Scenic Impact Analysis Review for Eastside Transmission Project

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Bellevue and the Olympic Mountains from Somerset Neighborhood

An analysis of scenic and visual resource impact issues that may result from the proposed Eastside Transmission Project by Puget Sound Energy.

It is intended to help the affected communities better understand and manage these impacts through their environmental review and permitting process.

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Table of Contents

1. Executive Summary

Dean Apostol was retained by the Coalition of Eastside Neighborhoods for Sensible Energy (CENSE) to provide expert review of the Eastside Transmission Project proposal by Puget Sound Energy. The project would increase the transmission line voltage from 115 kilovolts to 230 kilovolts. This would require the installation of taller and wider diameter poles and clearing of trees. Mr. Apostol reviewed the Environmental Impact Statement materials pertaining to scenic and visual impacts and conducted a field visit. He also consulted with James Palmer, a national expert in visual resource analysis, particularly related to transmission lines and energy projects.

Mr. Apostol concludes that the project, as presented in the Environmental Impact Statement and supporting materials, would have significant, and most likely, unavoidable impacts to scenic and visual resources in the area. Additionally, he concludes that the analysis of scenic impacts provided by Puget Sound Energy to neighborhoods in the City of Bellevue is flawed and incomplete. The analysis does not adequately follow generally accepted practices for Visual Impact Assessments (VIAs), errs in limiting the detailed analysis (based largely on visual simulations) to a one-quarter mile distance from the proposed transmission towers and conductors, and misapplies the methodology that was chosen (Federal Highway Administration 2015). In addition, the PSE analysis contains numerous omissions, and faulty or unsupported conclusions.

Among these:

- The Eastside Transmission Project VIA asserts “Because the value of scenic views and the aesthetic environment is subjective, based on the viewer, it is difficult to quantify or estimate impacts." This contradicts forty years of visual-perception research that has shown that the general public is in general agreement on what a scenic view is, and on what creates a scenic impact.1
- Landscape and scenic quality are intrinsic to physical attributes of the land, including water features, mountains, city skylines, and panoramas (wide, expansive views).
- The Federal Highway Administration (FHWA) methodology used by PSE to determine impacts is flawed and was improperly applied. It failed to include quantitative thresholds and appropriate documentation.

[1] Churchward, C., J. F. Palmer, J. I. Nassauer, and C. A. Swanwick. 2013. Evaluation of Methodologies for Visual Impact Assessments. Washington, DC: National Academy of Sciences.

- The use of "typical pole heights" to determine visibility is not best practice. The proposed height of each tower is considered best practice.
- Also, the normal practice is to use terrain data for visibility analysis then, through field work or additional modeling, to add screening. This approach is specified in the methodology PSE claims to be following (FHWA 2015).
- The visibility analysis included a questionable decision to remove all areas west of I-405 from detailed analysis (including simulations). This is arbitrary and not supported by factual data or likelihood of impacts.
- The results of the visibility analysis reported in Figure C-2 are not reliable and should not have been used.
- Table C-2 fails to use the correct definitions of important terms used to determine visual quality within the FHWA method, including "Natural Harmony, Cultural Order, and Project Coherence".
- PSE failed to ground their analysis on an inventory of visual character, as called for in the methodology used.
- The analysis failed to evaluate the compatibility of the project with the natural and cultural environment with respect to form, materials, scale, and visual character.
- The analysis of viewer sensitivity failed to follow the guidelines within the FHWA methodology PSE chose to use.
- The analysis asserts that drivers would have the shortest duration views (of the project) but provides no evidence of what the view duration of drivers would be, or their frequency of using important routes.
- The selection of viewpoints from which simulations were provided is suspect and not well explained.
- The description of the simulation methodology is not adequate. Important details, such as time of day, weather condition, view direction, elevation of the camera, pixel resolution, focal length, and degree of file compression are not provided. This makes it difficult to evaluate the accuracy of the photos and how well they represent actual conditions.
- Information on the technical process for creating the simulations is missing or buried.
- The time of the simulation following disturbance is not provided. This is important if vegetation recovery is included in the simulation.
- A number of the simulations seem to fail to account for tree removal or trimming likely necessary to make space for the larger lines.

- No information is provided on how the simulations should be viewed, i.e. screen or print, size of print or distance from screen. This information is critical for the viewer to approximate the actual scale of elements. This can significantly understate the visual magnitude of the project.
- Inadequate evaluation of the severity or significance of view obstruction for scenic views potentially impacted.
- The analysis cites Vissering, 2011 as its basis for determining adverse impacts, but it fails to apply the two-part test properly.
- Vissering also requires that if impacts are significant, then reasonable mitigation measures for those impacts need to be identified. PSE fails to do this.

While the information in the Eastside Transmission Project Visual Impact Analysis is incomplete and inadequate, nevertheless it finds that there are significant impacts in some areas that would result from this project. I concur with this finding, however based on my review I believe the impacts may be much more widespread than the VIA suggests.

A general principle in scenic impact analysis is that:
project visibility + viewer sensitivity along with a high negative visual contrast = substantial impacts.

The proposed Eastside Transmission Project would have all these characteristics. It is highly visible, the people who view it are sensitive to the view, and the scale and design of the transmission line is highly contrasting with its primarily residential surroundings.

Additionally, the impact assessment failed to consider how the new towers would look from viewpoints outside a one-quarter mile distance. Research shows that transmission lines are highly visible at a distance of several miles[2] . And if the proposed taller utility poles are viewed against the sky, not only will they be quite visible, the lines will also have (negative) high contrast from many places, including Lake Washington, downtown Bellevue, and multiple public park and recreation areas.

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[2] Sullivan, Robert G., Jennifer M. Abplanalp, Sherry Lahti, Kevin J. Beckman, Brian L. Cantwell, and Pamela Richmond. 2014. Electric transmission visibility and visual contrast threshold distances in western landscapes. In Changing Tides and Shifting Sands. Conference Proceedings of the 39th Annual NAEP Conference. April 7-10, 2014, St. Petersburg, FL.

Given the likely significance of these impacts, the City of Bellevue should require Puget Sound Energy to provide a more accurate and technically sound VIA before considering approval of this project.

2. Qualifications

Dean Apostol is a professional scenic and environmental consultant with over 38 years experience. His special areas of emphasis include scenic resource assessment, natural resource planning, landscape ecology, and ecological restoration. His clients have included: Friends of the Columbia Gorge, the Oregon Department of Transportation, the U.S. Forest Service, the National Park Service, the Washington Forest Law Center, the Forest Stewardship Council, Metro, City of Portland, the Quinalt Indian Tribe, and private landowners located within the Columbia Gorge National Scenic Area.

