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April 3, 2008

MEMORANDUM

TO: Power Committee Members

FROM: Terry Morlan, Director, Power Planning Division
Wally Gibson, Manager, System Analysis and Generation
John Fazio, Senior System Analyst

SUBJECT: Adoption of a Resource Adequacy Standard for the Northwest

At its April meeting, the Council will vote whether to adopt proposed language for a Pacific Northwest resource adequacy standard. The draft language was released for public comment on February 14th (Council document number 2008-01).

The most substantive comment (made by several groups) was a suggestion to only use firm or contracted resources to assess resource adequacy. Staff believes that these commenters have misinterpreted the standard's physical adequacy targets to be resource planning targets. The physical adequacy targets represent the *minimum thresholds* for resource development so that the resulting likelihood of a significant curtailment is no greater than 5 percent. The standard's economic target, which is tied to the Council's power plan, portrays a higher level of resource development to reduce the likelihood of future years with extremely high prices (such as what happened in 2001). Individual utilities must derive their own resource planning targets through integrated resource planning processes. It was clear from these comments, however, that a better explanation of the adequacy standard was needed, so to that end, a fact sheet was written to address this particular concern and others. Staff believes the language in the draft standard is appropriate, with minor editorial changes.

The power committee will discuss other comments received and staff response. The committee can amend the draft language, if necessary, before passing it on to the full Council for adoption.

Attachments for the power committee packet include:

- A summary of comments and staff response
- A red-lined version of the draft language (a clean version of the language is provided in the Council packet)
- A background paper providing a more in-depth explanation of the adequacy standard

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MEMORANDUM

TO: Power Committee Members

FROM: John Fazio, Senior System Analyst

SUBJECT: Comments received for Council document 2008-01 "A Resource Adequacy Standard for the Northwest" and staff response

Steve Weiss, NVEC (at the power committee meeting on February 12, paraphrased):

Steve believes that the current adequacy metrics are appropriate but would prefer that they only include "firm" regional resources. He said he would exclude the "planning adjustment" line item from the energy metric and show a deficit energy target. (The planning adjustment line item represents contributions from out-of-region spot markets and from non-firm hydro). He made no indication that within-region uncommitted IPP capability should be removed from the metric.

Response

The Forum's technical and steering committees have debated this issue at length. The prevailing opinion was that creating an adequacy standard with a deficit target would present a difficult public relations challenge. In addition, committee members agreed that non-firm resources relied upon to contribute toward regional adequacy should be explicitly accounted for in the standard's metrics.

Recommended action: none

Dick Adams, PNUCC (at the power committee meeting on February 12, paraphrased):

Dick reminded the committee of the "communication" problem that arose last year after the Forum released its first assessment of the power supply's adequacy. The Forum assessment showed a large surplus while the NRF (PNUCC report of loads and resources) showed deficits -- even though each report was describing the same system. He suggested that we could preempt the problem this year by preparing a message statement or a fact sheet explaining why differences exist.

Response

Dick's suggestion of preempting this potential problem by issuing a fact sheet makes a great deal of sense. The Forum did experience a communication problem last year when its assessment indicated the region to be largely surplus (with respect to the energy adequacy target) while both the PNUCC and BPA reports indicated the region to be deficit or near deficit. The problem arises because each report is compiled for different purposes and counts resources in a different way. All three reports are describing the same power system but their results are used in different ways. The Forum's assessment indicates whether the region is in danger of a significant curtailment due to a shortage of supply, irrespective of price, whereas both the PNUCC and BPA reports have more traditionally been used to assess whether regional utilities should be acquiring resources for both adequacy and economic reasons.

Recommended action: *Prepare a resource adequacy fact sheet to be released with the standard.*

Jim Sanders, Chairman, PNUCC Board of Directors (written statement):

Jim reiterates Dick Adam's concern regarding the "message" that the Forum's resource adequacy assessment is sending. He says that the adequacy standard was "written for a technical audience" but that "the public is an increasingly important audience for messages about adequacy." He goes on to say that the paper identifies "two related but distinctly different concepts in assessing the power system's adequacy – a physical standard and an economic standard," yet "falls short of differentiating between these two measures of adequacy when communicating with the larger public." While people in the industry should understand the difference between these two standards, the general public likely will not. He cautions the Forum about being attentive to the messages that they are communicating versus those that they intend to communicate. He recommends re-writing the paper "as necessary to clearly delineate these two different measures of adequacy."

Response

Jim's comments closely parallel those of Dick Adams. Rewriting the paper to more clearly explain the purpose of the regional standard and how it would be used is not a bad idea. However, doing so would delay the process of adopting the standard, which could affect the schedule for development of the Council's next power plan and the already delayed schedule for completion of BPA's regional dialog. By design the standard was written to be complete but concise – enough information to implement the standard and perform an assessment but not overwhelmed by background information. It has taken the Forum over two-and-a-half years to develop this standard. There exists a wealth of information describing the process and the decisions that were made along the way. A more practical way to alleviate Jim's concern may be to develop a fact sheet that provides this background information and explains more fully the purpose of the standard and its relationship to other regional reports.

Recommended action: *Prepare a resource adequacy fact sheet to be released with the standard.*

Mitzi Bennett, Senior Utility Analyst, Snohomish Co. PUD (email):

Mitzi asked how the 5 percent loss-of-load probability fits with the 23 and 24 percent planning reserve margin targets. She said that the two concepts seem independent of one another. The implication is that the paper does not make it clear enough how the adequacy targets are derived from the loss-of-load analysis.

Response

The question about how the 5 percent LOLP relates to the capacity planning reserve margin targets is commonly asked. It should be noted that the practice of linking a planning reserve margin to an LOLP is very common in other NERC sub-regions.

Using a Monte-Carlo simulation computer model (GENESYS), the LOLP is defined as the number of simulated futures with significant curtailment events divided by the total number of simulated futures. If that number is 5 percent or less, then the power supply is deemed to be adequate. To determine the planning reserve margin targets, a scenario with exactly a 5 percent LOLP is selected. The sustained peaking capability of the resources for that particular scenario can be calculated (although the hydro component is always a bit tricky to estimate). The excess peaking capability (over weather-normal load) is then converted into a planning reserve margin by dividing it by the weather-normal load. This percentage becomes the planning reserve margin target. Saying it in another way, a power supply that has this particular amount of reserve margin (or surplus sustained peaking capability) would yield a 5 percent LOLP in a GENESYS analysis.

