market System that has failed to meet performance targets
7	Lifecycle and Efficiency	Operational Tools Test Environment	Enhance the current pre-production environment, to better simulate the production environment for improved testing
8	Lifecycle and Efficiency	Oracle Database Upgrade and Consolidation	Transpower upgrade of all Oracle databases to the currently supported version, for which SO has an ACAM cost allocation
9	Lifecycle and Efficiency	MOI and SAD to Net 3.5	Upgrade the underlying code of the market operators interface (MOI) before it becomes unsupported
10	Lifecycle and Efficiency	Upgrade solver hardware	Updating the Windows servers that the Market solvers run on, to maintain warranty
11	Lifecycle and Efficiency	MOI and SAD to win 7	Upgrade the XP Desktop operating system before it becomes unsupported and in time to support the MOI upgrade
12	Lifecycle and Efficiency	Oracle Platform Upgrade	Transpower upgrade of all Oracle platform servers to the currently supported version, for which SO has an ACAM cost allocation
13	Lifecycle and Efficiency	SOS/MOS - CAPEX	Transpower's upgrade to the outage management system following the SOS enhancements project, with an SO ACAM allocation
14	Lifecycle and Efficiency	SOS Enhancements CAPEX	Transpower project to improve accurate and timely updates of outages in PROMS/SOS/MOS, with an SO ACAM cost allocation
15	Lifecycle and Efficiency	EMS Upgrade	Update the EMS and SFT hardware and software in line with the SCADA upgrade and to ensure ongoing vendor support
16	Lifecycle and Efficiency	Replace JMS Grid and upgrade to JCAPS V6	Tactical software upgrade to replace components either out of support or not meeting operational requirements
17	Lifecycle and Efficiency	MDB Remediation	Recode elements of the Market database to eliminate unused code, correct badly written code, and correct error handling
18	Lifecycle and Efficiency	Habitat Market Upgrade	Upgrade the Market System Habitat software to enable CSM and SFT upgrades and continued integration with SCADA systems
19	Lifecycle and Efficiency	Partial Market Systems Upgrade	Expected partial upgrade to Market System to follow incremental rather than 'big bang' approach, e.g. e-terramarket components
20	Lifecycle and Efficiency	ESB Architecture & Design Review	Replace the Enterprise Service Bus (ESB) that supports the Market System before the end of life of the current product
21	Transpower	Data Storage (Storage Upgrade)	Replacement of the Wellington and Hamilton data storage infrastructure to alleviate current performance issues and to provide future capacity.
22	Transpower	VOC01 Corp Operational Voice	Rollout of the new Corporate Voice Technology
23	Transpower	Office Suite Lifecycle Refresh	Refresh technologies (software) supporting desktop office services. Includes word processing, spread sheeting, presentation. Current platform is MS Office 2007, other options include Google docs and open office
24	Transpower	Database Lifecycle refresh (Oracle Version Consolidation)	Refresh database technologies (software). Database upgrade - lifecycle maintenance (relates to Oracle). Software consolidation.
25	Transpower	Electronic Mail lifecycle refresh	Refresh technologies (software and hardware) supporting electronic mail services. Includes exchange, blackberry, and HA capabilities. Current platform is MS Exchange, Outlook 2007 and BES, other options include gmail and onenote.
26	Transpower	Storage Upgrade (incl tools)	Regular extension of capability to store structured and unstructured data to cope with operational and project-driven growth
27	Transpower	Storage Lifecycle	EMC Storage : Lifecycle investment to refresh storage technology. Current platform is IBM SAN, with legacy HP gear still used as well. Future options include extension of SVCs, IBM XIV, and cloud storage providers
28	Transpower	Data retention and disaster recovery	Lifecycle investment to refresh backup and archive technology, to ensure we can: a) restore critical business data in the event of a disaster and b) comply with data retention requirements.
29	Transpower	VOC02 Corp Operational Voice	Rollout of the new Corporate Voice Technology
30	Transpower	Corporate Wireless Desktop Access	Provision of wireless access services at corporate sites
31	Transpower	SCADA Hardware Refresh	Replacement of 5 year old server hardware supporting the SCADA platform.
32	Transpower	Video Conferencing	Upgrade of the high quality video conference suits to provide more end points and to utilise new network
33	Transpower	Upgrade to Win 7	Lifecycle upgrade to new version of desktop operating system
34	Transpower	Antivirus Lifecycle	Refresh antivirus technologies.
35	Transpower	Application Delivery Technologies	Rationalise application footprint and improve access by using virtualisation technologies.
