

The Competitive Procurement of Black Start

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Process Clarification

In a compliance filing (ER98-3760-012) under Docket ER98-3760 the California ISO undertook to re-evaluate the procurement of Voltage Support and Black Start capability. In that filing the CAISO indicated that it would seek stakeholder input in the development of a conceptual design prior to June 30th 2006, for presentation to stakeholders prior to September 30th 2006. This preliminary white paper is the first step in that process. The purpose of this document is merely to survey the practices of other jurisdictions in an attempt to gather information as to how similarly situated ISOs procure these services, as the practices of other ISOs should inform and guide the conceptual development of our own design. A conference call will then be held with stakeholders in light of this information to gather initial feedback early in the process of determining a conceptual design. The CAISO would like to emphasize that the conference call scheduled for June 29th 2006, for which this paper is prepared, is merely the first opportunity market participants will have to voice their opinions. A further opportunity will be available when the CAISO's initial white paper is presented to stakeholders prior to September 30th, and possibly further opportunities depending on how the process unfolds thereafter.

Introduction

Black Start services are essential to any grid as they allow Black Start Capable units to start up from a shut down state and energize part of the grid without an external electrical supply. Having Black Start Capable units ready to provide this service is a necessary component of any system restoration plan. The manner in which this service is procured and the costs allocated is less settled than the need for the product as the following survey makes clear. Important concepts to bear in mind include:

1. Does the procurement of Black Start Services lend itself to competitive processes. Competitive procurement works best when the product is fairly homogeneous and geographically substitutable. Is Black Start capability on a hydro resource in the Sierras equivalent, or almost equivalent, to Black Start capability in the heart of a load pocket in the LA basin? This is important as the absence of geographic substitutability necessitates regional procurement, and the smaller the regions the greater the vulnerability to market power¹.
2. Should the cost allocation be socialized, meaning that all users of the grid pay an equal share, or should the cost allocation be regionalized geographically or by class of end user?

Current CAISO Practices

The California ISO currently rolls the cost of procuring Black Start services into RMR contracts with selected generators. This is not to say that RMR contracts are specifically initiated to provide Black Start but rather that Black Start capability is considered when making RMR decisions. There are non-RMR resources that have Black Start capability that are not receiving any explicit compensation for such service. These RMR contracts

¹ There is a measure of substitutability in Black Start capability. During restoration it is not unusual to have plans arranged whereby hydro power is expressly transmitted to thermal plants closer to load centers to begin their startup. That being said, this method of restoration can extend the time and increase the complexity of system restoration when compared to having local generation with Black Start capability.

are essentially Cost-of-Service (COS) based and generators providing the service have to test their units to make sure that the service is actually available. The total RMR costs are allocated to the Participating Transmission Owner (PTO) in whose service territory the RMR units reside. In turn the TOs file a Reliability Services Tariff with the CPUC and recover these costs from their customers. Thus the procurement is rolled into RMR contracts and the cost allocation is regionalized to the PTOs and is not spread evenly amongst all load.

ISO-NE

The ISO-NE has had two regimes to compensate Black-Start generators. Originally the ISO-NE had a complicated Cost-of-Service method by which unit owners volunteered to be Black Start units, and then received cost compensation based on the documented and audited costs of providing the service. The ISO-NE believed that this old process had numerous drawbacks. It was cumbersome and expensive beyond the significance of the monies being disbursed unit owners faced the risk of disallowance of cost reimbursement due to onerous documentation requirements and were consequently reluctant to “volunteer”. The policy had generally poor incentives to make unit owners maintain their Black Start capability, as well as poor incentives to encourage further BS capability on new units once existing units were retired. This original system lasted until the beginning of 2003 when the ISO-NE started a new FERC procedure (filed December 17 2002) to revisit their procurement methodology (See ISO-NE 2003a). In this application they revised Section 16 of their Open Access Transmission Tariff (see ISO-NE OATT) and changed the procurement methodology for BS services.

Procurement

NEPOOL created a Black Start Working Group (BSWG), which developed the following approach to replace the previous COS formula with the following monthly formula.

