Virtual Regional Dispatch

Pilot Project Description

Business Issues Committee

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1. Virtual Regional Dispatch Background

The coordination of interchange is the most fundamental seam between the New York and New England control areas. To ease the impediments to trade across this seam, the ISOs are proposing Virtual Regional Dispatch (VRD), which is a process of exchanging energy based upon price differentials. This process is designed to improve the efficiency of the operation of both ISO markets, by effectively increasing the size of the market. VRD would enable the ISOs to make substantial progress toward the efficiency gains of a single regional dispatch, while minimizing complex implementation barriers.

An efficient market maintains price consistency at non-congested interfaces. Market participants can quickly arbitrage large price differences, ensuring that energy flows from the lower priced area to the higher priced area, and rectifying divergent prices. However, under the current rules, New York and New England market participants often fail to converge prices at the border, and the efficiency of both markets suffers. The markets could potentially realize significant savings by mitigating the source of this inefficiency.

That these market inefficiencies remain unabated by participants in New York and New England is reflected by persistent price differences at non-congested interfaces and counterintuitive flows in both directions. As the New York ISO's Independent Market Advisor reported in 2002,[1] the two markets have not been able to enforce price convergence at their border pricing locations. Transactions respond sluggishly to large price differentials, and net flows often run counter to the prices in the two regions; i.e., energy sometimes flows toward the lower-priced region. While each ISO continues to develop its own market, planned improvements are not expected to alleviate the underlying cross-border issues that discourage arbitrageurs.

Participants do not adequately converge prices because these cross-border transactions entail considerable real-time financial risk. Participants must pay the

[1]2David B. Patton, Ph.D., Potomac Economics, Independent Market Advisor. *State of the Market Report 2002: New York Electricity Markets,* April 2003.

congestion charges to deliver power to the border in one market, and away from the border in the adjacent market, and the amount of congestion charges depends on the prices on each side of the border between the markets. When prices diverge substantially (as they do in many hours of high price volatility or congestion), participants engaged in *physical* transactions face considerable risk.

Virtual Regional Dispatch can circumvent these risks, while the two individual markets remain separate entities. Under VRD, the New York ISO and ISO-New England together would determine the real-time exchange of energy between them, enabling joint dispatch decisions to facilitate price convergence at the border. The objective is to allow the combined control areas to derive the benefits of a larger market, while maintaining separate dispatches. Resource use would be the most efficient in a unified dispatch regime, but the VRD process is expected to yield efficiency gains over current procedures.

The potential benefits of VRD are not limited to the combined New England/New York region, but also should lead to lower overall costs of serving load for each of the ISOs individually. Lower costs would follow from normal day-to-day efficiency improvements, but perhaps more importantly, VRD will expedite the importation of lower priced energy during periods when supply suddenly tightens due to unanticipated high load or outage conditions.

This paper proposes a process for studying VRD, termed the "VRD Pilot Program." It is targeted for the near-term period, while the requisite resources in both markets are committed to updating the current markets. The pilot program is intended to minimally impact both resources and on-going market operations. By conducting several key VRD processes for predefined finite test periods and examining the implications of these processes for electric system and market operations, the pilot test results can provide design guidance for the full VRD program.

The remainder of this paper presents details of the VRD Pilot Program. Section 2 provides an overview of the Pilot. Section 3 describes system operations during the Pilot, and Section 4 does the same for market operations. Section 5 explains how the results of

the first two trials are to be measured and reported. Finally, Section 6 discusses the proposed steps for going forward with VRD.

2. Pilot Project Overview

2.1 Objective

The ISOs define VRD as the exchange of energy between the New York and New England control areas based upon price differentials, with the goal of improving the efficiency of both ISO markets. This approach is analogous to the economy energy transactions that took place for many years prior to the advent of the wholesale energy markets. Thus, the two systems have many years of experience adjusting energy flow between the control areas, thereby affecting prices at the border, but this type of coordination has not been tested in today's competitive market environment.