Recommended action: *Prepare a resource adequacy fact sheet to be released with the standard, which contains a more detailed description of how the adequacy targets are determined.*

Tim Culbertson, General Manager, Grant County PUD (written statement):

Tim made several suggestions regarding how resources should be counted in the adequacy standard. First, he argued that generating capability from uncommitted independent power producer resources should not be depended on at any time of the year. Second, he proposed that out-of-region market generation also should not be counted on at any time of the year. Finally, he states that the proposed contributions from wind resources toward the energy and capacity adequacy assessments have not yet been resolved. He strongly proposes that wind's contribution should be "based on the ability of the resource in question to produce the required peaking power during each hour of the sustained peaking period." Grant County PUD may be implying that a resource adequacy assessment not be redone until this issue is resolved.

The first two suggestions may seem to be similar to Steve Weiss' comment but they are not. Steve proposes only counting "firm" resources but also adjusting the targets to the appropriately lower values. Grant County PUD suggests counting only "firm" resources but leaving the targets unchanged. This clearly implies that the generating capability from "firm" resources should at least match firm loads.

Response

The Forum technical and steering committees have debated this issue at length. Grant County PUD refers back to the situation in 2000-01 to support its position. The majority of the other Forum committee members, however, believe that the likelihood of such an event is so rare that that the region should not build resources to cover that type of event. The situation in 2000-01 was a combination of the second driest water condition in the Northwest with a lack of surplus resources from the Southwest. However, part of the lack of surplus from California was due to market manipulation and a flawed market structure. Since that time there has been a tremendous increase in resource development in California. For adequacy purposes, price issues notwithstanding, the majority of the Forum committee members agreed that not counting any non-firm resources would lead to an overbuilt and more expensive power supply for the Northwest.

Grant County PUD also correctly pointed out that the capacity and energy contributions of wind resources have not yet been resolved. Council staff agrees and is working with the wind integration committee to resolve this issue. However, delaying the adoption of this standard until this issue is resolved would jeopardize the schedule for the Council's next power plan and for BPA's regional dialog. Using placeholder values for wind resources will not affect the assessment of the adequacy of the Northwest's power supply.

Recommended action: *Highlight the importance of resolving the issues surrounding wind resources in the Northwest.*

M. Steven Eldrige, General Manager and CEO, Umatilla Electric Cooperative (written statement):

Mr. Eldrige states that “some of the findings and conclusions of the proposed Adequacy Standard are in conflict with the adequacy standards that I, as a utility manager, and my peers in the electric power industry, must apply to insure that the lights stay on in our respective service territories.” He goes on to say that the Forum has not fully explained “what it will mean to the region if the Council adopts this proposed standard.” This is, in essence, a reiteration the comment from the PNUCC that the “message” from the adequacy assessment is unclear, if not misleading. Mr. Eldrige gives an example. He states that the current assessment (done in June of 2006) shows the region to be more than 4,000 average megawatts surplus. His interpretation is that utilities need not acquire new resources and, in fact, should immediately “develop strategies for the region to address the high cost of over-building the electric power system by such a large margin.” That conclusion he says is “inconsistent with what is happening in the region's electric power industry.”

Mr. Eldrige also has concerns regarding the 1,300 average megawatt planning adjustment added to the resource capability in the adequacy assessment. He understands that this value is determined by a loss-of-load probability analysis. He correctly interprets this to mean that planning to a critical water standard is “too conservative.” He states that this represents a fundamental change from the 40 plus years of Pacific Northwest Coordination Agreement (PNCA) planning. He recommends that the Council “must have independent peer review of the

LOLP analysis to verify the conclusion that critical water for resource planning is too conservative.”

Mr. Eldrige also has concerns regarding the counting of uncommitted IPP generation and out-of-region market generation. His belief is that only “firm” resources should be counted on to meet firm load. In fact, he goes on to say that “the universal guidelines that are clearly defined in PNCA, and have been previously followed in the Council’s regional power plans, is that ‘firm resources’ must exceed ‘firm loads.’”

Mr. Eldrige points out that the regional load/resource balances as published by the PNUCC are “incomparable to those proposed in the Regional Adequacy Standard.” He suggests that this discrepancy be resolved.

Mr. Eldrige’s comments regarding the capacity standard are similar to those he made for the energy standard. He states that the current assessment shows the region to be capacity surplus yet “Bonneville and other major utilities are pursuing capacity additions to maintain their system reliability.”

Mr. Eldrige’s overriding comment is that the “message” being sent by the resource adequacy assessment, as currently defined in the standard, is not the correct message that utilities should be getting. He says that “if the Council’s power plan is to be useful in meeting the needs of the region, it should provide a clear and unambiguous message about what utilities should be doing at this time.”

Response

Council staff agrees with Mr. Eldrige that a better explanation of the purpose of the adequacy standard along with a clearer description of how it is related to other regional reports is needed. Mr. Eldrige’s comments concur with those of the PNUCC regarding this issue. A well written fact sheet, as proposed earlier, should satisfy this need while not delaying the Council’s next power plan or BPA’s regional dialog process.

The issue of critical water planning has been debated in the region since the early 1960s. Even in those early days, it was recognized that planning resource additions based solely on critical water would be too conservative – knowing that the likelihood of a critical water event is less than 2 percent and that California would have surplus winter capacity if it built sufficient resources to meet its summer peak loads. Back then, the hydroelectric system was operated in the fall based on slightly better than critical water (a practice commonly referred to as “shifting” and “shaping” hydro power). In the event of a critical water event, winter energy purchases from California could be made or, if that supply was unavailable, service to the region’s aluminum plants could be curtailed (by prior agreement with their owners). Service to aluminum plants was rarely, if ever, curtailed due to a low water condition. Of course, today the aluminum load is a small fraction of what it used to be and is no longer used as a contingency option during emergencies. However, given the magnitude of resource development in California over the past several years, Southwest winter surplus for import into the Northwest should be available for a long time to come.

