UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Integration of Variable Energy Resources	)	Docket No. RM10-11-000

COMMENTS OF CLEAN LINE ENERGY PARTNERS LLC

Pursuant to Rule 212 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") rules and regulations, 18 C.F.R § 212 (2010), Clean Line Energy Partners LLC ("Clean Line") respectfully submits these comments in response to the Commission's November 18, 2011 Notice of Proposed Rulemaking ("NOPR") in the above-captioned proceeding. Clean Line commends FERC for taking steps to ensure that variable energy resources, including renewable energy resources like wind and solar, do not face discrimination, and are successfully, and reliably integrated into the electric system. FERC has correctly recognized that scheduling practices and generation forecasting are key ingredients to the successful integration of large volumes of renewable energy. The proposal to amend the *pro-forma* Open Access Transmission Tariff ("OATT") to provide for intra-hour scheduling will greatly reduce the costs of wind integration since wind output fluctuates relatively little over fifteen minute time intervals compared to hourly intervals.[1] Furthermore, requiring wind and solar interconnection customers to provide meteorological and operational data to transmission providers is a critical step towards improved centralized forecasting of variable generation. Accurate forecasting provides longer lead times for dispatchable generators to adjust their output, reducing costs and inefficiencies.

On the other hand, FERC's proposal to allow transmission providers to charge generators for regulation service raises several concerns. As written, the proposed rule is likely to result in

[1] See Wan Y. *Wind Power Plant Behaviors: Analysis of Long-Term Wind Power Data*. National Renewable Energy Laboratory Report NREL/TP-36651, 2004 for an analysis of wind's variability over different time intervals. Available at www.nrel.gov/docs/fy04osti/36551.pdf.

discriminatory treatment of renewable generators. The rule does not adequately detail the nature of the service to be provided, how the costs of the service are allocated, and how rates are designed. Without more specificity, the rule is likely to create regulatory uncertainty that will discourage investment in renewable generation, and creates a high potential for transmission providers to charge unjust rates to variable generators. Moreover, the Commission's proposal singles out one ancillary service relevant to renewables and allocates it to generators. Such an approach discriminates against renewables because other ancillary services that primarily implicate other sources of generation would remain allocated to load. This provides an unjust advantage to non-renewable generators.

Even if FERC's proposal could be revised to allow equal treatment of generators with respect to ancillary services, in most circumstances new generation capacity is not necessary to balance variations in renewable output. This raises the question of why a special tariff to recover capacity costs related to variable generation is necessary. Transmission providers can manage variations in generation output within the scheduling interval through a variety of means, including forecasting, enlarging balancing areas, using existing storage facilities and generation, and implementing high voltage direct current ("HVDC") transmission solutions. HVDC projects, unlike alternating current transmission solutions, can fully control the amount of power transmitted. In cases where variable generation is exported to another balancing area through HVDC lines, the generation variability is effectively moved to the importing balancing area. This capability of HVDC is particularly important given the geographic concentration of wind and solar resources in areas with relatively low loads and relatively weak transmission networks. For many potential reasons – including higher loads, more flexible generation, and lower existing renewable penetration – importing balancing areas, rather than exporting balancing

areas, may be better equipped to integrate large volumes of variable renewable energy. Because many of the best renewable resources are located far from load centers, the need to manage exports to other balancing areas will continue to be a key issue in integrating variable generators.

Clean Line currently has four projects underway, explained in greater detail below, each of which utilizes HVDC technology to transport renewable energy across geographic areas. Clean Line Energy's proposed projects complement FERC's regulatory effort by providing transparent and well thought out solutions to the challenge of increasing renewable energy levels in the United States.

I. Background

Clean Line is an independent developer of high voltage, long-haul transmission lines and is not involved in any way with resource development or generation. Clean Line focuses exclusively on connecting the best renewable energy resources in North America with robust electricity demand centers. Clean Line provides transmission solutions to generators and load-serving utilities to efficiently distribute clean energy to consumers.

As the United States moves to achieve its ambitious renewable energy goals – 29 states and Washington DC have a Renewable Portfolio Standard (RPS) – a dramatic expansion of the transmission grid is needed to incorporate renewable resources. Clean Line will play an instrumental role in accelerating the delivery of renewable energy from remote resource areas to distant load centers and in achieving U.S. environmental policy goals. The need for transmission like the projects Clean Line is developing will continue to grow as electricity demand increases in the United States and as the demand for clean power sources accelerates.