The VRD Pilot Program affords an opportunity to study the operational impacts of the envisioned VRD approach in the market environment, and to collect data to inform the remaining design efforts for the coordinated VRD program. The Pilot program is designed to intrude minimally on the normal operation of the markets and on the resources committed to other major projects. Since the Pilot is focused on specific objectives, its scope is limited to the following tasks:

- Identify operations issues associated with intra-hour short-term exchanges of energy in a wholesale market environment.
- Evaluate the tools and data needed to support VRD in a production environment.
- Using intra-hour VRD energy exchanges, measure the validity of using the New England and New York energy supply curves in VRD applications.
- Observe the effect of intra-hour New York/New England VRD energy exchanges on the PJM, IMO, and Hydro-Québec proxy bus prices, and the feedback on New England and New York proxy prices and congestion patterns.
- Evaluate the need for additional pre-development or pre-deployment testing, and articulate the nature of these trials.
- Conduct the Pilot program in a manner that does not impact resources committed to other market and infrastructure initiatives in the respective ISOs.
- Limit undesirable impacts on normal system and market operations.

2.2 Pilot test schedule

The initial pilot testing sequence will be conducted in November or December of 2004, depending upon the NYISO's schedule and resource requirements for implementing SMD2. The pilot tests, as defined here, can be conducted in the NYISO under either the current or SMD2 systems. A specific time frame for VRD Pilot testing will be developed as the SMD2 schedule unfolds. ISO-NE does not have similar critical system upgrade deployment planned during the fourth quarter of 2004. In any case, VRD Pilot testing will not occur before FERC approves the testing regime, which the ISOs plan to file on or about September 1, 2004.

3. Pilot VRD and Electric System Operation

3.1 VRD transaction scheduling and management

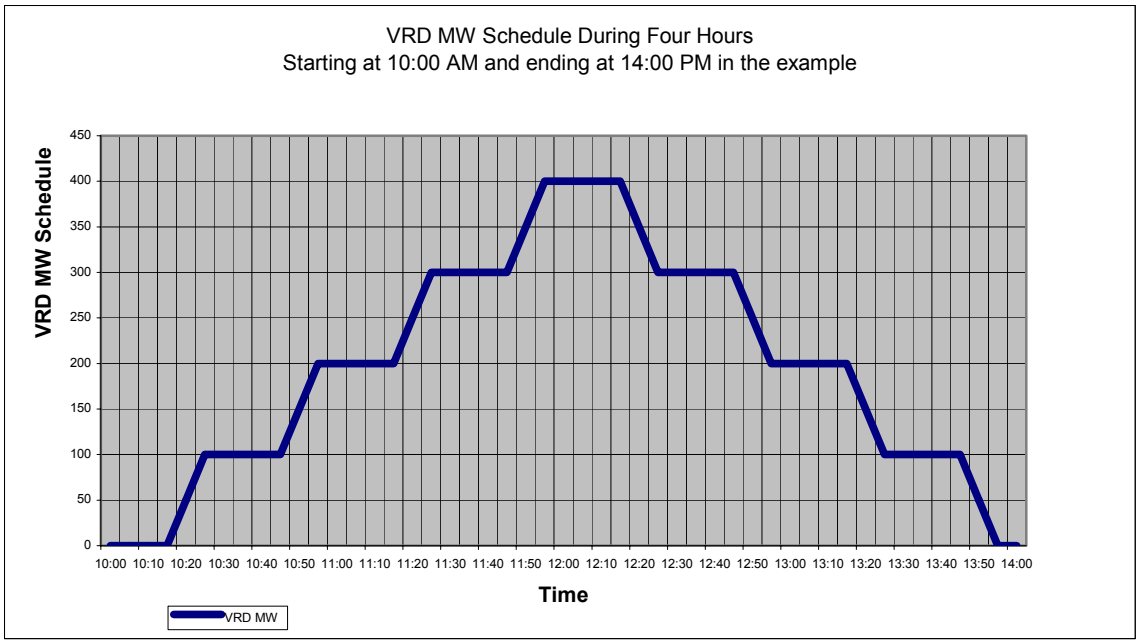
To fulfill its objectives, the Pilot program will be structured to minimize its impact on system operations. At least two sets of tests are planned to take place in real time. Each set will consist of two tests of limited duration, with the first set conducted during flat load and supply periods on normal operating days in both ISOs. The pilot tests will add specific VRD transactions to the normal flow of energy scheduled hourly between the NYISO and ISO-NE by market participants. The ISOs will provide ample advance notification to their respective market participants. The first set of two Pilot tests will be scheduled and managed according to the following steps:

