



California ISO

**2015 GMC Update
Energy Imbalance Market Cost of
Service Study**

April 2, 2014

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Executive Summary

The ISO and PacifiCorp in early 2013 agreed to form a new Energy Imbalance Market (EIM). The EIM provides entities with the opportunity to leverage the ISO's existing real-time market platform to facilitate five minute economic dispatch. The EIM provides reliability and economic benefits to both existing market participants and new EIM entities by utilizing the ISO's 15-minute market and real-time dispatch. The EIM relies on the ISO's existing real time portion of the market services activities and system operations activities. The EIM fee for 2014 was developed in collaboration with stakeholders and was based on the ISO's 2010 cost of service study. This fee was approved by the ISO Board of Governors (ISO Board) and will be filed with the Federal Energy Regulatory Commission (FERC) in 2014. Conceptually, EIM participants will pay the same rate as existing customers but only for the real time market and real time dispatch activities specifically related to the EIM. The purpose of this paper is to describe the development of the EIM fee that will be proposed for approval and will be effective in 2015 as part of the updated grid management charge (GMC) and ISO revenue requirement.

Currently, the GMC is made up of three components or services: market services, system operations and congestion revenue rights (CRR) services.¹ The market services charge encompasses all activities related to the processing of bids to issuing schedules in both the day ahead market and real-time market. The system operations charge encompasses all activities related to the dispatch of energy in support of grid conditions and balancing area activities, such as transmission planning. The third component, CRR services charge encompasses activities surrounding congestion revenue rights. Real time activities occur in market services for the real time market and in system operations for real time dispatch. The ISO has used the cost of service analysis for 2015 described in a separate discussion paper, posted at the same time as this update, to develop the updated EIM fee that is the subject of this paper.

To determine the updated EIM fee, using the 2015 cost of service study, the ISO identified

¹ The GMC also comprises several fees, in addition to the EIM fee, which are not relevant to the development of the revised EIM fee. See separate cost of service study discussion paper.

and aggregated the real time activity costs allocated to the two main cost categories. Indirect costs were then allocated to the categories based on the proportion to direct costs. The respective real time cost proportions were then applied to the respective rates for market services and system operations. For the final step, these two real time rates were added to derive the updated EIM rate (see Exhibit 2).

Table 1 – Summary of EIM Rate

Category	Net costs (\$ in thousands)	Cost of real time activities	Percentage share of costs	Pro forma 2013 rate	EIM rate
Market Services	\$47,625	\$28,911	61%	\$0.09	\$0.06
System Operations	136,731	60,932	45%	\$0.29	\$0.13
CRR Services	5,430	-	-	\$0.01	-
Total	\$189,786	\$89,843	47%		\$0.19

The costs include the EIM share of all components of the ISO's revenue requirement such that EIM participants will pay the same rate as existing customers for the real time activities they are using.

Application of ABC to EIM Structure

As discussed in the 2015 cost of service study paper, the ABC analysis disaggregated the ISO's primary business functions into nine core processes (level 1 activities). Each core activity was then divided into major processes (level 2 activities) that were mapped to the corresponding level 1 activity. The first step was to allocate the two cost category activities to the corresponding real time components. The market services component relates to either the real time market or the day-ahead market. The system operations component relates to either real time dispatch or balancing authority services.

Level 2 activities were mapped as one of the following: 1) all in one category or not in the category (100 percent or 0 percent); 2) a split between two categories (50 percent / 50 percent); or 3) partially in one category or another (80 percent or 20 percent). If the activity was identified as indirect or the attribute was not distinguishable to any specific category, it was not included in the initial steps of the allocation process but rather allocated at the end of the process based on percentages of direct allocable costs.

Mapping of Market Services to EIM activities

This mapping only addresses those level 2 activities that are mapped to market services, which then in turn were mapped to either the real time market (RTM) or the day ahead market (DAM). The direct ABC level 2 activities mapped to market services is taken from *Table 2 – Mapping of ABC Direct Operating Activities to Cost Categories* in the 2015 cost of service study paper.

Table 2 – Mapping of Market Services ABC Direct Operating Activities

Mapping of Market Services ABC level 2 Direct Operating Activities to EIM activities					
ABC Level 2 Activities	Cost Code	Market services	RTM	DAM	Comments
% of cost to allocate to category					
Definitions used in allocation			100%		the costs are entirely to support the RT market
				100%	the costs are entirely to support the DA market
			50%	50%	the costs support equally both RT and DA markets
			80%	20%	the costs are predominantly RT market related but have some DA market relationship
			20%	80%	the costs are predominantly DA market based but have some RT market relationship
ABC Direct Operating Activities					
Develop Markets (DM) (80002)					
Perform market analysis	232	100%	50%	50%	Market analysis and design encompasses both markets
Develop market design	233	100%	50%	50%	
Manage Market and Reliability Data and Modeling (MMR) (80004)					
Manage FNM maintenance	301	50%	50%	50%	The full network model encompasses both markets
Plan and develop operations simulator training	302	20%	100%		The grid is operated in real time
Manage credit and collateral	308	45%	50%	50%	Credit and collateral required for all markets
Resource management	309	50%	80%	20%	Transmission resource & operational characteristics are reflected in RT market
PIRP	313	20%	100%		Scheduling option for intermittent resources is in RT market
Manage & facilitate procedure maintenance	314	20%	100%		The grid is operated in real time
Procedure administration and reporting	315	20%	100%		
Plan and develop operations training	316	20%	100%		
Execute and track operations training	317	20%	100%		
Manage Markets and Grid (MMG) (80005)					
Manage DA market support	352	100%		100%	Applies to DA market
Operations RT support	353	50%	100%		Applies to RT market
Manage DA market	358	50%		100%	Applies to DA market
Manage operations engineering support	362	20%	50%	50%	Ensures system conditions accurately reflected in markets
RT market – shift supervisor – manage post DA and pre RT	363	50%	100%		Applies to RT market