Mr. Apostol is presently semi-retired from the Federal Government, where he was Chief Landscape Architect at Mt. Hood National Forest, and a Landscape Architect for both the Bureau of Reclamation and the Army Corps of Engineers (Seattle District). He has taught at Portland State University and Oregon State, and is presently on the adjunct faculty at the University of Oregon Department of Landscape Architecture.

Mr. Apostol has published four books and a number of other articles and book chapters on scenic landscape conservation and ecology. His most recent book is: *The Renewable Energy Landscape: Preserving scenic values in our sustainable future* (Rutledge Press 2016). This book is a detailed analysis of the scenic conservation challenges of energy projects, including transmission lines. It includes suggested guidelines for conducting Visual Impact Assessments, how to determine levels of impact, guidelines for visualizations, and offers design and mitigation recommendations, including avoidance of impact to sensitive locations.

A more complete resume is included elsewhere in the packet from CENSE.

3. Scenic and Visual Resources Background

Scenic landscape conservation and Visual Impact Assessment (VIA) has a long history. However, systems for assessing, avoiding and/or minimizing impacts to scenic and visual resources are not commonly used in Bellevue, and may be unfamiliar to public officials and the community. The following brief summary is intended to give some background into these systems, and to show that their application is widespread and adaptable to many situations, including the Eastside Transmission Project EIS. The following discussion draws heavily from *The Renewable Energy Landscape Chapter 2*,[3] which goes into much greater detail than presented here.

Most scenic landscape conservation focuses on rural and natural lands, such as the pastoral lands of Europe, and mountain areas of the United States. However, scenic resources have been identified and protected within cities since at least the early 1700's, when in London, views of St Paul's Cathedral were identified as meriting conservation.[4] (Urban scenic conservation has usually focused on protecting views of significant buildings, historic monuments, and natural features. For example, many state capitals around the US have long had view protection for capital buildings and their grounds. Natural features have been an increasing focus of urban view conservation, particularly in western US cities and counties. Denver protects views of the Rocky Mountains from public parks. Communities in Utah protect views of the Wasatch Range. Honolulu has long protected views to Diamond Head. Seattle and Vancouver BC have policies that protect views of water and the surrounding mountains. A number of California cities protect ridgelines from development and conserve views to the ocean. Portland recently adopted scenic view conservation measures for its central city area that take into account close-in views to the Willamette River, and distant views to hills and mountains.[5]

The modern era of Scenic and Visual landscape management systems is usually traced to the work of Dame Sylvia Crowe in Great Britain, who developed methods for conserving scenic rural landscapes facing impacts of post-WW2 sprawl and surface mining, as well as transmission of energy. Her approach was adapted in the US, Canada, and elsewhere beginning in the 1970s and 1980s, especially by Federal agencies tasked with managing large swaths of public land.[6] [7],The US Forest Service, USDI Bureau of Land Management and the Soil Conservation Service

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[3] Apostol, Dean, James Palmer, Martin Pasqualetti, Richard Smardon, Robert Sullivan, 2017. *The Renewable Energy Landscape, Preserving scenic values in our sustainable future*, Routledge Press.

[4] Apostol and Ribe 2014

[5] Portland 2015

[6] Elsner & Smardon 1979

[7] Smardon 1982 & 1986

(now the Natural Resources Conservation Service) were the early leaders among US federal agencies.[8]

The US Forest Service introduced its Visual Management System (VMS) in 1976.[9] This was revised and updated to the Scenery Management System (SMS) in 1995.[10] (Both the VMS and SMS systems require landscape classification of inherent scenic qualities, assessment of the sensitivity of users of the land to visual change, and the resilience of different landscapes to impacts. The Forest Service has produced a series of handbooks, including one for visual impacts of utilities, which addressed the visual impacts of electric power transmission lines and pipelines that ran through national forests.[11]

The Bureau of Land Management (BLM) is responsible for 243 million acres of surface lands, primarily in the Western US and Alaska. As renewable energy development has expanded, BLM has become a key agency in helping the US find places for renewable energy development and transmission while reducing impacts to scenic areas. To do this, the BLM did extensive mapping and analysis to identify areas suitable for utility scale renewable energy generation facilities, and areas where scenic conservation is most threatened.

The BLM developed Visual Resource Management (VRM) manuals and handbooks beginning in 1975. BLM classified scenic resources based on a combination of inherent scenic quality, public sensitivity, and the distance from which the land was viewed.

The BLM system is designed to be administered by staff without specialized expertise in scenic management or design (i.e. landscape architects). It includes a very useful and adaptable tool for visual impact assessment, easily understood by lay persons, that helps managers evaluate how a project like a transmission line can be visually distinguished from the context in which it is located. This includes "Contrast Rating," which measures the degree of negative contrast of a project with existing conditions. The BLM system has proven to be particularly useful in the assessment of energy facilities, including transmission lines and towers, which are often viewed against scenic backdrops in visually open landscapes.

[8] Bacon 1979, Ross 1979, Schauman and Adams 1979
[9] Bacon 1979, Smardon 1986
[10] USDA FS 1995
[11] USDA 1975

The Federal Highway Administration (FHWA) initially published a visual resource guidance document for highway projects in 1988.[12] This system offered visual inventory guidance specific to highway projects. It relied on the attributes of *landscape unity, vividness* and *integrity*. Updated guidance issued by FHWA in 2015[13] changed these factors, for the worse in the opinion of this author. *It is important to note that Puget Sound Energy claims to be using the FHWA method for this project, though their application of its system is, at best, partial.*

The US Army Corps of Engineers (USACOE) produced a *Visual Resources Assessment Procedure* (VRAP) in 1988.[14] The VRAP was based upon methods and training work developed by Richard Smardon and James Palmer from 1983 until 1988.[15]

The US energy licensing agencies, the Nuclear Regulatory Agency (NRC) and the Federal Energy Regulatory Commission (FERC) do not have specific methods for reviewing visual impacts. State regulatory bodies, including Washington State, require consideration of visual impacts within SEPA, though methodologies and standards of practice are not spelled out.

Over the last decade there has been a renewed interest in Visual Impact Analysis (VIA) methods due to the rapid expansion of renewable energy, particularly large-scale wind turbines and the new transmission lines needed to transport energy. This new interest has prompted a refinement in methods.[16] New interest has included updated research and application of new technical capability, particularly visibility analysis and visual simulations.

4. Visual Impact Analysis Approaches and Tools

All Visual Impact Assessment methods employ some common approaches and tools.

Landscape Characterization

The character of a landscape is the combined visual attributes that give a place its aesthetic qualities. These include landform, vegetation, water, buildings, roads, and other natural and cultural features. A landscape character analysis establishes a baseline against which a project's impacts are evaluated. For example, portions of the land that the PSE transmission line passes through, like the Somerset Neighborhood, have a panoramic (wide) character, while other

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[12] Blair et al 1979, Jones et al 2012

[13] FHWA 2015

[14] Henderson et al 1988, Smardon et al 1988

[15] Henderson et al 1988

[16] Apostol 2016

segments like North Bellevue, have a more enclosed character. While there are many ways to accomplish landscape characterization, it is normally a combination of description, supplemented by annotated photos or sketches that highlight the features that create a visual place.