Mr. Eldrige's comment regarding the inclusion of uncommitted IPP resource capability in the adequacy metric is consistent with his comment regarding the use of critical water for resource acquisition planning. The real question is whether or not these "non-firm" resources would be available to Northwest utilities during emergencies. Because the Northwest is a winter peaking region, competition for these uncommitted resources during that season should be minimal since the only other winter peaking region is Canada and it currently has surplus resources. In the summer, when both the Northwest and the Southwest may be competing for the same uncommitted resources, a different situation is observed. Since some IPP resources do not have direct access to interregional transmission lines, it seems logical to believe that Northwest utilities would have a first shot at their generation during emergencies, given enough forewarning. The Forum committee members agreed that the amount of available IPP generation for Northwest summer use should be limited to those resources that do not have direct access to interregional transmission.

Mr. Eldrige comments that "'firm resources' must exceed 'firm loads,'" in context to resource planning, yet in the 1900s when the load/resource balance was much more deficit than today (based on PNUCC reports) utilities in the region were not actively pursuing new resource acquisition. Over the past two years, Forum committee members have debated the issue of how much reliance the region should have on non-firm resources. Members agreed (although there were some dissenting votes) that some level of non-firm resources should be counted on when assessing regional power supply adequacy. This decision is supported by the loss-of-load probability analysis. Of course, if individual utilities do not have access to such resources or if they choose to be more conservative in their planning approach, then planning for new resources based only on "firm" resources makes sense for them.

Finally, Mr. Eldrige reiterates other comments received related to the "message" that the Forum is sending to both utilities and to the public. Council staff agrees that this message needs to be clearer and proposes writing a fact sheet to accommodate this need.

Recommended action: *Prepare a resource adequacy fact sheet to be released with the standard.*

Paul Norman, Senior Vice-President, Power Services, Bonneville Power Administration
(written statement):

Mr. Norman comments that the Bonneville Power Administration is satisfied with the regional adequacy standards developed by the Forum and recommends that the Council adopts them. However, BPA endorses "PNUCC's caution that proper public communication about the standard is crucial, to avoid misinterpretation of their implications for regional resource development." Mr. Norman also emphasizes that although BPA agrees with the concepts outlined in the adequacy standards, much more significant technical work needs to be done to properly implement them. In particular, he listed:

- Resolving the issues surrounding the capacity value for wind
- Refining the evaluation of the hydro system's capacity contribution
- Re-evaluating the contribution of independent power producer resources toward winter capacity
- Reflecting wind integration requirements in the capacity targets

Response

Council staff agrees with Mr. Norman that a better explanation of the purpose of the adequacy standard along with a clearer description of how it is related to other regional reports is needed. In addition, staff recognizes that much more technical work lies ahead. The issues raised by Mr. Norman will be addressed by the Forum's technical committee over the next year.

Recommended action: *Prepare a resource adequacy fact sheet to be released with the standard. Develop a detailed work plan for the Forum's technical committee to address the issues raised by Mr. Norman.*

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April 15, 2008

A Resource Adequacy Standard For the Northwest

Redlined Version
For Council Deliberation

Council Document 2008-05
Redlined Version

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A Resource Adequacy Standard for the Northwest

The Resource Adequacy Standard serves as a gauge to assess whether the Northwest electricity supply is sufficient to meet the region’s needs now and in the future. It provides a *minimum threshold* that serves as an early warning should resource development fall dangerously short. It also suggests a *higher threshold* that encourages greater resource development to offset electricity price volatility. It does not mandate compliance or imply any enforcement mechanisms. It does not directly apply to individual utilities – because every utility’s circumstances differ.

Currently, the region as a whole has more than sufficient resources to meet the *minimum threshold* for resource adequacy. The minimum threshold, however, should not be mistaken as a resource planning target. The prudent amount of resource acquisition should be derived from an integrated resource planning process. For the region, the Council’s power plan serves as a blueprint for the types and amounts of resources the Northwest should acquire. Individual utilities must assess their own needs and risk factors and determine their own planning targets, which are screened by public utility commissions or by their boards of directors.

The Pacific Northwest Utilities Conference Committee (PNUCC) and the Bonneville Power Administration (BPA) amass utility planning information and produce regional assessments of loads and resources. These tabulations have a different purpose than the resource adequacy standard – they address utilities’ need to acquire prudent amounts of new resources not the bare minimum necessary to keep the lights on. It would be a misapplication of the adequacy standard to infer that utilities should slow down their resource acquisition activity because the adequacy standard is already being met.

This document includes the language that defines the resource energy standard for the Northwest and a summary of the current assumptions and thresholds (Appendix A). Also included is the previously adopted implementation plan (Appendix B – Council document 2006-22), which describes how this standard will be used. Appendix C offers more background information for the standard.

Deleted: The Pacific Northwest Resource Adequacy Forum¹ (Forum) has developed a regional resource adequacy standard to be used both as an early warning system and for guidance in long-term resource planning. The Forum submits this standard to the Northwest Power and Conservation Council (Council) to adopt for its own planning process and recommends that other entities in the region incorporate the intent of this standard into their planning efforts. The Forum understands that the assumptions made in this standard apply only to regional resource development and that individual utilities may choose different levels of reliance on specific types of resources. The Forum also recommends that this regional standard be provided to the Western Electricity Coordinating Council (WECC) for consideration in its assessment of West-wide resource adequacy. ¶

¶ The term “standard” in this context does not mean mandatory compliance nor does it imply an enforcement mechanism. Rather, it is meant to be a gauge used to assess whether the Northwest power supply is adequate in a physical sense, that is, in terms of “keeping the lights on.” It can be thought of as the minimum threshold for resource acquisition. However, the Forum encourages utility planners to think beyond this minimum and consider strategies that also protect against potentially bad economic outcomes. The Forum recommends that the Council’s Regional Power Plan be used to assess the region’s resource [1]