Mapping of Market Services ABC level 2 Direct Operating Activities to EIM activities					
ABC Level 2 Activities	Cost Code	Market services	RTM	DAM	Comments
% of cost to allocate to category					
RT operations – Generation and RT renewables (GRC) desks - maintain balancing area and manage RT pre dispatch	364	20%	100%		Applies to RT market
Manage Operations Support and Settlements (MOS) (8007)					
Manage price validation & corrections	401	50%	50%	50%	Price corrections occur in both markets
Manage MQS	403	50%	80%	20%	Process to feed correct data into settlements (base EIM schedules are equivalent to DA schedules)
Manage market clearing	411	45%	80%	20%	Predominantly real time activity
Manage market billing & settlements	412	45%	80%	20%	
Manage settlements release cycle	414	45%	80%	20%	
Manage market performance	417	50%	50%	50%	Market performance and validation encompasses both markets
Perform market validation	419	50%	50%	50%	

This mapping was also applied to the software costs underlying the debt service portion of the revenue requirement. This market services mapping is taken from *Table 3 – Allocation of Debt Service and Capital to GMC to Cost Categories* in the 2015 cost of service study paper.

Table 3 – Allocation of Market Services Debt Service to RT Categories

Allocation of Market Services Debt Service to EIM activities					
System	Market services	RTM	DAM	Comments	
% of cost to allocate to category					
2008 Bond Debt Service (see spelled out abbreviations in cost of service discussion paper)					
ALFS	50%	100%		Load forecast is used in RT market	
DMM & compliance Tools (SAS MARS)	50%	50%	50%	ISO market monitoring covers all markets	
FNM / State estimator	50%	100%		Used to initialize the RT dispatch	
IFM	50%		100%	Applies to DA market	
MQS	50%	80%	20%	Use 80007 activity 403	
Master file	50%	100%		Stores resource operating characteristics	
RIMs	20%		100%	Balancing authority responsibility	
OASIS	50%	100%		Posts market results	
PIRP	20%	100%		Use 80007 activity 313	
Portal	50%	80%	20%	Enables participants to input and receive market information	
CMRI	50%	80%	20%		
RT markets	20%	100%		Applies to RT market	
HASP	50%	100%			
Resource Adequacy	50%		100%	ISO process to implement resource adequacy	
RAVE	50%		100%	ISO process to implement RMR	
SLIC	50%	100%		Required for recording outages in RT market	
SIBR	50%	50%	50%	Required for submitted bids	
SaMC	15%	80%	20%	Based on RT and DA charge codes	

The market services related non-payroll support costs were mapped from *Table 4 – Allocation of Non-Payroll Support Cost to GMC to Cost Categories* in the cost of service discussion paper.

Table 4 – Allocation of Market Services Non-Payroll Support Costs

Allocation of Market Services Non-Payroll Support Costs to EIM activities				
Type	Market services	RTM	DAM	Comments
		% of cost to allocate to category		
Non-Payroll Support Costs				
Operations Division				
PIRP forecasting costs	20%	100%		Use 80004 activity 313
General Counsel and Administrative Services Division				
SSAE 16 audit	45%	80%	20%	Use 80007 activity 412
Operational assessment	17%	To be based on %'s from 80005 between RTM and DAM		

The remaining market services other income from *Table 6 – Allocation of Other Income to GMC to Cost Categories* and operating reserve credit from *Table 7 – Allocation of Operating Reserve Credit to GMC to Cost Categories* in the 2015 cost of service study paper were then allocated to real time and day ahead components.

Table 5 – Allocation of Market Services Other Income

Allocation of Market Services Other Income to EIM activities				
Type	Market services	RTM	DAM	Comments
		% of cost to allocate to category		
Other Income				
PIRP forecasting fees	20%	100%		Use 80004 activity 313
COI path operator fees	17%	To be based on %'s from 80005 between RTM and DAM		

Table 6 – Allocation of Market Services Operating Reserve Credit

Allocation of Market Services Operating Reserve Revenue Credit to EIM activities				
Type	Market services	RT Market	DA Market	Comments
		% of cost to allocate to category		
Operating Reserve Credit				
25% debt service reserve on 2008 bonds	29%	To be based on %'s from 2008 bonds debt service between RTM and DAM		

FEES

Market service fees from *Table 23 – Estimation of Fee Revenue and mapping of Fees to Cost Categories* in the 2015 cost of service study paper are allocated as follows.