Clean Line is developing several high voltage transmission lines that will enable the export of wind and potentially solar energy from some of America's best resources to load

centers and customers in regions with less plentiful or less cost effective local renewable energy resources. Clean Line has already made significant progress on transmission projects in western Oklahoma and the surrounding region as well as the upper Midwest. The Company is developing the Plains and Eastern Clean Line to connect the wind resources of southwestern Kansas, western Oklahoma and the Texas panhandle to the Tennessee Valley Authority and other areas of the southeastern United States. The Plains and Eastern Clean Line will consist of two parallel circuit ± 600 kilovolt direct current overhead transmission lines and is scheduled to deliver up to 7,000 MW of power and the associated energy to the TVA network and surrounding areas beginning in 2016.

In the upper Midwest, Clean Line is developing the Rock Island Clean Line, a high-voltage, direct current transmission line that will be capable of moving up to 3,500 MW of power and the associated energy from Iowa and South Dakota or Nebraska with load centers near Chicago and the surrounding region. Although wind energy in Iowa, Minnesota and the Dakotas has grown impressively in recent years, the construction of new projects will grind to a halt if additional transmission lines are not built soon. For instance, in 2010 Iowa saw no new wind project installed. The Rock Island Clean Line will allow for continued growth of the wind industry in Iowa and surrounding areas.

Also in the Midwest, Clean Line is developing the Grain Belt Express Clean Line, a high voltage, direct current transmission line that will be capable of moving up to 3,500 MW of power and the associated energy from new generation projects in western Kansas to the Midwest Independent Transmission System Operator and to the eastern United States.

Finally in the West, Clean Line is developing the Centennial West Clean Line, a high-voltage, direct current transmission line that will gather energy from renewable energy

generation projects in eastern New Mexico and surrounding areas, and transmit it to load centers such as southern Nevada, Southern California, Arizona, and other areas in the Southwest. The Project will deliver up to 3,500 MW of power and the associated energy to these load centers beginning as early as 2016.

All four of Clean Line's projects will facilitate the reliable delivery of power generated by renewable resources, and the development of these projects will support national efforts to significantly increase renewable electric generation capacity. These projects will meet the needs of generators and utilities for new transmission capacity and enable the construction of thousands of megawatts of new, cost-effective renewable electric generation capacity. The addition of this generation capacity will create new jobs, stimulate domestic manufacturing, and reduce pollution and water consumption.

II. Comments

Clean Line submits the following comments in this proceeding.

1. Intrahourly scheduling

FERC proposes to require each public utility transmission provider to allow generators to adjust their schedules intrahourly. The Commission further proposes that generators be able to adjust their schedules at maximum fifteen minute intervals but also encourages shorter periods. Clean Line supports the Commission's proposed requirement. Most generators, not just a subset that provides ancillary services, have some ability to adjust their output levels on a fifteen minute timeframe. Therefore, relying exclusively on ancillary services to balance output variations on a sub-hourly basis dramatically increases any costs associated with integrating variable energy resources. Charging variable energy resources for variations from an hourly schedule cannot be

just and reasonable if the costs associated from those variations arise from flawed or inconsistent scheduling practices.

In implementing sub-hourly scheduling, FERC is correct to insist that all generators – not just variable generators – can submit sub-hourly schedules. This equal treatment of all generators is important to ensure that dispatchable generators have the same market opportunities as variable generators, avoiding discrimination against non-renewable resources. Allowing dispatchable resources to schedule sub-hourly also enables these resources to balance the variability of wind and solar resources through the primary energy dispatch. With all generators – not just ancillary service providers – able to balance changes in variable energy output, costs associated with integrating variable resources will be reduced. Moreover, the primary energy dispatch is designed to produce the lowest cost energy and, in many cases, send clear price signals to generators. In contrast, balancing ancillary services tend to be provided through a less transparent, less liquid, less cost sensitive process, sometimes without market forces to keep costs low.

Though the likely intent of the Commission's proposed rule is to match energy imbalance service periods to the fifteen minute or less scheduling interval, Clean Line asks that the Commission make this explicit in its final rule. The clear intent of energy imbalance service, as outlined in Order 888, is to compensate for deviations from schedules. It would be unreasonable for transmission providers to charge for imbalance service on a different interval than schedules are submitted.