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Deleted: threshold (an acceptable value for that metric) for both energy (annual) and capacity (hourly) capabilities of the system. Historically, Northwest resource planning has been aimed at securing adequate resources for annual or energy needs of the region. However, given recent increases in summer-time loads and decreases in the capability of [2]

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Deleted: thresholds (Appendix A) presented in this paper are appropriate. The Forum understands however, that as new information becomes available, underlying assumptions for the regional adequacy standard will require that metrics or

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Deleted: thresholds be updated. The Forum’s intent is for this process to be dynamic and recommends that an assessment of the region’s resource adequacy be made at least once per year and that the methodology behind the standard be reviewed whenever changes in the system deem it to be necessary. The adequacy assessments should [3]

The Pacific Northwest Regional Energy Standard

The **energy metric** for the Pacific Northwest³ is defined to be the *average annual load/resource balance*, which is the *available*⁴ *average annual energy* minus the *average annual firm load* in units of energy (average megawatts⁵), where:

- The *available average annual energy*⁶ is defined as the sum of:
 - **Non-hydro** resource generation, including renewable resources, accounting for maintenance and forced-outage rates and limited by fuel-supply constraints and/or environmental constraints
 - **Uncommitted Independent Power Producer (IPP)** resource generation, accounting for maintenance and forced-outage rates and limited by fuel-supply constraints and/or environmental constraints, and assuming
 - full capability from October through May and
 - the fraction of IPP capability available to Northwest utilities from June through September
 - **Firm hydroelectric** generation, based on critical water⁷ conditions
 - **Planning adjustment energy**,⁸ which is derived from the currently used 5 percent LOLP guideline⁹
- The *average annual firm load* is based on normal temperature conditions and is adjusted for firm out-of-region energy sales and purchases and for conservation savings.

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The **energy threshold** for the Pacific Northwest is zero, that is, on an annual basis, resources (as defined above) should at least match the expected annual load. When the energy **threshold** is achieved, the resulting loss-of-load probability should be 5 percent.

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³ The Pacific Northwest is defined to be the geographical area referenced in the 1980 Northwest Power Act, which includes the states of Oregon, Washington, Idaho, and the western part of Montana.

⁴ The term “available” does not mean “expected” in this context.

⁵ One average megawatt is equivalent to 8,760 megawatt-hours of energy.

⁶ This refers to resources that are committed to serve regional load, whether or not they are physically located in the region.

⁷ For the region, under current operating constraints (including actions listed in NOAA Fisheries’ biological opinion), the critical water year is defined by the hydrologic conditions from August 1936 through July 1937.

⁸ The value used for “planning-adjustment” energy is derived from the Genesys model and should be reassessed at least once a year or whenever new resource information is available. This factor represents an adjustment to be made to the load/resource balance so that when the balance is zero, the associated loss-of-load-probability (LOLP) will be 5 percent. The amount of planning-adjustment energy depends on assessments of the availability of out-of-region resources and non-firm hydro energy that the region believes is prudent to plan on for energy adequacy. See Appendix A for specific assumptions.

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⁹ The Resource Adequacy Forum is also reviewing the 5 percent LOLP guideline. Any change to this guideline could translate into a different “planning-adjustment” energy value.

The Pacific Northwest Regional Capacity Standard

The capacity metric for the Pacific Northwest is defined to be the *planning reserve margin* (PRM), which is the surplus *generating capability* over the *expected-peak load* averaged over the *sustained-peak period*, for summer and winter periods, in units of percent, where:

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- The *sustained-peak period* is defined to be the highest 6 hours per day over 3 consecutive days (18 hours in total).
- The *generating capability* is defined as the sum of the sustained-peaking capability from:
 - **Non-hydro** resources, including renewable resources, accounting for maintenance and limited by fuel-supply constraints and/or environmental constraints
 - **Uncommitted Independent Power Producer (IPP)** resources, accounting for maintenance and limited by fuel-supply constraints and/or environmental constraints, and assuming
 - full capability from October through May and
 - the fraction of IPP capability available to Northwest utilities from June through September
 - **Firm hydroelectric** sustained-peaking capability, based on critical water¹⁰ conditions and assuming that no extraordinary actions are taken to increase peaking capability
 - **Out-of-region** capacity for both winter and summer, which is reviewed annually
 - **Incremental hydroelectric** sustained-peaking capability, which is an additional amount available in water conditions better than critical¹¹
- The *expected-peak load* is defined as the average load over the *sustained-peak period*, based on normal temperature conditions and is adjusted for firm out-of-region sales and purchases and for conservation savings.

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The PRM **thresholds** are derived from the currently used 5 percent LOLP guideline.¹² The PRM is the excess of defined resources over expected loads that yields a 5 percent LOLP. The PRM **thresholds** can be thought of as providing components to cover:¹³

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- Operating reserve requirements
- Long-term loss of a resource
- Load increases arising from adverse temperature

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¹⁰ For the region, under current operating constraints (including actions listed in NOAA Fisheries' biological opinion), the critical water year is defined by the hydrologic conditions from August 1936 through July 1937.

¹¹ This amount will be defined by an analysis of hydroelectric sustained-peaking capability.

¹² The PRM **thresholds** are derived from the Genesys model and should be reassessed at least once a year or whenever new resource information is available.

¹³ These components are not strictly additive, and attempting to define a PRM **threshold** using this method may not lead to a result consistent with the loss-of-load probability analysis.