Table 7 – Allocation of Market Services Fees

Allocation of Market Services Other Income to EIM activities				
Type	Market services	RTM	DAM	Comments
		% of cost to allocate to category		
Fees				
Bid segment fees	100%	50%	50%	Bidding in both markets
Inter-SC trades	100%		100%	All in forward market
SCID fees	100%	50%	50%	Participate in both markets

Costing the Market Services EIM activities

The amounts from the 2015 cost of service study were applied to the market services categories to derive the direct costs of the real time and day ahead markets.

Table 8 – Components of the 2013 Market Services Revenue Requirement:

Revenue Requirement (\$ in thousands)	2013 Market Services Budget
Direct O&M	\$ 12,863
Non-ABC support O&M	614
Debt service 2008 bonds	7,263
Other income	(660)
Operating reserve credit	(1,647)
Allocation of Indirect costs	34,255
Revenue Requirement before fees	53,028
Fees	(5,063)
Total Market Services Revenue Requirement	\$ 47,625

Completing the analysis required the following steps:

1. applying EIM activity percentages to non-ABC O&M support costs;
2. applying EIM activity percentages to ABC direct O&M costs;
3. applying EIM activity percentages to debt service costs, other income and operating reserve credit;
4. aggregating costs and allocate indirect costs to EIM activities based on percentage of direct costs and allocation of fees to EIM activities to determine the resulting EIM activity amounts and percentages; and
5. applying the EIM activity percentage to market services rate to determine the EIM market services component.

Step 1: Applying EIM activity percentages to non-ABC O&M support costs

The non-ABC support costs from *Table 10 – Allocation of non-ABC Support Costs to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 4 above.

Table 9 – Allocation of Market Services Non-ABC Support Costs

Allocation of Market Services Non-ABC support costs to EIM Activities						
Non-ABC support costs	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activity \$ in thousands	
Non-ABC Support Costs						
Operations Division						
PIRP forecasting costs	20%	100%		\$ 337	\$ 337	\$ -
General Counsel and Administrative Services Division						
SSAE 16 audit	45%	80%	20%	243	194	49
Operational assessment	17%	66%	34%	34	22	12
Total				\$ 614	\$ 553	\$ 61

Step 2: Applying EIM activity percentages to ABC direct O&M Costs

The ABC direct O&M costs from *Table 15 – Mapping ABC Direct Operating Activities to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 2 above.

Table 10 – Allocation of Market Services ABC Direct Operating Costs

Allocation of Market Services ABC Direct Operating Costs to EIM Activities							
ABC Level 2 Activities	Cost Code	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activity \$ in thousands		
ABC Direct Operating Costs							
Develop Markets (DM) (80002)							
Perform market analysis	232	100%	50%	50%	\$ 1,604	\$ 802	\$ 802
Develop market design	233	100%	50%	50%	2,242	1,121	1,121
Total DM					3,846	1,923	1,923
Manage Market & Reliability Data & Modeling (MMR) (80004)							
Manage FNM maintenance	301	50%	50%	50%	862	431	431
Plan and develop operations simulator training	302	20%	100%		60	60	
Manage credit and collateral	308	45%	50%	50%	262	131	131
Resource management	309	50%	80%	20%	455	364	91
Manage & facilitate procedure maintenance	314	20%	100%		168	168	
Procedure admin & reporting	315	20%	100%		2	2	
Plan and develop operations training	316	20%	100%		143	143	
Execute and track operations training	317	20%	100%		277	277	
Total MMR					2,229	1,576	653
Manage Markets and Grid (MMG) (80005)							
Manage DA market support	352	100%		100%	115		115
Operations RT support	353	50%	100%		616	616	
Manage DA market	358	50%		100%	1,282		1,282

Allocation of Market Services ABC Direct Operating Costs to EIM Activities							
ABC Level 2 Activities	Cost Code	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
			% of costs allocated to activity			Cost of activity \$ in thousands	
Manage operations engineering support	362	20%	50%	50%	230	115	115
RT market – shift supervisor – manage post DA and pre RT	363	50%	100%		1,011	1,011	
RTO – GRC desks - maintain balancing area and manage RT pre dispatch	364	20%	100%		1,219	1,219	
Total MMG					4,473	2,961	1,512
Total MMG %					100%	66%	34%
Manage Operations Support & Settlements (MOS) (80007)							
Manage price validation and corrections	401	50%	50%	50%	78	39	59
Manage MQS	403	50%	80%	20%	571	481	120
Manage market clearing	411	45%	80%	20%	50	33	8
Manage market billing & settlements	412	45%	80%	20%	541	427	107
Manage settlements release cycle	414	45%	80%	20%	363	374	94
Manage market performance	417	50%	50%	50%	104	71	70
Perform market validation	419	50%	50%	50%	608	298	298
Total MOS					2,315	1,743	756
Total Direct O&M					\$ 12,863	\$ 8,508	\$ 5,327
Direct O&M %					100%	61%	39%

Step 3 – Allocating the remaining market service revenue requirements

Debt Service

The debt service costs from *Table 19 – Mapping Debt Service and Cash Funded Capital to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 3 above.