Sub-hourly scheduling is likely to have substantial benefits independent of variable generation integration. For the same reasons that sub-hourly scheduling is preferable to ancillary services in balancing variable generation, it is also a preferable method to balance load changes.

Sub-hourly load variations can be significant, and in most balancing areas are much greater than sub-hourly variations in variable generator output. Scheduling on shorter time intervals allows balancing areas to manage load changes in a more cost effective, more transparent manner.

In addition to generators, HVDC transmission lines typically are expected to submit schedules to a transmission provider. Unlike alternating current lines, which are not controllable, HVDC lines can precisely control the amount of power transferred from one end of the line to the importing balancing area. The controllability of HVDC lines importing energy into a balancing area, therefore, allows them to submit schedules alongside other generators. Clean Line requests that the Commission ensure that transmission lines that submit schedules also be able to schedule on the same sub-hourly basis as generators. Equal treatment of HVDC lines is particularly important given their likely application in the transmission of large volumes of renewable energy, exemplified by Clean Line's four projects.

2. Power Production Forecasting and Data Reporting

FERC proposes several related reforms on the use of power production forecasting and data reporting. While the proposed rule stops short of requiring all transmission providers and balancing areas to implement forecasting, it does make forecasting a requirement for those transmission providers seeking to specially recover costs from variable generators under the proposed new generation regulation ancillary service. Clean Line agrees that implementation of forecasting should be required before any special charges are assigned to renewable generators. Before transmission providers can charge a just and reasonable rate to recover ancillary service costs, they must use reasonable means to minimize those costs – such as forecasting.

Clean Line suggests that the Commission more directly address the implementation of forecasting and the manner in which transmission providers use forecasting to limit the needs for

additional ancillary services. Specifically, power production forecasting needs to be integrated into the operational models used by transmission providers to determine generation dispatch schedules. Models forecasting electricity production and load variability should be integrated. Correctly, the Commission finds that variable generation only creates additional variability to the extent that it adds to the already existing variability of load. Any special allocation of costs to variable generators for reserve capacity must look only at the net increase in variability.[2] The same logic applies to forecasting. What determines the need for reserves is the net deviation from load and variable generation forecasts. For example, if load is lower than forecasted but variable generation is also lower than forecasted, the transmission provider does not incur additional costs from balancing the variable generation shortfall.

As noted by the Commission, forecasting is valuable not only in its prediction of expected variable generator output but also in the probabilistic assessment of excesses or shortfalls in generation.[3] In order to provide ancillary services at reasonable cost, transmission providers' forecasting techniques should identify a subset of time periods in which additional reserve capacity is needed. For example, if a forecast indicates low levels of variable generation, added reserves are not needed in that time interval to deal with a potential ramp down in variable generation. Limiting the periods in which additional reserves are carried will reduce costs.

In assessing the probability of higher or lower than expected generation, forecasting must be performed on a centralized basis. A centralized forecast is different from a simple aggregation of individual plant forecasts because of the statistical independence of different generators' output. Single generators experience large changes in output much more frequently than groups of generators across a large geographical area. When assessing the probability of

[2] See NOPR at ¶105, 80.
[3] *Id.* at ¶59, 48.

schedule deviations or ramp events, forecasting should take into account the geographic, technological, and statistical diversity of resources.

The Commission seeks comment on the kinds of meteorological data that variable generators should be required to provide. The proposed rule specifically mentions wind speed, wind direction, atmospheric pressure, and temperature data.[4] Wind farms routinely track this kind of data, and providing it should not be an undue burden. Clean Line notes that the standard time frame for meteorological data collection is ten minutes and suggests this as an appropriate timeframe for generators to provide data. The Commission proposes to leave the details of meteorological towers providing the data to the transmission provider, specifically mentioning hub height and offsite or "upwind" towers. It is not standard for wind farms to install hub height or upwind towers. Certain measurements can be collected on turbine hubs, but installing separate hub height towers is a significant cost and is not needed unless there is an unusual, compelling reason. With respect to upwind towers, Clean Line believes such towers represent a meaningful opportunity to improve forecasting. Nevertheless, these upwind towers are best coordinated and located with an eye to all wind farms in a balancing area, not a single, specific wind farm. A single upwind tower may be useful in predicting output changes for multiple wind farms. Consequently, it would be more logical and equitable for transmission providers to install upwind towers as part of their centralized forecasting system rather than requiring individual wind farms to do so. The cost for upwind towers could be recovered through the same mechanism as the costs for the centralized forecasting system.