Visibility Analysis
A "visibility analysis" helps determine from where a facility can be seen and can provide information on which parts of a project are more visually exposed than other parts. This analysis is typically done using a geographic information system (GIS) that projects lines of sight to and from the proposed project related to the surrounding landscape out to an appropriate distance. The output is usually termed "*potential viewshed*" or the "*zone of visual influence"* (ZVI). The model shows the potential visual connection between the project and viewers. Puget Sound Energy included results of their viewshed analysis (flawed, as will be pointed out later) on -of the EIS Appendices.

Visual Simulations (From Apostol 2016 Chapter 6)
Photo-realistic simulations of projects have become a critical tool in Visual Impact Assessments. The old adage that "*A picture is worth a thousand words*" applies here. Simulations or "Sims" are used to show a project's likely appearance before it is approved or built. Sims can help reveal what the likely impact would be and can help communicate this to regulatory bodies and community stakeholders. They can also help project-designers make modifications to reduce impacts. Regulators and communities often rely heavily on the simulations provided by the project proponent, but do not have the technical knowledge or experience to understand the limitations of simulations, how to spot flaws, and what questions to ask. Even the best and most accurate simulations have unavoidable limitations that need to be understood if an accurate impact assessment is to be made.

Visual simulations have been around a long time and can include a wide range of representations of projects, including maps, aerial and ground-level photographs, watercolors, engineering and architectural drawings, 3-D models, computer generated images, and animations. One form or another has been used by designers since the time of the ancient Greeks[17] to show the expected look of projects.

In modern times, computer-generated, photo-realistic simulations are used to depict, as accurately as possible, the appearance of a proposed project. A well-prepared VIA provides an adequate number of spatially-accurate and realistic simulations from multiple and especially-

[17] Zube et al., 1987

important viewpoints. In the Eastside Transmission Project EIS, the term used is Key Viewing Point, or KVP.

Even the best photo-realistic simulations have important limitations that need to be understood and acknowledged. The simulation process is inherently subject to errors, inaccuracies, limitations, or misinterpretations that may have important effects on the quality of the product and how it is understood.

The following general principles for producing and presenting visual simulations are adapted from Sheppard (2005)[18] and should serve as high-level guidelines for any visual impact simulation:

- **Simulations should be spatially accurate and realistic.** Simulations should simulate the actual or expected appearance of the landscape and project as closely as possible, according to the data available at the time.
- **Simulations should be representative.**
  Simulations should represent the important viewpoints, and the range of views of the project. They should provide viewers with a range of viewing conditions, including worst-case scenarios.
- **Simulations should be visually clear and of sufficient scale and context.**
  Simulations should be properly prepared and displayed, such that project components and the surrounding landscape are depicted clearly and with sufficient detail to serve as a sound basis for impact assessment.
- **Simulation methodology should be defensible and documented.**
  The methodology used to produce simulations should follow procedures that will withstand scientific scrutiny, are consistently followed, and are thoroughly documented. The documentation should include clear descriptions of known and potential sources of error and uncertainty. And instructions to the viewer should be included, particularly with respect to the size of the image and correct viewing distance.

Simulations that do not adhere to the above criteria should be considered deficient by regulators and affected communities.

Single-frame vs. Panoramic Simulations

One of the most important tradeoffs that affect the accuracy and reliability of simulations is the choice of camera lens. Most sims derived from photos are produced from a single-frame shot

[18] Sheppard 2005

using a "normal" lens. A "normal" lens is supposed to capture the frame of view and level of detail that the human eye would experience from a given vantage point. A surprising level of disagreement exists within the visual simulation profession regarding which lens focal length best represents what people actually see, especially given the variability in digital photo equipment. Generally speaking a 50MM lens, or its equivalent, is the standard but some experts advocate 70mm.

A wide-angle lens, or several shots stitched together produce a panoramic image. There are tradeoffs to "normal" versus "panoramic" images. A single-frame image provides more detail and is easier to reproduce at a scale that represents the size of project and the elements a human eye would see from a given distance. A panoramic-image provides a wider frame, but at the expense of detail and scale.

A good rule of thumb is that simulations should show enough of the surrounding landscape to provide the appropriate spatial context. If the field of view is wider than that of a 50 or 70mm lens, then including both a single-frame and panoramic-image for each view provides a better representation than showing either alone. A transmission line corridor, like the one proposed in the Eastside Transmission Project, is a linear feature that crosses a wide swath of land. The more lines and towers captured from a given vantage point, the more dominant the transmission line might visually be.

The human, horizontal-field-of-view is approximately 124° [19] and this entire field of view can be captured only by using a panoramic image. However, unless reproduced at very large scales, panoramic images lack details that would be visible to a person at a particular viewpoint. Photo sims printed on 8 x 11 paper or viewed on a small screen normally fail to show detail in a panoramic image. Providing both types of images in any simulated view with at least a 124° field allows proper depiction of facility details, while also showing the facility in the proper visual context and better depicting its scale in relationship to its surroundings.

Viewpoint Selection

Choosing appropriate viewpoints from which to simulate a project is critical to assessing impacts. Additionally, variables such as the season, time of day, and lighting can change the way an object or project is viewed. Ideally, simulations reflect seasons and time periods of highest visibility. They should depict conditions with the greatest, reasonable visual impact scenario. For

[19] NZILA Education Foundation 2010

example, if glare or high reflectivity is expected, even if only for parts of a day or year, that image should be provided to help gauge impacts and avoid surprises.

Simulations are expensive to prepare, and thus all projects limit their number. Choosing an appropriate variety is crucial for representing project impacts.

Preparing Accurate and Realistic Simulations
Regulators and the affected community rely heavily on simulations to help them understand project impacts. These sims can look very "real." But, in fact, how real are they? A number of factors determine how well a simulation depicts the project's actual appearance from many given viewpoints.

Accuracy
Simulations should be based on detailed, project-design specifications. This starts with accurate spatial information, especially elevations. Simulations should show all of the project elements and other effects, including ground disturbance or anticipated vegetation removal. They should be realistic in terms of scale, colors, and textures. They should be properly illuminated and include shadows. If the simulation preparer knows of errors or uncertainties, these should be clearly stated so that viewer expectations are appropriate.

Image Size and Viewing Distance
It is vitally important that simulations are reproduced at a size large enough to be comfortably viewed from an appropriate viewing distance, to assure that the apparent size of the facility is seen as it would be seen in reality. For printed simulations, large paper or screens should be used so that adequate detail is provided along with a suitable horizontal field of view. The proper viewing distance at its intended reproduction size should also be specified, because slight changes in the distance of one's eye from the image can result in significant variations in perceived scale. When panoramic images are displayed at public meetings, they should be mounted on curved surfaces so that all parts of the image can be viewed at a correct viewing distance. If this is not practical, they should be displayed in a space that allows viewers to move to a position directly in front of the portion of the image they are viewing, i.e. center, left, and right.