Table 11 – Allocation of Market Service Debt Service Costs

Allocation of Market Services Debt Service Costs to EIM Activities						
System	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activity \$ in thousands	
2008 Bonds Debt Service Costs						
Operations Related Software						
ALFS	50%	100%		\$ 40	\$ 40	\$ -
DMM & compliance Tools	50%		100%	239	120	119
FNM / State estimator	50%	100%		91	91	
IFM	50%		100%	3,183		3,183
MQS	50%	80%	20%	506	405	101
Master file	50%	100%		205	205	
NRI	20%		100%	44		44
OASIS	50%	100%		33	33	
PIRP	20%	100%		9	9	

Allocation of Market Services Debt Service Costs to EIM Activities						
System	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activity \$ in thousands	
Portal	50%	80%	20%	236	189	47
CMRI	50%	80%	20%	206	165	41
RTMA split off 50% into HASP	20%	100%		254	254	
HASP	50%		100%	635	635	
Resource Adequacy	50%		100%	21		21
RAVE	50%		100%	3		3
SLIC	50%	100%		147	147	
SIBR	50%	100%		900	450	450
SaMC	15%	80%	20%	511	409	102
Total 2008 bond debt service				\$ 7,263	\$ 3,152	\$ 4,111
Total 2008 bond debt Service %				100%	43%	57%

Miscellaneous Revenue

The miscellaneous revenue from *Table 20 – Mapping Miscellaneous Revenue to Cost Categories* in the 2015 cost of service study paper was allocated using the percentages shown in Table 5 above.

Table 12 – Allocation of Market Services Miscellaneous Revenue

Allocation of Market Services Miscellaneous Revenue						
Type	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activities \$ in thousands	
Miscellaneous revenue						
Intermittent resource forecasting fee	20%	100%		\$ 320	\$ 320	\$ -
COI path operator fees	17%	66%	34%	340	224	116
Total miscellaneous revenue				\$ 660	\$ 544	\$ 116

Operating Reserve Credit

The operating reserve credit from *Table 21 – Mapping Operating Reserve Credit to Cost Categories* in the 2015 cost of service study paper was allocated using the percentages shown in Table 6 above.

Table 13 – Allocation of Market Services Operating Reserve Credit

Allocation of Market Services Operating reserve credit to EIM Activities						
Type	Market Services	RTM	DAM	2013 Market Services Budget	RTM	DAM
		% of costs allocated to activity			Cost of activities \$ in thousands	
Operating Reserve Credit						
25% debt service reserve 2008 bonds	29%	43%	57%	\$ 1,647	\$ 708	\$ 939
Total				\$ 1,647	\$ 708	\$ 939

Step 4 - Aggregating revenue requirement into cost categories and allocating fees

The individual revenue requirements for each category were aggregated, indirect costs were allocated based on the total of direct costs and fees were allocated using the factors in Table 7 - Allocation of Market Services Fees.

Table 14 – Mapping Revenue Requirement to Cost Categories

Revenue Requirement (\$ in thousands)	2013 Market Services Budget	Real Time Market	Day Ahead Market
Direct O&M \$	\$ 12,863	\$ 8,075	\$ 1,788
Non-ABC support O&M \$	614	553	61
Debt Service 2008 bonds	7,263	3,152	4,111
Other income	(660)	(544)	(116)
Operating reserve	(1,647)	(708)	(939)
Total before allocation of indirect	18,433	10,528	7,905
Allocate indirect based on direct cost %	100%	57%	43%
Allocate indirect	34,255	19,525	14,730
Total Revenue requirement	52,688	30,053	22,635
Less Fees			
Market bid fees	(203)	(102)	(101)
Inter-SC bid fees	(2,781)		(2,781)
SCID fees	(2,079)	(1,040)	(1,039)
Total fees	(5,063)	(1,142)	(3,921)
Revenue requirement to collect	\$ 47,625	\$ 28,911	\$ 18,714
% applicable to EIM activities	100%	61%	39%

Step 5 – Calculation of the EIM component of the 2013 market services rates

The percentages from Table 14 above were applied to the market services rate from *Table 23 – 2013 GMC rates Using Revised Cost Category Percentages* in the 2015 cost of service study paper.

Table 15 – EIM Component Rates of Market Services

Revenue Requirement	Market Services	Real Time Market
2013 Market Services rate	\$ 0.09	
Revenue requirement to collect	\$ 47,625	\$ 28,911
% of costs applicable to EIM activities		61%
2013 rates of EIM activities		\$ 0.06

Mapping of System Operations to EIM activities

This mapping only addresses those level 2 activities that are mapped to system operations that are in turn mapped to the real time dispatch (RTD) or the balancing authority services (BAS). The direct ABC level 2 activities mapped to system operations is taken from *Table 2 – Mapping of ABC Direct Operating Activities to Cost Categories* in the 2015 cost of service study paper.

