February 6, 2012

Sarah M. Fields
Program Director, Uranium Watch
P.O. Box 344
Moab, Utah 84532

RE: Orders of State Engineer, Permanent Change Applications 09-462 and 89-74

Subject: Independent Technical Analysis of Orders

Dear Ms. Fields;

My family and I have been Utah residents for over 30 years and I own homes in Park City and Moab. As such, I am a potential stakeholder in the proposed Blue Castle Nuclear Power Plant Project. I have carefully reviewed the documents submitted by the applicants and the protestors, as well as the Orders of State Engineer approving Permanent Change Applications 09-462 and 89-74, which are allied with water usage for the proposed project.

I have conducted an independent technical analysis of the Orders of the State Engineer and prepared the attached document which reflects my professional opinions and findings. My analysis focuses solely on the validity of the techniques that the State Engineer used to determine the adequacy of water supply for the proposed project. My analysis concludes that the methodology is fundamentally flawed, and as a consequence there is significant doubt regarding the State Engineers' primary affirmative conclusion leading to the approval of the applications.

I have undertaken this independent analysis as a concerned citizen without any compensation or remuneration from any party. I have done so as a licensed professional engineer (Texas, No. 95149), with over 40 years' experience in the engineering and construction industry. My experience extends to some of the largest power production projects in the US.

It is my understanding that Uranium Watch will be submitting a formal request for reconsideration of the Orders of State Engineer. You have my full permission to include my analysis in your submittal and it is at your sole discretion whether to do so.

Sincerely;

Lawrence R. Eichner, P.E.

1376 Silver Meadows Dr. #66, Park City UT 84098

Lawrence R. Eichner, P.E. *Curriculum Vitae*

Education
Doctoral Studies – Engineering Mechanics, Columbia University, 1968

MS – Engineering Mechanics, Columbia University, 1967

Certificate – NASA Summer Institute of Space Science, Columbia University, 1966

BS – Engineering,, CW Post College of Long Island University, 1966

Professional Registration
Professional Engineer, Texas No. 95149

Certification
National Council of Examiners for Engineering and Surveyors (NCEES)

Affiliations
Society of Fire Protection Engineers (SFPE) – Professional Member

National Fire Protection Association (NFPA) – Architects, Engineers, and Building Officials Section

Mr. Eichner's career encompasses over 42 years in project management and engineering, construction contracting, technical marketing support, and resolution of construction claims and disputes. His qualifications are the product of his strong educational background, extensive technical and business knowledge combined with his comprehensive field and contracting operations experience.

Most recently, Mr. Eichner has created a proprietary methodology for designing water spray systems for heat attenuation in oil and gas production. From 2006 to 2010, the Los Angeles Unified School District (LAUSD) engaged Mr. Eichner as a full-time construction consultant in support of its $21B new school construction and modernization program. In this capacity, Mr. Eichner assisted senior management in the resolution of complex engineering and construction issues and disputes.

Mr. Eichner has served as an on-site and home-office Senior Project/Construction Manager for prominent EPC specialty contractors. His project management experience extends to all project phases: pre-bid through contract closeout. He has written project implementation plans for Developers/Investors and performed in-depth project audits on their behalf. He has successfully resolved and completed disputed work. He has performed supplemental project support services such as independent in-progress work inspection and prepared construction status reports. In many cases his project management duties involved complete technical and financial responsibility:

His experience extends to a wide variety of major projects for municipalities and Government agencies, as well as heavy industry and commercial endeavors both in the United States and overseas.

Representative Construction Experience

LAUSD New School Construction and Modernization Program, Consultant – Los Angeles, CA
Newport Chemical Agent Storage Facility, Consultant – Newport, IN

Mystic Co-Generation Power Station, On-Site CM (fire protection) – Everett, MA
Tracy Fluidized Bed Power Plant, On-Site CM (fire protection) – Reno NV
Penuelas Co-Generation Power Station, On-Site CM (fire protection) – Ponce, PR
Intermountain Coal-fired Power Plant, On-Sit CM (fire protection) – Delta, UT
Antelope Valley Coal-fired Power Plant, On-Site CM (fire protection) – Beulah, ND
Laramie Coal-fired Power Station, On-Site CM (fire protection) – Wheatland, WY

One North Wacker Office Tower, Home-Office CM (HVAC) – Chicago, IL
U.S. Job Corps Training Center, Home-Office CM (HVAC) – Chicago IL
Chicago Symphony Hall, Home-Office CM (HVAC) – Chicago IL

Kennecott Molybdenum Extraction Facility, Contractor Branch Manager– Bingham Canyon, UT
Newmont Gold Mine Expansion, Contractor Branch Manager – Ely, NV