Simulation Output Quality
High-quality prints and screen resolutions are important for impact assessment and public information presentations. Correct color balance is also important, and color correction hardware

should be used. High-end, color-correction hardware requires ambient light readings to correctly determine the brightness for screen display.

Labeling and Supplementary Information
Supplementary information should be provided to indicate the project, viewpoint location, and alternative depicted in the simulation. This information should accompany the simulation. Supplementary information should include:

- Geographic coordinates and location (i.e. intersection) for the viewing location;
- Date and time the photo was taken;
- View direction;
- Weather conditions;
- Lighting condition (frontlit, backlit, sidelit);
- Camera and lens make and model;
- Focal length or 35-mm equivalent focal length for digital SLR cameras;
- Horizontal and vertical width of field depicted.

Limitations of Simulations
It is important that regulators and the community understand that, while the visual simulations provided by PSE can be helpful in determining visual impacts, their limitations also need to be understood. Even when properly done, simulations have limits. First, they are based on photographs, and what they simulate is actually a photograph of the site of a proposed project, not the site itself. Photo sims do not and cannot recreate the actual visual experience of a person in a real landscape looking at the real project.[20] This is due to the inherent limitations in photography. Observations made by Benson (2005)[21] suggest that simulations often underestimate the impacts compared with field observations of built projects. Once built, projects appeared nearer to the viewpoints, more visible, and more conspicuous than the simulations had predicted. It is important for regulators and the community to understand that photo simulations are not the real thing.

People tend to accept photographs as closely approximating reality. But photographs are static images of a dynamic environment. They provide a limited representation of a view from one location at one instant in time. This view is most often chosen by the simulation creator, not the

[20] NZILA Education Foundation 2010; Scottish Natural Heritage 2006
[21] Benson 2005

regulator or the community asked to review it. A human visual experience is much more dynamic than photos can capture. What one sees changes continuously as a viewer turns their head or moves about. The visual environment changes too, as the sun moves across the sky, wind moves leaves and branches, and clouds come or go (or in the case of Western Washington come and stay).

Even the best cameras cannot capture the range of visual contrast that the human eye sees.[22] Simulations are usually flatter and duller than real-life visual experience. The lower visual contrast normally shown in simulations may cause regulators and communities to think that the visual impacts of a project will be less than they turn out to be, since impacts are highly dependent on contrast.[23] While this inherent limitation applies to all photo simulations, it is an especially important if a facility has reflective surfaces and is subject to glare, which is the case for conductors and some types of utility poles (particularly untreated galvanized steel). Because brightness in reality has greater glare than what is experienced by looking at simulations printed and displayed in an EIS), glare is typically depicted as being less bright in a simulation than what would actually be experienced.

Photographs also have an inherently limited and predetermined field of view. They show only what is inside the picture frame. The visual context outside of the field of view of the photograph is lost.[24] This visual context can be very important in assessing the full effect that a project will actually have, seen from the same vantage point of the photo. As noted, panoramic (wide angle) simulations can expand the field of view to show more context, but at the expense of detail. In addition, viewing and understanding panoramic images is more complicated than "normal" views because of distortions when a panoramic image is projected onto a flat surface such as a screen or a printed page.

Limited Viewpoints

Simulations only show the views from selected viewpoints. Far more potential views are omitted due to time and budget constraints.[25] A typical VIA for a utility project includes simulations representing only a small part of the total area from which the project will ultimately be visible. It is important for regulators to note that the project will actually be visible from many locations not represented by whatever simulations are provided, and that a large portion of the total visual impact of the project may be experienced from these non-simulated locations. One way to

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[22] Scottish Natural Heritage 2006

[23] Benson 2005

[24] Sheppard 1989, 2005

[25] Scottish Natural Heritage 2006

overcome this problem is to provide a computer model that allows one to simulate moving through an area and capturing views from any location, but these simulations are complicated and there is a loss in photo realism.

Regulators and the community also need to understand that in order to see project components depicted in a simulation at the same size and scale that they would be seen from the actual viewpoint, the simulation has to be looked at from a specific viewing distance.[26] [27] The correct viewing distance for a photo sim is a math function of the camera's photographic sensor width, the focal length of the lens, and the size at which the photograph is reproduced or displayed on a screen. The formula for determining the correct size of the image in relation to the distance viewed is as follows:[28]

Distance from viewer = Width of image /(2 • tan (HFOV1 / 2)

Viewing the simulation at an incorrect viewing distance will result in objects appearing larger or smaller than they would actually be seen in the field. This can easily result in an over- or under-estimation of the project's visual contrast.[29]
Note: It is customary for the project proponent to inform the viewer of the correct distance at which to view a reproduced image and not leave it to the viewer to perform the above calculation.

Error and Inaccuracy in Simulations

The creation of spatially accurate and realistic simulations is a complex technical process that requires a high degree of skill, appropriate technology, accurate data, and rigorous methods. Inaccurate simulations can be misleading, and errors will not likely be apparent to non-professional observers. The following discussion highlights some common errors or inaccuracies in simulations.

First and most common is improper or inadequate selection of the viewpoints, resulting in a biased assessment. Typical sources of error include:

- Failing to select enough viewpoints;
- Failing to select viewpoints that represent worst-case scenarios;

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[26] NZILA Education Foundation 2010
[27] Scottish Natural Heritage 2006
[28] National Academy of Sciences 2007
[29] Sheppard 1989

- Conversely, selecting so many similar viewpoints that viewers become bored or overwhelmed by having to look at and assess large numbers of simulations that lack significant differences;
- Omitting viewpoints that are important to stakeholders; and
- Selecting viewpoints that under-represent impacts.

Second, spatial inaccuracy can result by omitting elements that would be visible in the real landscape, showing elements that would not be visible, and/or placing objects in the wrong locations, of the wrong sizes, or in the wrong visual perspective. There are many potential sources of spatial inaccuracy in simulations. Some may introduce potentially large errors in contrast assessment, while others result in minor errors and may not alter the assessment.

Potential inaccuracies include:

- Changes to the project design after the simulations are prepared.
- Incorrectly identifying locations.
- Incorrectly setting up viewing parameters in the software, such as incorrect focal length specification.
- Errors in elevation data resulting in incorrect concealment or exposure of landforms and project elements.
- Failure to account for screening elements, such as vegetation and structures, that would be present or might be removed during construction.
- Use of incorrect or incomplete models of facility components.
- Project elements not oriented properly with respect to the viewer.
- Minor distortions inherent in the base photograph which are not be reflected in the 3D terrain model.
- Improper registration of terrain and project models with the base photograph.