36	Transpower	Identity Management	Refresh technologies (hardware and software) supporting identity management, to enable timely and effective provision and de-provision of services. Includes authentication (incl 2FA), authorisation, access, internal certificate authority. Current platform includes active directory, oracle internet directory, novell IDAM, VASCO, Firepass.
37	Transpower	Integration Standardisation (CIM/61850)	Define standards, guidelines and design patterns for interfaces and middleware. Refactoring infrastructure level integration (email, FTP) to implement required groundwork so that applications can use the standards when updated as part of their roadmaps.
38	Transpower	Integration Technology Refresh	Upgrade integration platform to implement Enterprise Architectural vision, including new technology choice.
39	Transpower	Replacement of Mini-M Sat phones	All of Transpowers existing 16 mini-m phones will cease working from Dec 2012
40	Transpower	Server Lifecycle Refresh	Refresh technologies (hardware and software) supporting enterprise applications and services. Current platform is AIX on IBM pSeries, plus MS Windows 2003 on Intel hardware from HP and IBM. Future options include Linux on Intel, and cloud service providers.
41	RPO	Load Forecasting - CAPEX	Modify Market System to improve load forecasting and implement any related EA code changes. Enhance the load forecasting project if necessary to improve accuracy for GSCs (USI GSC GUP)
42	RPO	Market Systems Enhancements	Rolling enhancement/defect fixes of the Market System.
43	RPO	FRP Upgrade - CAPEX	Upgrade the File Replication (FRP) solution for SCADA to provide stability under heavy load
44	RPO	Block Security Constraint Automation	Enable automated Block Security Constraint (BSC) dispatch instructions in the Market System
45	RPO	CA Change Management Tool - Capex	Replace change management database (CMDDB) to improve visibility of the SO-IST Plan and provide workflow management for the Market and SCADA model change process.
46	RPO	CA SO Reports Update - Capex	Improve SO reports to provide high internal and external visibility to market information
47	RPO	Situational Awareness	Proof of Concept of Situational Awareness 2
48	RPO	Situational Awareness 2	Upgrade or replace current control room visualisation tool to increase visibility of forecasts and market situation
49	RPO	TSAT online	Online functionality of the TSAT functionality.
50	RPO	Wind Forecasting	Improve wind forecasting and implement any related EA code changes
51	RPO	ROC Integration	Upgrade SO infrastructure, tools and SCADA as required to enable effective ROC integration
52	Market	AGC Phase 0.5	Proof of concept of the AGC Stage 1 solution with one provider.
53	Market	AGC Stage 1	Modify or develop Market and SCADA Systems to trial automatic generation control (AGC) with one FK provider.
54	Market	Demand Side Bidding and Forecasting - CAPEX	Modify Market System to reflect EA's code changes for demand side bidding and forecasting
55	Market	FTR - CAPEX	Modify Market System to reflect EA's code changes for FTRs
56	Market	Scarcity Pricing	Modify Market System to reflect EA's code changes for scarcity pricing
57	Market	Dispatchable Demand	Enables demand side participants to be dispatched in the same way as generators.
58	RPO	Remedial Action Scheme 1 - EMS	Implement Remedial Action Scheme (RAS) functionality in EMS and SFT to improve modelling of special protection schemes for EMS
59	RPO	Remedial Action Scheme 2 - Market	Implement Remedial Action Scheme (RAS) functionality in EMS and SFT to improve modelling of special protection schemes for Market
60	RPO	RMT Replacement	Expand RMT in accordance with findings of reserves review and of market and HVDC developments, maybe using TSAT
61	Market	Round Power implementation	Modify Market and SCADA Systems to implement full HVDC roundpower functionality if required by the EA
62	Market	AGC Stage 2	Modify Market and SCADA systems to enable automatic generation control (AGC) for multiple frequency keepers (MFK)

Appendix B Latest update to the system operator capex plan

- B.1 The latest update of the capex plan, as provided by the system operator on 12 July 2012 is attached.
- B.2 Any costs in the updated capital plan beyond the 2013/14 financial year (i.e. beyond 30 June 2014) are indicative only and there is no binding commitment in place for the capital costs shown.
- B.3 The table below provides a guide to interpreting the columns in the capex plan:

Table 4: Key to capex plan

Column heading	Description
Category	General class or type of project, as described in section 3.