Table 16 – Mapping of System Operations ABC Direct Operating Activities

Mapping of System Operations ABC level 2 Direct Operating Activities to EIM activities					
ABC Level 2 Activities	Cost Code	System Operations	RTD	BAS	Comments
			% of cost to allocate to category		
Definitions used in allocation			100%		the costs are entirely to support RT dispatch
				100%	the costs are entirely to support BA services
			50%	50%	the costs support equally both RT dispatch and BA services
			80%	20%	the costs are predominantly RT dispatch related but have some BA relationship
			20%	80%	the costs are predominantly BA services based but have some RT dispatch relationship
ABC level 2 Direct Operating Activities					
Develop Infrastructure (DM) (80001)					
Manage GIP agreements	202	100%		100%	This is a balancing authority responsibility
Manage GIP	203	100%		100%	
Long-term transmission planning	204	100%		100%	
New transmission resources	205	100%		100%	
Transmission maintenance studies	206	100%		100%	
Load resource data	207	100%		100%	
Seasonal assessment	208	100%		100%	
Queue management	209	100%		100%	
Annual delivery assessment	210	100%		100%	
Develop Markets (DM) (80002)					
Develop infrastructure policy	231	100%		100%	This is a balancing authority responsibility
Manage Market and Reliability Data and Modeling (MMR) (80004)					
Manage FNM maintenance	301	50%	100%		The grid id operated in real time
Plan and develop operations simulator training	302	80%	100%		The grid id operated in real time
ISO meter certification	303	100%		100%	The EIM entity is responsible for ensuring that their resources meet metering requirements.
EMMAA telemetry	304	100%		100%	
Metering system configuration for market resources	305	100%	100%		Ensure meter telemetry data is reflected in the real time market
Manage credit and collateral	308	45%	100%		Relates to billing for market transactions
Resource management	309	50%	20%	80%	Transmission resource and operational characteristics for management of the balancing area
Manage reliability requirements	310	100%		100%	This is an ISO process to implement resource adequacy
Manage operations planning	311	100%		100%	This is a balancing authority responsibility

Mapping of System Operations ABC level 2 Direct Operating Activities to EIM activities					
ABC Level 2 Activities	Cost Code	System Operations	RTD	BAS	Comments
			% of cost to allocate to category		
Manage WECC seasonal studies	312	100%		100%	
PIRP	313	80%	100%		Scheduling option for intermittent resources in real time market.
Manage & facilitate procedure maintenance	314	80%		100%	This is a balancing authority responsibility
Procedure administration and reporting	315	80%		100%	
Plan and develop operations training	316	80%	100%		The grid is operated in real time
Execute and track operations training	317	80%	100%		
CETAC activities	318	100%		100%	This is a balancing authority responsibility
Manage Markets and Grid (MMG) (80005)					
Operations RT support	353	50%	100%		Applies to real time market
Outage model and management	355	100%		100%	This is a balancing authority responsibility
Manage DA market	358	50%	80%	20%	DA schedules in ISO are equivalent to EIM base schedules
Manage pre and post scheduling	359	100%		100%	This is a balancing authority responsibility
Manage operations engineering support	362	80%	100%		Ensures system conditions accurately reflect real time market
RT market – shift supervisor – manage post DA and pre RT & manage emergency operations	363	50%	20%	80%	Manages ISO grid reliability and ensures real time market dispatch after reflecting system conditions and man
RTO – GRC desks - maintain balancing area and manage RT pre dispatch	364	80%	100%		This is the preparation for running the real time market
RTO – transmission desk – manage transmission and electric system	365	100%		100%	This is a balancing authority responsibility
RTO – scheduling desk – manage RT interchange scheduling	366	100%		100%	
Manage Operations Support and Settlements (MOS) (8007)					
Manage price validation & corrections	401	50%	100%		Price corrections are in real time
Manage MQS	403	50%	100%		Process to feed correct data into settlements (base EIM schedules are equivalent to DA schedules)
Manage regulation no pay & deviation penalty calculations	405	100%		100%	This is a balancing authority responsibility
Periodic meter audits	407	100%	100%		Validated meter data for settlement purposes
RIG engineering	408	100%		100%	This is a balancing authority responsibility
Manage energy measurement acquisition & analysis	409	100%	100%		Validated meter data for settlement purposes
Manage market clearing	411	45%	100%		Predominantly real time or market activity
Manage market billing & settlements	412	45%	100%		
Manage RMR settlements	413	100%	100%		
Manage settlements release cycle	414	45%	100%		
Manage market performance	417	50%	100%		Market analysis and validation encompasses both markets
Perform market validation	419	50%	100%		
Support Customers and Stakeholders (SCC) (80010)					
Develop participating transmission owners	605	100%		100%	This is a balancing authority responsibility

This mapping was also applied to the software underlying the 2008 bond debt service portion of the revenue requirement. The system operations mapping s taken from *Table 3 – Allocation of Debt Service and Capital to GMC to Cost Categories* in the 2015 cost of study discussion paper.