Third, a simulation may be spatially accurate but not realistic. This means the project elements may not look the way they would in a real-world view. For example, the project elements placed into the simulation may be the wrong color, have overly sharp edges, or not blend well with the background. Errors in realism may be very subtle and difficult to detect, but can change the perceived contrast of project elements, causing bias in impact assessment. Potential sources of a lack of realism in simulations include:

- Insufficient contrast, as discussed earlier.

- Over- or under-incorporation of distance and atmospheric effects, with project features appearing too dull or hazy, or too clear and bright to match the surroundings.
- Improper coloring and shading, resulting in a flat appearance, or an overemphasis on three-dimensionality.
- Improper blending of model edges with the background photograph, resulting in overly sharp or sawtooth edges on objects, or "mushy" blurred edges that are inconsistent with the edges of other objects in the base photograph.
- Incorrect lighting and shadow casting, often resulting from incorrect time specification for sun positioning that causes illumination and shadows that do not match the lighting and shadows in the base photograph.

Fourth, potential problems with simulation display include:

- Improper viewing distance. It is very common for simulations to be reproduced at a size that they cannot be comfortably viewed from the required viewing distance for scale accuracy.
- Lack of detail. If simulations are presented at too small of a size, there may be insufficient detail of project elements that change the accuracy of assessment of impacts. Detail may also be lost from low-quality prints or loss of pixels when a digital image is shrunk to reduce file size for electronic transmittal.
- Improper lighting. If lighting is overly bright and improperly positioned, there may be glare on printed simulations that makes details difficult to see. Insufficient lighting may also make details difficult to see, especially in darker images;
- Lack of supplementary information needed to fully understand what is being shown and the limitations of the simulation.

The simulations included in typical paper copies of VIAs downloaded from Web sites and printed on standard office printers are generally of insufficient quality for an accurate impact assessment. They understate visual contrasts, will often have incorrect colors, and will usually lack details apparent in the original simulation.

Lastly, the methodology used and supporting documentation should be required for simulations. Regulators and communities should consult with independent simulation experts to help validate or find issues with what the project proponent has presented.

5. Flaws in the Visual Assessment provided by PSE

The Visual Assessment provided by PSE in the EIS and supporting documentation is flawed, incomplete, misleading, and does not, in my opinion, reflect the true level of visual impact that will result if this project is approved and built.

The following observations and comments about the Eastside Transmission Project VIA (EE VIA) do not constitute a complete technical review, which would need to include a reanalysis of the data that PSE's consulting team collected during fieldwork, the visibility analysis, simulation preparation, and analysis ratings. The focus of this review has been to understand what was done, and what is actually required by the methodology used, the updated Federal Highway Administration VIA guidelines.

First, the PSE assessment asserts the following:
"Because the value of scenic views and the aesthetic environment is subjective, based on the viewer, it is difficult to quantify or estimate impacts. In particular, little guidance exists supporting a standard methodology for assessing visual impacts associated with transmission line projects." [30]

This is a very misleading statement that should not be accepted at face value by regulators or the community. While a public evaluation of scenic impacts *may* include subjective judgement, the past forty years of landscape perception research has demonstrated that the public is generally in agreement about what constitutes a scenic view, and what creates a significant scenic impact to valued places. This literature is extensively reviewed in a report from the National Academy of Sciences.[31] Valid and reliable scientific methods based on public perceptions have been demonstrated to evaluate visual impacts.[32]

In my own experience, which includes over 30 years of practicing Visual Impact Assessment, a rough formula for determining level of impact is:
High viewer sensitivity + high negative visual contrast (from project) + large geographic extent + long duration (of impact) = significant impact.

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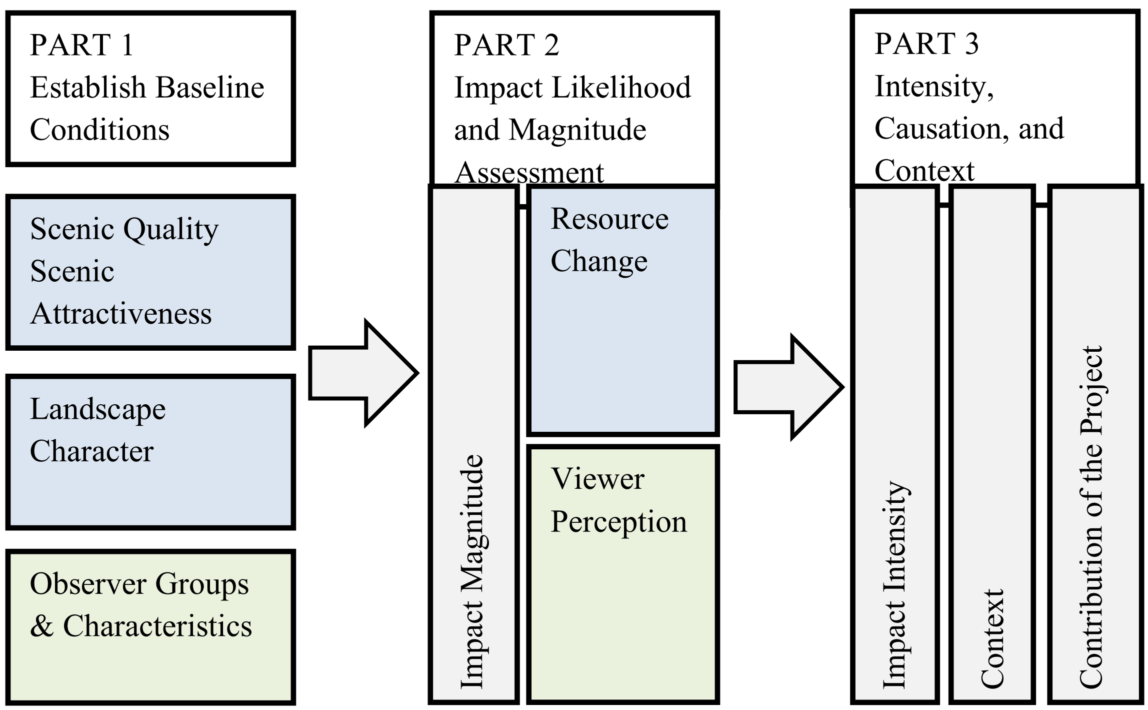
[30] EE VIA, p. C-1

[31] Churchward, C., J. F. Palmer, J. I. Nassauer, and C. A. Swanwick. 2013. *Evaluation of Methodologies for Visual Impact Assessments*. Washington, DC: National Academy of Sciences

[32] Palmer 2015

I asked Robert Ribe, Professor of Landscape Architecture at University of Oregon, to review this formula and he concurred and added that this represents a "best practices" approach. Additionally, the methodology for the recently completed scenic impact analysis for the *Boardman to Hemmingway Transmission line* in Oregon included the following flowchart to illustrate the procedure used.[33]):



In short, evaluating scenic impacts is not merely a "subjective" process as PSE claims. It is not "based on the viewer." It is based on what communities value about their surroundings. VIA is a well established, objectively-tested set of best practices that incorporates individual and community aesthetic preferences.