Project Name	Project name or title
Description	Short description of what the project entails
Estimated Total Project Budget	Estimated total cost of the project
SO%	The share of the project costs that are allocated to the system operator (some projects are shared with Transpower with costs allocated by the ACAM methodology).
SO% Budget	The estimated total cost of the project times the SO%
EA Budget	The costs to be recovered from the Authority via the SOSPA arrangements
SO% YTD Project Spend	Amount spent in current financial year
SO% Actual Project Spend	Total amount spent on project (across all financial years)
IAD Sent to EA	Date the system operator sent their completed investigation approval documents (IAD) to the Authority.
SO% Budget Phasing	How the 'EA Budget' is allocated over the term of the capex plan
CAPEX End	The expected project commissioning date.

SO-IST Portfolio Road Map

Row Ref	Category	Project Name	Description	Estimated Total Project Budget	SO %	SO % Budget	EA Budget	SO % YTD Project Spend	SO % Actual Project Spend	IAD Sent to EA	SO % BUDGET PHASING					CAPEX End
											EA 3 Year Capex Plan					
											2011/12	2012/13	2013/14	2014/15	2015/16	
1	SO/IST Portfolio															
2	Lifecycle and Efficiency	Market Systems Server Upgrades & Testing	Refresh of a selected number of MS servers (except for solvers which were refreshed in 2009)	\$519,538	100%	\$519,538	\$519,538					\$519,538				1/06/2013
3	Lifecycle and Efficiency	SFT Codeset Integration	Integrate SFT code into SCADA/EMS system to fully align the systems and facilitate coordinated maintenance	\$85,000	100%	\$85,000	\$85,000	\$0	\$0			\$0	\$0			1/10/2012
4	Lifecycle and Efficiency	MDB Performance (DR 05/10/2010) (complete)	Completed	\$400,000	100%	\$400,000	\$400,000	\$183,839	\$401,812	Jan 2011		\$401,812				30/06/2011
5	Lifecycle and Efficiency	Operational Tools & Test Environment	Enhance the current pre-production environment, to better simulate the production environment for improved testing	\$600,000	100%	\$600,000	\$600,000	\$119,808	\$119,808	Nov 2011		\$363,516	\$236,484			31/07/2012
6	Lifecycle and Efficiency	Support environment upgrade	Bring the pre-production environments up to a production-like capability and standard to more effectively test and deploy new software	\$1,200,000	100%	\$1,200,000	\$1,200,000						\$600,000	\$600,000		30/06/2013 (and 30/06/2014)
7	Lifecycle and Efficiency	MOI and SAD to Net 3.5	Upgrade the underlying code of the market operators interface (MOI) before it becomes unsupported	\$350,000	100%	\$350,000	\$350,000							\$350,000		30/06/2014
8	Lifecycle and Efficiency	MOI and SAD to win 7	Upgrade the XP Desktop operating system before it becomes unsupported and in time to support the MOI upgrade	\$250,000	100%	\$250,000	\$250,000							\$250,000		1/08/2014
9	Lifecycle and Efficiency	Oracle Platform Upgrade	Transpower upgrade of all Oracle platform servers to the currently supported version, for which SO has an ACAM cost allocation	\$1,352,851	54%	\$730,540	\$730,540	\$88,242	\$677,289	Jan 2011		\$677,289				31/03/2012
10	Lifecycle and Efficiency	SOS Enhancements (complete)	Completed	\$727,617	10%	\$72,762	\$72,762	\$1,465	\$72,574	Jan 2011		\$72,574				27/10/2011
11	Lifecycle and Efficiency	EMS Upgrade	Update the EMS and SFT hardware and software in line with the SCADA upgrade and to ensure ongoing vendor support	\$5,808,000	100%	\$5,808,000	\$5,808,000							\$5,808,000		30/08/2015
12	Lifecycle and Efficiency	MDB Remediation (MDB Performance Enhancement)	Recode elements of the Market database to eliminate unused code, and correct error handling	\$700,000	100%	\$700,000	\$700,000						\$700,000			1/06/2013