The Commission does not propose to make requirements to provide operational and meteorological data retroactive on existing interconnection customers. While Clean Line agrees that retroactive requirements are generally undesirable, most variable generators are already

[4] *Id.* ¶61, 49.

tracking the meteorological and much of the operational data they are required to submit. An effective compromise may be to require existing customers to submit data to the extent they are already collecting them. Clean Line is concerned that categorically exempting existing resources will lead to an incomplete data set and reduce the accuracy of forecasting.

Clean Line believes that operational and meteorological data should be made public to the maximum extent possible. Although certain operational data, such as turbine availability, may be proprietary, basic wind speed and output data do not seem particularly sensitive. Even if not made available to the general public, basic wind speed and output data should be available to parties willing to sign a confidentiality agreement with the transmission provider. Improving knowledge around variable resource integration will require the efforts of researchers in universities, non-profit organizations, and private companies. Current research efforts are hamstrung by a lack of publicly available data, though Clean Line notes that both the Electric Reliability Council of Texas and the Bonneville Power Authority have made individual wind farm output data available on their web sites. Variable generators and transmission providers have a shared interest in improved knowledge about renewable generation, which only can be accomplished through the careful study and free flow of data.

3. Generator Regulation Service-Capacity

FERC proposes to allow transmission providers to charge generators for regulation service capacity in a new Schedule 10 to the *pro forma* OATT. Clean Line believes that the nature of this service is not sufficiently clear. On the one hand, the new generator regulation service is modeled on the Regulation and Frequency Response service defined in Order 888. Order 888 states that Regulation and Frequency Response Service is needed to "follow the moment to

moment variations in load." [5] The Order contrasts Regulation and Frequency Response Service with Energy Imbalance Service as follows:

> Energy Imbalance Service supplies any hourly mismatch between a transmission customer's energy supply and the load being serving *(sic)* in the control area. That is, this service makes up for any net mismatch over an hour between the scheduled delivery of energy and the actual load that the energy serves in the control area. In contrast, Regulation and Frequency Response Service corrects for instantaneous variations between the customer's resources and load, even if over an hour these variations even out and require no net energy to be supplied.[6]

In Order 888 the difference between the new generator regulation service and existing Energy Imbalance Service is the time scale involved. Presumably, the new regulation service would balance "instantaneous" or "moment-to-moment" variations, while Energy Imbalance Service would balance variations over the period of the scheduling interval. (As described above, the definition of Energy Imbalance Service needs to be conformed to the sub-hourly scheduling period.)

Yet the proposed rule also describes a different definition of Energy Imbalance Service and generator regulation service.[7] It states that Energy Imbalance Service recovers the cost of energy production to balance generator variations from schedule, while regulation service recovers the cost of capacity to balance generator variations from schedule. The implication is that Energy Imbalance Service would cover the marginal cost of balancing resources while regulation service would recover the capital cost and fixed operating costs. It is unclear whether the proposed rule intends to modify the ancillary services described in Order 888, and what relationship the new service has to the currently existing services. Without clarification, the rule invites confusion about what kind of service would be provided under the new Schedule 10.

---

[5] Order No. 888, FERC Stats. & Regs at ¶359, 211.
[6] *Id.* at ¶361, 213.
[7] NOPR at ¶69, 54.

Even with clarification about the new service provided, the rule would remain unclear about what kinds of costs are eligible for recovery. Typically, "capacity" charges seek to recover the capital costs and fixed operating costs of a plant. If a transmission provider sees fit to pay for a new plant to provide additional reserve capacity, Clean Line notes that the same plant will often provide multiple ancillary services. For example, the same plant can support the reliability of the grid in the event of peak load conditions, a forced generator outage, and voltage issues. If the same plant provides multiple ancillary services, how then is plant capital cost to be allocated among the various services? Without clear guidance, decisions about cost allocation among ancillary services have a high potential for unreasonableness and arbitrariness. When similar ancillary services are allocated to load and generators, there is no clear method to determine "causation" of the need for new resources. If a new resource is needed for multiple factors – for example, an increase in peak demand, an increase in the capacity of the single largest contingency power plant in a balancing area, and new wind generation – how are costs allocated between load and generators?