There is a reason real estate values are much higher in scenic settings, with views of water and/or mountains. Our nation, Washington State, and local governments all take steps to protect natural

[33] Kling, personal communication 2018

and cultural landscapes that are considered scenic, like Olympic National Park, Mount Rainier, and the Columbia Gorge. These were not selected for conservation based on whims. And the elements that make a place scenic are well understood. These include: complex landforms, natural vegetation, water, color, and certain cultural attributes, including regular field patterns and well-designed buildings or towns.

We agree on what scenery is, and this means there is a strongly "objective" factor at work. Whether this is learned through acculturation or inherent biologically is a matter still open for debate.

The VIA goes on to state: *"For this project, the assessment of impacts was generally based on methods described in the Federal Highway Administration (FHWA) Guidelines for Visual Impact Assessment (FHWA, 2015). FHWA guidelines do not specify thresholds for determining significant impacts, nor do state or local regulations."*[34]

While the FHWA does not specify thresholds of impact significance, many readily available methods do, and these have been in use for decades. They provide the tools for systematic quantitative evaluation of visual impacts, including thresholds for determining significance (Sheppard & Newman 1979; Smardon et al. 1988). An important advantage of these methods is that they include documentation of evaluation ratings, allowing the process to be audited by outside parties. These methods have been found to be reliable (Feimer & Craik 1979, p. 27). This raises the question: Why did the Eastside Transmission Project VIA use a procedure that does not include quantitative thresholds and systematic documentation? There are multiple examples of recent VIAs prepared for other transmission projects that have used more appropriate methods that could have been adapted to use here.

The VIA also states that the selected procedure "*suggests identifying an Area of Visual Effect (AVE) based on the physical constraints of the environment and the physiological limits of human sigh*t" (ES VIA, p. C-1). But they did not apply this. Empirical studies based on the systematic observation of high voltage transmission lines have shown that towers can be detected at a distance of 10 miles and were characterized as **highly visible** at over 1-mile distance. (Driscoll 1976; Sullivan et al. 2014). Despite this, the EIS limited its (flawed) visibility analysis to five miles, and its more detailed analysis to: "*a study area with a one-quarter mile radius from the centerline of the proposed transmission line corridor (including all segment options) was used*" (ES VIA, p. C-3).

34

This is a not very defensible decision and represents a significant flaw in the EIS. There is no supporting evidence I am aware of that would justify limiting the analysis of visual impacts of high voltage transmission towers to a quarter mile radius.

PSE also appears to misunderstand the normal practice for conducting a visibility analysis. The ArcGIS Viewshed tool calculates visibility to nodes and vertices of a line segment, which may not accurately represent the location of the transmission towers. Normal, accepted practice is to conduct the visibility of each structure by using its expected height above the ground, rather than the "*typical pole height for line segments*" used by PSE (EE VIA, p. C-2).
The normal and recommended best practice is to perform the potential visibility analysis using only terrain data (i.e., DTM) (USFS 1995, p. 4.5; TLI & IEMA 2013, p. 103). This is the recommendation of the FHWA methodology used by PSE (2015, p. 4.10). A terrain-based analysis shows tower visibility usually from an observer height about 5-6 feet above ground. Once a terrain-based analysis is complete, it is accepted practice to supplement it with the height of vegetation and structures that may block or screen views. However, the VIA does not appear to have performed this analysis correctly. Instead it determined potential visibility by using a digital surface model (DSM) that factored in the height of the vegetation canopy and buildings. This results in a distorted picture of potential visibility.

Additionally, the actual elevation of I-405 should be accurately represented by the DSM data. Therefore, screening effects should be accounted for in a terrain-based visibility analysis. PSE's arbitrary decision to remove all areas to the west of I-405 from analysis by assuming screening effects is not based on a defensible analysis. In fact, the analysis that was done clearly shows potential visibility to the project from areas west of I-405, yet PSE claims viewers are screened by the terrain. This is a conclusion that needs much better support or explanation or both.

In my opinion, the failure to properly conduct the visibility analysis using well established procedures, and the failure to extend the analysis to a distance consistent with potential visibility make the results reported in Figure C-2 suspect at best. This error alone should be of sufficient concern to call into question the VIA results.

Another question concerns *Table C-2: Application of FHWA Methodology to Determine Visual Quality* (p. C-6), which attempts to describe the method, but defines important terms using the FHWA glossary (2015, p. A-4) instead of the more clear and complete definitions provided elsewhere by FHWA (FHWA 2015, p. 5.13-5.14). These include:

Natural Harmony: Viewing the visual resources of the natural environment creates a sense of natural harmony in people. People interpret the visual resources of the natural environment as being harmonious or inharmonious. The perception of natural harmony can be determined by viewing the character of the visual resources of the natural environment through the lens of viewer preferences. Viewers have a concept of what constitutes natural harmony. The greater the degree to which the natural visual resources of the AVE (or a particular landscape unit within the AVE) meet the viewer's preferred concept of natural harmony, the higher value the viewer places on those visual resources.

Cultural Order: Viewing the visual resources of the cultural environment creates in people a sense of cultural order. People interpret the visual resources of the cultural environment as being orderly or disorderly. Similar to the evaluation of natural harmony, the perception of cultural order can be determined by viewing the character of the visual resources of the cultural environment through the lens of viewer preferences. Viewers have a concept of what constitutes cultural order. The greater the degree to which the visual resources of the AVE (or a particular landscape unit) meet the viewer's preferred concept of cultural order, the higher value the viewer places on those visual resources.

Project Coherence: Viewing the visual resources of the project environment creates in people a sense of project coherence. People interpret the visual resources of the project environment as being either coherent or incoherent. Similar to the evaluation of natural harmony and cultural order, the perception of project coherence can be determined by viewing the character of the visual resources of the project environment through the lens of the viewer preferences. Viewers have a concept of what constitutes project cohesion. The greater the degree to which the visual resources of the project environment meet the viewer's preferred concept of project coherence, the higher value the viewer places on those visual resources.

The FHWA (2015) "*guidelines consider visual quality a result of the interactive experience between viewers and their environment."* It is the result of a viewer's perception of the environment. The "Application" column in the EE VIA Table C-2 Application of FHWA Methodology to Determine Visual Quality (p. C-6) does not appear to follow this guidance.

A visual quality analysis *should be grounded in an inventory of visual character* (FHWA 2015, p. 5.2-5.5). A visual quality evaluation matrix should be prepared that characterizes how each factor contributes to high, medium and low visual quality (e.g., BLM 1986a, Smardon et al.