$C_i = (\$/\text{kWyr}/12) \times (\text{the unit's Monthly Claimed Capability for that month}).$

Where

$C_i =$ Compensation to be paid to a specific generator

$\$/\text{kWyr} =$ An agreed upon rate

(The unit's...) A figure measured in percent

The only part of this methodology that was in the least controversial was the \$Y figure. To develop the \$Y value, the BSWG used three data inputs.

1. It used the actual annual payments made to black start generators from September 1, 1998 to December 31, 2001 (an average of approximately \$1.67/kW-yr in 1998, \$2.68/kW-yr in 1999, \$2.70/kW-yr in 2000, and \$3.13/kW-yr in 2001).
2. The BSWG used a recent study of the cost of equipping a new diesel generator with black start capabilities, which resulted in projected costs of \$8.00 - \$8.90/kW-yr.
3. The BSWG used information provided by black start generators as to what they would consider appropriate levels of compensation, which resulted in figures ranging from \$3.60 to \$5.00/kW-yr.

On the basis of these inputs, the BSWG suggested the following values for \$Y: \$3.75/kW-yr in 2003, \$4.00/kW-yr in 2004, \$4.25/kW-yr in 2005, and \$4.50/kW-yr in 2006. The rates

would then remain at that level, pending periodic review and adjustment. These rates are greater than those that would have been in place with the previous Schedule 16 formula, but less than those proposed by the generators. In its arguments NEPOOL stated that the proposed amended formula would provide administrative simplicity and provide a transparent cost recovery mechanism that would produce a knowable result, and so will reduce generators' fear that they might ultimately recover less than they initially believed due to problems with documentation and audits. Thus, NEPOOL argued, this formula eliminated disincentives to generators to volunteer to provide black start service. NEPOOL also stated that this amendment was recommended by a 73 percent vote of the Tariff Committee and an 85 percent vote of the Participants Committee.

ISO-NE is busy updating these figures and their most recent board proposal (ISO-NE, 2006) for a FERC filing is that the reimbursement rate will remain at \$4.50 for calendar year 2006 and \$4.58 for calendar years 2007 through 2011. The increase from \$4.50 to \$4.58 is a levelized rate for the years 2007 to 2011 that accounts for inflation. In an effort to file fixed rates accounting for the inflationary adder, the Working Group looked to create a levelized rate using a weighted US /Boston Consumer Price Index for 2007 thru 2011 and determined the effects of the after-tax Return on Equity and weighted cost of capital for that same period on the rate. The result was the levelized rate of \$4.58/kw-yr/12 over the period from 2007 thru 2011.

The "Y" value will be re-evaluated and a new filing will be made by July 1, 2011 that will either (i) justify the continuation of the \$4.58 for the "Y" value, or (ii) propose to change the "Y" value for the years following 2011. In that same memo (ISO-NE, 2006) the ISO-NE discusses making supplemental payments for new black start investment, but indicates that whilst no filing will be made discussions will continue.

Cost Allocation

The cost allocation in the ISO-NE is based on load ratio share and is thus shared equally between all who use the grid.

Whilst the new system used by the ISO-NE seems much better than the previous system, because it is both simpler, and also includes an incentive for utilities to provide the service, it is clearly not competitive procurement. It has much to recommend itself simply because it attempts to provide the necessary incentives to ensure a sufficient procurement of Black Start capability. It is however, clearly not competitive procurement, as everyone appears to simply be paid a single rate, which is based on a mixture of approximate costs with some undefined adder to encourage participants to provide the service.

References

ISO-NE (2003a) "Order Accepting Application" FERC ER03-291, issued February 14th 2003. Available at http://www.iso-ne.com/committees/comm_wkgrps/trans_comm/tariff_comm/mtrls/2006/may162006/index.html

ISO-NE OATT See page 311, Available at http://www.iso-ne.com/regulatory/tariff/sect_2/oatt/index.html

ISO-NE 2006 "A3 Black Start Working Group Memo to the NEPOOL Transmission Committee" dated May 9th 2006,
Available at http://www.iso-ne.com/committees/comm_wkgrps/trans_comm/tariff_comm/mtrls/2006/may162006/index.html

PJM

PJM does not appear to have a competitive procurement process for Black Start. It appears that PJM has a COS approach to procurement in that each generator establishes a Black Start Revenue Requirement, and simply has one twelfth of that figure paid monthly. The cost allocation is based on load ratio share, without any regionalization.