Table 17 – Allocation of System Operations Debt Service

Allocation of System Operations Debt Service to EIM activities				
System	System Operations	RTD	BAS	Comments
		% of cost to allocate to category		
2008 Bond Debt Service				
ADS	100%	100%		Used to send dispatch instructions to participating resources.
ALFS	50%	100%		Load forecast is used in real time
DMM & compliance tools	50%	100%		Market monitoring
EMS	100%		100%	This is primarily a balancing authority responsibility with some real time as the balancing authorities communicate with each other
ETCC	50%		100%	This is a balancing authority responsibility
FNM / State estimator	50%	100%		This is used to initialize the real time dispatch
IFM	50%	100%		
MQS	50%	100%		Process to feed correct data into settlements (base EIM schedules are equivalent to DA schedules)
Master file	50%	100%		Stores resource operating characteristics
MDAS	100%	100%		Receives meter data for settlement purposes
RIMs	80%		100%	This is a balancing authority responsibility
OASIS	50%	100%		Market results include EIM results
OMAR	100%	100%		Receives meter data for settlement purposes
PIRP	80%	100%		Scheduling option for intermittent resources in real time market
Portal	50%	100%		Enables EIM participants to input and receive market information
CMRI	50%	100%		
Pi	100%		100%	This is a balancing authority responsibility
RT markets	80%	100%		Includes the hour ahead, real time dispatch and fifteen minute market
HASP	50%	100%		
Resource Adequacy	50%		100%	This is a process to implement resource adequacy
RAVE	50%		100%	This is a process to implement RMR
SLIC	50%	100%		Required for reflecting outages in the real time
CAS	50%		100%	This is a balancing authority responsibility
SIBR	50%	100%		This is required for submitted bids
SaMC	75%	100%		Based on day ahead and real time charge codes

Next the system operations related non-payroll support costs were mapped from *Table 4 – Allocation of Non-Payroll Support Cost to GMC to Cost Categories* in the 2015 cost of service study paper.

Table 18 – Allocation of System Operations Non-Payroll Support Costs

Allocation of System Operations Non-Payroll Support Costs to EIM activities				
Type	System Operations	RTD	BAS	Comments
		% of cost to allocate to category		
Non-Payroll Support Costs				
Operations Division				
PIRP forecasting costs	80%	100%		Use 80004 activity 313
General Counsel and Administrative Services Division				
SSAE 16 audit	45%	100%		Use 80007 activity 412
Operational assessment	83%	To be based on %'s from 80005 between RTD and BAS		

The remaining system operations other income *Table 6 – Allocation of Other Income to GMC to Cost Categories* and operating reserve credit *Table 7 – Allocation of Operating Reserve Credit to GMC to Cost Categories*, both in the 2015 cost of service study paper, were then allocated to their RTD and BAS components.

Table 19 – Mapping of System Operations Other Income

Allocation of System Operations Other Income to EIM activities				
Type	System Operations	RTD	BAS	Comments
		% of cost to allocate to category		
Other Income				
PIRP forecasting fees	80%	100%		Use 80004 activity 313
LGIP study fees	100%		100%	Use 80001 activity 203
COI path operator fees	83%	To be based on %'s from 80005 between RTD and BAS		

Table 20 – Mapping of System Operations Operating Reserve Credit

Allocation of Market Services Operating Reserve Revenue Credit to EIM activities				
Type	System Operations	RTD	BAS	Comments
		% of cost to allocate to category		
Operating Reserve Credit				
25% debt service reserve on 2008 bonds	51%	To be based on %'s from 2008 bonds debt service between RTD and BAS		

FEES

Transmission ownership rights charges were allocated 100 percent to real time dispatch.

Costing the System Operations EIM activities

The amounts from the 2015 cost of service study were applied to the system operations categories to derive the direct costs of the RTD and BAS.

Table 21 – Components of the 2013 System Operations Revenue Requirement:

Revenue Requirement (\$ in thousands)	2013 System Operations Budget
Direct O&M	\$ 42,512
Non-ABC support O&M	1,759
Debt service 2008 bonds	12,481
Other income	(4,940)
Operating reserve credit	(2,897)
Allocation of Indirect costs	88,809
Revenue requirement before fees	137,724
Fees	(993)
Total System Operations Revenue Requirement	\$ 136,731

Completing the analysis required the following steps:

1. applying EIM activity percentages to non-ABC O&M support costs;
2. applying EIM activity percentages to ABC direct O&M costs;
3. applying EIM activity percentages to debt service costs, other Income and operating reserve credit;
4. aggregating costs and allocate indirect costs to EIM activities based on percentage of direct costs and allocating fees to EIM activities to determining resulting EIM activity amounts and percentages; and
5. applying EIM activity percentage to market services rate to determine the EIM market services component.

Step 1: Applying EIM activity percentages to non-ABC O&M support costs

The non-ABC support costs from *Table 10 – Allocation of non-ABC Support Costs to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 18 above.

Table 22 – Allocation of System Operations Non-ABC Support Costs

Allocation of System Operations Non-ABC support costs to EIM Activities						
Non-ABC support costs	System Operations	RT Dispatch	BA Services	2013 System Operations Budget	RT Dispatch	BA Services
		% of costs allocated to activity			Cost of activity \$ in thousands	
Non-ABC support costs						
Operations Division						
PIRP forecasting costs	80%	100%		\$ 1,350	\$ 1,350	\$ -
General Counsel and Administrative Services Division						
SSAE 16 audit	45%	100%		243	243	
Operational assessment	83%	36%	64%	166	60	106
Total				\$ 1,759	\$ 1,653	\$ 106

Step 2: Applying EIM activity percentages to ABC direct O&M Costs

The ABC direct O&M costs from *Table 15 – Mapping ABC Direct Operating Activities to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 16 above.