13	Lifecycle and Efficiency	Partial Market Systems Upgrade	Expected partial upgrade to Market System to follow incremental rather than 'big bang' approach, e.g. e-fermarket components	\$2,387,000	100%	\$2,387,000	\$2,387,000							\$2,387,000		1/08/2015
14	Lifecycle and Efficiency	ESB Architecture & Design Review	Replace the Enterprise Service Bus (ESB) that supports the Market System before the end of life of the current product	\$2,000,000	100%	\$2,000,000	\$2,000,000						\$1,000,000	\$1,000,000		1/08/2015
15	Lifecycle and Efficiency	NCC Desktop/screens refresh	Replace aging unsupported hardware and current end of life screens in the Coordination Centres	\$1,250,000	100%	\$1,250,000	\$1,250,000					\$1,250,000				1/06/2013
16	Lifecycle and Efficiency	NCC Desktop/screens refresh	Replace aging unsupported hardware and current end of life screens in the Coordination Centres	\$1,250,000	100%	\$1,250,000	\$1,250,000								\$1,250,000	1/06/2016
17	Lifecycle and Efficiency	OID Segregation (was Oracle Ver Consolid'n)	Design and implement a new dedicated MS OID service that is highly available, resilient, and runs on supported software	\$200,000	100%	\$200,000	\$200,000					\$0	\$200,000			30/06/2013
18	Lifecycle and Efficiency	AIX Operating System and Oracle Database Upgrade	Software lifecycle upgrade for AIX and Oracle Database software for the MS	\$750,000	100%	\$750,000	\$750,000					\$300,000	\$450,000			2/08/2014
19	Lifecycle and Efficiency	Active Directory Segregation	Dedicated active directory for MS to improve availability and resilience	\$300,000	100%	\$300,000	\$300,000						\$300,000			2/08/2014
20	Lifecycle and Efficiency	MOI Client O/S Refresh	Lifecycle investment to refresh MOI	\$250,000	100%	\$250,000	\$250,000						\$250,000			2/08/2014
21	Lifecycle and Efficiency	Server Upgrade (Phase 2)	Refresh the balance of MS servers	\$450,000	100%	\$450,000	\$450,000						\$450,000			2/08/2014
22	Lifecycle and Efficiency	Citrix segregation (MOI Client) Infrastructure	Segregate Citrix infrastructure for MS from other corporate infrastructure for availability and resilience		TBA											2/08/2014
23	Lifecycle and Efficiency	Firewall upgrade	Lifecycle upgrade of firewall for MS	\$200,000	100%	\$200,000	\$200,000						\$200,000			2/08/2014
24	Lifecycle and Efficiency	Test regions segregation	Segregate test regions infrastructure for MS from other corporate infrastructure for availability and resilience	\$350,000	100%	\$350,000	\$350,000							\$350,000		30/06/2015
25	Lifecycle and Efficiency	Core Infrastructure segregation (backups, security, third party access, business service management)	Segregate core infrastructure for MS from other corporate infrastructure for availability and resilience	TBA	TBA											30/06/2015
26	Lifecycle and Efficiency	Data Centre Move (Wellington)	Move the Wellington datacentre to coincide with building move and new requirements (% allocation to SO to be determined)	\$1,000,000	TBA									\$1,000,000		30/09/2015
27	Lifecycle and Efficiency	Data Centre Move (Hamilton)	Refresh the Hamilton datacentre to coincide with new requirements (% allocation to SO to be determined)	\$1,000,000	TBA										\$1,000,000	30/09/2016
28	Transpower	NCC Desk Replacement	Replace desks in the Control Centre - end of life	\$150,000	100%	\$150,000	\$150,000						\$150,000			
29	Transpower	Data Storage (Storage Upgrade)	Completed	\$2,865,569	33%	\$945,638	\$945,638	\$327,179	\$908,092	Jan 2011		\$923,571				29/02/2012
30	Transpower	VOC01 Corp Operational Voice	Completed	\$4,600,000	2%	\$92,000	\$92,000	\$10,210	\$82,766	Feb 2011		\$85,597				29/11/2011
31	Transpower	Electronic Mail lifecycle refresh	Refresh technologies (software and hardware) supporting electronic mail services. Includes exchange, blackberry, and HA capabilities. Current platform is lifecycle investment to refresh backup and archive technology, to ensure we can: a) restore critical business data in the event of a disaster and b) comply with data retention requirements.	\$650,000	15%	\$97,500	\$97,500						\$97,500			30/06/2013