- The tests will be scheduled when normal operating conditions prevail:
  - Not at the top of the hour, to avoid normal ramping limits;
  - Weekdays, Tuesday through Thursday;
  - During periods of relatively stable load conditions;
    - Between the hours of 10:00 and 15:00.
- All VRD schedules shall be agreed to by ISO-NE and NYISO prior to implementation.
- All VRD schedules shall be contingent on ongoing security analysis.
- Markets Development staff will be present in the control room to support and monitor the market effects of the tests.
- Each test cycle will consist of two proximate days of testing:
  - The Test 1 transaction would flow in one direction only, and
  - The Test 2 transaction would flow in the opposite direction of Test 1.
- Each daily test period will span four (4) hours:
  - Incremented over two (2) hours in one direction;
  - Similarly decremented for the following two (2) hours to eliminate the VRD transaction flow.
- Each transaction will be in pre-specified MW increment blocks:
  - VRD transactions will increment in blocks of 100 MW;
  - The maximum VRD flow in one direction will be 400 MW.

- VRD schedule changes are projected to occur at 30 minute intervals, as shown in figure 1:
  - 15 minutes after the hour;
  - 45 minutes after the hour;

  Ramped in over a period of 10 minutes.

Figure 1: VRD Scheduling



3.2 Capacity and operating reserves

Capacity. VRD transactions will not affect capacity requirements or the amount of capacity available system-wide. Specifically, in both the New York and New England systems:

- VRD transactions will not affect capacity requirements.
- The capacity commitment will not be changed to support VRD Pilot transactions.
- Fast start units will be included in the capacity assessment
  - Up to their 30-minute response.
- VRD Pilot transactions will not be considered in the Day-Ahead Market (DAM) solution.

Operating Reserve. VRD Pilot transactions also should not affect operating reserves in either system:

- VRD transactions will not affect the ISO-NE or NYISO 10-minute spin, 10-minute total, or the 30-minute operating reserve requirements.
- VRD transactions will not be allowed to reduce actual ISO-NE or NYISO system operating reserves below required levels.
- VRD energy is, therefore, considered recallable by either New York or New England prior to a reserve shortage.

3.3 System redispatch to meet VRD objectives

System dispatch will entail minimal changes to support Pilot VRD transactions. Each ISO intends to adapt its model for the dispatch of emergency energy transactions to the Pilot VRD tests.

New York

- VRD transactions will be entered into the NYISO Interchange scheduling process through IS-plus in much the same manner as emergency transactions, but with a VRD identification.
- No changes will be made to the normal NYISO real-time dispatch.
- Should the need to curtail transactions arise during the test period, the NYISO will cut VRD transactions prior to curtailing any participant transactions.

New England

- VRD transactions will be entered into the ISO-NE Interchange Frequency Schedule (IFS) page as "purchases/sales without capacity."
- Security constrained dispatch will be carried out in accordance with ISO-NE System Operating Procedures.
- Should the need for transaction curtailment arise, ISO-NE will cut VRD transactions prior to curtailing any participant transactions.

3.4 Additional resource commitment (GTs) to meet VRD objective

- To support VRD transactions, fast start resources will be committed in accordance with standard operating practices in both the New York and New England markets.

3.5 Emergency operation contingency guidelines

The following guidelines will apply in abnormal or emergency situations:

- VRD transactions shall be curtailed if they cause or contribute to either a system-wide or area-specific capacity deficiency.
- Shared activation of reserves shall not be an adequate reason for curtailing VRD transactions.

- First contingency coverage is to be provided without curtailing VRD transactions.
- Either of the ISOs may curtail VRD transactions for reliability reasons at any time during the Pilot test period.

3.6 General

- VRD transactions during the Pilot will not be curtailed for economic reasons:
  - Flow will not be curtailed even if the VRD transaction exacerbates price separation at the interface. It is important to note that these limited tests are not intended to level prices but to measure the effects of certain processes.