Hercules Rocket Motor Casting Facility, Contractor Branch Manager– Magna, UT
Delta Airlines Hanger, Contractor Branch Manager– Salt Lake City, UT

Emerald Bay Resort, Project Audit – Exuma Island, Bahamas
Kaholave Environmental Remediation, Proposal Manager - Kaholave, HI
Ft. Knox Gold Extraction Facility, Proposal Manager – Fairbanks, AK
Cyprus Coal Mine Aboveground Facility, Proposal Manager – Price, UT
Swan Hills Hazardous Waste Incineration Center, Proposal Manager – Alberta, Canada
New U.S. Embassy Center, Proposal Manager – Moscow, Russia

Atlantic Undersea Testing & Evaluation Center, Resident Civil Engineer – Andros, Bahamas
Rio Haina Power Station, Resident Civil Engineer – Rio Haina, Dominican Republic
Tanjung Priok Power Station, Pre-Construction Liaison (On-Site) – Jakarta, Indonesia
Trans-Alaska Gas Pipeline Feasibility Study, Lead Engineer – Alaska

Employment History

2010 to Present: Self employed, Park City UT, Consultant

2006 to 2010: AECOM (EarthTech), Los Angeles CA, Senior Project Director

2005 to 2006: SimplexGrinnell Fire & Security, Nationwide, Senior Project Manager

1994-2005: Technical Marketing Services, Inc., Park City UT, Principal Consultant

1990-1994: Ford, Bacon & Davis, Inc., Salt Lake City UT, Manager of Proposals

1986-1989: Grinnell Fire Protection Systems Co., Salt Lake City UT, Branch Manager

1982-1986: F.E. Moran Special Hazard Systems, Northbrook IL, Senior Project Manager

1978-1982: Grinnell Fire Protection Systems Co., Denver CO, Senior Project Manager

1977-1978: RCA Service Company, Andros Island Bahamas, Resident Civil Engineer

1974-1976: General Electric, Schenectady NY, Project/Resident Engineer

1971-1974: Capricorn Construction, Glenford NY, Consultant

1968-1971: Paul Weidlinger Consulting Engineers, New York NY, Research Engineer

Independent Technical Analysis

of

Orders of State Engineer
Permanent Change Applications 09-462 and 89-74
Blue Castle Nuclear Power Project
Green River, Utah

By

Lawrence R. Eichner, P.E.

February 6, 2012

The State Engineer has issued two Orders approving Permanent Change Applications 09-462 and 89-74. The approval is in part based on the State Engineer's belief that there is sufficient unappropriated water in the source to support the maximum additional diversion of 75 cfs for the proposed Blue Castle Nuclear Power Plant without adversely impacting current users, river ecology and biota, and recreation.

A technical analysis of subject Orders calls into question the veracity of State Engineer's conclusions because the techniques employed in determining the adequacy of the water supply are fundamentally flawed. The Orders use techniques that are not in agreement with current recommended practices for hydrologic investigations, as described in the following documents:

- NRC Draft Regulatory Guide DG-4021, *General Site Suitability Criteria for Nuclear Power Stations*.
- US Geologic Survey, *Techniques of Water-Resources Investigations Reports*, Book 4 Hydrologic Analysis and Interpretation, Sections A & B.

NRC Draft Regulatory Guide DG-4021 states:

> "This guide discusses the major site characteristics related to public health and safety and environmental issues that the NRC staff considers in determining the suitability of sites for light-water-cooled nuclear power stations. This guide provides a general set of safety and environmental criteria that the NRC staff has found to be valuable in assessing candidate site identification in specific licensing cases.
>
> Hydrology - Water Availability
> The limitations imposed by existing laws or allocation policies govern the use and consumption of cooling water at potential sites for normal operation. Consumption of water may necessitate an evaluation of existing and future water uses in the area to ensure adequate water supply during droughts for both station operation and other water users.
>
> The availability of essential water during periods of low flow or low-water level is an important initial consideration for identifying potential sites on rivers, small shallow lakes, or along coastlines. Both the frequency and duration of periods of low flow or low water level should be determined from the historical record and, if the cooling water is to be drawn from impoundments, from projected operating practices.
>
> Streamflow records might not cover a sufficiently long period to encompass major droughts or the probable minimum flow for the region. Statistical techniques may be used to extend and complement the period of record to help identify the expected minimum low flow for the region. The U.S. Geological Survey hydrologically based 7Q10 low-flow condition from regional streamflow historical records can be used for screening-level analysis. This statistical method is based on selecting and identifying an extreme value as the lowest 7-day average flow in a 10-year period. There is a 65-percent chance that a 7Q10 minimum flow will occur in any 10-year period."