32	Transpower	Data retention and disaster recovery	Lifecycle investment to refresh backup and archive technology, to ensure we can: a) restore critical business data in the event of a disaster and b) comply with data retention requirements.	\$1,500,000	33%	\$495,000	\$495,000						\$330,000	\$165,000		30/08/2015
33	Transpower	Corporate Wireless Desktop Access	Completed	\$862,291	10%	\$86,229	\$86,229	\$75,698	\$75,698	May 2011		\$77,323				27/01/2012
34	Transpower	SCADA Hardware Refresh	Completed	\$700,000	10%	\$70,000	\$70,000	\$59,523	\$59,523	May 2011		\$62,257	\$7,743			28/03/2012
35	Transpower	Desktop OS Refresh_Windows 7	Upgrade windows operating system to Windows 7 before current XP becomes unsupported	\$800,000	10%	\$80,000	\$80,000	\$3,659	\$3,659	Nov 2011		\$3,705	\$76,295			30/06/2013
36	Transpower	Replacement of Mini-M Sat phones	All of Transpower's existing 16 mini-m phones will cease working from Dec 2012	\$220,000	15%	\$33,000	\$33,000						\$33,000			30/06/2013
37	RPO	Load Forecasting	Modify Market System to improve load forecasting and implement any related EA code changes. Enhance the load forecasting project if necessary to improve accuracy for GSCs (USI GSC GUP)	\$1,750,000	100%	\$1,750,000	\$1,750,000							\$1,750,000		30/08/2014
38	RPO	Market Systems Enhancements	Rolling enhancements to the Market System.	\$3,000,000	100%	\$3,000,000	\$3,000,000	\$860,627	\$860,627	Jul 2011		\$1,026,742	\$998,258	\$1,000,000	\$1,000,000	1/06/2015
39	RPO	FRP Upgrade	Upgrade the File Replication (FRP) solution for SCADA to provide stability under heavy load	\$304,688	100%	\$304,688	\$304,688	\$146,412	\$170,620	May 2011		\$170,711				30/03/2012
40	RPO	Block Security Constraint Automation	Enable automated Block Security Constraint (BSC) dispatch instructions in the Market System	\$300,000	100%	\$300,000	\$300,000	\$81,756	\$81,756	Feb 2011		\$110,239	\$189,761			30/04/2013
41	RPO	CA Change Management Tool	Replace change management database (CMBD) to improve visibility of the SO-IST Plan and provide workflow management for the Market and SCADA model	\$312,000	100%	\$312,000	\$312,000	\$214,955	\$290,293	Mar 2011		\$309,345	\$250,000			30/06/2012 (balance)
42	RPO	CA SO Reports Update	Improve SO reports to provide high internal and external visibility to market information	\$270,831	100%	\$563,000	\$563,000	\$0	\$0	Aug 2011		\$2,130	\$560,870			1/10/2012
43	RPO	Situational Awareness	Completed	\$1,078,328	100%	\$1,078,328	\$1,078,328	\$662,235	\$662,235	Jul 2011		\$763,248	\$46,990			30/06/2012
44	RPO	Situational Awareness 2	Upgrade or replace current control room visualisation tool to increase visibility of forecasts and market situation	\$3,000,000	100%	\$3,000,000	\$3,000,000							\$1,500,000	\$1,500,000	30/12/2016
45	RPO	TSAT online	Online functionality of the TSAT functionality.	\$500,000	100%	\$500,000	\$500,000	\$29,948	\$29,948	Jul 2011		\$168,619	\$331,381			1/10/2012
46	RPO	Wind Forecasting	Improve wind forecasting and implement any related EA code changes	\$600,000	100%	\$600,000	\$600,000	\$72,300	\$72,300	Jul 2011		\$157,179	\$442,821			1/06/2013
47	RPO	ROC Integration (2016/17)	Upgrade SO infrastructure, tools and SCADA as required to enable effective ROC integration	\$0	100%	\$0	\$0									30/09/2017
48	RPO	TTSE Upgrade	Upgrading/replacing the training simulator for the system coordinators with appropriate functionality	\$3,000,000	100%	\$3,000,000	\$3,000,000							\$1,500,000	\$1,500,000	1/08/2016
49	Market	AGC Phase 0.5	Completed	\$216,000	100%	\$216,000	\$216,000	\$82,345	\$213,436	Mar 2011		\$217,636				30/08/2011