3.7 NERC tagging of VRD transactions

ISO-NE will create open purchase and sale VRD transactions. Each VRD transaction will be treated as follows for NERC tagging purposes:

- ISO-NE will assign a unique NERC tag and transaction number to each transaction.
- For each ramp interval, hourly energy amounts for each transaction will be determined prior to control room checkout and will be based on the test schedule.
- Checkout between ISO-NE and NYISO control rooms will use the NERC tag number, akin to the way that Pool-to-Pool emergency energy transaction checkout is now conducted.

4. Pilot Market Operation

4.1 Market participant notification of test periods

Market participants in both ISOs will receive ample notice of the Pilot VRD test periods.

ISO-NE: market participants will be notified via a "Special Notice" on the website 14 calendar days in advance of VRD Pilot commencement.

NYISO: market participants will be notified via a "Special Notice" on the website 14 calendar days in advance of VRD Pilot commencement.

4.2 Market Rules

There are no plans to change market rules or tariffs for the VRD Pilot Program, except as noted in Section 4.4.

ISO-NE: No substantial changes.

NYISO: No substantial changes.

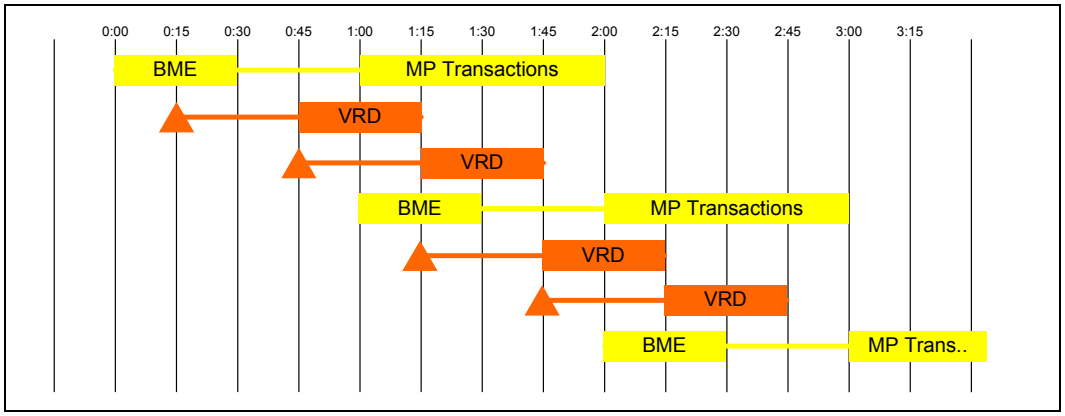
4.3 Scheduling and settlement of market participant transactions during pilot operation

The timing of VRD transactions, at 15 and 45 minutes after the hour, is designed to avoid ramp problems at the top of the hour, when market participant transactions are adjusted.

NYISO: The NYISO currently (legacy system) evaluates and schedules market participant transactions once each hour, and this procedure will continue under the new Real-Time Scheduling (RTS) system. No changes to either the current process or the RTS process are anticipated for the VRD Pilot. Market participant transactions will be evaluated and scheduled once per hour.

The legacy system is illustrated in Figure 2. It consists of an hourly short-term unit commitment function, the Balancing Market Evaluation (BME), and a periodic (every five minutes) economic dispatch function - the Security-Constrained Dispatch (SCD). SCD can commit 10-minute generating units, and real-time prices are generally set by SCD.