Table 23 – Allocation of System Operations ABC Direct Operating Costs

Allocation of System Operations ABC Direct Operating Costs to EIM Activities							
ABC Level 2 Activities	Cost Code	System Operations	RTD	BAS	2013 System Operations Budget	RTD	BAS
			% of costs allocated to activity			Cost of activity \$ in thousands	
ABC Direct Operating Costs							
Develop Infrastructure (DI) (80001)							
Manage GIP agreements	202	100%		100%	\$ 818	\$ -	\$ 818
Manage GIP	203	100%		100%	2,342		2,342
Long-term transmission planning	204	100%		100%	4,723		4,723
New transmission resources	205	100%		100%	552		552
Transmission maintenance studies	206	100%		100%	499		499
Load resource data	207	100%		100%	268		268
Seasonal assessment	208	100%		100%	223		223
Queue management	209	100%		100%	615		615
Annual delivery assessment	210	100%		100%	25		25
Total DI					9,615		9,915
Develop Markets (DM) (80002)							
Develop infrastructure policy	231	100%	100%		829		829
Total DM					829		829
Manage Market & Reliability Data & Modeling (MMR) (80004)							
Manage FNM maintenance	301	50%	100%		862	862	
Plan and develop operations simulator training	302	80%	100%		240	240	
ISO meter certification	303	100%		100%	416		416
EMMAA telemetry	304	100%		100%	100		100

Allocation of System Operations ABC Direct Operating Costs to EIM Activities							
ABC Level 2 Activities	Cost Code	System Operations	RTD	BAS	2013 System Operations Budget	RTD	BAS
			% of costs allocated to activity			Cost of activity \$ in thousands	
Metering system configuration for market resources	305	100%	100%		70	70	
Manage credit and collateral	308	45%	100%		262	262	
Resource management	309	50%	20%	80%	455	91	364
Manage reliability requirements	310	100%			931		931
Manage operations planning	311	100%			1,321		1,321
Manage WECC seasonal studies	312	100%			71		71
PIRP	313	80%			1	1	
Manage & facilitate procedure maintenance	314	80%		100%	673		673
Procedure administration and reporting	315	80%			9		9
Plan and develop operations training	316	80%	100%		571	571	
Execute and track operations training	317	80%	100%		1,106	1,106	
CETAC activities	318	100%			73		73
Total MMR					7,161	3,203	3,958
Manage Markets and Grid (MMG) (80005)							
Operations RT support	353	50%	100%		615	615	
Outage model and management	355	100%		100%	2,921		2,921
Manage DA market	358	50%	80%	20%	1,282	1,026	256
Manage pre and post scheduling	359	100%		100%	974		974
Manage operations engineering support	362	80%	100%		918	918	
RT market – shift supervisor – manage post DA and pre RT	363	50%	20%	80%	1,010	202	808
RTO – GRC desks - maintain balancing area and manage RT pre dispatch	364	80%	100%		4,874	4,874	
RTO – transmission desk – manage transmission and electric system	365	100%		100%	4,956		4,956
RTO – scheduling desk – manage RT interchange scheduling	366	100%		100%	3,754		3,754
Total MMG			36%	64%	21,304	7,635	13,669
Manage Operations Support & Settlements (MOS) (80007)							
Manage price validation and corrections	401	50%	100%		78	78	
Manage MQS	403	50%	100%		571	571	
Manage regulation no pay & deviation penalty calculations	405	100%		100%	8		8
Periodic meter audit	407	100%	100%		4		4
RIG engineering	408	100%		100%	332		332
Manage energy measurement acquisition & analysis	409	100%	100%		926	926	
Manage market clearing	411	45%	100%		50	50	
Manage market billing & settlements	412	45%	100%		541	541	
Manage RMR settlements	413	100%	100%		10	10	
Manage settlements release cycle	414	45%	100%		363	363	
Manage market performance	417	50%	100%		104	104	

Allocation of System Operations ABC Direct Operating Costs to EIM Activities							
ABC Level 2 Activities	Cost Code	System Operations	RTD	BAS	2013 System Operations Budget	RTD	BAS
			% of costs allocated to activity			Cost of activity \$ in thousands	
Perform market validation	419	50%	100%		608	608	
Total MOS					3,595	3,255	340
Support Customers and Stakeholders (SCS) (80010)							
Develop PTOs	605	100%		100%	8		8
Total SCS					8	-	8
Total Direct O&M					\$ 42,512	\$ 14,093	\$ 28,419
Direct O&M %					100%	33%	67%

Step 3 – Allocating remaining system operations revenue requirement components

Debt Service

The debt service costs from *Table 19 – Mapping Debt Service and Cash Funded Capital to Cost Categories* in the 2015 cost of service study paper were allocated using the percentages shown in Table 17 above.