50	Market	MPK Stage 1	Modify or develop Market and SCADA Systems to trial automatic generation control (AGC) with one FK provider.	\$1,700,000	100%	\$1,700,000	\$1,700,000	\$150,370	\$150,370	Mar 2011		\$184,706	\$1,515,294			30/06/2013
51	Market	Demand Side Bidding and Forecasting	Modify Market System to reflect EA's code changes for demand side bidding and forecasting	\$1,619,703	100%	\$1,619,703	\$1,619,703	\$1,226,994	\$1,402,219	Dec 2010		\$1,576,136	\$43,567			1/06/2012
52	Market	FTR	Modify Market System to reflect EA's code changes for FTRs	\$560,000	100%	\$560,000	\$560,000	\$84,346	\$84,346	Nov 2011		\$111,551	\$448,449			1/11/2012
53	Market	Scarcity Pricing	Modify Market System to reflect EA's code changes for Scarcity Pricing	\$500,000	100%	\$500,000	\$500,000						\$500,000			30/06/2013
54	Market	Dispatchable Demand (ph 1)	Modify Market System to reflect EA's code changes for Dispatchable Demand (non-confirming nodes)	\$2,500,000	100%	\$2,500,000	\$2,500,000					\$98,047	\$401,953	\$2,000,000		1/01/2015
55	Market	Dispatchable Demand (ph 2)	Modify Market System to reflect EA's code changes for Dispatchable Demand (confirming nodes)	\$3,000,000	100%	\$3,000,000	\$3,000,000								\$3,000,000	30/06/2016
56	RPO	Remedial Action Scheme 1 - EMS	Implement Remedial Action Scheme (RAS) functionality in EMS and SFT to improve modelling of special protection schemes for EMS	\$750,000	100%	\$750,000	\$750,000	\$22,612	\$22,612	Jul 2011		\$51,420	\$698,580			30/12/2012
57	RPO	Remedial Action Scheme 2 - Market	Implement Remedial Action Scheme (RAS) functionality in EMS and SFT to improve modelling of special protection schemes for Market	\$750,000	100%	\$750,000	\$750,000							\$750,000		1/01/2014
58	RPO	RMT Replacement	Expand RMT in accordance with findings of reserves review and of market and HVDC developments, maybe using TSAT	\$3,000,000	100%	\$3,000,000	\$3,000,000							\$2,500,000	\$500,000	1/08/2015
59	Market	Round Power Implementation	Modify Market and SCADA Systems to implement full HVDC roundpower functionality if required by the EA	\$5,212,109	100%	\$5,212,109	\$5,212,109							\$2,712,109	\$2,500,000	1/08/2015
60	Market	AGC Stage 2	Modify Market and SCADA systems to enable automatic generation control (AGC) for multiple frequency keepers (MPK)	\$2,000,000	100%	\$2,000,000	\$2,000,000								\$2,000,000	1/06/2016
61	Building/Fixed Assets	Hamilton air conditioning	Upgrade NCCN air conditioning to appropriate standards	\$547,852	100%	\$547,852	\$547,852						\$403,447	\$144,405		year end
62	Building/Fixed Assets	NCCN Upgrade Security Cameras and monitoring equipment	Upgrade NCCN security equipment to appropriate standards		100%		\$0									year end
63	Building/Fixed Assets	Replace concrete Fire Water Tanks with PEL	Replace the concrete fire tanks at NCCN with PEL - upgrade to appropriate standards	\$26,061	100%	\$26,061	\$26,061							\$26,061		year end
64	Building/Fixed Assets	NCCN Refurbish interior of co-ordination centre	Refurbish NCCN coordination centre	\$40,000	100%	\$40,000	\$40,000						\$25,000	\$15,000		year end
65	Building/Fixed Assets	Transpower Building Move (TBA in 2016)	Transpower lease expires on current building. Percentage share of costs for SO to be determined.				\$0									TBA
66	Expenditure Total											\$7,615,353	\$11,001,931	\$9,625,466	\$20,187,109	
67	Lifecycle and Efficiency				\$23,380,006			\$20,102,839	\$20,102,839	\$4,504,523	\$6,441,983	\$1,515,191	\$3,806,022	\$3,600,000	\$10,795,000	
68	Transpower				\$12,347,860			\$2,049,367	\$2,049,367			\$1,152,453	\$364,538	\$330,000	\$165,000	
69	RPO				\$18,615,847			\$18,908,016	\$18,908,016			\$2,759,633	\$3,518,661	\$3,500,000	\$6,500,000	
70																