The NRC Guide cites US Geologic Survey, Chapter Bl, *Low-Flow Investigation,* by H. C. Riggs as a reference for techniques to determine water availability. Riggs states:

> "The adequacy of streamflow to supply requirements for disposal of liquid wastes, municipal or industrial supplies, supplemental irrigation, and maintenance of suitable conditions for fish is commonly evaluated in terms of low flow characteristics.
>
> Low-flow characteristics at a gaging station may be described by frequency curves of annual or seasonal minimum flows, by duration curves, and by base-flow recession curves."

The Orders' affirmative conclusions regarding availability of water are inappropriately based on average flows, annual mean flow, and misleading exceedance percentages. This questionable methodology is contrary to the accepted practice of using statistical techniques, which are cited in the above references and are based on historical low flow records, to determine the probable minimum water flow at the proposed point of diversion. Consequently, the Orders mischaracterize and grossly overstate the availability of water during predictable low flow conditions. In turn, the collective impacts at these low flow conditions are incorrectly characterized and evaluated, calling into question the Orders' affirmative conclusions.

The Orders state that flows as low as 500 cfs have been recorded in the Green River near the proposed point of diversion. A presentation by Blue Castle Project proponents cites a recorded minimum flow of 418 cfs, which occurred sometime after the construction of the Flaming Gorge Dam. An analysis of water availability and potential environmental impacts should be conducted at some validated baseline low flow condition along with a conservative additional flow depletion based on a stochastic analysis of a major drought occurring during the proposed plant's life-cycle. Both the NRC and USGS recommend performing the latter analysis which would allow the State Engineer to avoid acknowledging "climate change" and allied impacts.

The Orders employ average and annualized data as well as generalized statements regarding the larger Colorado Basin's flows rather than actual, local low flow conditions at the point of diversion on the Green River. Overall, this technique tends to overstate water availability and minimize potential impacts to current users, the river environment, and recreational usage. This is a pervasive fundamental flaw and it could adversely affect the State Engineers affirmative conclusion as well as specific conclusions regarding the following topics under consideration:

1. Colorado River Allocation
2. Local Appropriation of the Green River at Green River, Utah
3. Climate Variability
4. Recreation
5. Natural Stream Environment

The discussion that follows specifically identifies the fundamental flaws in each of the above topics.

1. Colorado River Allocation

The Orders state that Utah currently underutilizes its 1.4 MAF/yr share of the Colorado River allocation based on current depletion rates of 1.0MAF/yr. However, the Orders go on to state Utah water right records indicate over 2MAF/yr depletion is possible if the rights were to be developed. The Orders acknowledge that curtailment of the proposed depletion may be necessary in the future as a result of increased water use and hydrologic factors.

The Orders fail to address or analyze under what conditions increased water usage will precipitate forced curtailment. Perhaps more importantly, the Orders fail to present a quantitative analysis or even an acknowledgement of the "hydrologic factors" - duration and frequency of low flow conditions that would cause curtailment. Curtailment of the proposed water rights would indeed force a plant shut down. Furthermore, although there appears to be an administrative mechanism for determining curtailment quantities and timing, the Orders do not provide any assurance that curtailment objectives can be achieved in a timely manner without incurring prior adverse impacts to current users, river environment and recreation due to exacerbated low flow conditions.

The Orders offer a generalized discussion of water storage projects in the Colorado River Basin. The projects "currently allow for storage of four times the mean annual flow of the river" providing flexibility to capture above average flows during good water years.

The Orders fail to specifically address the storage capacity of projects on the Green River in relation to mitigating low flow conditions at the point of diversion. The primary storage project is Flaming Gorge Dam, which is operated by the US Bureau of Reclamation. During the record drought of August 2002, the dam was releasing about 800 cfs but about 700 cfs was recorded at the proposed point of diversion, which included the additional flow from all upstream tributaries. The Orders generalized statements about the Basin's storage capacity does not correctly portray actual or projected low flow conditions along the Green River.

2. Local Appropriation of the Green River at Green River, Utah

The Orders state that for the full historical record of USGS Station at Green River the annual mean flow of the river is 6,048 cfs. The project could divert up to 74 cfs. The Orders go on to claim that based on historical flow records there has always been sufficient water for the project and the additional depletion would be about 1.22% of the annual mean volume.