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Appendix A

Current Adequacy **Thresholds** and Assumptions

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Current Adequacy **Thresholds**

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- **Energy:**
 - Average annual load/resource balance is zero
- **Capacity:**
 - Winter planning reserve margin is 23 percent
 - Summer planning reserve margin is 24 percent

Resource Assumptions

- **Non-hydro resources:**
 - Capacity will reflect seasonal adjustments.
- **Wind:**
 - To be updated when the wind subcommittee completes its analysis of historic wind data
 - Energy standard: expected average annual generation (currently 30 percent of nameplate)
 - Capacity standard: 15 percent of nameplate
- **Uncommitted Independent Power Producer (IPP) resources:**
 - To be updated annually or when new information is available
 - full capability from October through May and
 - 1,000 megawatts from June through September
- **Out-of-region market**
 - To be updated annually or when new information is available
 - 3,000 megawatts per hour from October through May
 - None available from June through September
- **Incremental hydroelectric sustained-peaking capability:**
 - To be updated annually or when new information is available
 - 2,000 megawatts from October through May
 - 1,000 megawatts from June through September
- **Energy Planning Adjustment:**
 - 1,300 average megawatts derived from the LOLP analysis

Loss-of-load Probability Assumptions

- **Significant Curtailment for Energy:** 28,800 megawatt-hours of total curtailment over the December through March period or the energy equivalent of the loss of 1,200 megawatt-hours over a 24-hour period.
- **Significant Curtailment for Capacity:** 3,000 megawatts in any hour of the winter or summer period

Appendix B – Document 2006-22
Pacific Northwest Resource Adequacy Warning Implementation Plan

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INTRODUCTION

This paper describes the role the Council will take and the Council’s expectations of the roles others will take in the Pacific Northwest Resource Adequacy Implementation Plan. It includes current expectations about the outcome of Bonneville’s Regional Dialogue process, recognizing that those discussions are not yet complete.

BACKGROUND

Regional Awareness of Resource Adequacy Framework: There are a number of national, west-wide, regional and state efforts currently underway, which have thrust resource adequacy into the limelight. The Energy Policy Act of 2005 mandates the Electric Reliability Organization (ERO), established by the act to implement mandatory reliability standards for the bulk-power system under the purview of the Federal Energy Regulatory Commission (FERC), “to conduct periodic assessments of the reliability and adequacy of the bulk-power system in North America.” The North American Electric Reliability Council (NERC), which was certified as the ERO on July 20, 2006, is in the process of developing a standard for resource adequacy assessments. FERC said in its final rule on implementation of the ERO provisions of the legislation that it intends to require the ERO to make recommendations where entities are found to have inadequate resources following the assessments.

In the West, the Western Electricity Coordinating Council (WECC) is developing guidelines to recommend appropriate methodologies for assessing resource adequacy. Although the NERC and WECC efforts act as drivers, momentum is also building within the region for a regional resource adequacy standard through the Forum and the resurgence of Integrated Resource Plans (IRPs). In fact, the state of Washington recently passed legislation requiring all large electric utilities, both public and private, to prepare IRPs. Utilities, state regulators and the elected boards of public utilities are all explicitly examining strategies for planning resources to meet load. The efforts described above, the active participation by the utility and state regulatory communities in the Forum and the adoption of **the adequacy metrics and thresholds** for the region by the Council all serve to elevate the electricity industry’s awareness of the regional standard, which is the first step to achieving resource adequacy.

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APPROACH

Utility Reporting: Utilities, other than those that have chosen in advance to put their entire load on Bonneville, would report their load and resource forecasts annually to some regional entity. Bonneville would report for all the utilities that have chosen it as their ongoing resource supplier for load growth. Currently the utilities with responsibility for procuring resources to meet their load obligation report their forecasted loads and resources to PNUCC. This approach proposes to continue using PNUCC and its Northwest Regional Forecast (NRF) as the vehicles for reporting. Aside from possible refinements in data definitions and development of protocols for any new data, this reporting process would involve little change from current practice, except for those utilities that are newly assuming independent resource procurement responsibility. The NRF currently uses a five-year planning horizon, which would be maintained for this purpose.

Reporting is central to the proposed implementation process and relies on full participation by the utilities, their regulators and local boards, and Bonneville. Bonneville contracts would not require that its customer utilities develop resources to meet adequacy standards, but they would require that utilities who do not rely on Bonneville to meet their load growth to report their load and resource data for this assessment.

PNUCC and Council Assessments: The results of this reporting would be used in an assessment, in which the regional totals would be checked against the regional energy and capacity metrics and **thresholds**. This assessment would be done in the first instance by PNUCC. The assessments for the planning years, five and three years out, would be of most consequence for the region. The results of these “bottoms-up” assessments could then be compared with the Council’s “top-down” regional assessments in order to validate the assessments, or, in the case of discrepancies, either inform quality control checks of the data to further refine the assessments in the future or highlight differences in assumptions. Some differences in assumptions e.g., about capacity factors of wind generation, might provoke additional research, while others could be the result of policy or regulatory decisions.

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At this stage, the results of the assessment(s) would be depicted on an aggregated basis, as is currently done in the NRF. Utilities would be able to compare their resource strategies for meeting load obligations to the regional resource adequacy situation and adjust their plans accordingly. The regional assessment(s) would include the “planning adjustment” (winter out-of-region spot market purchases plus hydro flexibility) and the regional uncontracted IPP generation in the regional totals, as described in the energy metric and **threshold** adopted by the Council.

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Highlighting how much the region is relying on the external spot market or on uncommitted regional IPP generation, compared to the amounts included in the currently proposed standard would provide a kind of warning signal to the region about potential upcoming adequacy problems.

Indicators of Resource Adequacy Levels: The section below describes in more detail a “green light, yellow light, red light” approach to regional adequacy assessment and describes actions to be taken with each outcome.

The description refers both to a physical standard, the **minimum threshold** adopted by the Council, and to an economic standard, a **higher threshold** that provides more resources than simply enough to avoid loss of load. The Council’s implied economic **threshold**¹⁴ developed in the Fifth Power Plan is an example of a possible economic standard. Developed by analyzing the exposure of the Northwest power system to a large variety of risks, including the risk of high market prices, such as were experienced in 2000-01, this **threshold** would give the region approximately an additional 3,000 MW of resources, above the level that would be developed pursuant to the **minimum threshold** adopted in the adequacy standard. **The forum recommended that the Council’s power plan be used to set the threshold for the economic standard.**

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¹⁴ See Volume 2, Chapter 7, “Portfolio Analysis and Recommended Plan” in Northwest Power and Conservation Council. *Fifth Northwest Electric Power and Conservation Plan*. Portland, Oregon, 2005.