1988). This matrix should be part of the Eastside Transmission Project VIA methods, and individual ratings for each viewpoint or area evaluated should be reported. Absent this, it is very difficult to understand the basis for the visual quality evaluation.

The VIA (p. C-8) evaluates impact "based on the FHWA concepts of compatibility of impact (degree of contrast), sensitivity to the impact (viewer sensitivity), and degree of impact (whether it would result in a beneficial, neutral, or adverse impact)." The EE VIA incompletely implements the FHWA method as it is described.

- FHWA defines Compatibility (rather awkwardly) as "... the ability of the environment to absorb the proposed project as a result of the project and the environment having compatible visual characters" (FHWA 2015, p. 6.1). (They suggest that a project either is or isn't inherently compatible with its surroundings). To determine this, they list four factors to evaluate: scale, form materials and visual character. There is no indication in the VIA that this analysis was performed.
- Sensitivity is "the ability of viewers to see and care about a project's impacts. The sensitivity to impact is based on viewer sensitivity to changes in the visual character of visual resources. Viewers are either sensitive or insensitive to impacts" (FHWA 2015 p.6.1)
- Viewer exposure is evaluated by considering: proximity, extent, and duration. … These measure and describe the expected viewer awareness: attention, focus, and protection." (FHWA 2015, p. 6.2-6.3).
- PSE provides a map of residential density (Fig. C-5) to represent viewer extent. This only represents households, not workers, recreationists, school children, etc.
- There is a statement that "*Drivers would have the shortest view duration due to the speed at which they travel.*" It may be true that a driver has a shorter duration view of the project than a resident would. But no evidence is presented by PSE that this shorter duration (and frequency, given many drivers use these roads repeatedly) reduces impacts. [In fact, research suggests that judgments of scenic value can be based on a duration of less than a second, and that these judgments are very similar to longer duration views.
- The VIA also lacks documentation of any ratings and fails to note any procedure to determine viewer sensitivity at specific viewpoints. Are viewers at some locations more sensitive than viewers elsewhere? We do not know.

Lastly the "Degree of impact" is deemed important by FHWA, but is not addressed by PSE. even though it was identified as one of the three assessment components (EE VIA, p. C-8).

Viewpoint Selection
As mentioned earlier, selecting the viewpoints from which to analyze impacts, and for simulation purposes is a critical decision for any VIA project. PSE's description of how viewpoints were selected for simulations is in section 6.1 Degree of Contrast, 6.1.2 Built order (EE VIA, p. C.10-C.13). Visual simulations are crucial in conveying (and influencing) the regulators and the public's understanding of how a project will likely impact the community. Providing information about how viewpoints were selected in an unrelated section of the EIS has the perhaps unintended effect of obfuscating this critical process.

My review finds that the description of the photography and visual simulation methodology used is inadequate. The model of camera is presented, but other important information about the photography is lacking, including:

- Date and time the photograph was taken. This determines the direction of sunlight and shadows.
- Weather conditions. This effects rendering brightness and colors.
- Viewpoint's GPS location (e.g., latitude & longitude), orientation and the elevation of the camera.
- Resolution of the photos when taken, and the resolution of the reproductions. (The resolution should be sufficient to represent a half-minute of arc).
- Focal length of the lens and the photograph's horizontal angle of view. This effects the number of pixels needed to meet the half-minute of arc standard.
- Whether the original digital photographs were saved as RAW or JPG files. And the degree of compression used. (This strongly influences photo clarity)
- The information provided about the process used to create the simulations is also very general. In order to understand the accuracy of the sims, it is useful to know:
  - The data used to create the 3D model that is the base for the simulations
  - The method for placing project elements into the 3D landscape model.
  - How textures and colors were determined for rendering project elements. Also steps to insure the accuracy of these colors and textures.
  - Software used to align the 3D project and landscape model with the original photograph. The elements common to the 3D model and photograph used as registration points.
- It is unclear whether existing trees or structures are removed in the simulations. When this is done, judgments have to be made about what is seen behind the trees.

- The resolution and file compression of the simulations is not provided. The resolution needs to be adequate to show the level of detail that viewers will experience.
- No mention is made as to the appropriate viewing distance of the simulation to properly represent the project's visual magnitude (Sheppard 1989, p. 185).

As mentioned earlier, simulations should be reproduced at a certain size and viewed at a correct distance in order for the project elements to have the appropriate visual magnitude. It appears that two simulations are to be printed to a single tabloid sheet (11-by-17 inches); the simulation would then measure approximately 6.75-by-10.1 inches. If a 50 mm lens is used on a FX DSLR camera, the horizontal angle of view is 39.6 degrees, and the viewing distance is 14.0 inches. If a 28 mm (panoramic) lens is used, the horizontal angle of view is 65.5 degrees, and the viewing distance is 7.9 inches.

Most viewers are unlikely to hold printed simulations that close to their face. It is more likely they will be held at arm's length, or as one might hold a book one is reading. The result of holding the image farther away is a reduction in the visual magnitude of the project, because critical elements, like the poles, will appear much smaller than they would if standing at that spot in the field

The VIA states that: "*The assessment of impacts to <u>scenic views</u> was based on the potential for view obstruction and the FHWA concept of sensitivity to the impact (viewer sensitivity)*." Section 7 Impacts to Scenic Views is distinct from section 6 Impacts of the <u>Aesthetic Environment</u>.

The method used to determine scenic view obstruction is unclear, but appears to involve comparing (1) areas where visual resources can be seen to (2) areas where the project can be seen. Seven scenic resources are listed in Table C-9 and represented in a visibility analysis by a polyline with an unknown number of nodes and vertices. It is unclear how the location of these lines was determined.

If we assume that the visibility of the line was determined using the procedures discussed above, it was limited to places only within a quarter mile of the project. This is inadequate. As discussed earlier, transmission facilities are visually evident and dominant at a distance of miles, not a fraction of a mile.

Figure C-7. Potential Areas Where Scenic Views May Be Impacted appears to factor in scenic view obstruction. However, the map scale makes it impossible to determine which viewpoints are expected to be impacted. There does not appear to be any evaluation of the severity or significance of the scenic view obstruction. And the results do not appear to be reported for specific viewpoints or simulations.

The VIA references Vissering et al. (2011), but appears to misunderstand the criteria it proposed. Vissering used Vermont's Quechee Analysis, a two-part test. The first part determines whether a visual impact is adverse or not. If the visual impact is adverse, the second part determines the significance. The VIA applies the three criteria listed in the second part before a determination of adversity was made and documented.

Visssering's method also calls for mitigation for all views adversely impacted by the project. It describes projects that fail to take reasonable measures to mitigate significant or avoidable impacts as "unreasonable." Yet PSE does not provide any discussion of mitigation, even where adverse impacts are acknowledged. There is some mention of general mitigation measures, but nothing specific to the impacted areas and views.