Table 24 – Allocation of System Operations Debt Service Costs

Allocation of Market Services Debt Service Costs to EIM Activities						
System	System Operation	RTD	BAS	2013 System Operations Budget	RTD	BAS
		% of costs allocated to activity			Cost of activity \$ in thousands	
Debt Service Costs						
ADS	100%	100%		\$ 30	\$ 30	\$ -
ALFS	50%	100%		39	39	
DMM & compliance Tools	50%	100%		239	239	
EMS	100%	20%	80%	1,923	385	1,538
ETCC	50%		100%	5		5
FNM / State estimator	50%	100%		91	91	
IFM	50%	100%		3,182	3,182	
MQS	50%	100%		507	507	
Master file	50%	100%		204	204	
MDAS	100%	100%		15	15	
NRI	80%		100%	175		175
OASIS	50%	100%		33	33	
OMAR	100%	100%		96	96	
PIRP	80%	100%		36	36	
Portal	50%	100%		237	237	
CMRI	50%	100%		205	205	
PI	100%		100%	137		137

Allocation of Market Services Debt Service Costs to EIM Activities						
System	System Operation	RTD	BAS	2013 System Operations Budget	RTD	BAS
		% of costs allocated to activity			Cost of activity \$ in thousands	
RT markets	80%	100%		1,017	1,017	
HASP	50%	100%		635	635	
Resource Adequacy	50%		100%	22		22
RAVE	50%		100%	2		2
SLIC	50%	100%		148	148	
CAS	100%		100%	47		47
SIBR	50%	100%		901	901	
SaMC	75%	100%		2,555	2,555	
Total 2008 bond debt service				\$ 12,481	\$ 10,555	\$ 1,926
Total 2008 Bond debt Service %				100%	85%	15%

Miscellaneous Revenue

The miscellaneous revenue from *Table 20 – Mapping Miscellaneous Revenue to Cost Categories* in the 2015 cost of service study paper was allocated using the percentages shown in Table 19 above.

Table 25 – Allocation of System Operations Miscellaneous Revenue

Allocation of System Operations Miscellaneous Revenue						
Type	System Operations	RTD	BAS	2013 System Operations Budget	RTD	BAS
		% of costs allocated to activity			Cost of activities \$ in thousands	
Miscellaneous revenue						
Intermittent resource forecasting fee	80%	100%		\$ 1,280	\$ 1,280	\$ -
LGIP study fees	100%		100%	2,000		2,000
COI path operator fees	83%	36%	64%	1,660	598	1,062
Total miscellaneous revenue				\$ 4,940	\$ 1,878	\$ 3,062

Operating Reserve Credit

The operating reserve credit from *Table 21 – Mapping Operating Reserve Credit to Cost Categories* in the cost of service discussion paper was allocated using the percentages shown in Table 20 above.

Table 26 – Allocation of System Operations Operating Reserve Credit

Allocation of System Operations Operating reserve credit to EIM Activities						
Type	System Operations	RTD	BAS	2013 System Operations Budget	RTD	BAS
		% of costs allocated to activity		Cost of activities \$ in thousands		
Operating Reserve Credit						
25% debt service reserve 2008 bonds	51%	85%	15%	\$ 2,897	\$ 2,462	\$ 435
Total				\$ 2,897	\$ 2,462	\$ 435

Step 4 – Aggregating revenue requirement into cost categories and allocating fees

The individual revenue requirements for each category were aggregated, indirect costs were allocated based on the total of direct costs and fees were allocated as described above.

Table 27 – Mapping Revenue Requirement to Cost Categories

Revenue Requirement (\$ in thousands)	2013 System Operations Budget	Real Time Dispatch	Balancing Authority Services
Direct O&M \$	\$ 42,512	\$ 14,093	\$ 28,419
Non-ABC support O&M \$	1,759	1,653	106
Debt Service 2008 bonds	12,481	10,555	1,926
Other income	(4,940)	(1,878)	(3,062)
Operating reserve	(2,897)	(2,462)	(435)
Total before allocation of indirect	48,915	21,961	26,954
Allocate indirect based on direct cost %	100%	45%	55%
Allocate indirect	88,809	39,964	48,845
Total Revenue requirement	137,724	61,925	75,799
Less TOR charges	(993)	(993)	
Revenue requirement to collect	\$ 136,731	\$ 60,932	\$ 75,799
% applicable to EIM activities	100%	45%	55%

Step 5 – Calculation of EIM component of 2013 system operations rates

The percentages from Table 27 above were applied to the system operations rate from *Table 23 – 2013 GMC rates Using Revised Cost Category Percentages* in the 2015 cost of service study paper.

Table 28 – EIM Component Rate for System Operations

Revenue Requirement	System Operations	Real Time Dispatch
2013 System Operations rate	\$ 0.29	
Revenue requirement to collect	\$ 136,731	\$ 60,932
% of costs applicable to EIM activities		45%
2013 system operations rate for EIM activities		\$ 0.13

Summary of EIM Rate

The results of the cost of service analysis for the EIM fee that will go into effect in 2015 are as reflected in the following table:

Summary of EIM Rate for 2015

Category	Net costs (\$ in thousands)	Cost of real time activities	Percentage share of costs	Pro forma 2013 rate	EIM rate
Market services	\$ 47,625	\$ 28,911	61%	\$ 0.09	\$ 0.06
System Operations	136,731	60,932	45%	\$ 0.29	\$ 0.13
CRR services	5,430	n/a		\$ 0.01	
Total	\$ 189,786	\$ 89,843	47%		\$ 0.19