The approach is summarized in the following table:

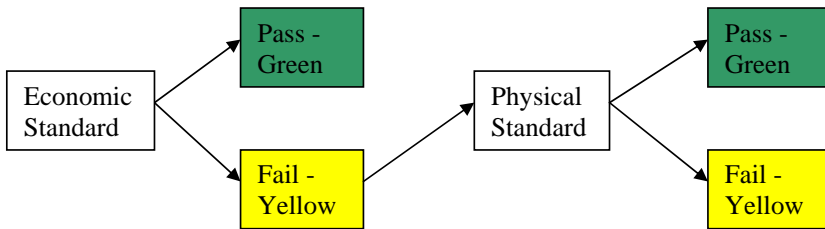
Deleted: An alternative economic standard could be when the region as a whole begins to show reliance on the extra-regional spot market and the uncontracted IPP generation within the region. ¶

How When	Economic Standard		Physical Standard	
	Pass	Fail	Pass	Fail
5 th Year Out	Green	Yellow	Green	Yellow
3 rd Year Out	Green	Yellow	Green	RED

A green light would trigger an acknowledgement that the region is on track. The yellow and red lights would be used to trigger different regional actions.

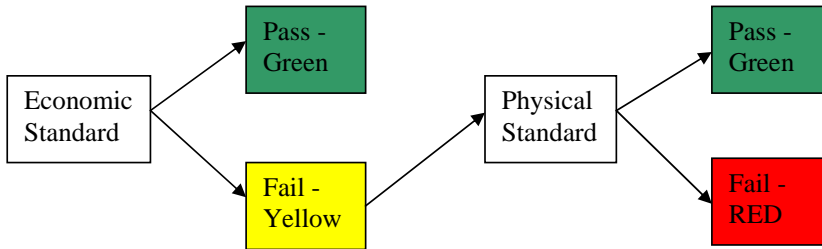
The process can also be described by the following flow charts:

Fifth Year-Out Assessment:



Third Year-Out Assessment:

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Council Actions, Yellow Light: Since the yellow light would indicate a kind of early warning, a regional report could be issued by the Council. It would be presented at a Council meeting and public comment would be taken. This report would emphasize that the region is potentially entering a more serious situation and encourage utilities with load service responsibilities to take action. This report would not single out individual utilities. The Council could also convene a regional meeting to discuss the results of the assessment.

Council Actions, Red Light: For the red light, additional actions would be taken. A regional discussion would be started to understand the reasons for being in the situation triggering a red light, to determine whether sufficient actions are being taken to remedy the forecast inadequacy,

and to identify additional measures needed, if any. A regional conference would be held to begin that discussion. The goal of these discussions would be to ensure that sufficient actions will be taken to avoid an actual inadequacy. If the discussions are successful, then the Council would publicly announce its conclusion that sufficient actions are being taken to address the “red light” and would monitor progress on these actions.

In the event that the Council concludes that these discussions did not succeed in providing sufficient assurance of avoiding inadequacy, further steps could be taken. One of those steps, for example, would be for the Council to report that the initial problem is not being adequately addressed. A second possible response would be for the Council to communicate directly with individual utilities, local boards or state commissions for those utilities that appeared to be disproportionately relying on uncommitted purchases. This action would ensure both that these key decision makers were aware of the potential problems and that the Council fully understood the reasons for the utilities’ being in such a circumstance. The Council could also consider publicly announcing which utilities are relying disproportionately on uncommitted purchases. With these options the Council would have sufficient recourse to follow up on regional inadequacy if it were to persist.

Utility Economic Incentives for Meeting Adequacy Standards: Because of the variation in water conditions the Northwest experiences, prospective (planning) inadequacy will not necessarily turn into inadequacy in actual operations. However, should the region be inadequate on a near-term planning basis (too short a timeline for construction of new resources), utilities that are short, for whatever reason, would face the market price and any environmental mitigation consequences of their actions. This will provide a strong natural incentive to develop adequate resources.

Expected Bonneville Actions: Though Bonneville contracts will not require its customers to meet adequacy standards, they will reinforce this economic incentive. The Regional Dialogue discussions are not complete and Bonneville has not yet issued a final decision. Assuming, however, that discussions continue along the path they are currently on, the following is one set of probable outcomes. Bonneville expects to negotiate contracts with its public agency customers that will provide that customers either make an election to (1) purchase load-following power products from BPA or (2) take fixed amounts of power that do not follow load. Once a customer’s load is forecasted to exceed their entitlement to power at the Tier 1 rate on a three year out basis, the customer needs to decide whether to procure their own resources to meet its load growth, or to contract for power from Bonneville at the Tier 2 rate. Contracting for Tier 2 power from Bonneville would potentially include a three-year notice requirement. This requirement would make it clear that Bonneville will not provide an assured “backstop” for utilities which fail to develop their own resources. The contracts would also include affirmation by the customers that they understand the resource adequacy standards and that Bonneville would not provide short-term backup service.

The details of this relationship (amounts of power to be provided by Bonneville, etc.) will have to be worked out in the contract discussions between Bonneville and its power customers.

It is also important to remember that, just as conditions could turn out in an operating year to be better than expected, they could also turn out to be worse. The planning metrics and **minimum thresholds** are established based on a five percent LOLP, which means that they are not intended

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to protect against all possible outcomes. There will be some circumstances in which, even if **the region** meets the planning criteria, **it** could face high market prices or even potential load curtailments.

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Appendix C

Northwest Resource Adequacy Background

Summary

The Resource Adequacy Standard serves as a gauge to assess whether the Northwest electricity supply is sufficient to meet the region's needs now and in the future. Developed over the last two and a half years by the Pacific Northwest Resource Adequacy Forum, it provides a *minimum threshold* that serves as an early warning should resource development fall dangerously short. It also suggests a *higher threshold* that encourages greater resource development to offset electricity price volatility.