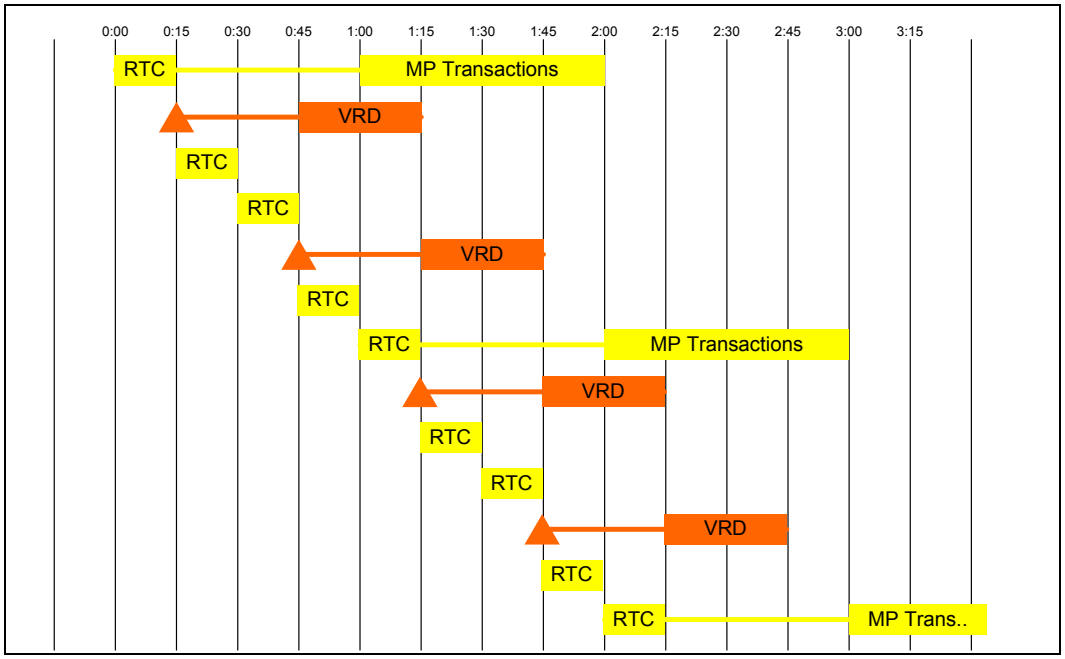
Figure 2: VRD Pilot in Legacy System



In the legacy system, BME would make no unit commitments to support VRD transactions, and market participant transactions would be scheduled as if no VRD transactions existed. Unlike BME, SCD would recognize the existence of VRD transactions, and generate prices that properly reflect re-dispatch of the entire New York system to accommodate, among many other things, the VRD transaction. Unless the interface with New England is constrained, SCD will set real-time prices.

Figure 3 illustrates the NYISO's new RTS, which will consist of a periodic (every fifteen minutes) short-term unit commitment function, the Real-Time Commitment (RTC), and a periodic (every five minutes) economic dispatch function - the Real-Time Dispatch (RTD). Unlike SCD, which can commit 10-minute generating units, RTD cannot commit any generating units. Real-time prices will generally be set by RTD.

Figure 3. VRD in Pilot Real-Time Scheduling System



The RTC will schedule market participant transactions as if no VRD transactions existed. Otherwise, RTC will accommodate VRD transactions and may commit or de-commit generating units in response to VRD transactions.

RTD will recognize the existence of VRD transactions, and produce prices properly reflective of the re-dispatch of the entire New York system to accommodate, among other considerations, the VRD transaction. Unless the interface with New England is constrained, RTD will set the real-time prices.

ISO-NE: There are no changes planned related to the scheduling procedures for ISO-NE participant transactions.

NYISO Settlement of market participant transactions: Real-time market participant transactions are currently settled at the real-time price of the New England proxy bus (Sandy Pond). Real-time market participant transactions will also be settled at the Sandy Pond price after RTS becomes operational. No changes will be made to the settlement of market participant real-time transactions during intervals when the VRD Pilot is tested.

ISO-NE Settlement of market participant transactions in the ISO-New England: There are to be no changes in the settlement treatment of participant transactions during the VRD Pilot test period.

4.4 Settlement of VRD Transactions

During the Pilot program, VRD transactions will be settled in a manner similar to emergency energy purchases and sales. This method of settlement will not carry over to production VRD, but it is adequate for settlement of the Pilot VRD transactions during the few, brief test periods that are planned. For the VRD Pilot, the importing control area (I) will pay the exporting control area's (E) real-time price proxy bus for I, plus any export charges that may be applicable to an emergency transaction.

ISO-New England:ISO-NE Settlements essentially would process each VRD Pilot Test as an Emergency Energy Transaction, according to the rules set forth in Sections 8.1 through 8.3 of *NEPOOL Manual 28*[2].