For those transmission providers and balancing areas operating markets for energy imbalance service, it is likely that participating generators already recover some or all of their capital and operating costs via the market mechanism. In those scheduling periods where the balancing area is short energy, imbalance prices often substantially exceed the marginal cost of production. Creating a new capacity service for generators may lead to double recovery of costs. Clean Line notes that risk could be mitigated with a competitive market for the new service. If, however, generators recover Energy Imbalance Service costs from the market, they should not be allowed to recover their full capital and fixed operating costs from a new ancillary service market.

Clean Line notes that all types of generators and many loads impose additional ancillary service costs on a system. Although FERC's proposed rule proposes to charge all generators for the new generator regulation ancillary service, it is inherently unjust and unreasonable to charge renewable resources for the ancillary services for which they may create a demand and not charge other resources for different ancillary services for which they create a demand. For example, a large thermal plant may require additional operating reserves to deal with the potential of its forced outages or a new nuclear facility may require new pumped storage facilities to be able to generate at minimum loads. It is unjust and discriminatory to charge wind farms and solar facilities for their rare ramp events and not charge a thermal plant for its own risk of a dramatic drop in output or to not charge a nuclear plant for its inflexibility. Clean Line submits that all facilities have integration costs, most of which are allocated to load. Any reallocation of these ancillary services to generators must comprehensively consider all ancillary services, not just those which disproportionately implicate renewable generation.

Clean Line notes that there are multiple ways to balance the variability of renewable generation. One important reform would be to enlarge the size of existing balancing areas. Many of the best wind and solar facilities are located in balancing areas with relatively low loads. If dispatched in isolation, these small balancing areas will experience additional ancillary service costs associated from high levels of renewables. In contrast, larger balancing areas will have higher loads, more resources to deal with changes in net load, and are likely to have statistically independent renewable resources. All of these factors mitigate or eliminate added variability form renewable output. It is not just and reasonable to charge renewable resources for costs that are purely an artifact of balancing area boundaries. Another important technique is the use of forecasting, as the Commission has clearly recognized in its proposed rulemaking.

Finally, Clean Line submits that HVDC transmission lines have a key role in cost effectively integrating large volumes of renewable energy. In order to reach high levels of renewable penetration, large volumes of energy need to be exported from renewable rich areas to balancing areas without access to low cost renewables. In isolation, this will create disproportionately high variability in those balancing areas with rich renewable resources.

Unlike alternating current lines, HVDC lines are strictly controllable with respect to the amount of power transmitted. This allows HVDC lines that transmit renewable energy to electrically "move" the variability from one balancing area to another. Balancing areas with higher load levels are able to integrate variable generation at much lower cost because they already have the generation resources to manage large load swings. HVDC lines also can transmit more power using less right-of-way than comparable alternating current solutions. While HVDC lines do not eliminate the need for alternating current upgrades, they can play a key role cost effectively integrating the levels of renewable energy called for by state and federal policies.

Clean Line applauds FERC's ongoing efforts to remove barriers to the integration of renewable energy, and improve the efficiency of the transmission system. However, if any targeted allocation of ancillary services to renewable generators is implemented, Clean Line respectfully suggests that it must, at the very least, be more precisely defined. Clean Line requests that the Commission pay particular attention to the question of discrimination against particular generation sources broadly and with respect to all ancillary services, not just those ancillary services that disproportionately affect renewables. Finally, Clean Line wishes to highlight the role of multiple methods, including long-haul HVDC lines, to move large amounts

of renewable power long distances and to mitigate additional variability from renewable generation.

Respectfully submitted,

/s/ Kathryn L. Patton

Michael Skelly, President
Jimmy Glotfelty, Executive Vice President
Clean Line Energy Partners
1001 McKinney, Suite 700
Houston, Texas 77002
832-319-6327
jglotfelty@cleanlineenergy.com

Kathryn L. Patton
Vice President and General Counsel
Erin Szalkowski
Corporate Counsel
Clean Line Energy Partners LLC
1001 McKinney, Suite 700
Houston, TX 77002
832-319-6330
kpatton@cleanlineenergy.com