The standard was developed for a number of reasons. First, the operation of the power supply is becoming increasingly complex with the addition of wind resources and greater operating constraints on the hydroelectric system. Second, utility planners want to avoid a repeat of the electricity crisis of 2000-01, which brought the region to the brink of a blackout and caused electricity prices to soar. Finally, the North American Electric Reliability Corporation (NERC) plans to initiate the development of a resource adequacy assessment standard in 2009, which will require the Western Electricity Coordinating Council (WECC) to develop an adequacy assessment framework. The WECC, in turn, has asked for help in assessing the adequacy of the Northwest's power supply.

The standard does not mandate compliance or imply any enforcement mechanisms. It does not directly apply to individual utilities – because every utility's circumstances differ. The forum has provided some guidance for applying the standard to utility resource planning, but ultimately, each utility must assess its own needs and risk factors, such as its reliance on market supplies.

Currently, the region as a whole has more than sufficient resources to meet the *minimum threshold* for resource adequacy. The minimum threshold, however, should not be mistaken as a resource planning target. The prudent amount of resource acquisition should be derived from an integrated resource planning process. For the region, the Council's power plan serves as a blueprint for the types and amounts of resources the Northwest should acquire. Individual utilities determine their own planning targets, which are screened by public utility commissions or by their boards of directors.

The Pacific Northwest Utilities Conference Committee (PNUCC) and the Bonneville Power Administration (BPA) amass utility planning information and produce regional assessments of loads and resources. These tabulations have a different purpose than the resource adequacy standard – they address utilities' need to acquire prudent amounts of new resources not the bare minimum necessary to keep the lights on. It would be a misapplication of the adequacy standard to infer that utilities should slow down their resource acquisition activity because the adequacy standard is already being met.

Background

Electricity does more than keep the lights on in the Pacific Northwest. It literally powers our economy. The absence or presence of an adequate electricity supply can either curtail or facilitate economic growth. That's why the region's electricity experts have been working on a resource adequacy standard – to help ensure we continue to have an adequate electricity supply well into the future.

In the worst extreme, an inadequate electricity supply can affect public health and safety, as in a blackout. Fortunately, such events are rare and when they do happen are most often caused by a disruption in the delivery of electricity (transmission lines), not the supply. However, there have been times – during extreme cold spells or heat waves – when the supply has been tenuous. The fact that most of the region's electricity comes from hydropower presents unique challenges to the energy supply, too, since periods of drought that limit hydropower production are unpredictable.

While most disruptions in supply have been short term, the Western United States did experience an extended energy crisis in 2000-01. At its root, the crisis was precipitated by an imbalance of electricity supply and demand centered in California and the Pacific Northwest, where for years, development of new energy resources had lagged behind energy demand. The ripple effects were felt throughout the West as the crisis drove electricity prices and consumer rates to historic highs.

Electricity planners in the Pacific Northwest are taking the lessons learned from that crisis to heart. They have been working to ensure that such a crisis does not happen again in this region.

The Adequacy Forum

In the summer of 2005, BPA and the Council jointly initiated the Pacific Northwest Resource Adequacy Forum. The forum includes representatives from the region's electric utilities and utility organizations, public utility commissions and public interest groups, as well as from BPA and the Council. It is made up of a steering committee and a technical committee.

The forum's overarching goal is to *“establish a resource adequacy framework for the Pacific Northwest to provide a clear, consistent, and unambiguous means of answering the question of whether the region has adequate deliverable resources to meet its loads reliably and to develop an effective implementation framework.”*

To that end, the forum has been working to forge a consensus-based standard for the region to address both energy (annual needs) and capacity (hourly needs). This standard has been designed to assess whether the region has sufficient resources to meet growing demand for electricity well into the future. This is important, because it takes time – usually years – to acquire or construct the infrastructure necessary to provide an adequate electricity supply.

As part of this effort, the Council accepted the recommendations of the forum and has adopted the proposed resource adequacy standard for the Northwest. The Council also adopted a voluntary implementation plan that was developed and recommended by the forum.

Two Perspectives: Utility and Regional

When the region's utilities add up their loads and resources through the PNUCC Northwest Regional Forecast, they currently show a substantial need to acquire resources, and they identify the type and quantity of resources they plan to acquire. In contrast, the regional resource adequacy assessment currently indicates that the region is above the minimum threshold for resource adequacy. While these perspectives appear inconsistent with one another, each is valid. The regional adequacy standard defines a floor or minimum amount of resource development, whereas the utility assessment and the Council's power plan suggest targets for more optimal amounts of new resource capability.

There are four main reasons for the difference:

- First, the regional adequacy standard includes a large amount of generation that is physically available to the region but is not owned or contracted for any utility. Most utilities only count resources they have firm rights to, through ownership or contract.
- Second, most utilities use critical water (driest year on record) to measure hydroelectric generating capacity. The regional adequacy standard uses a somewhat less stringent measure to define the minimum threshold for adequacy.
- Third, many utilities do not count the full availability of particular resources because of high operating costs, lack of firm fuel contracts or other reasons. The regional standard is based on the assumption that during emergencies, many of these resources would be available.
- Fourth, many utilities are concerned about the risk of high costs during periods when the power supply is tight and, therefore take a more conservative approach in defining their need to acquire new resources.

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The current adequacy assessment indicates that there are sufficient resources (both firm and non-firm) physically available to regional utilities to make the likelihood of a blackout very low – within the limits of what the region will tolerate. However, the minimum threshold does not address the optimal amount of resources, nor the types of resources that the region should acquire. Being at the minimum level may keep the likelihood of blackouts low, but it does not guarantee that prices will remain stable. The desired or prudent amount of resource development for the region is determined by the Council's Power Plan, not by this standard. This higher threshold for resource development for the region has been referred to as the *economic threshold*. The optimal amount of resource development for individual utilities must be derived from their own integrated resource planning processes.

The Regional Standard

As the standard was developed, the forum considered a number of recent changes in the regional power picture. These changes include the growing role of independent power producers, enhanced wholesale power trading, reduced flexibility in the hydroelectric system, the increased importance of natural gas-fired generation, the growth in wind generation, and higher summer air-conditioning loads.

The new standard is based on a sophisticated hourly assessment of loads and resources and how they might be affected by temperature (load deviations), precipitation (water supply), forced outages to generating resources, and other factors. At the heart of the forum’s effort is a computer program that estimates the future likelihood of a significant power curtailment under many possible future load and resource conditions.