Section 8.1 of Manual 28 provides an overview of Emergency Energy accounting. In summary, it dictates allocating both purchases and sales based on real-time negative deviations (from those cleared in the day-ahead market). Sections 8.2 and 8.3 provide the details of Emergency Energy purchase and sales allocation methodologies. Both credits and charges for purchases or sales are allocated *pro-rata* based upon the sum of the following real-time deviations:

- Self-Schedule deviation.
- Not following dispatch deviation.
- Negative Generator Obligation Deviation at External Node.
- Negative Adjusted Load Obligation Deviation.
- Negative Increment Deviation.

In addition, charges to the external control area for Emergency energy sales may include an adder made up of operating reserve and ancillary services costs. Currently, if there are any RMR charges within the reliability region in which the

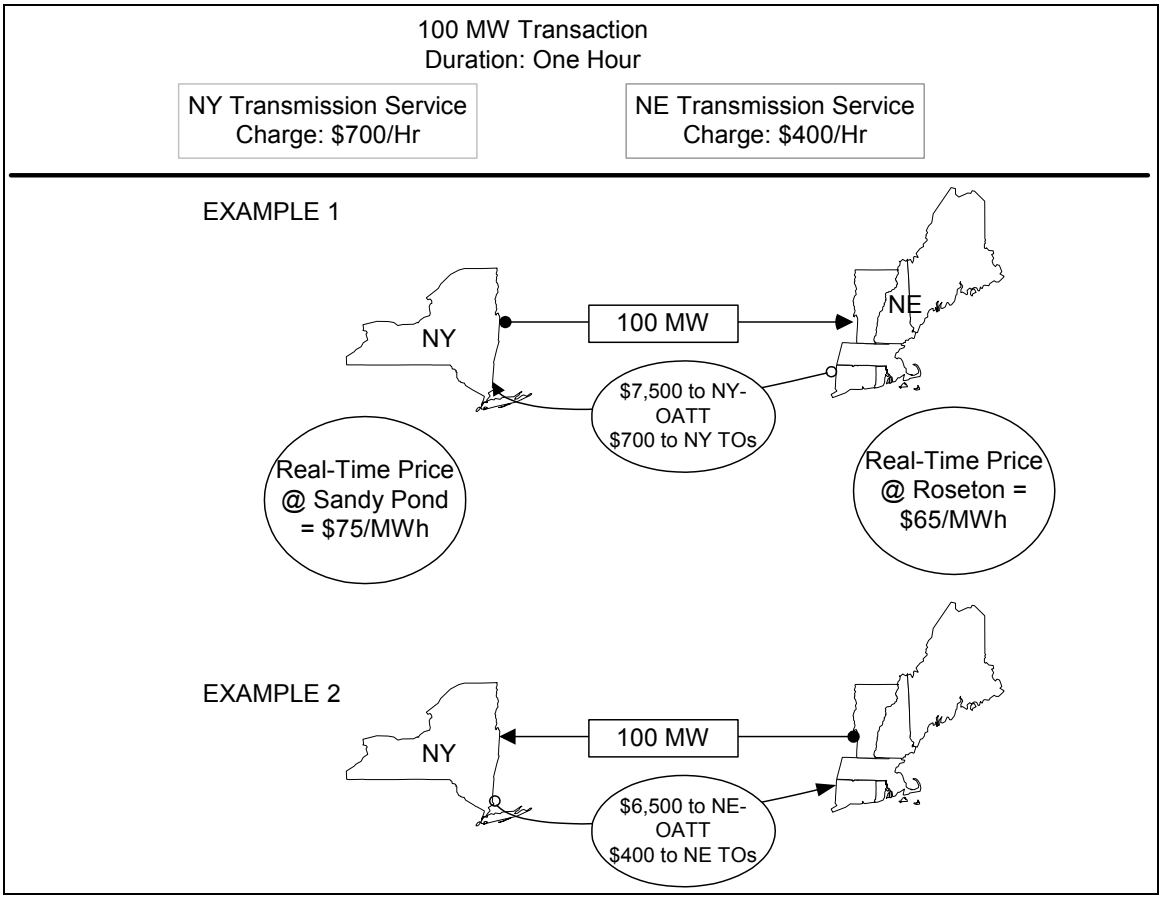
[2] Available on the ISO-NE website: http://www.iso-ne.com/smd/market_rule_1_and_NEPOOL_manuals/NEPOOL_Manuals/M-28_Market_Rule_1_Accounting/.

external node sits during the hour(s) of an emergency sale, an RMR component is also added to the invoice for the emergency sale. This functionality should be removed from the settlement treatment of VRD transactions, as ISO-NE's agreement with New York does not include adders to the cost of VRD transactions.