The Orders acknowledge that flows as low as 500 cfs have been recorded but fail to analyze this low flow condition. As a result of basing conclusions on annual mean flow, the impact of the proposed additional depletion is vastly understated and incorrectly characterized. During a prolonged low flow condition without any additional depletion due to drought severity or upstream water right development, the additional 74 cfs maximum depletion from the project would be about 15% of the daily flow.

There is the potential for development of a significant amount of senior water rights upstream of the project. Due to a numerical error in the Orders, the potential depletion can not be determined. However, the impact on the daily flow increases when those additional upstream

depletions are included. Although there might be sufficient water to operate the plant during low flow conditions, the resulting adverse impact to existing diversions needs to be properly addressed.

3. Climate Variability

The Orders acknowledge the existence of climate model studies and other allied studies pointing to a potential decline in future availability of water. The Orders state, "The State Engineer is not aware of any available predictive model has been scientifically validated as a definitive predictor of future conditions."

The State Engineer's observation about climate modeling is perhaps true. However, discounting the potential for a major drought that is more severe than the historical records is contrary to NRC and USGS recommendations regarding statistical calculations of the probable minimum flow for a region. Aside from failing to take into account actual low flow records, the Orders also reject the likelihood that lower flows could occur sometime in the future. Reducing the actual minimum flow by some statistical factor and conducting an appropriate impact analysis reflects conservative engineering judgment consistent with the unique circumstances presented by this significant project.

4. Recreation

The Orders rely on statements and analysis presented by the applicant (BCH) to reach affirmative conclusions rather than an independent analysis. The Orders state that the applicant presented information "that showed less than a few inches of change to water depth … during average water years." And the State Engineer concludes, "Based on the analysis provided by the applicant, it is unlikely that the withdrawal of an additional 75 cfs of flow from the Green River will impact recreational rafting on the Green River."

The applicant did not use the techniques recommended by the NRC and USGS to determine the probable minimum flow conditions. In view of the importance of recreation to the region as well as the significance of this project, the State Engineer should have conducted an independent analysis of the hydrologic variability at the point of diversion using the techniques recommended by the NRC and USGS rather than relying on the applicant's methodology. As such, the State Engineer's affirmative conclusions are inappropriately based on a flawed analysis provided by the applicant.

5. Natural Stream Environment

The Orders rely on statements and analysis presented by the applicant to reach affirmative conclusions on this crucial concern. In addition, the Orders contain a circuitous acknowledgement of potential environmental impacts at unspecified low flow conditions, but shift responsibility for a conducting a complete analysis to federal agencies - the NRC and USFWS, as well as mitigation of potential impact to the Bureau of Reclamation, thereby evading the analysis and relinquishing stewardship of Utah's natural resources. The State Engineer's statements about this important issue do not support or justify his affirmative conclusion.

The Orders state, "BCH states that the scientific evidence presented shows an additional 70 cfs diversion produces a minimal impact to the river system resulting in small changes in the surface elevation of the river at flow rates of 1400 cfs and above which are exceeded 95% of the time."

The Orders go on to state that during drought years flows have typically fallen below the 1300 cfs base flow target recommended by USFWS. Further, the State Engineer opines that there is sufficient flow during most periods to satisfy the USFWS recommended flows but acknowledges that there are periods when the flows drop below the target flow. And, the State Engineer goes on to state "Approval of this application has the potential to exacerbate the low flow condition."

Based on the above rationale, the Orders conclude in the affirmative, "The State Engineer is of the opinion that the natural stream environment and endangered fish habitat through this stretch of the river will not unreasonably be impacted by this application."

The preservation of the Utah's natural stream environment is and will continue to be of prime importance to all stakeholders, including the NRC and USFWS. This is a critical concern that warrants an independent, screening level analysis of the potential adverse impacts allied with the proposed additional depletion. It is entirely misleading to evaluate the impact of the additional diversion at flows of 1400 cfs and above, which represent 95% exceedance. The impact should be analyzed at the lowest probable flow condition per NRC and USGS techniques along with quantification of the frequency and duration of those periods when flows actually or potentially drop below base target levels of 1300 cfs. Consequently, the Orders fail to correctly quantify how the proposed additional depletion exacerbates the impacts to the river environment and biota during low flow conditions.

In summary, the Orders improperly employ criteria such as; average flow, mean annualized flow, etc., to quantify the availability of water for the proposed additional depletion. This technique is contrary to methods recommended by the NRC and USGS, which use criteria allied with probable low flow conditions. As a result, the Orders overstate the availability, which in turn alters the basis for the affirmative conclusions regarding potential impact to current users, the river environment and biota, and recreational use. Collectively the fundamental flaws produce significant doubt and uncertainty about the State Engineers' primary affirmative conclusion leading to the approval of the applications.