Historically, the region’s tolerance for a significant power supply shortage has been assumed to be 5 percent – that is, the region would tolerate a significant power shortage no more than once in 20 years. This assessment, usually referred to as a loss-of-load probability (LOLP) analysis, is converted into an equivalent, but simpler and more familiar load/resource balance measurement that regional planners use in their calculations. The boxed text summarizes the current standard. To view the actual standard, go to: <http://www.nwcouncil.org/energy/resource/Default.asp>.

Implementing the Standard

The forum also wanted to ensure it did not overstep the jurisdiction of states or the prerogatives of individual utilities in planning and acquiring resources to meet load. Because each utility’s circumstances differ, it is difficult to translate a regional standard into a utility-specific standard. The forum has provided some guidance for utilities but, ultimately, they and their regulators are the decision makers for resource acquisition. The implementation plan depends on regional sharing of

Energy Standard

Energy in this context refers to the annual electricity needs of the region. The measure for this standard is the annual average load/resource balance in units of average megawatts. The threshold for this measure is set so that the resulting loss-of-load probability assessment yields a 5 percent value. In determining resource generating capability, the forum includes hydroelectric generation available under critical water, available annual output of regionally committed thermal generators and renewable resources, and a portion of the uncommitted independent power producer generation. The forum also includes a small amount of non-firm resources such as out-of-region market supplies and non-firm hydroelectric generation. The amount of non-firm resources the region should rely on is determined by the 5 percent loss-of-load probability analysis. In determining load, the standard uses the region’s average annual firm load based on normal temperatures and adjusted for firm out-of-region energy contract sales and purchases and savings from conservation programs.

Capacity Standard

Capacity in this context refers to the peak electricity needs of the region. The measure for this standard is the planning reserve margin, or the surplus sustained-peak capacity, in units of percent. It represents the surplus generating capability above the sustained-peak demand. In determining resource peak capability, the forum includes the same firm and non-firm resources used to assess the energy standard for the region. The planning reserve margin is assessed over the six highest load hours of the day for three consecutive days (sustained-peak period). This is intended to simulate a cold snap or heat wave – periods of the year when the Northwest requires the most capacity. The planning reserve margin is computed relative to normal weather sustained-peak loads. The threshold for this measure is determined by the 5 percent loss-of-load probability analysis and should be sufficient to cover load deviations due to extreme temperatures and the loss of some generating capability.

information, transparency of assessment methodologies, and regional coordination. The forum believes that a voluntary approach will work because utilities and their governing bodies have a strong incentive to develop adequate resources to meet retail loads.

BPA will also play a significant role. As it signs new wholesale power contracts with its utility customers, BPA will require that customers provide forecast loads and resource data annually, on a confidential basis, to the PNUCC, or its successor organization. This information will be used to facilitate regional resource adequacy assessments. BPA expects its customer contracts to include terms that define which parties will have responsibility to serve load growth.

For the reasons addressed above, it is to be expected that utilities will be acquiring resources even when the resource adequacy standard is already being met. The adequacy standard is intended to be the bare minimum, not the target, for regional resource development.

The Future

The Northwest is not alone in focusing on ensuring an adequate power supply. NERC plans to initiate the development of a resource adequacy assessment standard in 2009, which will require the WECC to develop an adequacy assessment framework. WECC has spent the past several years developing a framework for the West's power supply, which is currently in place. WECC's framework is explicitly not intended to override any state or regional assessments, including regional adequacy measures or their thresholds. In fact, WECC has solicited help from regional entities to aid in its assessment of west-wide resource adequacy.

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The Pacific Northwest Resource Adequacy Forum ¹ (Forum) has developed a regional resource adequacy standard to be used both as an early warning system and for guidance in long-term resource planning. The Forum submits this standard to the Northwest Power and Conservation Council (Council) to adopt for its own planning process and recommends that other entities in the region incorporate the intent of this standard into their planning efforts. The Forum understands that the assumptions made in this standard apply only to regional resource development and that individual utilities may choose different levels of reliance on specific types of resources. The Forum also recommends that this regional standard be provided to the Western Electricity Coordinating Council (WECC) for consideration in its assessment of West-wide resource adequacy.

The term “standard” in this context does not mean mandatory compliance nor does it imply an enforcement mechanism. Rather, it is meant to be a gauge used to assess whether the Northwest power supply is adequate in a physical sense, that is, in terms of “keeping the lights on.” It can be thought of as the minimum threshold for resource acquisition. However, the Forum encourages utility planners to think beyond this minimum and consider strategies that also protect against potentially bad economic outcomes. The Forum recommends that the Council’s Regional Power Plan be used to assess the region’s resource adequacy with respect to economic considerations. A description of how the physical and economic standards will be used is provided in the previously adopted implementation plan (Appendix B).

The regional standard is based on an analytical assessment of the likelihood of failure to provide electricity service. More precisely, the region’s resources should be sufficient to limit the likelihood of a significant curtailment ² to no more than 5 percent of future years. Based on that assessment, a simple and more transparent adequacy standard has been developed for the Northwest power supply. The standard includes a metric (something that can be measured) and a

threshold (an acceptable value for that metric) for both energy (annual) and capacity (hourly) capabilities of the system. Historically, Northwest resource planning has been aimed at securing adequate resources for annual or energy needs of the region. However, given recent increases in summer-time loads and decreases in the capability of the hydroelectric system, capacity needs have also become a focus for new resource acquisition.

The Forum believes that the definitions of the energy and capacity metrics and the values for the

thresholds be updated. The Forum’s intent is for this process to be dynamic and recommends that an assessment of the region’s resource adequacy be made at least once per year and that the methodology behind the standard be reviewed whenever changes in

¹ The Pacific Northwest Resource Adequacy Forum was created in response to action items ADQ-1 and ADQ-2 in the Council’s 5th Power Plan (see www.nwcouncil.org).

² See Appendix A.

the system deem it to be necessary. The adequacy assessments should be for three and five years out, to give planners time to take appropriate actions, if necessary.