New York ISO: Emergency energy sales and purchase settlements are described in section 3.3.3 of the NYISO Accounting and Billing manual. Per the procedure and current agreement with ISO-NE, emergency export transactions from the NYCA to another control area are subject to transmission service charges, but are not charged for reserve ancillary service. Applicable service charges will apply to VRD exports from NYISO. However, the premium that is currently applied to emergency exports from New York, typically 50% of the real-time price, will not be applied to VRD transactions.

Examples of VRD Pilot Transactions: Examples may help to clarify the settlement of VRD imports and exports during the Pilot. New York's proxy for New England is the Sandy Pond bus. New York determines a real-time price for Sandy Pond and will use that price to settle VRD exports from New York to New England during the VRD Pilot. Analogously, New England's proxy for New York is Roseton, and ISO-NE will use that real-time price to settle VRD exports from New England to New York. Figure 4 shows the results for two 100 MW VRD transactions. In example 1, energy flows from New York to New England; in example 2, from New England to New York..

Figure 4: Examples of two VRD Pilot Transactions



5. Pilot Results: Measurement and Publication

5.1 Measuring Results

The results of the test scenarios will provide insights into the requirements of VRD operation and the impact of these transactions in a market environment. The context for the evaluation of results is as follows:

- The nature and purpose of the tests will not result in a pass/fail conclusion related to VRD.
  - The results *will* indicate areas where current tool sets, data availability or methods of presentation are inadequate to support the process in a production environment.
    - Deficiencies will be noted and recommendations made for rectifying them.
- The Pilot tests should provide insight about the sensitivity of the proxy bus pricing models for VRD operation.
  - These observations, if anomalous, may indicate the need for additional simulations to assess adequacy and/or recommend changes.
- We will also observe the impact on non-VRD interface prices of changes at a VRD-controlled border.
  - These observations will factor into the considerations for the design of scheduling processes associated with VRD operation.
  - These observations may also indicate the need for additional off-line simulation work prior to design finalization.
- The results will help determine additional on-line testing that would substantially benefit the process of designing VRD for production.

5.2 Data Collection

The present Energy Management and Market Systems in place at New York and New England should be adequate for collecting the data needed to properly evaluate the results of the VRD Pilot tests, as currently envisioned. Data collection, therefore, should not be a problem.

- Real-time data produced during the test periods will be used to evaluate flow changes, system conditions, events and prices at all locations, including Proxy Buses.
- Daily debriefings of System Dispatchers and test support personnel focusing on process and information adequacy will be conducted and documented following each test day.

- The need for additional data collection tools is not anticipated.

5.3 Publication

The ISOs will publish a report on the results of the first set of tests after the conclusion of the second test.

6. Going Forward

6.1 Subsequent Pilot Test Cycles

Following the completion and evaluation of the results of the first two tests, subsequent testing is anticipated. The purpose of Test 3 through Test N would be to further refine our understanding of how VRD transactions might best be used to converge prices at the interface. The specific nature and design of subsequent tests will be informed by the results of the first test cycle, but could potentially involve operation during load pickup or drop-off periods, steeper supply curves, or other considerations.

A subsequent report(s) will be produced describing the results of any additional tests. The nature of these reports will be dictated by the additional tests that are conducted.

The Pilot tests will provide information to help the ISOs evaluate the merits of continuing to develop Virtual Regional Dispatch. The test results also will provide insights about designing an effective permanent VRD system.

6.2 Stakeholder Approval Process and Schedule

Milestone	Date
1. Compliance filing to the Federal Energy Regulatory Commission, including report on seams resolution progress.	June 22, 2004
2. Jointly develop pilot program, and resolve settlements issues.	June – November 2004.
3. Implement the VRD pilot program under normal operating conditions.	November 01, 2004 through Feb , 2005
4. Evaluate pilot program.	November 2004 – June 2005
5. Evaluate pilot program results and develop a full VRD program or alternative.	June – December 2005
6. Phase-in of full-scale VRD program or alternative.	January – June 2006.