Procurement

All Transmission Customers purchase Black Start from PJM to ensure the reliable restoration following a shut down of the PJM transmission system. Generators with approved black start revenue requirements are paid a monthly figure equal to 1/12th of their annual black start revenue requirement. Owners of Black Start Units initially commit to providing Black Start Service for a two-year period. Black Start Unit owners and Transmission Owners may terminate this two-year commitment upon notice given one year before the date the commitment period ends.

The general formula for calculating a generator's annual Black Start Service revenue requirement is:

$\{(Fixed\ Black\ Start\ Service\ Costs) + (Variable\ Black\ Start\ Service\ Costs) + (Training\ Costs) + (Fuel\ Storage\ \&\ Carrying\ Costs)\} * (1 + Incentive\ Factor)$

where:

Fixed Black Start Service Costs = $CDR * 365 * Black\ Start\ Unit\ capacity * X$

CDR = PJM Capacity Deficiency Rate on an installed capacity basis

Unit Capacity = Black Start Unit's installed capacity

X = Black Start Service allocation factor (Hydro = 0.01, Diesel = 0.02, CT = 0.02) unless another value is supported by the documentation of costs

Variable Black Start Service Costs = Black Start Unit O&M * Y

Variable Black Start Service Costs are the variable O & M costs that can be attributed to supporting Black Start Service

Y = 0.01 unless another value is supported by the documentation of costs

Variable O&M costs associated with Black Start Service are equal to annual variable O&M as outlined in the Cost Development Task Force PJM manual.

Training Costs = $50\ staff\ -hours/year/plant * \$75/hour$

Fuel Storage & Carrying Costs (applicable only to oil-fired units) = $(\# Run\ Hours) * (Fuel\ Burn\ Rate) * (12\ Month\ Forward\ Strip + Basis) * (Bond\ Rate)$

Cost Allocation

Monthly pool-wide black start revenue requirements are allocated as charges to point-to-point customers based on their monthly peak usage of the PJM transmission system. Monthly peak usage equals the total hourly amounts of transmission capacity reserved, and not curtailed by PJM, divided by 24. The remaining black start revenue requirements nominated by each zonal Transmission Owner not recovered from point-to-point

customers are allocated to the network customers and point-to-point customers serving load in that transmission zone based on their monthly peak loads. Monthly peak loads equal the sum of all daily network service peak load contributions.

References

PJM Tariff: Schedule 6A of the PJM Tariff. Available at:

<http://www.pjm.com/documents/downloads/agreements/tariff.pdf>

Black start Business Rules Available at:

<http://www.pjm.com/markets/ancillary/downloads/blackstart-buss-rules.pdf>

NY ISO

The NYISO does not appear to have a competitive black start procurement process. Instead the procurement of Black Start is COS based. Unlike PJM where the revenue requirement seems to be set by the regulatory authority it appears that in the NYISO generating units with Black Start capability seeking reimbursement simply present their costs to the NYISO, which pays them and allocates the costs out to the entire system on a load ratio share basis, without any regionalization of costs.

Procurement

By May 1st of each year generators with Black Start capability provide the NYISO with the following cost information

1. Capital and fixed operation and maintenance costs associated solely with the provision of Black Start Capability.
2. Annual costs associated with training the Generator operators in system restoration.

Besides the usual testing requirements, which generally entail no-pay if the unit fails, the NYISO also requires that units commit for an initial three year period. After the first two years either party can give a year's notice of intent not to contract any further, but the intent is to have a series of rolling three year contracts.

Cost Allocation

The NYISO has a fairly simple cost allocation mechanism. It is based on the load ratio share of each LSE. It is basically equal to the product of (a) the Transmission Customer's monthly Load Ratio Share of Load, and (b) the total payments for existing Black Start and System Restoration Services.