6. Bellevue Visual Impact Issues

Bellevue has regulations that appear designed to protect scenic and visual resources.

My understanding is that the proposed transmission is reviewed as a Conditional Use under Section 20.30B.140 of the Bellevue Municipal Code (BMC). Subsection B provides that the design should be "compatible with and respond to the existing or intended character, appearance. . . " *of the immediate vicinity including physical characteristics*."

The proposed transmission line certainly fails to meet this test. High voltage transmission lines are not compatible with, and do not respond to the residential neighborhood character that most of the route passes through. The height of the towers, the required tree clearing, and the conductor lines all are well outside what any reasonable person would describe as the character of these neighborhoods. The scale of the towers alone is enough to reach this conclusion. And even though the simulations provided by PSE are of suspect accuracy and quality, and consider important views, if viewed at the appropriate scale they clearly show this to be the case.

PSE's proposal rests largely on the premise that the new towers and conductors simply replace existing ones. But this premise falls apart because the existing towers are much smaller in height and diameter, and are wooden rather than steel, meaning they are much more compatible with the neighborhood character. Additionally, there will be more, and larger conductors arrayed vertically, which increases their visibility in foreground views. Taller, higher voltage lines will also require permanent tree clearing. The tree clearing does not appear to be accurately represented in the simulations provided by PSE. Regulators also need to take into account potential future tree clearing , which PSE would have a right to do within the Right of Way.

Bellevue has regulations specific to locating electrical utility facilities, including transmission lines. (Bellevue Land Use Code 20.255). " *Purpose. The purpose of this section is to regulate proposals for new or expanding electrical utility facilities and to minimize impacts associated with such facilities on surrounding areas through siting, design, screening, and fencing requirements."*

Section D. Subsection d provides a "selection hierarchy" which make the preferred location of generating and transmission facilities nonresidential zones, with residential areas the least favored site. By placing the project primarily in residential neighborhoods, including ones with covenants that protect trees and views, PSE is clearly choosing a route through already settled communities that are highly sensitive to visual impacts.

The applicant may identify a preferred site alternative in a Residential Land Use District or Transition Area (including the Bel-Red Office/Residential Transition (BR-ORT) upon demonstration that the location has fewer site compatibility impacts than a nonresidential land use district location.

The proposed corridor has significant site compatibility issues, and yet no alternative has been proposed. Multiple public perception surveys conducted over a period of decades clearly show that most of the public does not like the visual appearance of overhead transmission facilities (Anderson et al 2017). These are visually problematic facilities and have real impacts on people's enjoyment of their homes and communities.

Section E6 of the Bellevue Code states: The proposal shall provide mitigation sufficient to eliminate or minimize long-term impacts to properties located near an electrical utility facility.

The mitigation proposed by PSE is not nearly sufficient to eliminate or minimize long term aesthetic impacts to nearby properties.

Under Design Standards, Section Fb, Impacts associated with the electrical utility facility have been mitigated to the greatest extent technically feasible."

Under G, Mitigation Measures: Mitigation Measures, "*The City may impose conditions relating to the location, development, design, use, or operation of an electrical utility facility to mitigate environmental, public safety, or other identifiable impacts. Mitigation measures may include, but are not limited to, natural features that may serve as buffers, or other site design elements such as fencing and site landscaping as provided for in subsection F of this section*".

In my professional opinion, there are no natural features or opportunities for fencing or landscaping that can sufficiently mitigate the visual impacts of this project, because the core issue - scale compatibility and view interruption, cannot be mitigated through these means.

This requirement has not been met. There are technically feasible alternatives, described by others, that are technically feasible.

7. Conclusions

The Visual Impact Analysis provided in the Eastside Transmission Project EIS fails to adequately assess impacts to scenic and visual resources. The analysis has multiple technical flaws, and likely understates the degree of impact, particularly from views outside of the one-quarter mile analysis area. PSE used a flawed methodology to conduct the assessment, and then failed to properly apply this methodology.

A simple formula for determining visual impact significance is:

> ***High viewer sensitivity + high negative visual contrast (from project) + large geographic extent + long (impact) duration = significant impact.***

The number and sensitivity of viewers is readily apparent based on the number of homes and businesses in close proximity to the project, and the public record of input in which people have stepped forward to express their concerns.

High negative visual contrast is apparent based on the literature that demonstrates aesthetic issues with transmission lines and based on a review of the limited (and technically suspect) simulations provided by PSE. The new poles would be greatly out of vertical scale in the neighborhoods they pass through. They would be out of scale, from base to top. The color and texture of the poles and conductors would not match anything in the surroundings. Tree removal is substantial and there is a strong likelihood that ongoing maintenance will result in additional removal or pruning resulting in continuing impacts over time.

The geographic extent of the project is clearly large, a miles-long corridor, visible out to 5 miles, potentially impacts dozens of square miles. This is a potential eyesore that will be seen from many parts of Bellevue and Newcastle well beyond the immediate neighborhoods. PSE's analysis is not sufficient to account for these more distant views and makes a substantial and indefensible error in limiting its detailed analysis to a one-quarter mile distance from the corridor. Research demonstrates that the size and types of towers planned have high visibility out to two or more miles away, with moderate visibility to five miles (Sullivan 2014, Jones and Jones 1976).

And the impact is long term. Once the line is built, it will be there for many decades.

PSE claims that visual impacts are only "subjective" and are difficult to measure, but impact magnitude can be calculated based on a measure of the reduction in scenic quality. For example, if PSE had people rate views as they currently are (say on a 10-point scale) and then had them rate the same view based on an accurate, properly scaled simulation, they could determine the degree of negative change. But they do not appear to have made any effort to do such a measurement. An alternative method would measure the degree of contrast introduced by the new facilities, but PSE also failed to attempt this.

To summarize a few of the most important flaws in this analysis:

- The visibility assessment was not done to Best Practice standards.
- The photo simulations provided are suspect on technical grounds.
- There are no criteria for properly viewing these simulations.
- The limitation of the detailed analysis to one-quarter mile is not defensible.
- The formula for determining impacts is not properly understood or applied.
- PSE used a flawed methodology (FHWA 2015) and improperly executed it.
- Visual and scenic impacts can be objectively measured, but PSE made no effort to do so
- While the analysis does identify significant impacts along portions of the line, its findings are far too limited.
- Where impacts are identified as significant, PSE fails to provide mitigation measures adequate to minimize or compensate for these.

My professional opinion is that the potential scenic resource and visual impacts of this proposed project are clearly significant, given their extent, the number of sensitive viewers impacted, their inability to be compatible with their surroundings, and the long-term nature of the impact.

On this issue of visual and scenic impacts, regulators, before approving this project, should send PSE back to the drawing boards to improve their assessment, properly analyze the impacts using objective measures, and should require PSE to show how it plans to mitigate or avoid these impacts.

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