References

NYISO(2006) Accounting and Billing Manual. Available at:

<http://www.nyiso.com/public/webdocs/documents/manuals/administrative/acctbillmnl.pdf>

NYISO "Ancillary Services Manual" Available at

<http://www.nyiso.com/public/documents/manuals/operations.jsp?maxDisplay=20>

NYSIO Tariff (Rate Schedule 5 - starting page 91, Revised Sheet 311) Available at

http://www.nyiso.com/public/webdocs/documents/tariffs/market_services/rate_schedules.pdf

ERCOT

ERCOT appears to have a competitive process to procure Black Start Services based on yearly tenders.

Procurement

Beginning in 2001, ERCOT has been requesting bids from Generation Resource Entities for the provision of Black Start Service prior to June 1st of each year for the subsequent year. Bids are evaluated based on public evaluation criteria attached as an appendix to the request for bids and contracted by December 31st for the following calendar year. ERCOT pays an hourly standby fee, determined through this competitive annual bidding process, with an adjustment for reliability based on six month rolling availability in accordance with the Black Start Agreement in Section 22, ERCOT Protocols Agreements².

Cost Allocation

Black Start Service Costs are allocated on a Load Ratio Share per QSE (6.9.4.1 of ERCOT Protocols) Section 6: Ancillary Services

References

ERCOT (2006) Protocols Section 6. Available at:
<http://www.ercot.com/mktrules/protocols/current.html>

Conclusion

A few broad themes stand out from this survey;

- With the exception of ERCOT there is no conventional “competitive procurement” of Black Start capability, and even in the case of ERCOT it is a long-term offer and award process.
- Most compensation methodologies attempt to recognize fixed costs associated with the equipment and the variable costs associated with delivery of the service.
- Most allocation methods spread the costs to all demand including exports

Among the various ISOs surveyed here the California ISO has probably the most unusual procurement and cost allocation process. This appears to be a function of the fact that the procurement is not independent, but is rolled into the RMR contracts. In the eastern ISOs the designation of Black Start units appears to be via system recovery studies, and once designated remuneration is determined based on some variant of COS. This revenue requirement is then approved by a regulator and collected by the System Operator based on load ratio share. Despite the fact that the procurement in the three eastern ISOs is not competitive the cost allocation appears to be better. The load ratio share billing determinant socializes the cost of providing Black Start to all customers on the grid, which by implication indicates that they think that the reliability service is shared equally among all consumers regardless of the location of the actual Black Start units. This appears uncontroversial, and the CAISO’s allocation of Black Start costs is most likely less than optimal. On the other hand as the costs of Black Start are fairly stable and not onerous the

² ERCOT’s bidding form is located at:
<http://www.ercot.com/mktrules/protocols/current/22-%28A%29BlackStart-050105.doc>

magnitude of this inefficiency is not large. There are probably much greater cost allocation inefficiencies elsewhere in the system³.

The options for the CAISO might include:

1. Stay with the current system on the grounds that the increase in cost allocation efficiency is minor.
2. Stay with a COS-based system, but divorce it from the RMR contract and change the cost allocation methodology to something more conventional, such as load ratio share.
3. Change both the procurement and the cost allocation by more fully investigating the ERCOT system. Under the ERCOT system the procurement is competitive via yearly tenders, and the cost allocation is via load ratio share, which is probably better. There remain outstanding issues with this approach, namely whether or not ERCOT has locational issues as the CAISO does, and how they might counter any attempted exercise of market power. If market power is an issue a price-capped RFP system might be a solution.

³ For example frequency regulation, which is spread to load via load ratio share despite the fact that some loads induce a greater need for regulation than others, such as electric arc furnaces.

All References

ERCOT (2006) Protocols Section 6. Available at:
<http://www.ercot.com/mktrules/protocols/current.html>

ISO-NE (2003a) "Order Accepting Application" FERC ER03-291, issued February 14th 2003. Available at http://www.iso-ne.com/committees/comm_wkgrps/trans_comm/tariff_comm/mtrls/2006/may162006/index.html

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